

*Fukushima-is-still-news*

- vol. 1 -

# **Daiichi Nuclear Plant**

## **2012-2014**



**Odile Girard**



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# INTRODUCTION

J'ai « découvert » l'écologie au début des années 70, croisant dans le même temps la pollution, les luttes paysannes et la malbouffe, la médecine qui avait (déjà) perdu son âme, les mouvements sociaux et bien sûr le nucléaire qui a occupé une grande partie de ma vie.

Après la catastrophe de mars 2011 au Japon, j'ai suivi chaque jour une partie des grands journaux japonais anglophones pour essayer de sauvegarder un maximum d'articles ayant trait à Fukushima. L'idée était de conserver une sorte d'archive accessible à tous, qu'ils soient écrivains, journalistes ou tout simplement intéressés.

Le blog « [Fukushima-is-still-news](#) » a été poursuivi jusqu'en 2019. Ci-dessous la conclusion parue le jour où j'ai décidé d'arrêter mon blog.

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## **End of March 2019: Time to stop this blog**

29 Mars 2019

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### **End of March 2019: Time to stop this blog**

I have been collecting and spreading information on the Fukushima disaster for more than 8 years.

More than ever I am convinced that the name of my blog « Fukushima-is-still-news » was aptly chosen. Or perhaps i should have called it « Fukushima should still be news ». What i'm getting at is that i know the disaster is going on and we cannot simply forget Fukushima and turn the page. But the mode of action I chose 8 years ago has its limits and it is time for me to stop this blog.

I don't want the contents to be lost, so I will try and publish the lot with the Éditions de Fukushima so that the information remains available online.

Good bye for now. I am not doing a disappearing act. I'm still there tracking what's going on in the world of nukes.

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C'est maintenant chose faite. Le blog fukushima-is-still-news est désormais disponible aux Éditions de Fukushima. Une fois de plus merci à mon ami Pierre, qui m'a convaincue à l'époque de tenir ce blog et m'a aidée à le lancer.

Le présent volume est le premier d'une collection de 16 ouvrages qui seront édités petit à petit.

Vol. 1 : Daiichi Nuclear Plant (1)

Vol. 2 : Daiichi Nuclear Plant (2)

Vol. 3 : Radioactive Fallout And Waste  
No.4 Fuel Removal  
Nuclear Workers  
UN Conference

Vol. 4 : Nuke Safety (1)

Vol. 5 : Nuke Safety (2)

Vol. 6 : Reprocessing  
Storage Nuclear Waste  
Decommissioning

Vol. 7 : Practical Problems For The Japanese Population (1)

Vol. 8 : Practical Problems For The Japanese Population (2)

Vol. 9 : Practical Problems For The Japanese Population (3)

Vol. 10 : Health Effects Of Radiation  
Collateral Effects

Vol. 11 : Anti-Nuclear Activity-Opinion

Vol. 12 : Vested Interests - Transparency - Corruption (1)

Vol. 13 : Vested Interests - Transparency - Corruption (2)  
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# Why this new blog? Feb 12, 2012

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Depuis presque un an, je “scanne” au moins deux fois par jour une partie de la presse japonaise qui parait en anglais, pour essayer de comprendre ce qui se passe à Fukushima. Les articles que vous trouverez sur ce blog proviennent principalement de :

- The Yomiuri Shimbun (**Daily Yomiuri Online**)
- The **Mainichi Daily News** et
- **NHK World English** (le Service de diffusion internationale du Japon)

Je suis toujours très étonnée de voir que les journaux japonais continuent à publier régulièrement des articles sur Fukushima, alors qu’en France, le consensus semble être que tout va bien là-bas, qu’il n’y a pas à s’inquiéter, bref, que la catastrophe nucléaire japonaise n’est plus d’actualité. D’où le titre de ce blog.

Il m’aura fallu tout ce temps pour me décider à ouvrir un blog et partager les informations collectées au fil des jours avec d’éventuels intéressés. Sur ce blog, je ne suis remontée qu’à la fin janvier, mais j’ai sauvegardé tous les articles depuis le 11 mars 2011 et ils sont à la disposition de tous (par ordre chronologique, mais sans classement).

J’ai choisi, pour le moment, de classer les informations en cinq catégories :

1. **L'état de la centrale de Fukushima Daiichi** (fuite, état des installations, problèmes de maintenance, fusion des cœurs, etc.)
  2. **Rejets et déchets radioactifs** (dans l'atmosphère, dans la mer, déchets solides, incinération, traitement des déchets, stockage, décontamination etc.)
  3. **Effets des radiations sur la santé** (études médicales, dosimètres, évolution des normes, décès et problèmes sanitaires touchants les ouvriers de TEPCO)
  4. **Problèmes pratiques pour la population japonaise** (évacuation, compensation, problèmes liés à l'alimentation, à l'agriculture, hotspots, vie quotidienne des enfants, etc.)
  5. **Liens d'intérêt et corruption** (liens entre le gouvernement japonais et l'industrie nucléaire, manque de transparence, retards dans la publication de l'information, sous-traitance, contrats de travail illégaux, subventions touchées par les villes qui acceptent une centrale nucléaire sur leur territoire etc.)
- 

## FOR MY ENGLISH-SPEAKING READERS

For almost a year now I have been checking – at least twice a day - part of the Japanese press in English for news of Fukushima. In this blog you will find articles which were for the most part found in:

I never cease to be amazed at how much information still crops up in Japanese newspapers, while the consensus in the French press seems to be that the situation at Fukushima is all under control and hardly ever makes “the news” any more. Hence the title of this blog.

It's taken me all this time to dare launch a blog to share this info with those who may be interested. The entries only start around the beginning of February 2012. However should anybody be looking for older articles, I have kept most of them (in chronological order but without any attempt at classification).

I have - for the time being - chosen to file the info collected under 5 headings :

1. **The Fukushima Daiichi plant** (leaks, overall state of the facilities, maintenance, meltdown, etc.)
2. **Radioactive fallout and radioactive waste** ( in the air, in the sea, solid waste, incineration, waste treatment, storage, decontamination problems, etc.)
3. **Health effects of radiation** (medical reports, dosimeters, evolution of standards, deaths and health problems affecting TEPCO nuke workers)
4. **Practical problems for the Japanese population** (evacuation, compensation schemes, food-related problems, local agriculture, hotspots, everyday life for children etc.)
5. **Vested interests and corruption** (links between the Japanese government and the nuclear industry, lack of transparency, delays in making information public, subcontracting, illegal labour deals, subsidies to towns hosting nuclear plants, etc.)

## New categories

March 4, 2012

The five categories chosen when I started the blog have proved too limited to accommodate the variety of articles on Fukushima. I therefore added one new category a little while ago:

**Collateral effects** (consequences which have not been immediately obvious or were not to be expected)

I will also from now on include a category:

**Anti-nuclear activity/opinion**

## Introduction

Not a day without one or several articles on the issue of restarting -or not - the (shutdown) nuclear plants in Japan.

I am therefore adding a new category to this blog: "**Start again ?**"

Those who check the blog regularly may have noticed that I had recently added a new category to cover the info on antinuke activity and/or opinion in Japan.



## **UPDATE (end of March 2013) :**

Readers will have noticed that I also regularly use articles from:

- **The Japan Times**
- **The Asahi Simbun AJW** (Asian and Japan Watch)

I have also in the meantime added some new categories. It is sometimes difficult to choose which category an article should come under since these categories inevitably overlap at times.

**Anti nuclear opinion/activity**

**Start again ?**

**New techniques & renewable energies**

**Reprocessing**

**Nuke safety**

**Nuclear future**

## **This blog is 3 years-old today**

yes, three years of "faithful" reporting.  
and four of keeping track of what's happening at Fukushima after the 3/11 disaster.

## **Four years...**

**This blog is actually 4 years old today.**

That is without counting the first year of archives on Fukushima.

A birthday should be an opportunity to celebrate, but WHAT is there to celebrate in the disastrous aftermath of 3/11 ?

It is getting more and more obvious that this could go on for many more years/decades (centuries?).

I'm not sure what to do about this blog. The only thing I know for sure is that I don't want to be keeping it forever. When - hopefully in 40 years - the Fukushima plant is finally dismantled, I certainly won't be alive. Any suggestions/bright ideas ? Thx.

## Personal (and final) communication

I have decided to end my blog on March 11, 2016, fifth anniversary of the Fukushima disaster. The date is of course symbolic and marks for me 5 years of hard, often depressing work. For the past five years, I have kept an eye on the English-speaking Japanese press for any article related to Fukushima (and the nuclear power industry in Japan).

The idea was - originally - to keep some sort of archive which could be used for instance by somebody wanting to write a book on Fukushima or to check how transparent information on nukes is or whatever. But this never materialised.

After all this time i still don't know who my readers are or what they do with my work. And the way I work involves daily checks for fear of missing some articles. On the whole maybe not the most efficient time investment.

Not a rhythm i can afford to keep for another xxx ( ???) years.

I want to keep all this info available to the public so we are thinking, with several colleagues/friends also involved in the aftermath of 3/11, of making an e-book. The info must simply not be allowed to evaporate.

## End of March 2019: Time to stop this blog

I have been collecting and spreading information on the Fukushima disaster for more than 8 years.

More than ever I am convinced that the name of my blog « Fukushima-is-still-news » was aptly chosen. Or perhaps i should have called it « Fukushima should still be news ». What i'm getting at is that i know the disaster is going on and we cannot simply forget Fukushima and turn the page. But the mode of action I chose 8 years ago has its limits and it is time for me to stop this blog.

I don't want the contents to be lost, so I will try and publish the lot with the Éditions de Fukushima so that the information remains available online.

Good bye for now. I am not doing a disappearing act. I'm still there tracking what's going on in the world of nukes.

# Daiichi Nuclear Plant

## 2012-2014

January 29, 2012

### **TEPCO ordered to prevent water leaks at reactors**

NHK World English

Japan's nuclear safety agency has instructed the operator of the Fukushima Daiichi nuclear plant to prevent water leaks at the plant.

The move follows the discovery of water leaks on Sunday in 14 locations at the damaged plant.

Tokyo Electric Power Company says about 40 liters of water leaked from a cooling system for a spent fuel pool at the No. 4 reactor, forcing the system to stop for one hour and 40 minutes. The utility also says that 7 tons of water leaked from the No. 6 reactor.

The company says that the leakages apparently occurred after frozen water in pipes loosened the pipes' connections or broke some parts.

The company adds that the leaked water did not contain radioactive materials or had already been processed to remove them.

Similar water leaks occurred in 3 locations at the plant on the previous day.

Responding to the agency's call for preventive measures, TEPCO has decided to conduct frequent checks on early mornings when temperatures often drop below zero and protect pipes from the cold with



insulation materials or heaters, if necessary.

The utility says measures are already in place to protect critical systems, such as those used for cooling reactors.

### **Frozen water blamed for leaks at Fukushima plant**

Tokyo Electric Power Company has found water leaks in 14 locations at the Fukushima Daiichi nuclear plant.

The utility says the leaks apparently occurred after frozen water ruptured the pipes and the leaked water did not contain any radioactive materials.

Tokyo Electric said about 40 liters of water leaked from a cooling system for a spent fuel pool at the No.4 reactor on Sunday, but the flow stopped when workers closed the valve.

The company said the leak forced the system to stop for one hour and 40 minutes, but the pool's temperature did not rise.

Tokyo Electric said 7 tons of water had leaked from the No.6 reactor.

The temperature fell to minus 8 degrees Celsius on Sunday morning near the damaged plant.

Ruptured pipes caused 3 water leaks on the previous day.

Tokyo Electric official Junichi Matsumoto admitted that the utility failed to take sufficient steps to prevent frozen pipes. He said it will take quick action to protect the pipes from the cold weather.

January 30, 2012

### **More water leaks found at Fukushima nuclear plant**

NHK World English

More water leaks have been found at the troubled Fukushima Daiichi nuclear power plant.

Tokyo Electric Power Company told reporters on Monday morning that it has discovered 2 additional water leaks at the nuclear plant.

This comes after it was announced on Sunday that nearly 8 tons of water was found to have leaked in 14 locations at the plant.

One of the 2 new findings involves about 30 liters of water that has leaked from a device that is removing salt from contaminated water. The other leak is from a valve of a pipe that is injecting water into a reactor.

TEPCO says leaked water has neither spilled out of the plant, nor flowed into the sea.

The utility firm is trying to determine whether water in some of the pipes froze and cracked the pipes, or loosened the pipes' connections.

It plans to quickly implement preventive measures, including carrying out more patrols early in the morning and **wrapping insulation around the pipes and other equipment. !!!!!!!**

The temperature on Monday morning around the plant dropped to minus 8.7 degrees Celsius.

January 31, 2012

## **Govt plans Fukushima decontamination test-run**

NHK World English

Japan's Environment Ministry has unveiled a model project designed to decontaminate areas with high levels of radiation around the crippled Fukushima Daiichi nuclear plant.

In a test-run for a wider clean-up, the ministry will first try to decontaminate 3 closed sections of a national expressway running through the no-entry zone near the plant.

The ministry last week announced a 2-year plan to decontaminate by March 2014 some evacuation zones where radiation levels have dropped below 50 millisieverts per year.

Radiation levels over a total 5 kilometers of expressway slated for the new project have ranged from a little to substantially above 50 millisieverts a year.

The ministry plans to assess the project's effectiveness in a test-run from the middle of March through July.

February 2, 2012

## **TEPCO says 8.5 tons of water leaked from Fukushima No. 4 reactor**

<http://mdn.mainichi.jp/mdnnews/news/20120202p2g00m0dm028000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Wednesday that 8.5 tons of radioactive water leaked from the No. 4 reactor of the crisis-hit Fukushima Daiichi power plant because a pipe connected to the reactor dropped off, but added that the liquid has not flowed outside the reactor building.

At the time of the devastating earthquake and tsunami last March 11, the reactor's fuel rods were in its spent fuel pool due to maintenance work that was taking place. The water contains radioactive materials as it is mixed up with water that is in contact with the fuel in the spent fuel tank.

According to the utility known as TEPCO, water was found to have leaked onto the floor of the No. 4 unit building at 10:30 p.m. Tuesday. The leak was stopped at 10:43 p.m. by closing a valve, officials said.

The total amount of leakage from the reactor was initially estimated to be 6 liters, but the utility revised the figure later Wednesday, adding that the leakage appears to have started at around 5 p.m. Monday. The pipe may have dropped off because water inside increased in volume as it turned into ice due to cold temperatures.

The utility plans to check whether there are similar cases in the other crippled reactors. The Nos. 1 to 3 reactors have fuel inside, which is believed to have melted in the early phase of the nuclear crisis because the plant lost its cooling functions following the natural disasters.

The No. 4 unit also lost the function to cool its spent fuel pool, but no serious damage is believed to have occurred in the fuel stored there.

### **Radioactive water leaking from inside Fukushima No. 4 reactor**

<http://mdn.mainichi.jp/mdnnews/news/20120201p2g00m0dm150000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Wednesday that it has found radioactive water leaking from a broken pipe connected to the No. 4 reactor of the crisis-hit Fukushima Daiichi power plant, but added that the liquid has not flowed outside the reactor building.

At the time of the devastating earthquake and tsunami last March 11, the reactor's fuel rods were in its spent fuel pool due to maintenance work that was taking place. The water contains radioactive materials as it is mixed up with water that is in contact with the fuel in the spent fuel tank.

According to the utility known as TEPCO, about 6 liters of water were found to have leaked onto the floor of the No. 4 unit building at 10:30 p.m. Tuesday. The leak was stopped at 10:43 p.m. by closing a valve, officials said.

The utility is looking into the cause of the damage to the pipe and believes it may have some connection with the recent cold weather or the explosions that took place at the plant in the early phase of the nuclear crisis.

The density of radioactive substances included in the water is estimated at 35.5 becquerels per cubic centimeter, according to TEPCO.

February 3, 2012

## **Safety checks to begin at Fukushima Daiichi plant**

NHK World English

Japan's nuclear safety agency will begin inspecting the Fukushima Daiichi nuclear plant from Monday to see if it can safely remain in a state of cold shutdown.

Officials from the Nuclear and Industrial Safety Agency plan to check equipment and contingency preparations by examining manuals and interviewing workers during their three-week inspections.

Among the seven types of equipment to be checked is a reactor cooling system that recycles decontaminated water from the facility.

Another is a nitrogen-injection system to prevent hydrogen explosions within the disabled reactors.

Agency officials say they will open the onsite inspections to the media. The checks will be the first safety tests required under law since the March 11th accident.

The government declared on December 16th that the Fukushima Daiichi reactors had achieved a state of cold shutdown.

This means reactor temperatures have stabilized below 100 degrees Celsius, and the release of radioactive substances has been contained.

February 4, 2012

## More leaks found at crippled Japan nuclear plant

<http://mdn.mainichi.jp/mdnnews/news/20120204p2g00m0dm015000c.html>

TOKYO (AP) -- Leaks of radioactive water have become more frequent at Japan's crippled nuclear power plant less than two months after it was declared basically stable.

The problem underlines the continuing challenges facing Tokyo Electric Power Co. as it attempts to keep the Fukushima Dai-ichi nuclear plant under control. A massive earthquake and tsunami badly damaged the plant last March, resulting in the melting of three reactor cores.

Workers spotted a leak Friday at a water reprocessing unit which released enough beta rays to cause radiation sickness, TEPCO spokesman Junichi Matsumoto said. He said no one was injured and the leak stopped after bolts were tightened on a tank.

Matsumoto said TEPCO also found that 8.5 tons of radioactive water had leaked earlier in the week after a pipe became detached at Unit 4, one of the plant's six reactors. The company earlier had estimated that only a few gallons (liters) had leaked.

He said officials are investigating the cause of that leak, but that it was unlikely the pipe had been loosened by the many aftershocks that have hit the plant.

The structural integrity of the damaged Unit 4 reactor building has long been a major concern among experts because a collapse of its spent fuel cooling pool could cause a disaster worse than the three reactor meltdowns.

Cold winter weather has also caused water inside pipes to freeze elsewhere at the plant, resulting in leaks in at least 30 locations since late January, Matsumoto said.

Officials have not detected any signs of radioactive water from the leaks reaching the surrounding ocean. Sandbag walls have been built around problem areas as a precaution. [don't worry, everything is safe] More than 100,000 people around the plant fled their homes after the disaster due to radiation fears.

The government announced in December that the plant had reached "a cold shutdown condition" and is now essentially stable.

On Monday, six inspectors from the government's Nuclear and Industrial Safety Agency will begin an inspection of the plant to ensure its continued stability. They will study the reactors' cooling functions and measures to prevent explosions and nuclear chain reactions, among other steps to keep the plant under control, officials said.

February 6, 2012

## **Temperature at No.2 reactor remains high**

[http://www3.nhk.or.jp/daily/english/20120206\\_29.html](http://www3.nhk.or.jp/daily/english/20120206_29.html)

Attempts to cool the temperature in the No. 2 reactor of the disabled Fukushima Daiichi nuclear power plant have only partially succeeded despite the injection of more cooling water.

The temperature in the reactor has gradually risen from about 45 degrees Celsius registered on January 27th.

In the past 4 days, the temperature has climbed more than 20 degrees to above 70 degrees.

The plant operator, Tokyo Electric Power Company began pumping more water into the reactor at around 1:30 AM on Monday. But at 7 AM, the temperature stood at 73.3 degrees and at 5 PM, 69.2 degrees.

The utility firm says 2 other thermometers elsewhere in the reactor gave readings of about 44 degrees.

TEPCO says the rise in temperatures indicate that the flow of water in the reactor may have changed direction after plumbing work, and is no longer able to properly cool down the melted down nuclear fuel.

However, the utility says radioactive xenon has not been detected in gases around the reactor, and that nuclear criticality is not taking place.

The government and TEPCO announced in December that the 3 troubled reactors at the Fukushima plant had reached a state of cold shutdown with their temperatures below 100 degrees. But the situation inside the reactors remains unclear.

New regulations established after the state of cold shutdown was achieved require the utility to keep temperatures inside the reactors below 80 degrees.

TEPCO says it will increase the amount of water being injecting into the reactor to see if the temperature in the reactor drops.

The government's Nuclear and Industrial Safety Agency says there is a need for a comprehensive study to determine whether the reactor is actually in a state of cold shutdown. It says a brief reading of over 80 degrees on one of the thermometers does not necessarily mean there is trouble in the cooling system.

Meanwhile, the Chairman of the Nuclear Safety Commission, Haruki Madarame, says that a recurrence of nuclear criticality is unlikely.

But he criticized TEPCO and the nuclear safety agency for their handling of the matter. He says they are failing to properly explain the state of the reactors to the people.

## **Temperature rises at Fukushima No.2 reactor**

[http://www3.nhk.or.jp/daily/english/20120206\\_17.html](http://www3.nhk.or.jp/daily/english/20120206_17.html)

The operator of the Fukushima Daiichi nuclear plant says the temperature in the No.2 reactor remains high despite the injection of additional water.

A thermometer at the bottom of the reactor showed 73.3 degrees Celsius on Monday morning. It was around 45 degrees on January 27th and 71.7 degrees at 4 PM on Sunday.

Tokyo Electric Power Company began injecting 10.6 tons of water per hour from around 1:30 AM on Monday. That's one ton more per hour than before.

The utility says 2 other thermometers placed at the bottom of the reactor have been giving readings of about 44 degrees.

It says the flow of water in the reactor may have changed after plumbing work, causing difficulties in cooling the nuclear fuel.

In December last year, the government and TEPCO declared the 3 reactors at the Fukushima Daiichi plant had been successfully put into a state of cold shutdown as their temperatures had fallen below 100 degrees. But the situation inside the reactors remains unknown.

TEPCO says the regulations set after the state of cold shutdown was achieved require the utility to keep temperatures inside the reactors below 80 degrees.

So it says the No.2 reactor is still in the state of cold shutdown.

February 7, 2012

## **Temperature remains high at damaged reactor**

[http://www3.nhk.or.jp/daily/english/20120207\\_21.html](http://www3.nhk.or.jp/daily/english/20120207_21.html)

An unknown rise in temperature at one of the reactors at the damaged Fukushima nuclear plant is troubling its operator. Tokyo Electric says the temperature hasn't gone down even after it increased the volume of cooling water on Tuesday.

One of the thermometers at the bottom of reactor No. 2 at the Fukushima Daiichi plant gradually rose to about 70 degrees Celsius since January 27th. It had stayed around 45 degrees before.

In an effort to lower the temperature, the operator increased the amount of water sprayed on the nuclear fuel by 3 tons to 13.5 tons per hour Tuesday morning.

But Tokyo Electric said readings were down only about 3 degrees after some 5 hours of operation, hardly showing signs of improvement.

The utility said the flow of water in the reactor may have changed after plumbing work in late January, causing difficulties in cooling part of the melted nuclear fuel.

It added that no temperature rise has been observed at 2 other thermometers in the same reactor and that it will continue to carefully monitor the reactor.

TEPCO has been unable to visually confirm conditions inside the reactors since the nuclear disaster last March because of high radiation.

### **TEPCO increases water injection in reactor showing temperature rise**

<http://mdn.mainichi.jp/mdnnews/news/20120207p2g00m0dm147000c.html>

TOKYO (Kyodo) -- Workers at the crippled Fukushima Daiichi power plant on Tuesday raised the amount of water injected into the No. 2 reactor to the highest level since the plant achieved a stable state of cold shutdown in December, as concerns grew over the rising temperature recently detected at the bottom of the reactor's pressure vessel.

Following the move, the temperature measured at the same spot on the vessel dropped to 69.0 C at 10 a.m. from 72.2 C logged at 5 a.m., Junichi Matsumoto, spokesman for plant operator Tokyo Electric Power Co. told a press conference, but added that the company needs more time to assess the effect of the latest step.

"It is difficult to judge whether the temperature is rising or dropping unless we monitor the development for about a day," Matsumoto said.

TEPCO said it increased the amount of injected water at 4:24 a.m. Tuesday. The No. 2 reactor is now being cooled with the injection of 13.5 tons of water per hour, up from 10.5 tons.

Nuclear disaster minister Goshi Hosono told a press conference that TEPCO is making utmost efforts to lower the temperature.

Touching on last month's change in the amount of coolant water at the No. 2 reactor for pipe replacement, which is believed to have affected the temperature, Hosono said, "This was a process to enhance stability, but it has become clear that there is a possibility of (replacement work) creating an unstable situation temporarily."

"We have to consider in an even more careful way," he said.



TEPCO's Matsumoto said he believes the No. 2 reactor is maintaining a state of cold shutdown, because the temperature is not rising continuously. Readings on two other thermometers checking the temperature of the bottom of the pressure vessel were around 40 C as of 10 a.m.

A cold shutdown is defined by the Japanese government as a situation in which the bottom part of a reactor pressure vessel is kept below around 100 C and radiation exposure from the release of radioactive substances is significantly held down.

At the Fukushima Daiichi plant in northeastern Japan, the Nos. 1 to 3 reactors have suffered meltdowns as a result of the loss of their key cooling functions in the wake of the devastating earthquake and tsunami on March 11 last year.

TEPCO is now injecting water into the three crippled reactors through a new water circulation system installed after the accident.

February 8, 2012

### **TEPCO injects more water into reactor**

<http://www.yomiuri.co.jp/dy/national/T120207005567.htm>

Tokyo Electric Power Co. has increased the amount of water being injected into the No. 2 reactor at the Fukushima No. 1 nuclear power plant because the temperature at the base of the pressure vessel has been rising, the company said Tuesday.

The 13.5 tons being injected each hour to cool the reactor--an increase of three tons--is the most since the government announced the crippled plant had achieved a stable state of cold shutdown in December.

According to the utility, after increasing the amount of water being injected at 4:30 a.m. Tuesday, the temperature at the vessel's base has been fairly constant: It was 72.2 C at 5 a.m. and 69 C at 10 a.m. The temperature at the base of the vessel had been 45 C as of Jan. 27, but began rising earlier this month.

TEPCO is investigating the cause of the higher temperature.

### **Temperature decreasing inside Fukushima reactor**

[http://www3.nhk.or.jp/daily/english/20120208\\_26.html](http://www3.nhk.or.jp/daily/english/20120208_26.html)

Tokyo Electric Power Company says it has been able to lower the temperature inside the No.2 reactor at the troubled Fukushima Daiichi nuclear power plant by increasing the amount of water being injected into it.

TEPCO had been struggling to deal with rising temperatures inside the reactor. A thermometer located at

the bottom of the reactor read 45 degrees Celsius on January 27th, but rose to over 70 degrees on Sunday. The cause is unknown, and two other thermometers at the reactor have shown no such increase.

TEPCO said on Wednesday that the temperature inside the reactor was 66.7 degrees at 5 AM, 5.5 degrees lower than a day earlier. The temperature gradually declined after the company increased the rate of water injection by 3 tons to 13.5 tons per hour on Tuesday.

Such a high rate of injection has not been used since just after the nuclear crisis began last March.

TEPCO says the temperature inside the reactor rose slightly to 68 degrees at 10 AM, but it is still dropping overall.

The utility cannot determine the exact situation inside the reactor or the cause of the temperature rise.

The utility says it will continue to monitor the situation closely while maintaining the current rate of water injection.

## **Nuke dangers nowhere near resolved: Kan's crisis adviser**

By REIJI YOSHIDA - <http://www.japantimes.co.jp/text/nn20120208f1.html>

In December, Prime Minister Yoshihiko Noda announced the "conclusion" of the meltdown crisis at the Fukushima No. 1 nuclear plant, saying Tokyo Electric Power Co. was managing to keep the three crippled reactors cool, as well as the facility's spent fuel pools.

But a former special adviser to Naoto Kan, who was prime minister when the crisis started, warned that the situation is far from resolved and said Fukushima has exposed a raft of serious nuclear problems that Japan will have to confront for years.

**"I would say (the crisis) just opened Pandora's box,"** Hiroshi Tasaka, who has a doctorate in nuclear engineering and is now a professor at Tama University, said in a recent interview with The Japan Times. He was one of a select group who glimpsed the secret worst-case scenario document written up by the Japan Atomic Energy Commission on March 25 that was later reportedly quashed by the government.

According to the scenario, the biggest risk during the meltdown crisis wasn't the reactors themselves but the **spent fuel pools** sitting atop them, particularly the one above reactor 4, which still contains about 1,500 nuclear fuel assemblies, Tasaka said.

Unlike reactors 1, 2 and 3, the No. 4 unit was offline for regular checks when disaster struck on March 11 and thus didn't suffer a meltdown. But its fuel rods were in the pool outside the reactor, and its coolant water fell dangerously low.

Adding to the danger is that the fuel pool is now directly exposed to the outside environment after a hydrogen explosion blew off the upper part of the reactor building on March 15, Tasaka noted.

The potential heat from the pool was also much higher than other pools because 204 of the 1,535 assemblies were still "new ones" that had been temporarily removed from reactor 4 for regular checks.

The Fukushima crisis has highlighted the dangers of spent fuel pools, which are outside the robust primary containment vessels of the reactors themselves, Tasaka said.

**Under the current circumstances, the nation has no prospect of starting up the experimental high-level nuclear waste processing facility in Rokkasho, Aomori Prefecture, because of both technical difficulties and the sentiments of antinuclear activists.**

This means utilities must store their spent fuel assemblies in cooling pools at their respective reactor sites as a "temporary measure." This situation greatly increased the danger at Fukushima No. 1 on March 11.

"The storage capacities of the spent fuel pools at the nation's nuclear power plants are reaching their limits," Tasaka wrote in a new book, "Kantei Kara Mita Genpatsu Jiko No Shinjitu" ("The Truth About the Nuclear Accident as Viewed From the Prime Minister's Office").

According to Tasaka, the utilities' fuel pools were about 70 percent full on average in 2010, but the figure was 80 percent at Fukushima No. 1.

The makeshift cooling systems set up at Fukushima No. 1 to stabilize the stricken reactors and fuel pools have greatly reduced the possibility of another catastrophe, Tasaka said, but the ad hoc system for decontaminating the coolant water is nevertheless generating large amounts of highly contaminated waste every day.

Making matters worse, the government doesn't have any place to permanently store it, he wrote. Tasaka is also deeply concerned about the "groundless optimism" displayed by bureaucrats and business leaders as they rush to restart dozens of reactors that remain halted for safety checks since March 11.

"I understand quite well the intentions of the government, which now wants to send out a message of hope. But at this stage, all the risks should be put on the table," he said.

The nation's nuclear regulators must carry out drastic reforms to regain the people's trust. This is an imperative for the government if it wants to keep pushing nuclear power, Tasaka said.

He recalled viewing the government's worst-case scenario in late March. He was officially appointed special adviser to the prime minister on March 29.

The document detailed a hypothetical Fukushima crisis worst case: Eventual contamination from the plant would require the government to assist residents in the Tokyo area to evacuate if they wanted to voluntarily "migrate," based on the same evacuation protocols adopted for the 1986 Chernobyl accident.

The scenario assumed another hydrogen explosion would occur in the reactor 1 building and radiation would force all of the workers at the plant to evacuate.

All of the pools storing hundreds of nuclear fuel assemblies would eventually lose their cooling ability and the assemblies would melt down and breach the pools.

According to Kyodo News, the simulation was "so shocking" that top government officials decided to keep the paper secret by treating it as a mere personal document of Japan Atomic Energy Commission Chairman Shunsuke Kondo, who compiled the simulation. The government only gave it official recognition at the end of December, according to Kyodo.

More than 10 months after he saw the worst-case scenario paper, Tasaka is still not sure if such scary information should immediately be made public during a nuclear plant crisis.

The assumed worst case was extreme and people did not need to immediately flee the Tokyo area even in March or April, Tasaka said. Disclosing the simulation could have caused panic in the capital, he said. Tasaka was obliged to keep secret what he learned through his work at the prime minister's office and was not in a position to decide what information was to be made public during the crisis.

He said he decided to start talking about the worse-case scenario only after Kan mentioned some of its highlights during an interview with the media in September.

Tasaka believes the media and government should lay some ground rules in advance on what sensitive information should be made clear in a nuclear crisis.

February 9, 2012

## **Prefectural team makes 1st inspection of Fukushima No. 2 nuke plant**

<http://mdn.mainichi.jp/mdnnews/news/20120209p2a00m0na009000c.html>

A team of Fukushima prefectural officials visited the Fukushima No. 2 nuclear plant on Feb. 8, marking the first prefectural inspection of the plant since the March 11, 2011 disasters forced it to shut down.

"Right now, the most important tasks are to keep the reactors in cold shutdown and cool the spent fuel rods while preparing safety measures to deal with any unexpected problems," said the deputy head of the prefecture's living environment division following the inspection. "I felt that work there to maintain emergency power supplies and prevent flooding of the plant buildings was progressing."

The reactors at the Fukushima No. 2 plant -- about 11 kilometers south of the disaster-struck Fukushima No. 1 nuclear complex -- stopped automatically when the Great East Japan Earthquake hit and are now in cold shutdown, but the plant was very nearly the site of a second nuclear crisis.

In circumstances similar to those at the No. 1 plant, the cooling systems in three of Fukushima No. 2's four reactors failed when the March 11 tsunami hit and knocked out their backup generators. Unlike the situation at the No. 1 plant, however, staff at the No. 2 station managed to patch into external power before the reactor cores could seriously overheat.

In December last year, the government's Nuclear and Industrial Safety Agency officially declared the nuclear emergency at the plant over, while Tokyo Electric Power Co. -- operator of both the Fukushima No. 1 and 2 plants -- has submitted a plan to the agency for maintaining cold shutdown.

Fukushima Prefecture is calling for the shutdown of all nuclear stations in the prefecture, including Fukushima No. 2.

However, Fukushima No. 2 plant director Naohiro Masuda suggested it's too soon to discount restarting the reactors there, saying, "Under present circumstances, it's impossible to say how the reactors here will be dealt with in the future. For now, we have to maintain a steady cold shutdown by transitioning from the temporary cooling equipment we now have in place to proper, permanent equipment."

### **Temperature inside reactor stops rising**

<http://www.yomiuri.co.jp/dy/national/T120208005861.htm>

The abnormal rise in temperature in a reactor at the Fukushima No. 1 nuclear power plant has stopped, apparently because more water has been injected into the crippled reactor, according to Tokyo Electric Power Co.

TEPCO said the temperature at the base of the No. 2 reactor's pressure vessel had fallen to 68.5 C at 5 p.m. Tuesday after earlier peaking at 73 C. However, **the cause of the increased temperature remained unclear.**

Junichi Matsumoto, acting head of TEPCO's headquarters regarding nuclear plant locations, said increasing the amount of water injected hourly into the reactor by three tons to 13.5 tons since 4:30 a.m. Tuesday seemed to be having an effect.

"[The temperature] has begun falling after peaking," Matsumoto said.

Keeping the temperature at the base of the reactors at 100 C or less is a stable state known as cold shutdown. Reaching cold shutdown was a precondition for enabling the government to declare in December that the crisis at the nuclear plant had been brought under control.

TEPCO's guideline stipulates the temperature should be kept at 80 C or lower to allow for possible measurement errors.

The reactor will need to be monitored carefully because the condition inside the reactor's inner part containing melted nuclear fuel is not clear, and the reason for the temperature rise has yet to be pinpointed.

Currently, cooling water is injected into the No. 2 reactor via two piping systems--the coolant water supply system that can deliver water to the vessel's base, and the reactor core water spray system that aims water directly at the reactor core.

The temperature in the pressure vessel's base began rising from 45 C around Jan. 26, when the water injection balance of the two systems was changed several times during pipe repair work.

One of three thermometers installed around the base recorded a temperature increase of nearly 30 C over a little more than 10 days, reaching as high as 73 C at one time.

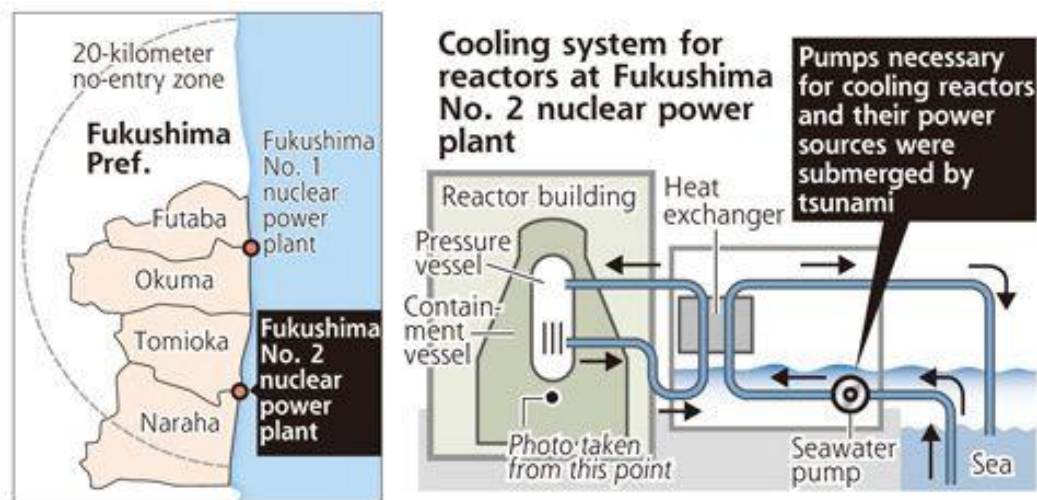
According to TEPCO, the volume of water being injected was far less than usual. It is possible that the way water was injected into the reactor might have changed around the time of the pipe repairs, and that water did not reach some of the fuel.

TEPCO also speculated that the fuel, which had melted and then solidified, might have cracked due to some shock or dropped down and changed shape.

February 10, 2012

## Fukushima No. 2 plant was 'near meltdown'

The Yomiuri Shimbun



FUKUSHIMA--The Fukushima No. 2 nuclear power plant was "near meltdown" after being hit by tsunami following the Great East Japan Earthquake on March 11, according to the head of the plant.

The No. 2 plant, on the border of Naraha and Tomioka towns in Fukushima Prefecture, was opened to the media Wednesday for the first time since the disaster. It is 12 kilometers from the Fukushima No. 1 nuclear power plant, which suffered a meltdown. Both facilities are operated by Tokyo Electric Power Co.

Plant chief Naohiro Masuda, in charge of plant operations since the crisis, told reporters Wednesday, "The No. 2 plant almost suffered the same fate as No. 1 [which led to a severe crisis]."

On March 11, a 9-meter-high tsunami struck the No. 2 plant, while the No. 1 plant was hit by a 13-meter-high tsunami. The tsunami caused the No. 2 plant's seawater pumps, used to cool reactors, to fail. Of the plant's four reactors, three were in danger of meltdown.

**Luckily**, one external high-voltage power line still functioned, allowing plant staff in the central control room to monitor data on internal reactor temperatures and water levels.

By March 15, the No. 2 plant's four reactors reached a state of cold shutdown without any leakage of radioactive materials.

"[At that point, the situation at the No. 2 plant] was considerably different from the No. 1 plant where it was difficult to know what was going on," Masuda, 53, said.

However, despite intense efforts by all employees, it took a long time to stabilize the reactors.

On March 11, **about 2,000 employees** of the No. 2 plant worked to stabilize the reactors. Some employees connected 200-meter sections of cable, each weighing more than a ton, over a distance of nine kilometers.

Masuda noted the timing of the disaster was critical in saving the plant.

**"We were lucky it happened on a Friday afternoon [and not on a weekend],"** he said.

Masuda pointed out only 40 employees would have been at the plant if the earthquake had occurred in the evening or on a weekend.

"[In that case] it would be have been difficult for us to deal with the disaster," he said.

The Fukushima prefectural government conducted an on-site inspection at the No. 2 plant on Wednesday and repeated a request to TEPCO to decommission the facility.

Masuda did not elaborate and said, "At the moment, I can only say we'll maintain a state of cold shutdown."

The No. 2 plant's No. 1 reactor began operating in 1982. Following the Great East Japan Earthquake, a Nuclear Emergency Situation Declaration was issued for both the No. 1 and No. 2 plants. The declaration was lifted for the No. 2 plant in December.

February 12, 2012

## **Fukushima No. 2 reactor temperature up to 82C, but not critical: TEPCO**

<http://mdn.mainichi.jp/mdnnews/news/20120212p2g00m0dm020000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Sunday the temperature at the bottom of the No. 2 reactor at its crippled Fukushima No. 1 nuclear plant rose further to 82 C, but the reactor has not gone critical.

While the thermometer reading at shortly after 2 p.m. marked a new high since the reactor attained a cold shutdown in December, the utility known as TEPCO said it has confirmed that sustained nuclear reactions are not taking place in the reactor as no radioactive xenon has been detected inside its containment vessel.

TEPCO reported the latest development immediately to the Nuclear and Industrial Safety Agency of the Economy, Trade and Industry Ministry as the temperature exceeded the limit of 80 C designated by the company's safety regulation for maintaining a cold shutdown, it said.

It is considered desirable to keep the temperature below 80 C, while the bottom of a reactor pressure vessel must be kept below 100 C in a stable cold shutdown, in view of the margin of error of thermometers, according to TEPCO officials.

TEPCO plans to increase the amount of water injected as a coolant by 3 tons per hour and pour 1 ton of boric acid later Sunday to prevent any event of criticality.

As a reason for what is causing the temperature rise, TEPCO said it is possible the water flow is unstable and thus failing to cool the reactor stably, while also saying it will check the thermometer for any irregularities. The temperature was measured at 78.3 C at 10 a.m. and fell to 75.4 C at 11 a.m.

The decline occurred after TEPCO on Saturday night increased the amount of water being injected into the reactor to 14.6 tons per hour from 13.6 tons, after seeing the temperature rise to 73.3 C at 9 p.m. It reached 74.9 C at 11 p.m. Saturday. The temperature readings began rising on Feb. 1.

One of the three thermometers at the bottom of the reactor's pressure vessel stayed between 67 C and 71 C from Friday evening to Saturday evening after hitting 73.3 C on Monday.

Readings from two other thermometers that check the temperature at the bottom of the No. 2 reactor vessel were around 35 C, TEPCO said.

The Nos. 1 to 3 reactors at the Fukushima No. 1 plant in northeastern Japan experienced meltdowns as a result of the loss of key cooling functions in the wake of the devastating earthquake and tsunami on March 11 last year.



## Temperature rising at No.2 reactor

[http://www3.nhk.or.jp/daily/english/20120212\\_12.html](http://www3.nhk.or.jp/daily/english/20120212_12.html)

The temperature at the No.2 reactor of the Fukushima Daiichi nuclear power plant keeps rising even after the injection of more cooling water on Saturday night.

The plant operator, Tokyo Electric Power Company, or TEPCO, says a thermometer at the bottom of the reactor registered 78.3 degrees Celsius at 10 AM on Sunday.

The reading began to rise in late January to around 70 degrees. TEPCO pumped in more water to push down the temperature, but it rose again on Saturday night to 74.9 degrees.

The temperature continued to climb on Sunday morning to hit its highest level since last December, when the government and TEPCO declared all the reactors were at a state of cold shutdown, with their temperatures below 100 degrees.

TEPCO denied the possibility of nuclear criticality, saying 2 other thermometers at the bottom of the reactor show temperatures at around 35 degrees.

It adds that continuous nuclear fission would generate radioactive xenon, but gas samples collected from near the reactor found the element below the detection limit.

TEPCO is set to dump in boric acid to prevent any nuclear criticality later on Sunday and increase the volume of cooling water by 3 tons per hour.

Under new guidelines, the company must **keep reactor temperatures at 80 degrees or below**, given thermometers' margin of error of up to 20 degrees.

February 13, 2012

## Fukushima No. 2 reactor nears 94 C, thermometer likely faulty: TEPCO

<http://mdn.mainichi.jp/mdnnews/news/20120213p2g00m0dm084000c.html>

TOKYO (Kyodo) -- Thermometer readings at the bottom of the No. 2 reactor at the damaged Fukushima Daiichi nuclear plant rose further Monday to exceed 90 C for the first time since it attained a cold shutdown in December, reaching a new high of 93.7 C as of 11 a.m., Tokyo Electric Power Co. said.

While concerns are mounting that the reactor may be reheating, TEPCO said it was likely the thermometer was malfunctioning. The device in question had fluctuated between 75 C and 90 C within a short time, while readings from two other thermometers also at the bottom of the reactor vessel have remained around 35 C.

Earlier in the morning, nuclear disaster minister Goshi Hosono said at a parliament budget committee, "The device's movements are perplexing. At this stage, however, it is not necessary to change the judgment that (the reactor is) in a state of cold shutdown."

TEPCO reported on Sunday to the Nuclear and Industrial Safety Agency of the Economy, Trade and Industry Ministry that the temperature exceeded the limit of 80 C designated by the company's safety regulation for maintaining a cold shutdown. The temperature readings first began rising on Feb. 1.

The utility said it believes sustained nuclear reactions were not taking place in the reactor as no radioactive xenon has been detected inside the containment vessel. To prevent the possibility of the reactor going critical, it has increased the amount of water injected as coolant by 3 tons per hour and poured in 1 ton of boric acid on Sunday.

Junichi Matsumoto, spokesman of the plant operator, told a news conference Monday, "It is likely the thermometer is malfunctioning."

Meanwhile, Fukushima Gov. Yuhei Sato urged the nuclear safety agency to investigate the reason behind the temperature rise and demanded that information be disclosed to the public to ease residents' concerns.

A stable cold shutdown is achieved when the temperature inside the reactor is kept below 100 C. TEPCO considers it desirable to keep the temperature below 80 C, assuming a margin of error of 20 C for the thermometers.

The Nos. 1 to 3 reactors at the Fukushima Daiichi plant in northeastern Japan experienced meltdowns as a result of the loss of key cooling functions in the wake of the devastating earthquake and tsunami on March 11 last year. Melted fuel is believed to have gathered at the bottom of the reactors' pressure vessels.

### **TEPCO carefully monitoring No.2 reactor**

[http://www3.nhk.or.jp/daily/english/20120213\\_16.html](http://www3.nhk.or.jp/daily/english/20120213_16.html)

The operator of the Fukushima Daiichi nuclear plant is carefully monitoring the No. 2 reactor one day after the reading of one of its thermometers topped the critical safety threshold of 80 degrees Celsius.

The reading of the thermometer at the bottom of the containment vessel shifted between 80 and 90

degrees even after plant workers increased the amount of water injected into the reactor to about 17 tons per hour.

As of 10 AM on Monday, the reading stood at 91.2 degrees.

The Tokyo Electric Power Company says the thermometer could be malfunctioning, as 2 other thermometers at the same height are showing temperatures of around 33 degrees.

It says 3 other thermometers about 1.5 meters below the others show that temperatures inside the reactor are falling.

TEPCO adds it will continue to carefully monitor the reactor, as it has yet to confirm that the thermometer is malfunctioning.

## **A faulty thermometer?**

### **TEPCO: broken thermometer may show high temperature**

[http://www3.nhk.or.jp/daily/english/20120213\\_28.html](http://www3.nhk.or.jp/daily/english/20120213_28.html)

Tokyo Electric Power Company says a malfunctioning thermometer at the disabled Fukushima Daiichi nuclear power plant is likely to blame for the high temperature reading in one of the reactors.

The reading of one of the thermometers at the bottom of the No. 2 reactor began to rise late last month. On Sunday the temperature exceeded the critical safety threshold of 80 degrees. On Monday the reading rose to 94.9 degree Celsius at noon.

The utility firm says it thinks the thermometer is broken since the readings of 2 other thermometers set at the same height dropped to about 33 degrees.

The company says an inspection showed that a cable inside the thermometer is probably cut, resulting in a false reading.

### **Possible sensor failure throws Fukushima reactor temp. data into doubt**

<http://mdn.mainichi.jp/mdnnews/news/20120213p2a00m0na015000c.html>

Doubt has been cast on the accuracy of temperature readings from the No. 2 reactor at the Fukushima No. 1 nuclear plant, as the government and plant operator Tokyo Electric Power Co. (TEPCO) increasingly suspect a temperature sensor inside the reactor has malfunctioned.

According to TEPCO, readings from the suspect sensor -- which registered 94.9 degrees Celsius at the bottom of the reactor's pressure vessel on Feb. 13 -- have been rising since the end of January this year. At the time, unable to determine if the elevated readings were real or not, the utility injected extra water into the core to prevent overheating. However, TEPCO began to suspect a malfunction on Feb. 12, when readings from the sensor -- one of three in the reactor -- fluctuated wildly between 75 and 90 degrees. The "safe" temperature for maintaining cold shutdown has been set at 80 degrees.

The sensor in question uses metal components whose electrical resistance changes with temperature, and calculates the ambient temperature based on changes in the electrical current. TEPCO plans to confirm the sensor's condition by rechecking its electrical resistance, among other measures.

However, the very fact that the sensor may have malfunctioned casts doubt on the cold shutdowns of reactors No. 1-3, declared by Prime Minister Yoshihiko Noda in December last year. The declaration was based on readings showing pressure vessel temperatures had come below 100 degrees. Since then, TEPCO has assumed a maximum margin of error of 20 degrees Celsius. Even so, the admission of a possible sensor failure calls all the temperature data collected thus far into question, and with it the condition of the reactor cores.

"Because we haven't been able to grasp how the nuclear fuel in the cores has been distributed, it's impossible to rule out localized high temperature spots," says Kazuhiko Kudo, a special professor of nuclear engineering at Kyushu University. "As the high radiation rules out installing new temperature sensors, if the last two sensors (in the No. 2 reactor) fail, the situation will be much more serious indeed." [Click here for the original Japanese story](#)

## Faulty thermometer again

February 14, 2012

### **TEPCO: No.2 reactor thermometer likely broken**

[http://www3.nhk.or.jp/daily/english/20120214\\_27.html](http://www3.nhk.or.jp/daily/english/20120214_27.html)

The operator of the damaged nuclear power plant in Fukushima suspects a thermometer that has been showing rising temperatures in one of the reactors is malfunctioning.

The thermometer at the bottom of the Number 2 reactor showed a reading of 251.2 degrees Celsius as of 11 AM on Tuesday, while the 2 other thermometers showed temperatures of around 31 degrees.

On Monday afternoon, the thermometer in question showed a reading of more than 200 degrees.

Earlier on Monday, Tokyo Electric Power Company passed an electrical current through the thermometer and found that resistance was about 1.7 times the normal level.

TEPCO says this happens when a wire is broken.

The operator denied the possibility of the reactor heading toward criticality again, as it has not detected any radioactive xenon, which would be generated from continuous nuclear fission.

It says it will continue to circulate water through the reactor and carefully monitor the situation.

The Nuclear and Industrial Safety Agency has instructed TEPCO to measure the temperature in different ways and submit a report by Wednesday.

Early last week, TEPCO said the thermometer read about 45 degrees on January 27th and that it rose to 71 degrees about 10 days later, although the 2 other thermometers continued to indicate about 45 degrees.

## **"Update" Feb 15, 2012: it's all suspiciously quiet on the Fukushima front**

<http://www.youtube.com/watch?v=oxC4LgXiUW0>

nothing this morning (about Fukushima Daiichi) in the papers I normally read

## **Study of tsunami on Fukushima coast**

February 19, 2012

### **21.1-meter tsunami hit Fukushima coast on March 11**

[http://www3.nhk.or.jp/daily/english/20120219\\_15.html](http://www3.nhk.or.jp/daily/english/20120219_15.html)

Japanese scientists and prefectural officials have found that a tsunami more than 21 meters high hit the coast near the Fukushima Daiichi nuclear plant on March 11th last year.

The group led by University of Tokyo Professor Shinji Sato carried out a survey earlier this month of about 40 kilometers of coastline in no-entry zones in Fukushima Prefecture.

This is the first study of tsunami in the area since last year's earthquake as no one was allowed to enter the zones due to radiation from the plant.

Among the 28 spots studied, the wave reached its highest point of 21.1 meters in Tomioka Town.

Tsunami more than 10 meters high hit other places around the nuclear plant.

A previous survey of areas outside the no-entry zones found that the waves were less than 10 meters high in many spots.

Sato said it is necessary to study why the tsunami were so high in the area around the plant, as this will help in drawing up preventive measures.

## **A bus tour of Fukushima Daiichi plant**

February 20, 2012

### **Media allowed access to Fukushima Daiichi plant**

[http://www3.nhk.or.jp/daily/english/20120220\\_22.html](http://www3.nhk.or.jp/daily/english/20120220_22.html)

Tokyo Electric Power Company has given members of the media access to the Fukushima Daiichi nuclear power plant for the first time since the government declared 2 months ago that reactors had been stabilized.

The utility gave reporters a bus tour of the facility on Monday. The visit coincides with inspections by the Nuclear and Industrial Safety Agency that began on February 6th.

The bus passed by reactor cooling systems and spent fuel pools where 43 incidents of water leaks have occurred since January. Workers have swathed pumps on trucks with sheets and wrapped pipes with insulation materials to prevent leaks.

Reporters were allowed to get off the bus on a hill near the No.4 reactor and see first-hand its building, which was damaged by a hydrogen blast last March.

When the media visited the plant in November, reporters had to stay inside their bus throughout the tour.

Radioactivity levels on the hill are now 50 microsieverts per hour. Anyone spending the day there would

be exposed to more than one millisievert of radiation, the annual limit for the general public.

Workers in protective gear were preparing to build a facility to store radioactive waste.

Plant chief Takeshi Takahashi gave his first interview since assuming the post in December and said that he and other workers at the plant have the responsibility of ensuring its safety.

He stressed that containing radioactive materials within the nuclear facility is his top priority and that workers will achieve this goal.

## **New robots for Fukushima**

### **New robots on their way to Fukushima nuclear plant**

[http://www3.nhk.or.jp/daily/english/20120220\\_25.html](http://www3.nhk.or.jp/daily/english/20120220_25.html)

Two Japanese-made robots will be used to examine the inside of reactors at the damaged nuclear power plant in Fukushima.

A group of researchers at Chiba Institute of Technology developed the remote-controlled robots named Quince Number 2 and Number 3.

On Monday, a truck carrying the pair left for Fukushima from the school's campus in Narashino, Chiba Prefecture.

Quince Number 1 was put to work at the Fukushima Daiichi plant in June last year. It was the only Japanese-made robot involved in the operation at the plant after the March 11th disaster. It took video footage of reactor buildings and checked radiation levels, but stopped operating in October after becoming tangled in cables.

The 2 new robots have been remodeled to deal with cables. They are equipped with blades to cut away the cables left behind by the first robot, allowing them to move smoothly in the area. One of the robots has a camera fixed at a higher position that will let it record the inside of a storage pool for spent fuel.

Deputy Director Eiji Koyanagi of the Future Robotics Technology Center at the Chiba Institute of Technology said he expects the robots to take precise readings of radiation levels inside the plant. He said the dismantling of the reactors requires work by people, and he hopes the robots will help pinpoint spots where workers can operate with less exposure to radiation.

The new robots are scheduled to begin their work before the end of the month.

February 21, 2012

## **Photo special: Inside the damaged Fukushima power plant**

<http://mdn.mainichi.jp/photospecials/graph/fukushima/>

## **Touring Fukushima Daiichi plant**

### **Fukushima nuclear plant shown to media, plant chief apologizes for water leaks**

<http://mdn.mainichi.jp/mdnnews/news/20120221p2a00m0na014000c.html>

OKUMA, Fukushima -- The crippled Fukushima No. 1 Nuclear Power Plant was shown to the media on Feb. 20 for the first time since the government declared in December that the nuclear facility had achieved a stable "cold shutdown" state.

The media tour of the nuclear plant was aimed at letting people know about progress being made in efforts to bring the troubled nuclear power station under control. But a rough road still lies ahead for the government and Tokyo Electric Power Co. (TEPCO) to bring the plant under control, as levels of radiation remain high there and truck-mounted pumps to inject water into the reactors leaked water frequently due to the water freezing.

The plant's chief Takeshi Takahashi, 54, apologized for the repeated water leaks, telling visiting reporters, "We have taken measures primarily to keep key facilities warm, but there is no denying that our calculations were inaccurate."

It was the second time for the media to tour the nuclear plant after an earlier visit in November. As in the previous round, journalists got on a bus to move round the area where six nuclear reactors lie. The radiation level on the ocean side of the No. 3 reactor was 1.5 millisieverts per hour. That means a person gets exposed to an annual dose limit in just one hour. The levels of radiation were so high that journalists were allowed to get off the bus and walk around facilities only for 15 minutes during their one-hour tour. Among the six reactors, the No. 4 reactor has seen the biggest progress in the decommissioning project, with several workers using a crane to move scaffolding and other materials.

The truck-mounted water injection pumps were shown to the media for the first time. The pumps, which were hastily installed about three months after the outbreak of the nuclear crisis, are supposed to perform key functions for the cooling water recycling system at the Fukushima plant. Three pumps for regular use and three others for emergencies are mounted on trucks parked on higher ground about 35 meters above sea level. But there were a series of mishaps with water leakages from the pumps, northwest of the No. 1 reactor, in late January due to frozen water, prompting workers to conduct repair work by wrapping hoses with heat insulators made of rubber.



During the media tour of the nuclear plant, the government's Nuclear and Industrial Safety Agency (NISA) was questioning TEPCO officials about the operations of treatment and storage facilities for contaminated water in an effort to check whether steps were being properly taken to maintain the conditions of the "cold shutdown."

## US worried about Fukushima... a year ago

February 22, 2012

### **U.S. worried about Fukushima meltdown early on: commission transcript**

<http://mdn.mainichi.jp/mdnnews/news/20120222p2g00m0dm025000c.html>

WASHINGTON (Kyodo) -- The U.S. Nuclear Regulatory Commission released Tuesday some 3,000 pages of transcripts from the days following Japan's tsunami and nuclear disaster last March, showing that U.S. officials were concerned at an early stage about possible meltdowns at the Fukushima Daiichi nuclear plant and their debate over the scope of the evacuation zone.

The documents showed that as early as March 16, five days after the accident, NRC Chairman Gregory Jaczko projected "a worst scenario" that all three operating reactors at the crippled plant might be experiencing meltdowns.

"The reactors would likely eventually...breach primary containment and have some type of (radioactive) release," he said during a conference call, while adding that "it's difficult to predict the magnitude of that released."

The prediction turned out to be accurate and showed that NRC officials viewed the situation gravely, a stark contrast to the lack of crisis management in the Japanese government which took months before finally acknowledging that there was a meltdown.

On the evacuation zone for U.S. citizens in Japan, NRC officials were discussing as early as March 12 whether a 50-mile evacuation zone for U.S. citizens would be appropriate.

On March 16, when asked about the impact on Tokyo if the wind kept blowing in its direction, Jaczko said, "At this point, I think I would still go with the 50 miles right now is what we see as the actual direct evacuation. But it is uncertain and it would possibly have to get beyond 50 miles. I don't know that we've run a model out yet to Tokyo."

Similarly, Bill Borchardt, NRC's executive director for operations, also said, "If this happened in the U.S., we would go out to 50 miles. That would be our evacuation recommendation."

The 50-mile evacuation radius for U.S. citizens was about four times farther than what the Japanese government urged at the time and some had criticized it for fueling fear and tension in Japan.

The transcripts also showed that Jaczko mentioned "potentially up to six spent-fuel pools in a degraded condition, possibly with spent fuel pool fires."

The NRC officials also believed that the spent fuel pool in the No. 4 reactor had been substantially damaged to the point that it could no longer retain water, which is needed to prevent the rods from releasing radiation into the atmosphere.

The documents, released in response to Freedom of Information Act requests, consist of phone conversations at the commission's operations center during the first 10 days after a magnitude-9.0 earthquake and massive tsunami on March 11 triggered the worst nuclear accident in Japan's history.

## **US nuke regulator releases March 11 transcripts**

[http://www3.nhk.or.jp/daily/english/20120222\\_23.html](http://www3.nhk.or.jp/daily/english/20120222_23.html)

Newly released transcripts of the US nuclear regulator show it contemplated an evacuation advisory for US citizens near the Fukushima Daiichi nuclear plant soon after the March 11th earthquake and tsunami.

The regulator's thinking was based on a worst-case scenario of meltdowns at all 3 operating reactors after they sustained heavy damage in the disaster.

On Tuesday, the Nuclear Regulatory Commission released more than 3,000 pages of transcripts, covering in-house conferences over 10 days from March 11th last year, when the massive quake hit northeastern Japan.

The documents show a senior member calling for evacuating people within a radius of 50 miles, or about 80 kilometers, from the plant about 2 days after the disaster on March 12th US eastern time.

Cesium had been detected within the plant compound, apparently leading the official to believe the cores of the reactors could be partially damaged.

On March 16th US eastern time, Chairman Gregory Jaczko pointed out the Number 1, 2 and 3 reactors may all melt down in the worst case.

Executive director for operations Bill Borchardt said the United States would issue an evacuation advisory for people within a radius of 50 miles if a similar case occurred in the country.

The US ultimately issued an evacuation advisory for its citizens on March 16th.

The Japanese government issued an evacuation notice for those within a radius of 20 kilometers and also urged those in areas between 20 to 30 kilometers to stay indoors.

## **US was worried about cooling of spent fuel pools**

[http://www3.nhk.or.jp/daily/english/20120222\\_41.html](http://www3.nhk.or.jp/daily/english/20120222_41.html)

Newly released minutes from a US nuclear commission show a US regulator had concerns about the cooling of spent fuel pools at the Fukushima Daiichi nuclear plant one day after the accident took place on March 11th.

Documents from the US Nuclear Regulatory Commission show the agency chairman received a report from a senior official one day after the accident on the condition of the building that houses the No. 1 reactor. The report said that the reinforced frames of the building that holds a spent fuel pool were exposed after a hydrogen explosion damaged the building.

Agency officials expressed concern that Japanese authorities had provided little information about whether the cooling of the pool was being carried out properly.

At that time, the Japanese government and the Tokyo Electric Power Company were busy looking into the hydrogen explosion and taking safety measures for other reactors.

Four days after the accident, the Japanese authorities finally noticed the cooling of spent fuel pools at the No. 3 and 4 reactors were not being carried out properly. A cloud of steam from the No. 3 reactor building was one of the factors that alerted the authorities to the problem.

Six days after the accident, helicopters from Japan's Self-Defense Forces sprayed water to cool the pools.

## **Not everything is under control, apparently**

### **Seabed near nuke plant to be covered with cement**

[http://www3.nhk.or.jp/daily/english/20120222\\_01.html](http://www3.nhk.or.jp/daily/english/20120222_01.html)

Tokyo Electric Power Company will begin cementing the seabed near the Fukushima Daiichi nuclear plant to prevent radioactive materials from spreading at sea.

On Wednesday, the utility plans to start pouring cement and clay over a 70,000-square meter area near the water intakes of the plant's 6 reactors. The seabed is about 6 meters deep.

The company says a 60-centimeter layer on the seabed will prevent the spread of contaminated mud and sand for about 50 years.

Extremely high levels of radioactive cesium have been detected in the area. The cesium mainly came from melted nuclear fuel rods from 3 of the reactors and contaminated water that leaked into the sea.

There is growing concern that ships will scatter the contaminated sand when work begins to retrieve the fuel rods in several years' time.

Tokyo Electric will start full-scale application of the cement in late February and hopes to complete the task in 4 months.

## **New robots for Fukushima**

February 24, 2012

### **TEPCO to use underwater robot for repair work**

[http://www3.nhk.or.jp/daily/english/20120224\\_38.html](http://www3.nhk.or.jp/daily/english/20120224_38.html)

Tokyo Electric, or TEPCO, the operator of the Fukushima Daiichi nuclear power plant says it is considering using an underwater robot to probe and repair the damaged reactor containment vessels.

The plan was unveiled at a meeting in Tokyo to discuss ways to dismantle the reactors at the plant on Friday. Nuclear experts and officials from the robot maker attended.

The utility firm and the manufacturer say they are planning to deploy the remotely controlled robot on the underground level of the reactor buildings, as it is flooded with contaminated water.

They say this is a step toward repairing the containment vessels of No.1 to No.3 reactors so that the melted nuclear fuel can be removed.

In the meeting, another proposal was also made to use a 10-meter-long rod with a camera on the tip to examine the interior of the containment vessels.

A roadmap for decommissioning the reactors, set by the government and TEPCO, says the removal of the nuclear fuel should start within 10 years. Technological development appears to hold the key to the project's success.

## **First flight over Fukushima Daiichi**

February 26, 2012

## **New aerial view of Fukushima plant**

[http://www3.nhk.or.jp/daily/english/20120226\\_16.html](http://www3.nhk.or.jp/daily/english/20120226_16.html)

An NHK helicopter has flown near the Fukushima Daiichi nuclear plant for the first time since the accident last March.

The footage shows reactor buildings with their structures exposed by hydrogen explosions.

No one can be seen in the towns in the no-entry zones around the plant.

The land ministry scaled back the no-fly zone on Saturday from a 20-kilometer radius to 3 kilometers. It calculated that the aerial radioactive readings around the plant had dropped to a safe level.

NHK's helicopter flew around 4 kilometers from the plant at an altitude of some 700 meters on Sunday for the first time since the accident.

The aerial footage shows that the No. 3 reactor building has been distorted by a hydrogen explosion.

The yellow cover of the nuclear containment vessel has been exposed in the No. 4 reactor building, where the walls were ripped out by another explosion. A person in a yellow worksuit is walking on the 5th story.

At a port used by the plant, some 10 workers in white protective suits are working on a crane vessel to cover the seabed with cement and clay to stop the spread of radioactive substances.

About 1,000 gray and blue steel tanks to store contaminated water can be seen in the western part of the plant compound.

There are no signs of life in the no-entry zone that covers a 20-kilometer radius around the plant.

Destroyed buildings and boats washed ashore by the tsunami remain untouched near Ukedo port in Namie Town, to the north of the plant.

## **The Yomiuri flies over Fukushima Daiichi plant**

February 28, 2012

### **Photos from jet show devastated N-plant**

Tatsuo Nakajima / Yomiuri Shimbun Staff Writer

<http://www.yomiuri.co.jp/dy/national/T120227004796.htm>

FUKUSHIMA--The heavily damaged upper framework of the buildings housing the Nos. 3 and 4 reactors at the Fukushima No. 1 nuclear power plant were photographed from a Yomiuri Shimbun jet Sunday, one day after the easing of restrictions on the area's no-fly zone.

Also photographed were rows of about 1,000 tanks used to store increasing amounts of radiation-contaminated water that were installed on the plant grounds after the disaster.

The aircraft Mirai carried us north from Tokyo and came as close as six kilometers from the plant in Fukushima Prefecture.

The Land, Infrastructure, Transport and Tourism Ministry reduced the area of the no-fly zone around the plant from a radius of 20 kilometers to three kilometers on Saturday.

The upper part of the buildings housing the Nos. 3 and 4 reactors appeared skeletal due to the explosions that occurred in the buildings in the wake of the Great East Japan Earthquake on March 11.

As we approached the plant, the buildings' miserable appearance became apparent.

The plant grounds were entirely covered with snow, and the lid of the No. 4 reactor's containment vessel was clearly seen through the building's exposed framework.

Once the aircraft turned to view the No. 2 reactor building from the coast, a big opening in the wall was visible despite the fact that the building had not exploded. The opening was created after a pressure-release panel fell down due to some shocks.

Walls of some other structures located on the sea coast were also blown away.

West of the No. 4 reactor building are blue and gray tanks standing in orderly rows.

The tanks were installed to contain an increasing amount of water with low levels of radioactive substances. About 1,000 tanks contain an estimated 120,000 tons of contaminated water.

No people were spotted in neighboring towns. Alleys in local residential areas were covered with snow. A dosimeter installed in the Mirai aircraft detected radiation measuring as high as 0.9 microsieverts per hour northwest of the plant.

About 40 years of challenging work will be needed to decommission and dismantle the Nos. 1 to 4 reactors.

The sight of the plant from the air has seared into our memory the cruel accident, which destroyed the livelihoods of more than 110,000 local residents.

## **Photos from Fukushima, a year later**

<http://mdn.mainichi.jp/photospecials/graph/20120226/index.html>

## Not a bright picture

### Japan Struggles With Tainted Reactor Water

By PHRED DVORAK, The Wall Street Journal,

February 29, 2012

<http://online.wsj.com/article/SB10001424052970203833004577251150563609254.html>

OKUMA, Japan—Nearly a year after the March 11 earthquake and tsunami sparked triple meltdowns at reactors here, the taming of Fukushima Daiichi has become in large part a quest to control water.

Foreign journalists on a tour of the Fukushima Daiichi compound Tuesday saw fields of squat, gray water-storage tanks; miles of orange, black and gray hoses; an AstroTurf-covered barge full of contaminated water; and white-suited workers huddled in a field preparing space for a new water container.

Water is crucial to the continued safety and stability of the Fukushima Daiichi plant, even after reactor temperatures fell at the end of last year to a level at which little radioactivity is being emitted. Plant operator Tokyo Electric Power Co. is still injecting hundreds of thousands of gallons into the reactors every day to keep them from overheating again. **Because that water and groundwater—now contaminated—is leaking out of the reactors at an estimated 10,000 tons a month**, cleaning it up and storing the excess is a constant challenge.

When the temperature drops, as it is expected to do Tuesday night, there is the added problem that the water might freeze, bursting out of hoses, tanks and pipes.

Tepco says workers have been installing heaters near key equipment and wrapping pipes with insulation, starting with the most important ones that could cause the worst spills. Still, the company said **frozen pipes likely caused 28 leaks in January and February**. In one of the worst incidents, more than 8 tons of radioactive water leaked from a pipe in reactor No. 4 in early February. Tepco said the water had a low level of radiation, and drained into the basement without leaving the building.

"We've been taking steps to prevent freezing, starting with critical facilities like those for storing water from the reactors," Takeshi Takahashi, Fukushima Daiichi's new plant manager, told reporters Tuesday at the plant's command center. Like much of the staff there, Mr. Takahashi, a serious-looking man with dark circles under his eyes, was living at the center.

The water problem isn't one that will go away soon: Tepco has to keep bathing the nuclear reactors in cooling water until the fuel is removed. And until Tepco can plug the leaks and cracks in reactor piping and buildings, contaminated water will keep welling out. Officials estimate it will take six years to plug the leaks and 25 to remove the fuel.

The heart of Fukushima Daiichi's waterworks is atop a hill in the middle of the compound, in the back of a blue truck. There, three pumps send water coursing through thick, black, insulated hoses and into the three damaged reactors below. Next to that truck is a white one with three more pumps—emergency backup.

A third truck holds the emergency diesel generators that are supposed to power the pumps if the electricity goes down, as it did on March 11 of last year. At that time, the generators on the lower floors of the reactor buildings were destroyed by the tsunami. This time, they are set high enough on the hill so that they might remain dry if another big wave comes, said a Tepco official.

On the far side of the reactors, pumps suck contaminated liquid out of the reactor building basements and send it through a series of white, block buildings where oil, cesium and salt are removed.

**One facility for removing cesium was created by Kurion Inc. of Irvine, Calif., featuring equipment so big it could only be transported by a special Russian aircraft, Tepco officials said. Another was made by France's Areva SA, which came up with an intricate system of pipes and valves that took 50 welders more than a month to put together, Tepco said. The Areva system isn't being used now.**

A third cesium-removal facility was made by Toshiba Corp. Tepco says that one is the main decontamination system in use. Toshiba and support companies deploy 140 workers to operate and monitor the water-processing system, and another 20 to oversee pumping and circulation, through a 2.5-mile line of pressure-resistant hoses. Tepco has two sets of backup lines in place as well, in case the main line gets blocked and needs to be flushed out.

Some of this cleaned-up water goes back up to the truck at the top of the hill, to get rerouted through the reactors.

But much of it gets stored in the squat, gray tanks that have replaced the trees that once grew throughout the sprawling Fukushima Daiichi compound. The tanks store water that has a high saline content, which can damage equipment, explains one Tepco official. Water at other stages of processing are stored in containers of other shapes and colors. Tepco has the capacity to store 165,000 tons of contaminated water, said Katsuhiko Iwaki, deputy manager of the Fukushima Daiichi stabilization center. **About 125,000 tons of water already is being stored. The company plans to expand capacity to about 205,000 tons, he said.**

Fukushima Daiichi also has one floating container for contaminated water. "There's Megafloat," said Mr. Iwaki, pointing to a big, flat AstroTurf-covered barge quietly anchored in the sea by the side of reactor No. 1. The barge was originally created to be a floating fishing pier for the southwestern city of Shizuoka.

## TEPCO workers not trained enough?

March 1, 2012



## Fukushima one year on: Tracing the causes of the nuclear disaster

<http://mdn.mainichi.jp/mdnnews/news/20120301p2a00m0na011000c.html>

It has been nearly a year since the Great East Japan Earthquake and tsunami triggered the triple meltdown at the Fukushima No. 1 nuclear plant. How did this man-made disaster happen?

The government Investigation Committee on the Accident at the Fukushima Nuclear Power Stations stated in a midterm report released in December last year that, first and foremost, the actions taken to protect the reactors from danger were not appropriate.

For instance, in the opening hours of the crisis, the report claims that Fukushima No. 1 plant manager Masao Yoshida and his staff failed to properly grasp the condition of one emergency cooling system called an isolation condenser (IC). The report furthermore pointed to the clumsy handling of water injections into the No. 3 reactor. The cores in both these reactors melted down, and both reactor buildings were blown apart by hydrogen explosions -- No. 1 on March 12, 2011, and No. 3 on March 14.

"March 11, 4:42 p.m.: Water level in No.1 reactor dropping," reads the plant event log on the day the disaster began. "Same day, 5:50 p.m.: Radiation rising around No. 1 reactor building."

After the No. 1 reactor lost power, it is possible an IC system valve was stuck closed, and there were plenty of signs that it was not working properly. Both staff on site and the headquarters of plant operator Tokyo Electric Power Co. (TEPCO), however, believed the valve was functioning until 11:50 p.m. This misinterpretation was at least partially responsible for the dispatch of firefighters to pump water into the reactors from outside, and the late venting of gas building up inside the reactor structures.

But why didn't the TEPCO workers understand that the IC valve in the No. 1 reactor was shut?

First of all, the reactor operators had never been trained how to open and close IC valves, and didn't have the necessary skills. TEPCO headquarters in Tokyo, too, could not contribute any helpful direction.

"If the situation had been evaluated correctly, then there should have been no misapprehensions regarding the state of the IC valve," the investigative committee report stated. **TEPCO's workers, however, did not have enough training to deal with the realities of the growing disaster.**

At the No. 3 reactor, at 2:42 a.m. on March 13, one of the reactor operators stopped the reactor's high pressure coolant injection system (HPCI), which had been pumping water into the core, to switch over to another injection method. That second method, however, failed.

The midterm report stated that partly due to poor communication, Yoshida and other senior managers at the plant didn't find out that the HPCI system had even been stopped for about an hour. Staff took countermeasures, but they were already behind the curve and the crisis grew that much worse.

"It cannot be said for certain that the hydrogen explosions could have been averted had the alternate water injection methods gone well," the report says of the No. 1 and 3 reactors, "but it is possible that damage to the reactors could have been retarded, the amount of radioactive material emitted constrained, and later operations made easier."

## Water water

March 2, 2012

### **Tainted water still major problem at Fukushima nuke plant 1 year after meltdowns**

As Japan prepares to mark the first anniversary of the meltdowns at the Fukushima No. 1 nuclear plant, the facility remains plagued with problems despite Prime Minister Yoshihiko Noda's declaration that the crisis has been brought under control.

In order to decommission reactors No. 1 through 4 at the crippled plant, it is imperative to improve the work environment by draining and decontaminating areas submerged in radioactive water as much as possible. The flow of ground water into these areas, however, means making such operations a reality is a long way off.

According to plant operator Tokyo Electric Power Co. (TEPCO), the amount of radioactive water at the plant, inclusive of treated water, has reached as much as some 200,000 cubic meters. The utility has managed to secure 165,000 cubic meters worth of temporary tanks and has been building tanks that can hold another 40,000 cubic meters of water, on top of a 4,000-cubic-meter underground "reservoir" being built. However, all of these facilities are expected to be full by this fall, making the utility's efforts look like a shoestring operation even almost a year after the onset of the nuclear crisis.

Three essential tasks must be performed to shut down a nuclear plant: suspending the reactors, cooling them and containing radioactive materials. However, hydrogen explosions at the Fukushima No. 1 plant's reactor buildings in the days after the tsunami hit damaged the reactor pressure vessels. In the opening hours of the crisis, pumper trucks and other machinery injected water into the reactors to cool them, but the water leaked out of the damaged pressure vessels and into the basements of the buildings -- a continuing problem that has led to the ever-growing stock of contaminated water.

In June last year, TEPCO set up a circulating cooling system, in which radioactive materials are removed from contaminated water so that the water can be re-injected into the cores. The system had initially been made up of four stages -- oil separators provided by Toshiba Corp., cesium absorption equipment provided by Kurion Inc. of the United States, a decontamination apparatus set up by France's Areva SA, and desalination units by Hitachi Ltd. Areva's system, plagued with repeated water leakages, was later designated as a back-up. As the total pipe length of these systems extends four kilometers, the risk of leaks remains.

In a road map for bringing the nuclear crisis under control announced by TEPCO in April last year, the utility had stipulated that the contaminated water would be treated and reduced by mid-January 2012.

However, the utility pushed that deadline back to fiscal 2020 in its plant decommissioning plan announced in December last year.

Water flowing in from outside the plant has also been hampering the treatment of contaminated water. On top of rainwater pouring in through the damaged reactor buildings, 200-500 cubic meters of groundwater is estimated to be seeping into plant building basements daily.

"The more contaminated water we collect, the more groundwater flows in because of the changes in water pressure," TEPCO spokesperson Junichi Matsumoto explains. In order to keep the pressure balanced, TEPCO has been maintaining the level of contaminated water in the basements, and no serious solution is in sight.

Furthermore, it appears difficult to dispose of the highly radioactive waste generated from the treatment of contaminated water. As of Feb. 21 this year, 581 cubic meters of radioactive mud has been accumulated, along with 358 used cesium filters. While TEPCO is planning to introduce dedicated containers for such materials by fiscal 2014, its road map for decommissioning the reactors only states that the materials "will be transported to disposal sites" as if these will be the final destination for the waste.

## Problems non stop

March 3, 2012

### **From broken temp sensors to leaky pipes, Fukushima nuke plant plagued with problems**

<http://mdn.mainichi.jp/mdnnews/news/20120303p2a00m0na008000c.html>

Nearly a year has passed since the meltdowns at the Fukushima No. 1 nuclear plant, and while some progress has been made in decommissioning the power station, operations continue to be plagued with problems from broken temperature sensors to leaky piping.

Plant operator Tokyo Electric Power Co. (TEPCO) took a major step forward in the decommissioning and dismantling process -- expected to take at least 30 years -- in January when it inserted an endoscope into the plant's No. 2 reactor vessel, beginning the first direct internal observations since the crisis began in March 2011.

Cooling at the plant's No. 1 through 4 reactors and their spent fuel pools broke down when the March 11, 2011 tsunami knocked out all power to the coolant pumps. As a result, nuclear fuel was exposed, generating hydrogen gas that built up inside the reactor buildings, eventually causing explosions that destroyed the No. 1, 3 and 4 reactor buildings and releasing a massive amount of radioactive substances.

The government and TEPCO set up a temporary water recycling system to purify water contaminated with radioactive substances and re-inject it into reactors and fuel pools.

Nine months after the crisis broke out, the government declared that the plant had achieved "cold shutdown" after judging that regular cooling of the reactors and fuel pools had been guaranteed and that there were no longer radioactive substances being emitted.

However, the nuclear plant has since been plagued by various technical problems. In particular, a sensor suddenly began registering alarmingly high temperatures at the bottom of the No. 2 reactor's pressure vessel. The temperature sensor had been registering around 40 degrees Celsius until late-January, but after the water injection method was changed the reading began to rise, topping 70 degrees on Feb. 6.

Unsure of whether there was a problem with the sensor or if the reactor really was heating up again, TEPCO gradually increased the amount of water being pumped into it and also poured in boric acid to prevent the melted core from going critical again. Still, the reading continued to rise and surpassed 80 degrees on Feb. 12 -- the maximum "safe" temperature for maintaining a cold shutdown.

The sensor eventually registered temperatures surpassing 400 degrees, leading TEPCO to conclude it was faulty. However, the entire episode revealed how little the company actually understood of the conditions inside the plant's reactors and the fragility of the cold shutdown.

The loss of the sensor also meant that TEPCO's grasp of conditions had got that much worse, while the increase in the water injected into the reactor resulted in even more contaminated water.

After the government declared that the plant had been brought to cold shutdown, water leaked from 44 locations at the plant, including seven sections of the water injection equipment -- the core of the water recycling and re-injection system -- as well as from spent fuel pools at its No. 3 and 4 reactors. On Jan. 29, cooling at the No. 4 reactor stopped entirely for about two hours.

Moreover, a weed was found growing through a pressure resistant hose of the water recycling and re-injection system, causing a pinhole-sized opening. Also, water containing radioactive strontium leaked from a tank holding enriched saline -- generated after radioactive water is purified -- on two occasions. Up to 2 millisieverts of radiation was detected around the tank following the leaks.

TEPCO wrapped the piping in insulation in a desperate attempt to prevent it from freezing, which was the cause of the leak.

Pipes freezing in winter, however, was a perfectly foreseeable difficulty.

"We've taken countermeasures against freezing of important devices, but they were insufficient," said plant manager Takashi Takahashi, and workers there are expected to continue to face problems with contaminated water.

## Maybe it's time to change some thermometers

### TEPCO notifies gov't of plan to replace thermometer at Fukushima plant

<http://mdn.mainichi.jp/mdnnews/news/20120303p2g00m0dm019000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Friday it has notified the government of a plan to set up a new temperature gauging device replacing a troubled thermometer at a reactor at its crippled Fukushima Daiichi nuclear power plant.

According to a report to the Nuclear and Industrial Safety Agency, the utility is considering putting a thermometer down to a depth of 15 to 20 meters through an existing pipe to gauge the temperature of water at the bottom of the No. 2 reactor.

But the company said it may be able to start the work in late July at the earliest, citing the need for complicated work such as passing a thermometer through a tiny hole measuring only 6 millimeters in diameter.

TEPCO also said the No. 2 reactor is equipped with 41 thermometers, of which 16 are currently usable. Readings of one of the three thermometers rose abnormally at the bottom of the unit last month, temporarily topping 400 C, while the two others read around 30 C. TEPCO concluded the thermometer had broken down.

## A new robot to help Fukushima workers

March 6, 2012

### New robot to explore damaged nuclear plants

[http://www3.nhk.or.jp/daily/english/20120306\\_30.html](http://www3.nhk.or.jp/daily/english/20120306_30.html)

A Japanese firm has developed a robot that can efficiently explore highly radioactive reactor buildings.

Tokyo-based Topy Industries developed the robot at the request of Tokyo Electric Power Company, the operator of the Fukushima Daiichi nuclear power plant. Topy Industries makes rescue robots for fire disaster sites.

The 50-centimeter-long robot is more compact and mobile than the one currently used at the plant, and

has five cameras and a dosimeter that can continually monitor radiation levels.

The robot has a compact body that enables it to move on stairway landings that are only about 70 centimeters wide, and can maneuver on steep stairs.

It can also move through about three centimeters of water and work under dripping water.

The robot's developer, Shingo Tsukui, says he hopes it will help reduce plant workers' radiation exposure.

## Too much cesium in the sea

March 7, 2012

### **Contaminated water may still be leaking into sea from Fukushima plant**

<http://mdn.mainichi.jp/mdnnews/news/20120307p2g00m0dm052000c.html>

TOKYO (Kyodo) -- A group of researchers has reported that radiation-contaminated water could still be leaking into the sea from the Fukushima Daiichi nuclear power plant, nearly a year after the March 2011 earthquake and tsunami triggered meltdowns at the complex.

Data on radioactive cesium in the sea near the plant shows a slower-than-expected decline in concentrations, the group, including Michio Aoyama of the Meteorological Research Institute, said.

Tokyo Electric Power Co., the operator of the nuclear plant, said it does not suspect contaminated water is leaking at present.

Although data for the past three to four months indicate a slower decline in radioactive cesium concentrations, current levels are far lower than those recorded just after the disaster, it said.

Last April, TEPCO found that contaminated water was leaking into the sea and stopped the flow by injecting chemicals into the ground.

## The "Survey Runner"

March 8, 2012

### **Robot built to explore nuclear plant**

<http://www.yomiuri.co.jp/dy/national/T120307005857.htm>



"Survey Runner," a robot to help repair work at the Fukushima No. 1 nuclear power plant, demonstrates its high mobility.

A Tokyo company has developed a small, highly mobile robot that will be sent into the crippled Fukushima No. 1 nuclear power plant to take photos inside reactor buildings and measure radiation levels.

Topy Industries Ltd. said the "Survey Runner" robot will be used to help with repair work at the plant after checking its performance and other details.

The Survey Runner is expected to be able to maneuver around areas where other robots could not.

It can even go up and down steep, wet stairs--an essential feature because coolant water has been injected into the reactors since the crisis at the plant began--and can turn around in a space just 70 centimeters square.

The robot can be controlled remotely or by a long connection cord. It also can adjust the slack of the communication cable automatically while running, a feature that could prevent it from meeting the fate of other robots that have stopped because their control cable somehow got severed.

## Far from perfect yet

### **Fukushima plant still needing great care a year after tsunami**

<http://mdn.mainichi.jp/mdnnews/news/20120308p2g00m0dm057000c.html>

TOKYO (Kyodo) -- A year after the Fukushima Daiichi nuclear power plant was ravaged by a huge earthquake and tsunami, Japan continues to face the challenge of keeping the complex under control without much knowledge of what is actually happening inside the three crippled reactors.

The country is also gearing up to clean the vast radiation----contaminated areas outside the plant, located about 220 kilometers northeast of Tokyo, but securing places to store the topsoil after removal is not easy given the opposition of local residents.

The nuclear crisis at the plant in Fukushima Prefecture occurred shortly after the March 11 natural disasters led to the loss of nearly all of the plant's power sources, and consequently the ability to cool the reactors and spent fuel pools.

The Nos. 1 to 3 reactors have suffered core meltdowns and the buildings housing the Nos. 1, 3 and 4 reactors were ripped by explosions caused presumably by hydrogen released from the core.

Following a painstaking process to contain the world's worst nuclear crisis since the 1986 Chernobyl disaster, the government announced in December that the plant has achieved a stable state of cold shutdown.

But the fact that no one knows precisely what has happened inside the reactors and where the melted nuclear fuel is located means there is still great uncertainty over the situation at the complex.

Most recently, tensions grew over the status of the No. 2 reactor after readings on one of its thermometers showed a notable rise in February in a possible sign that there may be some trouble in cooling the fuel.



While plant operator Tokyo Electric Power Co. determined that the thermometer in question was broken, the incident highlighted the need for the utility to enhance the credibility of its system for monitoring the reactors.

"We should take this problem in the measuring equipment seriously," nuclear disaster minister Goshi Hosono told a press conference on Feb. 14. "Given that work toward scrapping the reactors is expected to last for 30 to 40 years, it is extremely unfavorable to see a situation in which the utility cannot obtain data."

According to a road map for decommissioning the reactors, the utility known as TEPCO will start removing the fuel stored in the spent fuel pools of the Nos. 1 to 4 units within two years and the fuel from the Nos. 1 to 3 reactors within 10 years.

Tadashi Narabayashi, a Hokkaido University professor, called on the utility to swiftly create "criteria and a monitoring system to judge whether a cold shutdown condition has been maintained," using the readings of properly functioning thermometers and the amount of radioactive substances released from the reactor buildings.

He also pointed to the need to develop robots within five years that can operate inside the reactors, where radiation levels could be high enough to destroy integrated circuits in a short time, so that they can carry out such work as installing new thermometers for the reactors.

In addition to the situation of melted fuel, due attention is needed in handling the massive amounts of contaminated water created as a result of constant water injection into the stricken reactors.

After being used to cool the reactors, the water goes through a processing facility so that radioactive substances are removed to a certain extent. Some of the water is then recycled as a coolant and the remaining portion is placed in tanks at the site.

But the storage capacity could eventually run short, raising the possibility that TEPCO may resort to dumping low-level radioactive water in the Pacific Ocean, a plan the utility said it was considering in December but gave up due to opposition from the fishing industry.

Outside the plant's premises, work to reduce the contamination level of land detected to have an annual exposure dose of 1 millisievert or more, excluding natural dosage, is set to accelerate in eight prefectures in the northeastern and eastern regions of Japan.

Talks are also under way between the central government and municipalities located near the stricken plant to build a facility in Fukushima Prefecture to store the removed soil for a certain period of time. The government aims to select the location for the interim storage facility during fiscal 2012, but the eight municipalities concerned have not yet reached a consensus on the issue and it remains to be seen whether things will go as scheduled.

Reflecting the sensitivity of the matter, a gathering between the government and the municipalities planned for Feb. 26 was abruptly canceled, with the mayor of one of the two towns that host the

Fukushima plant expressing his "strong mistrust" of the state due to media reports that described in advance what the government planned to discuss at the meeting.

Swift establishment of the facility is necessary to move the decontamination process forward and help people in Fukushima Prefecture restore their shattered lives.

The following is the current status and other information on the six reactors at the Fukushima Daiichi nuclear power plant, crippled by the magnitude 9.0 earthquake and ensuing tsunami on March 11 last year, based on data issued by the government and plant operator Tokyo Electric Power Co.

----- Reactor No. 1 (Operation suspended after quake)

Core melted after loss of power supply, 392 fuel assemblies stored in spent fuel pool, building housing the reactor damaged by hydrogen explosion on March 12, building cover completed on Oct. 28, achieved state of cold shutdown on Dec. 16.

----- Reactor No. 2 (Operation suspended after quake)

Core melted after loss of power supply, 615 fuel assemblies stored in spent fuel pool, achieved state of cold shutdown on Dec. 16, industrial endoscope passed into reactor on Jan. 19, malfunction of thermometers confirmed in February.

----- Reactor No. 3 (Operation suspended after quake)

Core melted after loss of power supply, 566 fuel assemblies stored in spent fuel pool, building housing the reactor damaged by hydrogen explosion on March 14, achieved state of cold shutdown on Dec. 16, work to remove debris from upper area of building continuing.

----- Reactor No. 4 (Under maintenance when quake struck)

No fuel rods in core, 1,535 fuel assemblies stored in spent fuel pool and stably cooled, building housing the reactor damaged by hydrogen explosion on March 15, supporting structure under bottom of pool installed as countermeasure against aftershocks by July 30, work to remove debris from upper area of the building continuing.

----- Reactors No. 5, 6 (Under maintenance when quake struck)

Achieved cold shutdown on March 20, with power supplied by one emergency diesel generator.

### **Fukushima gov. inspects Daiichi nuclear plant**

[http://www3.nhk.or.jp/daily/english/20120308\\_30.html](http://www3.nhk.or.jp/daily/english/20120308_30.html)

The governor of Fukushima Prefecture has asked the operator of the Fukushima Daiichi nuclear plant to continue efforts to decommission its crippled reactors.

Yuhei Sato on Thursday visited the plant run by Tokyo Electric Power Company for the first time since the accident there last March.

Sato was told by plant chief Takeshi Takahashi that there's still a long way to go, but that the government and the firm said in December that the plant had been brought to a state of cold shutdown. The state marks the second phase of a timetable to bring the plant under control.

Takahashi added that the firm wants to steadily carry out operations such as removing fuel rods that melted and fell to the bottoms of the plant's reactors.

Sato said residents of the prefecture remain uneasy due to reports on a series of problems at the plant.

The governor later visited the plant's emergency response room and thanked about 150 workers for their efforts. He then boarded a bus to tour 4 reactor buildings and other facilities.

Sato said the visit made him think again about the severity of the accident. He added that the prefectural government will have to work to realize an early return of nuclear evacuees and reconstruction of infrastructure.

## Regrets

### **Ex-fire department head regrets issuing order to spray water on Fukushima nuclear plant**

<http://mdn.mainichi.jp/mdnnews/news/20120308p2a00m0na016000c.html>

A former head of the Tokyo Fire Department expressed regret for ordering firefighters to spray water into the crippled Fukushima No. 1 Nuclear Power Plant in March last year while their safety was not guaranteed.

"I still believe I shouldn't be forgiven for issuing the order as the safety of my subordinates was not confirmed," Yuji Arai, who headed the fire department when the operation was conducted, said in an exclusive interview with the Mainichi Shimbun. He left his post in July last year.

Firefighters deployed to the plant were successful in spraying water into the building housing the plant's No. 3 reactors in the predawn hours of March 19, 2011.

Arai said he dispatched firefighters to the tsunami-hit nuclear power station at the urging of Tokyo Gov. Shintaro Ishihara.

He called the governor at around 6 p.m. on March 17 at the request of a Tokyo Metropolitan Government official.

"The prime minister says the Tokyo Fire Department is reluctant to cooperate with the national government. Is it true?" Ishihara asked Arai on the phone.

Arai replied that the Tokyo Fire Department was already cooperating in rescue and relief operations by dispatching special disaster countermeasure vehicles on March 16 and by taking other steps.

The governor said he would contact then Prime Minister Naoto Kan again.

Ishihara subsequently called Arai and told him, "The central government is terribly confused. There is no other choice. The government says it will officially ask the Tokyo Fire Department to dispatch personnel to the site if you're prepared to do it. Is that all right?"

The fire department chief replied, "We're prepared, so we'll dispatch personnel."

Arai said he deemed that he must dispatch personnel after confirming on the morning of March 17 that Self-Defense Force helicopters' spraying of water onto the crippled plant did not produce positive results.

He then launched a large-scale drill by spraying water on the bank of the Arakawa River in Tokyo.

"By evening, we had been notified that water could be supplied for fire engines at the site within 15 minutes," he said, adding that Yoshihiro Yamaguchi, professor at Kyorin University's medical school and disaster relief adviser, reassured the department by advising it on how to avoid exposure to radiation.

However, he was worried about a possible explosion due to a lack of information. "What we were worried about most was that absolutely no information was available on the plant's No. 4 reactor, and that the possibility that it would blow up couldn't be ruled out."

Nevertheless, the fire department chief was forced to dispatch personnel to the nuclear plant.

"We had no choice under such a critical situation. However, since my most important responsibility is to guarantee the safety of my subordinates in their operations, my issuance of the order constitutes negligence of my responsibilities," he said. "I still feel it was contradictory."

Arai also said the department had not been notified that there was a radiation-proof building on the premises of the nuclear plant.

"Even the Fire and Disaster Management Agency of the Internal Affairs and Communications Ministry didn't know the existence of the facility and we were never informed of it. If we had known about the facility, we could have used it as a base for our operations," he said.

"Even the ministry only learned of the facility after we lodged a protest. Out of reflection on its slow response to the (January 1995) Great Hanshin and Awaji Earthquake, the government set up a crisis

management center at the Prime Minister's Office. It should have shared necessary information on disasters with relevant organizations but failed to do so," he said. "The reason for the failure is the lack of a coordinator in response to the disaster. It's the most serious problem we should reflect on."

[Click here for the original Japanese story](#)

## Better late than never

March 9, 2012

### **Nuclear disaster taskforce minutes compiled**

[http://www3.nhk.or.jp/daily/english/20120309\\_22.html](http://www3.nhk.or.jp/daily/english/20120309_22.html)

The government has released pieced-together minutes from its task force meetings after the crisis at the Fukushima Daiichi nuclear power plant began on March 11th of last year.

On that day, the earthquake and tsunami knocked out external power and disabled the plant's backup generators. Then Prime Minister Naoto Kan declared a state of emergency at the nuclear plant, and presided over the first meeting of the task force on the evening of March 11th. But it was recently discovered that no minutes of that or subsequent meetings had been taken.

In response to public criticism, the Nuclear and Industrial Safety Agency interviewed those who had taken part in the meeting and studied their notes in order to prepare the minutes, which were released on Friday.

The minutes of the task force's first meeting show that an unidentified participant spoke about a worst-case scenario. The participant said meltdowns could occur if the core temperatures of the reactors were to rise after backup cooling batteries were exhausted, after about 8 hours.

The government had not yet issued an evacuation order at the time. But the record also shows that another member of the task force told the meeting that it may be necessary at some point to evacuate people from an area within 10 kilometers of the plant.

At the 3rd meeting, held after noon on March 12th, then National Policy Minister Koichiro Gamba pointed out the possibility of meltdowns occurring at the plant and asked whether a 10-kilometer evacuation radius would be sufficient.

At the time, an evacuation zone was set up within 10 kilometers of the plant. The zone was expanded to 20 kilometers after a hydrogen explosion occurred at the Number 1 reactor at 6:25 PM on March 12th.

The minutes offer no detailed accounts of how decisions were made on crucial matters, such as reviewing the evacuation zones. This makes it difficult to examine the government's decision-making process in handling the disaster.

## **Gov't recognized meltdown possibility hours after tsunami hit plant**

<http://mdn.mainichi.jp/mdnnews/news/20120309p2g00m0dm086000c.html>

TOKYO (Kyodo) -- The Japanese government was aware of the possibility of a nuclear meltdown at the Fukushima Daiichi nuclear power plant on the very day the complex was hit by the earthquake and tsunami last March, a summary of the meetings of the government's nuclear emergency headquarters showed Friday.

The possibility was pointed out by an unidentified attendee at the first meeting convened for about 20 minutes from 7:03 p.m. on March 11 last year, after the plant was hit by the magnitude 9.0 earthquake at 2:46 p.m.

The summary suggests that the government, from the beginning of the accident, had in mind the worst case scenario that may occur at the plant, about 220 kilometers northeast of Tokyo, but was reluctant to actively disclose information to the public.

It took a few months for the government to officially acknowledge that meltdowns had occurred in three crippled reactors. The government has also stirred controversy for replacing a spokesman of the nuclear safety agency, after he touched on the possibility of meltdown at a press conference on March 12.

After being criticized for failing to create minutes of the key gathering, the government compiled a 76-page summary of the headquarters' 23 meetings from recorded conversations and memos written by officials of the Nuclear and Industrial Safety Agency and other government organizations who were attending the meetings.

The document showed that a participant said, "There is a need to move emergency diesel generators to cool (the reactors), but they are not moving because of tsunami. The only thing that is moving is cooling (equipment) that can be operated by batteries. This will last for eight hours."

"If the temperature of the reactor rises after eight hours, there is a possibility that a meltdown will occur," the summary quoted a person as saying.

At the third meeting held at noon on March 12, then national strategy minister Koichiro Gemba was quoted saying, "There is a possibility of a meltdown. Is it OK with the evacuation zone set at 10 kilometers? Is there no need to reconsider?"

In the afternoon, the government decided to expand the evacuation zone to a 20-km radius from the plant.

At the seventh meeting on March 14, then Prime Minister Naoto Kan said that "the consensus of experts is that 20 km is enough," and Gemba argued, "Some experts have different views."

Gemba is a House of Representatives member, and his election district is in Fukushima Prefecture. The summary of the fourth meeting on March 12, meanwhile, showed that Kan feared the nuclear crisis at the plant might turn into a situation similar to the 1979 accident at the Three Mile Island Unit 2 in the United States, which resulted in a partial meltdown of the reactor core.

He also said that Japan is "facing the biggest crisis in the postwar period" at a meeting on March 13.

The summary was unveiled just before the first anniversary of the natural disasters, which devastated the country's northeastern coast and triggered the world's worst nuclear crisis since the 1986 Chernobyl disaster.

## Is TEPCO to decide?

March 10, 2012

### **TEPCO to indicate in March whether all Fukushima reactors to be scrapped**

<http://mdn.mainichi.jp/mdnnews/news/20120310p2g00m0dm027000c.html>

FUKUSHIMA (Kyodo) -- Tokyo Electric Power Co. will indicate later in the month whether all the reactors at its two nuclear power plants in Fukushima Prefecture will be scrapped, not just the four badly damaged reactors to be decommissioned at the Fukushima Daiichi plant, company President Toshio Nishizawa said Friday.

Fukushima Gov. Yuhei Sato has demanded that the utility known as TEPCO scrap not only the crisis-hit Nos. 1 to 4 units at the Fukushima Daiichi power plant but also the Nos. 5 and 6 reactors at the complex, as well as the Nos. 1 to 4 reactors at the company's Fukushima Daini plant.

"We must show our view" in the company's comprehensive restructuring plan to be compiled by the end of the month, Nishizawa told reporters during a visit to the prefecture ahead of the first anniversary of the March 11 earthquake and tsunami, which triggered the nuclear crisis.

He also said the company will consider whether to scrap all the reactors by "listening to local opinions and watching discussions on nuclear power taking place inside the government."

Cash-strapped since the accident, TEPCO and a state-backed bailout fund are working to compile the restructuring plan.

Sources close to the matter said Friday that TEPCO is also set to compile a plan on power supply over the next 10 years, based on the assumption that the six reactors other than the Fukushima Daiichi plant's Nos. 1 to 4 units remain suspended.

The plan, which utilities are obliged to submit to the Economy, Trade and Industry Ministry every year, will also be submitted later in the month, the sources said.

If left unable to restart for 10 years, the six reactors would exceed, or move closer to, the 40-year limit that the government is seeking to set for the operational life of the country's nuclear reactors in the wake of the Fukushima crisis.

As the government plans to basically scrap reactors that surpass the limit as part of enhanced nuclear regulation, TEPCO's power supply plan suggests the six reactors may end up entering the decommissioning process without resuming operation.

Deciding to scrap the six reactors would mean that TEPCO, already struggling under massive compensation payments related to the crisis, could face a much greater financial burden.

The power-generation capacity of the six reactors totals 6.28 million kilowatts. TEPCO will make up for the loss by increasing thermal power generation and through other means.

## **Fukushima no.2 "torus" OK**

March 15, 2012

### **No cracks or strains seen in suppression chamber of No. 2 reactor at Fukushima plant**

<http://mdn.mainichi.jp/mdnnews/news/20120315p2a00m0na009000c.html>

Tokyo Electric Power Co. (TEPCO) took and released photographs on March 14 of the pressure suppression chamber of the No. 2 reactor at the crippled Fukushima No. 1 Nuclear Power Plant and the utility said there were apparently no cracks in the chamber or no changes in the shape of the device.

It is the first time TEPCO, the operator of the troubled nuclear power station, has taken photographs of the interior of a pressure control chamber at the troubled Fukushima nuclear plant since the outbreak there of the ongoing crisis. "Apparently, there were no cracks in the suppression chamber and there were no changes in the shape."

The pressure suppression chamber is designed to turn steam in the reactor into water to be used for cooling. In order to identify places to which coolant water leaked from the reactor or underground water flowed to, TEPCO planned to check the inside of a doughnut-shaped pressure suppression pool called "the



torus," which houses the pressure suppression chamber. TEPCO took the photographs of the pressure control chamber as part of its preliminary survey for the plan.

TEPCO employees entered the basement mezzanine of the reactor building at the No. 2 reactor on March 14 and confirmed that the doors to the "torus" could be opened. The maximum level of mid-space radiation in the "torus" was 160 millisieverts per hour. There was contaminated water about 60 centimeters beneath the basement mezzanine, and the level of radiation on the surface of the tainted water was the same as that of the mid-space radiation in the chamber. Part of the reddish brown paint seemed to have come off inside the pressure suppression chamber, and TEPCO said, "That could be because dust piled up, or the color may have changed due to the accident."

Meanwhile, other TEPCO employees walked down to the basement mezzanine of the No. 3 reactor and confirmed that the doors to the "torus" were deformed and could not be opened. That's apparently due to a hydrogen explosion. The level of mid-space radiation in front of the chamber was up to 75 millisieverts per hour. As was the case with the No. 2 reactor, there was contaminated water about 60 centimeters beneath the mezzanine, and the radiation level on the surface of the tainted water was 140 millisieverts per hour.

The TEPCO employees were exposed to up to 2.87 millisieverts of radiation during their missions. That was below the 10 millisieverts per hour of radiation the utility had assumed they would be exposed to. [Click here for the original Japanese story](#)

## Camera in no.4 - not exactly reassuring

March 16, 2012

### Camera inserted in Fukushima No.4 reactor

[http://www3.nhk.or.jp/daily/english/20120316\\_35.html](http://www3.nhk.or.jp/daily/english/20120316_35.html)

Debris from a hydrogen explosion and large volume of floating objects were observed inside the Number 4 reactor of the crippled Fukushima Daiichi nuclear power plant.

The plant operator Tokyo Electric Power Company used an underwater camera to survey the reactor on Thursday.

It is the first such attempt since the reactor building was damaged by a hydrogen explosion 4 days after the earthquake and tsunami last March.

Wreckage, which included two pieces of long, thin sheets, was seen at the bottom of the reactor and a large number of floating white objects were also observed.

Similar floating matter was also found in the spent fuel pool inside the building, causing the pool's visibility to fall from 5 meters last month to one meter now.

TEPCO plans to start removing 1,535 fuel rods from the pool by December next year and temporarily keep them on the plant premises.

It says removal of the spent fuel from the pool requires a visibility of at least 7 meters and that it will investigate how the floating matter was created.

## More "inadequate previsions"...

### **Nuke crisis far from under control as TEPCO's 'inadequate predictions' continue**

<http://mdn.mainichi.jp/perspectives/news/20120316p2a00m0na007000c.html>

The crisis at the Fukushima No. 1 nuclear plant is far from over. I became certain of this when the power plant was opened to the media on Feb. 20, and witnessed the reality of what was going on inside. This, despite the government's declaration just two months prior, that the reactors had achieved a "cold shutdown" state, bringing the crisis "under control."

The invitation for journalists to inspect the plant in February was no doubt intended to drive home the impression that the disaster had indeed been resolved. However, the key element in the cooling system now in place appeared unstable and hastily thrown together, and high radiation levels were detected inside the plant. The plant was far from being "normal" or "under control."

On the morning of our visit, some 40 members of the press changed into white protective suits and entered the grounds on two buses. After stopping to look inside the quake-proof tower that serves as the recovery effort headquarters, we toured the plant grounds for about an hour by bus.

When we arrived at the waterfront, where the plant's No. 1-4 reactors are located, a nearby building's blown-out windows -- the result of a hydrogen explosion at the neighboring No. 1 reactor -- jumped out at us. The alarms on the radiation dosimeters we were wearing started going off, and an official from plant operator Tokyo Electric Power Co. (TEPCO) accompanying us yelled out, "100 microsieverts (0.1 millisieverts per hour)!"

Radiation levels inside the plant have dropped from those detected immediately after the crisis began. However, close to the No. 3 reactor, which still has the highest radiation levels inside the plant, the figure can reach 1.5 millisieverts. In other words, the amount of radiation one is exposed to by being near the No. 3 reactor for just one hour is equivalent to what a Japanese resident is exposed to in a whole year from background radiation.

The No. 4 reactor has relatively low radiation levels, and atop a hill some 300 meters southwest of it, we got out of our buses for 15 minutes. We could see several people working on the fourth and fifth floors of the No. 4 reactor building. The No. 3 reactor building was still just a tangle of steel from the reactor building's frame.

Our guide's voice was difficult to follow, as it was muffled by the same mask we all wore. Breathing with those masks was difficult, and seemed to exacerbate my exhaustion; I have nothing but respect for the workers who do their jobs wearing such equipment. Struck by the harsh conditions, I realized that mishaps that would not happen under normal conditions were more likely to occur here, and that extra care must be taken to avoid them.

While I believe it was TEPCO's intent to convince us that the disaster has been "resolved," the media inspection was limited to certain areas, citing "high radiation levels" in other parts of the plant. As for our "interview" of plant workers, three TEPCO-approved employees of a TEPCO subsidiary were prepared for us, with a TEPCO public relations official in tow.

What most struck me as dangerous was what we saw first -- the injection pumps located on a hill overlooking one of the reactors.

Currently, radiation-tainted water is sent through a purifying system before it is reused to cool down the No. 1, 2 and 3 reactors, which all suffered core meltdowns. In other words, the abovementioned injection pumps function like hearts, sending clean, cooling water to the reactors. The system was built in approximately three months following the outbreak of the disaster.

The pumps -- three of them -- were set up on the bed of a truck in a parking lot on a hill northwest of the No. 1 reactor. The pumps were covered with tarps, while pipes leading to the reactors were covered in black rubber insulation. Both are measures taken against freezing. I was shocked, however, to learn that both the tarp and the rubber insulation were put in place after water had already leaked due to freezing.

Low temperatures in January had caused the pumps and their surrounding pipes to freeze, leading to a series of water leakages. While the situation never deteriorated so far as to bring water injection to a complete stop, the incident exposed the vulnerability of the temporary equipment that has been installed. Water leaks due to freezing in the spent nuclear fuel pools of the No. 3 and No. 4 reactors and in a desalinating system for radiation-tainted water have also occurred. Cooling of the No. 4 reactor's fuel pool -- which holds 1,535 spent fuel rods, equivalent to what is used by two reactors -- was halted for approximately two hours.

Nuclear power plants have been running in the Fukushima area for over 40 years. Why hadn't countermeasures against the cold winters been taken earlier? Takeshi Takahashi, who became plant chief last December, said, "We believed that we had taken adequate steps against the freezing, especially with our most crucial facilities, but our predictions were inadequate."

Inadequate predictions or assumptions are precisely what caused the disaster in the first place. Based on a long-term evaluation of quake activity published by the government's Earthquake Research Committee

in 2002, TEPCO released calculations in the spring of 2008 that "tsunami of up to 15.7 meters will hit (the Fukushima No. 1) plant." Subsequently concluding, however, that "such a tsunami will not actually take place," the utility failed to implement any tsunami countermeasures. Even now, with a crisis still unfolding, the company continues to act in the same way.

To the reporters visiting the plant, Takahashi tried to reinforce the government's assurances that a "cold shutdown" had been achieved, saying, "Almost a year after the disaster (began), the reactors are releasing less and less heat, and because we are consistently injecting them with water, they have been stabilized. Our facilities are equipped with various back-ups that even if something malfunctioned, we have a sufficient margin within which to deal with it."

However, whether the reactors are stable or not can only be determined right now using indirect circumstantial evidence such as temperature. Furthermore, one of the thermometers used to determine the so-called cold shutdown broke earlier this year. No matter how many emergency back-up measures TEPCO arms itself with, they mean nothing if the utility's fundamental predictions and assumptions are flawed. The latest series of water leaks is an indication of TEPCO's basic lack of vision and imagination. A year on, and we are still unable to ascertain what's actually happening inside those reactors. There is no more room for "inadequate predictions." (By Ei Okada, Science & Environment News Department)

## New measures in the no-go zone

March 19, 2012

### **Tsunami that hit around Fukushima nuke plant was 21 meters high: researchers**

<http://mdn.mainichi.jp/mdnnews/news/20120319p2a00m0na014000c.html>

The tsunami that hit the Pacific coastline within what is now the no-go zone around the crippled Fukushima nuclear power plant topped 21 meters, researchers have found.

A team of researchers headed by University of Tokyo professor Shinji Sato and the Fukushima Prefectural Government found that up to 21.1 meters of tsunami had struck the coastal areas within a 20-kilometer radius from the Fukushima No. 1 Nuclear Power Plant on March 11, 2011.

The finding came one year after the Great East Japan Earthquake and tsunami struck, as the 20-kilometer nuclear exclusion zone had hampered researchers from conducting a field survey there.

Clad in protective gear, the researchers entered the no-go zone on Feb. 6 and 7 this year, covering 28 locations along a 40-kilometer coastal stretch from Minamisoma to Naraha, Fukushima Prefecture.

After examining the traces of tsunami left on window glass and roof tiles, researchers found that a 21.1-meter-high tsunami had hit the Kobama district of Tomioka, Fukushima Prefecture, located between the

Fukushima No. 1 and No. 2 nuclear plants; followed by a 16.5-meter-high tsunami that attacked the town of Futaba; and tsunami 15.5 meters high in Namie and 12.2 meters high in Minamisoma and Okuma. Overall the tsunami topped 10 meters high at a total of 16 locations.

Plant operator Tokyo Electric Power Co. (TEPCO) had previously estimated that the tsunami that hit the Fukushima No. 1 nuclear plant, straddling Futaba and Okuma, had reached 14 to 15 meters high.

Researchers also found that there were only a few locations in Fukushima Prefecture outside the exclusion zone that had been hit by tsunami topping 10 meters high -- a result that underscores the fact that the Fukushima No. 1 and No. 2 nuclear plants were located among the most severely hit zones.

"It is likely that the waves were easy to gather (around the nuclear plants) because the shores there are arching out into the sea," said professor Sato, explaining why high waves attacked the no-go zone. [Click here for the original Japanese story](#)

## 60 cm, not 3 meters. What now ?

March 26, 2012

### **TEPCO: Just 60cm of water in Fukushima reactor**

[http://www3.nhk.or.jp/daily/english/20120326\\_34.html](http://www3.nhk.or.jp/daily/english/20120326_34.html)

Tokyo Electric Power Company says it has found that the cooling water in one of the damaged reactors at Fukushima is only 60 centimeters deep, far lower than previously thought.

The utility confirmed the water level by inserting an endoscope into the No.2 reactor at the Fukushima Daiichi nuclear power plant on Monday.

TEPCO had thought that the water level was about 3 meters. It has been injecting nearly 9 tons of water per hour into the reactor to cool the melted fuel that has fallen to the bottom of the containment vessel.

But the shallow level indicates that the water continues to leak into the reactor building through the suppression chambers under the vessel.

The utility argues that the fuel is still being cooled, as the water temperature remains at around 48 degrees Celsius.

But the low level suggests that decommissioning the reactor could be much more difficult. The operator may need to repair more parts of the containment vessel so it can be filled with water to block the strong

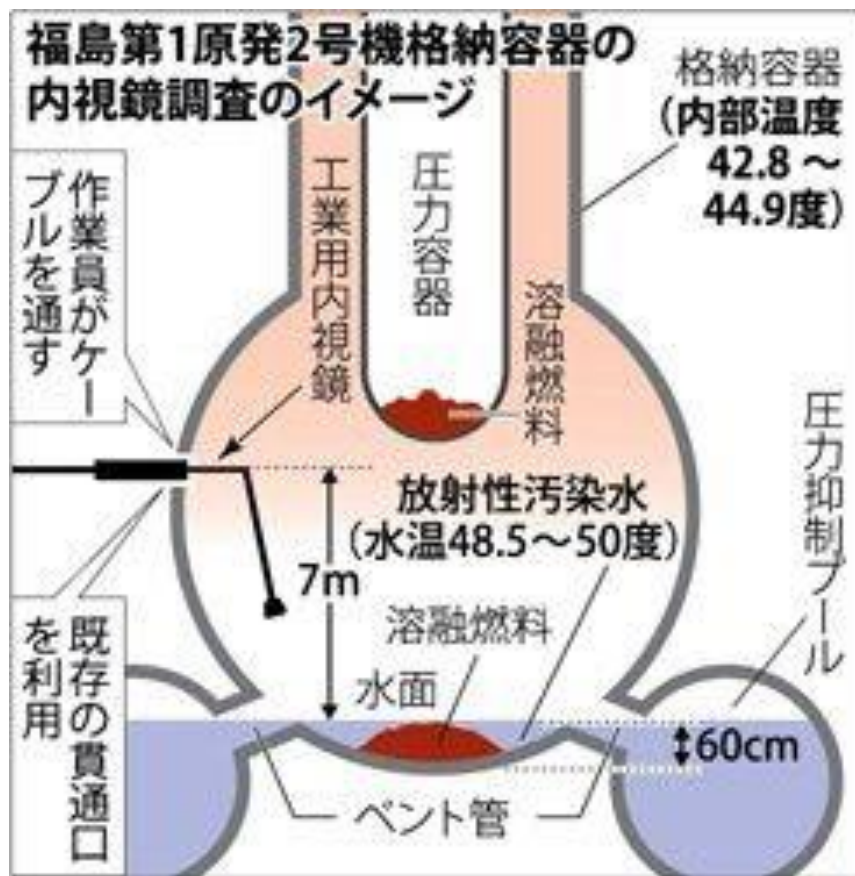
radiation.

The No. 2 reactor's containment vessel is believed to have been damaged on March 15th with the sudden loss of pressure inside the reactor.

Monday's survey was the second look inside the No.2 reactor since January. During the first survey, an endoscope was unable to confirm the water level in the containment vessel. This time, TEPCO used a scope that is 10 meters longer.

### Reactor no.2 again

I can't read Japanese but you may have this (from the Mainichi Shimbun) It speaks for itself :



### A bit more about No.2

March 27, 2012

## **Water level of Fukushima No. 2 reactor only 60 cm above bottom**

<http://mdn.mainichi.jp/mdnnews/news/20120327p2g00m0dm011000c.html>

TOKYO (Kyodo) -- The operator of the Fukushima Daiichi nuclear power plant on Monday found that the water level in the No. 2 reactor's primary containment vessel was only 60 centimeters deep when it checked the interior of the crippled reactor using an endoscope.

Tokyo Electric Power Co. spokesman Junichi Matsumoto gave assurances that the melted fuel inside the No. 2 reactor remains cooled through continuous water injection, as the water temperature in the vessel was 48.5 C to 50 C.

But he acknowledged that the lower-than-expected water level suggests that a large portion of the injected water is leaking from the primary containment vessel, possibly via the damaged suppression pool that is linked to the reactor.

To specify from where the water is leaking, the company needs a "broader inspection," Matsumoto told a press conference. TEPCO plans to conduct another survey into the No. 2 reactor Tuesday to check the interior radiation level.

It is the first time the utility has confirmed the existence of water inside any of the Nos. 1 to 3 reactors since the nuclear accident was triggered by the huge earthquake and tsunami last March.

The fuel inside the Nos. 1 to 3 reactors is believed to have melted through the pressure vessels and accumulated in the outer primary containers.

The water filling the No. 2 reactor containment vessel was transparent, but some sediment was found. The sediment could be paint that peeled off or rust, and unlikely to be melted fuel, Matsumoto said. As TEPCO could not confirm the water level in the previous industrial endoscope survey on Jan. 19, the company this time used a longer 20-meter endoscope to check deeper inside.

**TEPCO also said Monday that about 120 tons of water containing radioactive substances leaked from the water circulation system involved in cooling the Nos. 1 to 3 reactors.**

**Of the leaked water, which is believed to contain radioactive strontium, 80 liters leaked out into the Pacific Ocean. The concentration level is about 140,000 becquerels per cubic centimeter, the company said.**

March 28, 2012

## **Fukushima reactor water level shallower than thought**

<http://www.yomiuri.co.jp/dy/national/T120327006202.htm>

The water level in the containment vessel of the No. 2 reactor at the Fukushima No. 1 nuclear power plant is only about 60 centimeters deep, far shallower than previously assumed levels of about four meters, according to Tokyo Electric Power Co.

The lower-than-expected water level was discovered for the first time when the power utility used an industrial endoscope to check the crippled reactor's interior on Monday, TEPCO said.

According to some experts, it is possible that nuclear fuel that melted through the reactor's pressure vessel and accumulated on the bottom of the containment vessel in the aftermath of the March 11 earthquake and tsunami may not be completely covered in the water.

TEPCO said the water temperature in the vessel remained relatively low within a range of 48.5 C to 50 C. The discovery of the unexpectedly shallow water level will not affect TEPCO's judgment that the reactor is in a state of "cold shutdown."

## **More bad news about No.2**

### **Fukushima No. 2 reactor radiation level up to 73 sieverts per hour**

<http://mdn.mainichi.jp/mdnnews/news/20120328p2g00m0dm010000c.html>

TOKYO (Kyodo) -- The operator of the Fukushima Daiichi nuclear power plant said Tuesday that the radiation dose inside the crippled No. 2 reactor stood at an extremely high level between 31.1 and 72.9 sieverts per hour, underscoring the existence of radioactive substances from the melted fuel inside the structure.

Tokyo Electric Power Co. measured the radiation level by inserting a long dosimeter into the round-bottomed, flask-shaped primary containment vessel, where fuel is thought to be accumulating at the bottom following the nuclear accident last year.



Human beings could die within one month once exposed to 7 sieverts and within several days once exposed to 20 sieverts or more. Usually, when an ordinary reactor is not operating, the radiation level is low enough for workers to enter inside, according to the utility known as TEPCO.

The highest radiation dose was measured at about 4 meters from the bottom and about 1 meter away from the vessel's interior wall. The utility said it could not check a deeper area because the dosimeter had no camera attached.

The utility's spokesman Junichi Matsumoto said he cannot immediately tell whether the latest outcome will affect the current road map toward scrapping the Nos. 1 to 4 units, but added that the data can be used to study what kind of devices should be developed for the decommissioning work.

"One important challenge is resistance to radiation...If we are going to use electronic devices inside the primary containment vessel, we may have to consider shielding the devices, or use parts that can tolerate high levels of radiation," Matsumoto told a press conference

TEPCO carried out an industrial endoscope survey a day before, and found the vessel filled with water only 60 centimeters deep, a lower-than-expected height considering the amount of water injected into the reactor to keep the fuel inside cool.

The utility used the same hole to insert the endoscope and the dosimeter.

The No. 2 reactor is one of the plant's three reactors that have suffered meltdown in the nuclear accident, and its fuel is believed to have melted through the pressure vessel and accumulated in the outer primary container.

## **Lethal radiation detected inside Fukushima reactor**

[http://www3.nhk.or.jp/daily/english/20120328\\_14.html](http://www3.nhk.or.jp/daily/english/20120328_14.html)

Tokyo Electric Power Company has detected extremely high levels of radiation inside one of the crippled reactors of the Fukushima Daiichi nuclear power plant.

TEPCO was able to place monitoring equipment directly inside the reactor for the first time since last year's accident.

A dosimeter lowered into the containment vessel of the No.2 reactor registered 72.9 sieverts, or 72,900 millisieverts per hour at maximum -- a level where a human is certain to die within about 7 minutes of exposure.

The utility hopes to determine the state of the vessels as it moves to decommission the reactors.

It says radiation levels increased as the dosimeter was lowered inside the reactor. This suggests the nuclear fuel melted down and collected at the bottom of the vessel.

The utility also learned the water level inside the vessel was only 60 centimeters, compared to the original estimate of about 3 meters.

TEPCO suspects the suppression chamber at the bottom of the vessel may have been destroyed.

The findings are a setback for plans to scrap the reactor. The utility has to pinpoint and repair damaged parts inside the vessel and fill it with water before extracting the fuel.

TEPCO says the development of devices that can withstand the extremely high levels of radiation is a pressing matter.

### **Fumiya Tanabe in the JNST**

<http://ex-skf.blogspot.fr/2012/03/jnst-scenario-of-large-amount-of.html>

JNST: "A scenario of large amount of radioactive materials discharge to the air from the Unit 2 reactor in the Fukushima Daiichi NPP accident"

Journal of Nuclear Science and Technology has a paper by Fumiya Tanabe of Sociotechnical Systems Safety Research Institute published online on March 28, 2012.

Tanabe is the one who said last August that there was a second "meltdown" in Reactor 3 on March 20-21, in which the melted fuel dropped through the Reactor Pressure Vessel onto the floor of the Containment Vessel, releasing a large amount of radioactive materials that caused the spikes in radiation levels in wide areas in Tohoku and Kanto.

In November last year (11/19/2011), he also disclosed his analysis of the Reactor 2 Suppression Chamber, and concluded that it may have been damaged by the earthquake. This paper looks to be that analysis, now peer reviewed and published.

The paper was received on December 9, 2011, accepted final version for publication on January 24, 2012.

So it is possible to disclose the outline of the analysis before submitting the paper to a peer-reviewed magazine, and the magazine has no problem accepting and publishing the paper. (All those researchers in Japan and elsewhere in the world who withheld their data, analysis, research until their papers were published by peer-review magazines, what would you say now?)

From Taylor & Francis Online:

A scenario of large amount of radioactive materials discharge to the air from the Unit 2 reactor in the Fukushima Daiichi NPP accident

Fumiya Tanabe

Abstract:

Based on an analysis of the measured data with review of calculated results on the core melt accident, a scenario is investigated for large amount of radioactive materials discharge to the air from the Unit 2 reactor. **The containment pressure suppression chamber (S/C) should have failed until the noon on 12 March 2011 only by seismic load due to the huge earthquake on 11 March or by combination of seismic deterioration and dynamic load due to steam flowing-in through safety relief valve. Opening of the two safety relief valves (SRVs) at 14 March 21:18 should have resulted in discharge of large amount of radioactive materials through the S/C breach** with the measured air dose rate peak value of  $3.130E-3$ Sv/h at 21:37 near the main gate of the site. **The containment drywell (D/W) should have failed at 15 March 06:25, at the cable penetration seal due to high temperature caused by the fuel materials heating up on the floor of the D/W, which had flowed out from the reactor pressure vessel. Then large amount of radioactive materials should have been discharged through the D/W breach** with the measured air dose rate peak value of  $1.193E-2$ Sv/h at 15 March 9:00.

Is Tanabe saying that venting of Reactor 2 on the night of March 14, 2011, with the Suppression Chamber already broken due to the earthquake, caused a discharge of a large amount of radioactive materials through the Suppression Chamber?

What a tragi-comical sequence. Amateur hours.

If the Reactor 2 Suppression Chamber was already damaged by the earthquake, what about other Reactors?

## Wake up!

March 29, 2012

"Suddenly" (after 48 hours for the French radio) the western media seem to realise something is happening in Japan. The situation at Fukushima Daiichi is slowly making it in the news again.

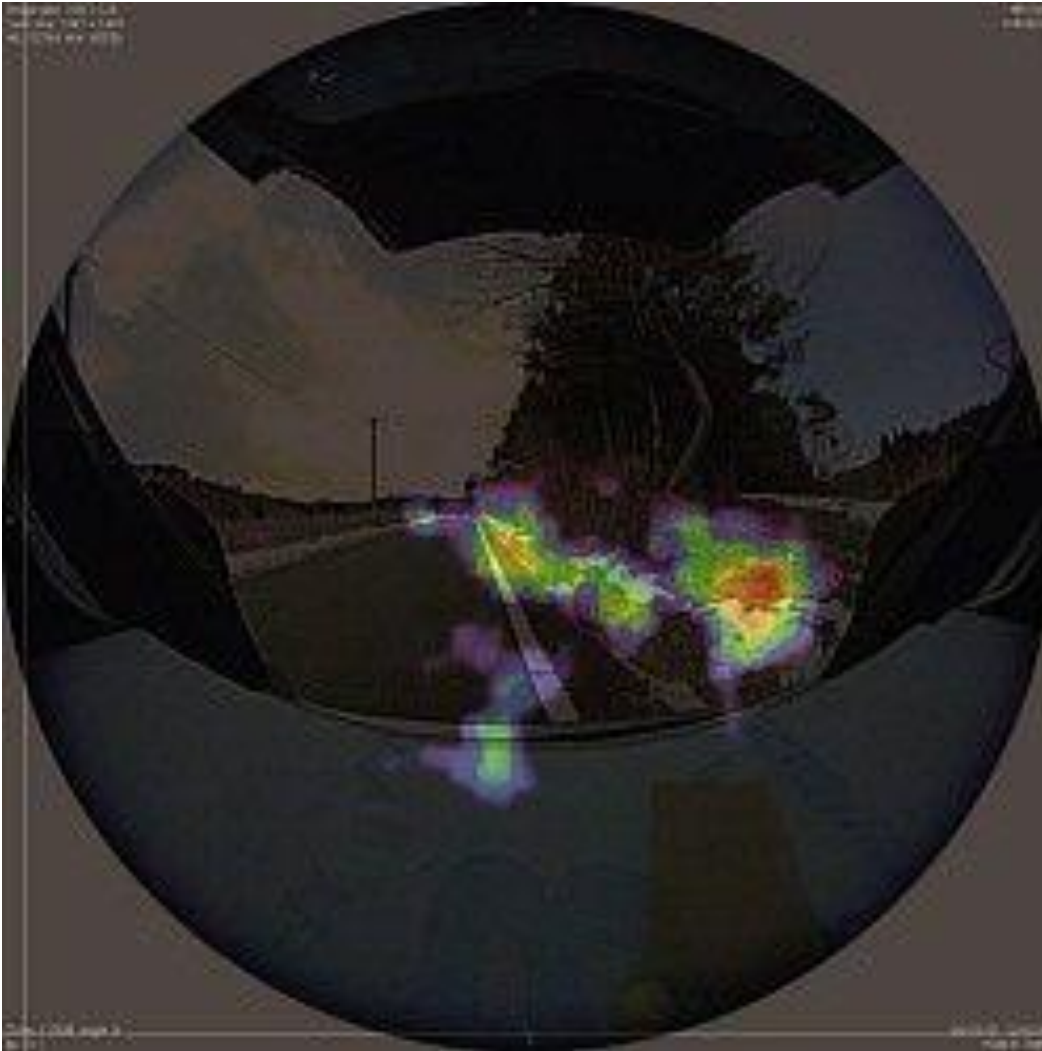
[http://internacional.elpais.com/internacional/2012/03/28/actualidad/1332943044\\_455572.html](http://internacional.elpais.com/internacional/2012/03/28/actualidad/1332943044_455572.html)

<http://www.independent.co.uk/news/world/asia/still-critical-radiation-levels-at-fukushima-can-kill-in-minutes-7595018.html>

## A new camera that sees radiation

### JAXA develops camera that can 'see' radioactive contamination

<http://mdn.mainichi.jp/mdnnews/news/20120329p2a00m0na006000c.html>



A photograph taken in Iitate, Fukushima Prefecture, with a prototype camera developed by JAXA that is capable of capturing images of radioactive contamination. The red parts in the photograph show the highest radiation levels detected. (Photo courtesy of JAXA)

The Japan Aerospace Exploration Agency (JAXA) and the Japan Atomic Energy Agency (JAEA) have developed a prototype camera that can "see" radioactive contamination, officials said on March 29.

The new camera detects gamma rays emitted by radioactive cesium and other substances, and creates a wide range of images of radioactive contamination.

The total amount of gamma rays emitted by cesium 137 and 134 are captured in six different colors in an image taken with a wide-angle lens, with red representing the highest and yellow second highest radiation levels.

The new development makes it possible to easily grasp where radioactive substances spewed from the stricken Fukushima No. 1 nuclear plant have accumulated, and is likely to help decontamination work in the affected areas, officials say.

In February this year, JAXA and JAEA tested the prototype camera in several locations in Fukushima Prefecture, including supermarkets and roads in the village of Iitate -- part of the nuclear disaster evacuation zone -- and confirmed its effectiveness.

According to the agency, images produced with the new camera are more precise than those taken with imaging equipment currently in use at the crippled nuclear plant.

### **Newly-developed cameras can "show" radiation**

[http://www3.nhk.or.jp/daily/english/20120329\\_25.html](http://www3.nhk.or.jp/daily/english/20120329_25.html)

Japanese researchers have developed a super-wide angle digital camera capable of depicting radiation in the environment.

The camera, developed by the Japan Aerospace Exploration Agency, is an application of a technology used in gamma ray detectors aboard a space probe.

A gamma-ray detector installed in the camera shows levels of radiation on buildings and the landscape in six colors according to radiation intensity.

The prototype camera can capture images at an angle of nearly 180 degrees, three times wider than existing models.

Images shot during a field test in February show a wide area of contamination by radioactive cesium on the ground and wall of a supermarket in Iitate Village, located within a mandatory evacuation zone.

The camera has been developed at the request of the Tokyo Electric Power Company, the operator of the

Fukushima Daiichi nuclear plant.

Professor Tadayuki Takahashi of the space agency says his team will work to make the camera lighter so that it can help in environmental decontamination operations

## Koide Hideaki on "Japan's nightmare"

April 1, 2012

### Japan's Nightmare Fight Against Radiation in the Wake of the 3.11 Meltdown

<http://japanfocus.org/events/view/136>

Koide Hideaki, a researcher at Kyoto University's Nuclear Reactor Experiment Research Center, speaks with Watanabe Taeko

#### Translated by Kyoko Selden

*It is now the second year in the fight against radiation. What should be done in a situation where we can't see what lies ahead of us at all, and what is the situation inside the Fukushima atomic power plant meltdown? We asked Koide Hideaki.*

**—The fight against radiation and contamination has entered a second year and new issues are emerging. First I would like to ask about plans to widely disperse contaminated rubble, which are troubling the nation.**

As far as radioactivity is concerned, the fundamental rule is to make it compact and seal it off, not dilute and spread it. Scattering rubble all over the country violates the rule. National policy at present consists of two pillars. One is for local governments throughout the country to burn contaminated rubble in incinerators. The other is for each local government to dispose of the ashes as it wishes. Both are wrong.

#### ***Although it is not good to scatter the rubble . . .***

Radiation should not be handled except at facilities designed for that purpose. It should not be burned in an ordinary incinerator. If you do that, radioactive matter will disperse. If radioactive contaminated rubble has to be burnt throughout the country, then the first thing that has to be done is to check whether

the facilities have the capacity to prevent radiation from scattering. If it seems that radiation may scatter, then equipment must be added to prevent it. Unless that is done, burning should not take place.

**—Do you mean adding a filter?**

Yes. Most incinerators are equipped with a bag filter. If that is correctly used, then I think that cesium can be processed. However, it is necessary to check whether radiation can, in fact, be captured by a filter. If a bagged filter doesn't work, then it is necessary to add a ceramic or high performance filter to contain radiation.

Next, one should never allow each local government to bury the ashes. My proposal is to return the ashes to the Fukushima Daiichi Nuclear Power Plant. In the past, ashes following a meltdown have been used as material for making concrete. At Fukushima Daiichi, a concrete sarcophagus may be constructed over the power plants. Also, it will be necessary to build dams underground to prevent contaminated water from leaking out. For that, massive amounts of concrete will be necessary. So, my idea is to use the ashes to make concrete.

Ideally, incinerators should be used exclusively to handle the rubble at the actual site. But the country has not created appropriate incinerators. Even now the rubble is exposed to the air. If this situation continues unchecked, children in the contaminated areas will continue to be exposed to radiation.

I want to protect children from exposure to radiation. Children here includes those in Tokyo, Osaka, Fukushima, Miyagi, Iwate and all other areas. I think that the main issue is how we can best reduce children's exposure to radiation. We cannot wait until an incinerating facility for exclusive handling of radiation-contaminated rubble is available. But if it can't be helped that the entire country accepts the rubble, the two conditions that I posited must be fulfilled.

About half a month ago, thirty some members of Osaka's Ishin no Kai (Mayor Hashimoto's group) asked me about disposal of contaminated waste. My proposal was that it should not be done unless the two conditions have been met. But they ignored this. It seems they are claiming that, "Koide says that the rubble must be accepted." People at large, too, are angry, saying that Koide is saying something preposterous. But I am saying no such thing.

***If Reactor #4 Crumbles, That's the End***

**—It was pointed out in the October 21 2011 issue that Reactor #4 is in danger. Recently, an aerial video was broadcast showing workers at #4.**

I saw that video, too. The environment is one of intense exposure to radiation. How many minutes can one stay in that place? It's work that requires a stopwatch held in one's hand. But the work has to be done because, if the pool for spent fuel rods at # 4 crumbles, that's the end. So, the spent fuel at the bottom of the pool has to be taken out before the pool crumbles. At any rate, it has to be removed as soon as possible, before an after shock occurs. For that purpose, some radiation exposure is inescapable.

The reactor core contains approximately 100 tons of uranium. The pool for spent fuel at reactor #4 contains approximately 2.5 times that amount of spent fuel . . . approximately 250 tons. And besides that, there is fuel that has not yet been spent. So, in all, the amount of fuel must be around 300 tons. That is 4,000 times the size of the Hiroshima atomic bomb. Spent fuel is a huge mass of nuclear reaction product. Keeping it at the bottom of the pool allows it to be cooled. At the same time, radiation is blocked.

It cannot be released into the air, so the only way to handle it is to sink a special container exclusively for removal of the spent fuel. The only way is to put the spent fuel into the container within the pool, put a lid over the container and pull it out. But the floor of the reactor building where the spent fuel pool is buried is crumbling, so a crane cannot be used. Therefore, it is necessary to suspend a long armed crane from outside the building, which means that you have to make a colossal container that exceeds the weight of 100 tons. You have to sink the crane to the bottom of the pool and move the spent fuel into it. This is an enormous operation.

### **—What about recriticality and explosion?**

I think that the possibility of re-criticality is low, and I don't think that there will be an explosion. When the fuel melted and the zirconium reacted with water to produce hydrogen, the hydrogen leaked into the closed space in the reactor building and an explosion occurred. The spent fuel pool is now exposed, but even if the fuel melts and produces hydrogen, it is not accumulating within a closed space. It becomes diluted and escapes. So I don't think that there will be a hydrogen explosion. However, spent fuel is heat generating. If water evaporates and cooling becomes impossible, then the temperature rises and the fuel melts. It melts at 2800 degrees (C.) At that temperature, what can become a gas will all come out. Iodine, cesium, all kinds of radiation, will suddenly jump out into the air.

### **—*We Want to Take it Out, But We Can't Take it Out***

As mentioned, the basic principle for handling radiation is to not spread but seal it in as compactly as possible. So if it is there, then take it out and compact it.

TEPCO and the government imagine that Reactors No. 1-3 had a meltdown of the fuel and the bottom of the pressure containment vessel dropped, so the fuel is at the bottom of the container. But even that is not clear. It is possible that the bottom of the containment vessel is also broken, so the fuel may have sunk even lower. If that is the case, it can no longer be taken out and the only thing to do is to seal it in place.

The Chernobyl Nuclear Reactor was sealed with a sarcophagus without taking out the fuel. Now that coffin is crumbling, so they have to make a second coffin. That too will crumble, so eventually they will have to make a third . . . to be repeated eternally. I think that this will be the case at Fukushima, too. You make a huge concrete coffin; when it crumbles, you cover it with a larger coffin . . . then an even bigger coffin. It is an overwhelming operation. So if possible it would be good to take the fuel out, including the



fuel that has already melted. TEPCO also says so. But I think that will take more than ten years to accomplish.

**—Concerning the report that the thermometer broke at No. 2, should this claim be taken at face value?**

Yes, I think it is broken. Radiation generates heat, so if it accumulates where the thermometer is, the temperature rises. However, the thermometer indicated 400 degrees C. It is impossible that a temperature of 400 degrees C. could be generated in the pressure containment vessel. So after all my guess is that the thermometer is broken. TEPCO's conjecture seems to be the same.

That thermometer uses the principle of thermocoupling. It is a very simple principle and it rarely breaks down. So what does it mean that the thermometer broke?

Some time ago, TEPCO put an industrial TV set inside the containment vessel of No. 2. Water was not visible. In short, water has not accumulated there. Moreover, inside the containment vessel, water is dropping like a waterfall, radiation rays are flying wildly and the image on TV is scarred. It was realized afresh that this was a terrible environment. In that environment, a cable runs which pulls the signal of the thermocouple outside. What I think is that the cable was hit. This means that from now on, thermometer after thermometer will break. When they break, we have no clue to detect what is going on and we will less and less understand the present situation.

***What Does it Mean to Decommission a Nuclear Reactor?***

**—We often hear of decommissioning, but what precisely is meant?**

When a nuclear plant operates and stops without any big accident, that is, when it runs its course, the reactor is then decommissioned and the spent fuel is removed, but the pressure vessel and other things remain a radioactive mass. So, how is decommissioning accomplished? To oversimplify, there are two approaches.

One is to bury it on the spot. You seal the door so that people cannot approach. In this method, you don't have to do too much and there is little exposure to radiation. However, this means that the power plant itself becomes garbage. So it's thought that this is not a very good plan for a country like Japan where land is scarce. So Japan proposes another method.

That method is to take apart the plant and sort out things ranging from badly contaminated parts like the pressure vessel to things that are not so badly contaminated. Something like a pressure vessel can't be handled, so it is necessary to make a deep hole and bury it. As for things that are not badly contaminated with radiation, because it is too much work to baby-sit them given the radiation, they can be handled as general waste.

Handling these parts as general waste is called clearance. But when you chop up a nuclear plant, you get 600,000 cubic meters. When you sort that garbage by degree of radiation, more than 90% is barely contaminated, so it can be handled as general waste.

For example, iron. It may be viewed as general waste. Then scrap iron dealers buy it and recycle it, making for example, tables or desks or frying pans for home use. If you cook with such a frying pan, you will eat radiation with the food. If you eat something cooked in that pan, and if the amount of radiation does not exceed 10 mSv, then it's ok. This was the law up to now. This is what decommissioning a nuclear reactor means.

But the case this time is completely different. First, it's not clear if the spent fuel can be removed and it's hardly possible to dismantle the reactor. So whatever we choose, there has to be a sarcophagus. But it is said that to decommission a normal atomic power plant without problems takes 30, 40, or 50 years. So, it will take far longer to decommission Fukushima Daiichi, which has melted down.

### ***To Mothers of Fukushima***

**—I hear that in Koriyama, people who call themselves advisors have been instructing groups of ten or more people saying, "We radiation specialists are here, so you need not worry." When people are totally exhausted, many feel "that's enough". Fukushima mothers say that they are utterly exhausted. May I have your message for them?**

I'm not qualified. I'm at one end of the spectrum of the group of criminals. I'm among the criminals who made them shoulder a heavy weight. I can only say that I'm very sorry. It's impossible to keep facing fear forever. That is exhausting and people want to forget if possible. How are we to handle such a heavy burden? If you speak of monetary calculation, individual suffering and sorrow can't be translated into money and there is already a huge amount of sorrow. It's hard to know what to do. As long as one lives, there is no choice but to live with this reality. I'm very sorry. I don't know how to apologize. But apology doesn't allow one to take responsibility. I have long been thinking about what I can do to reduce radiation exposure in children, if only a little. And I would like to continue to do so.

Interviewer: Watanabe Taeko (editorial board, Shukan Kinyobi.)

Koide Hiroaki, b. 1949, assistant professor, Kyoto University, Nuclear Reactor Experiment Research Center.

Main writings: Genpatsu no uso (The Lie of Nuclear Power) (Fusosha); Genpatsu wa iranai (We don't need Genpatsu) (Gentosha); Genpatsu. hoshano -- kodomo ga abunai (Nuclear Power Generation: Radiation. Children are in Danger (co-authored, Bunshun Shinsho).

*Kyoko Selden is an Asia-Pacific Journal associate. With Noriko Mizuta she edited and translated Japanese Women Writers and More Stories by Japanese Women Writers. She is the coeditor and translator of The Atomic Bomb: Voices From Hiroshima and Nagasaki.*

This interview appeared in the March 16, 2012 Shukan Kinyobi.

April 3, 2012

## **Fukushima Daiichi : cesium 137 85 times greater than at Chernobyl**

<http://akiomatsumura.com/?p=682>

**[\*Ed: This page was updated on 4/5/12 to reflect corrected calculations]**

Japan's former Ambassador to Switzerland, Mr. Mitsuhei Murata, was invited to speak at the Public Hearing of the Budgetary Committee of the House of Councilors on March 22, 2012, on the Fukushima nuclear power plants accident. Before the Committee, Ambassador Murata strongly stated that if the crippled building of reactor unit 4—with 1,535 fuel rods in the spent fuel pool 100 feet (30 meters) above the ground—collapses, not only will it cause a shutdown of all six reactors but will also affect the common spent fuel pool containing 6,375 fuel rods, located some 50 meters from reactor 4. In both cases the radioactive rods are not protected by a containment vessel; dangerously, they are open to the air. This would certainly cause a global catastrophe like we have never before experienced. He stressed that the responsibility of Japan to the rest of the world is immeasurable. Such a catastrophe would affect us all for centuries. Ambassador Murata informed us that the total numbers of the spent fuel rods at the Fukushima Daiichi site excluding the rods in the pressure vessel is 11,421 (396+615+566+1,535+994+940+6375).

I asked top spent-fuel pools expert Mr. Robert Alvarez, former Senior Policy Adviser to the Secretary and Deputy Assistant Secretary for National Security and the Environment at the U.S. Department of Energy, for an explanation of the potential impact of the 11,421 rods.

I received an astounding response from Mr. Alvarez **[updated 4/5/12]**:

In recent times, more information about the spent fuel situation at the Fukushima-Dai-Ichi site has become known. It is my understanding that of the 1,532 spent fuel assemblies in reactor No. 304 assemblies are fresh and unirradiated. This then leaves 1,231 irradiated spent fuel rods in pool No. 4, which contain roughly 37 million curies (~1.4E+18 Becquerel) of long-lived radioactivity. The No. 4 pool is about 100 feet above ground, is structurally damaged and is exposed to the open elements. If an earthquake or other event were to cause this pool to drain this could result in a catastrophic radiological fire involving nearly 10 times the amount of Cs-137 released by the Chernobyl accident.

The infrastructure to safely remove this material was destroyed as it was at the other three reactors. Spent reactor fuel cannot be simply lifted into the air by a crane as if it were routine cargo. In order to prevent severe radiation exposures, fires and possible explosions, it must be transferred at all times in water and heavily shielded structures into dry casks.. As this has never been done before, the removal of the spent fuel from the pools at the damaged Fukushima-Dai-Ichi reactors will require a major and time-consuming re-construction effort and will be charting in unknown waters. Despite the enormous destruction cased at the Da-Ichi site, dry casks holding a smaller amount of spent fuel appear to be unscathed.

Based on U.S. Energy Department data, assuming a total of 11,138 spent fuel assemblies are being stored at the Dai-Ichi site, nearly all, which is in pools. They contain roughly 336 million curies (~1.2 E+19 Bq) of long-lived radioactivity. About 134 million curies is Cesium-137 — **roughly 85 times the amount of Cs-137 released at the Chernobyl accident** as estimated by the U.S. National Council on Radiation Protection (NCRP). The total spent reactor fuel inventory at the Fukushima-Daichi site contains nearly half of the total amount of Cs-137 estimated by the NCRP to have been released by all atmospheric nuclear

weapons testing, Chernobyl, and world-wide reprocessing plants (~270 million curies or ~9.9 E+18 Becquerel).

It is important for the public to understand that reactors that have been operating for decades, such as those at the Fukushima-Dai-Ichi site have generated some of the largest concentrations of radioactivity on the planet.

Many of our readers might find it difficult to appreciate the actual meaning of the figure, yet we can grasp what 85 times more Cesium-137 than the Chernobyl would mean. It would destroy the world environment and our civilization. This is not rocket science, nor does it connect to the pugilistic debate over nuclear power plants. This is an issue of human survival.

There was a Nuclear Security Summit Conference in Seoul on March 26 and 27, and Ambassador Murata and I made a concerted effort to find someone to inform the participants from 54 nations of the potential global catastrophe of reactor unit 4. We asked several participants to share the idea of an Independent Assessment team comprised of a broad group of international experts to deal with this urgent issue.

I would like to introduce Ambassador Murata's letter to the UN Secretary General Ban Ki-moon to convey this urgent message and also his letter to Japan's Prime Minister Yoshihiko Noda for Japanese readers. He emphasized in the statement that we should bring human wisdom to tackle this unprecedented challenge. It seems to us that the Nuclear Security Summit was focused on the North Korea nuclear issue and on the issue of common security from a terrorist attack. Our appeal on the need for the independent assessment at Reactor 4 was regarded as less urgent. We predicted this outcome in light of the nature of the Summit. I suppose most participants fully understood the potential disaster which will affect their countries. Nevertheless, they decided not to raise the delicate issue, perhaps in order to not ruffle their diplomatic relationship with Japan.

I was moved by Ambassador Murata's courage in pressing this issue in Japan. I know how difficult it is for a former career diplomat to do this, especially in my country. Current and former government officials might be similarly restricted in the scope of their actions, as Ambassador Murata is, but it is their responsibility to take a stand for the benefit of our descendants for centuries to come—to pass on a world safer than our ancestors passed us.

If Japanese government leaders do not recognize the risk their nation faces, how could the rest of us be persuaded of the looming disaster? And if the rest of us do not acknowledge the catastrophe we collectively face, who will be the one to act?

Letter from Mitsuhei Murata, dated March 25, 2012

**Dear Secretary-General,  
Honorable Ban Ki-moon,**

**I wish to express my heartfelt gratitude for your considerate letter dated 2 March, 2012. Your moral support for a United Nations Ethics Summit will remain a constant source of encouragement for my activities.**

**Please allow me to pay a tribute to your great contribution to strengthen nuclear safety and security. The current Nuclear Summit in Seoul is no doubt greatly benefiting from the high-level meeting you convened last September.**

**I was asked to make a statement at the public hearing of the Budgetary Committee of the House of Councilors on March 23. I raised the crucial problem. of NO.4 reactor of Fukushima containing 1535 fuel rods. It could be fatally damaged by continuing aftershocks. Moreover, 50 meters away from it exists a common cooling pool for 6 reactors containing 6375 fuel rods!**

**It is no exaggeration to say that the fate of Japan and the whole world depends on NO.4 reactor. This is confirmed by most reliable experts like Dr. Arnie Gundersen or Dr. Fumiaki Koide. Please allow me to inform you of an initiative being taken by a former UN official who is endeavoring to have the Nuclear Security Summit take up the crucial problem. of NO.4 reactor of Fukushima. He is pursuing the establishment of an independent assessment team. I think his efforts are very significant, because it is indispensable to draw the attention of world leaders to this vital issue.**

**I am cooperating with him, writing to some of my Korean acquaintances that this issue deserves the personal attention of President Lee Myung-bak. I have written today to Prime Minister Yoshihiko Noda. I asked him to consider taking the initiative of mobilizing human wisdom on the widest scope to cope with the Fukushima reactor No.4 problem, fully taking into account the above-mentioned "independent assessment team".**

**The world has been made so fragile and vulnerable. The role of the United Nations is increasingly vital. I wish you the best of luck in your noble mission. Please accept, Secretary-General Ban Ki-moon, the assurances of my highest consideration.**

**Mitsuhei Murata**

**Former Japanese Ambassador to Switzerland and Senegal**

**Executive Director, the Japan Society for Global System and Ethics**

## **Not to worry: the pumps only stopped for a short time**

April 5, 2012

### **Nitrogen injection briefly halts at N-plant**

<http://www.yomiuri.co.jp/dy/national/T120404005065.htm>

A system that injects nitrogen into the containment and pressure vessels of the Nos. 1, 2 and 3 reactors at the crippled Fukushima No. 1 nuclear power plant stopped for nearly 1-1/2 hours Wednesday, Tokyo Electric Power Co. said.

Hydrogen levels within the vessels did not rise because the injections resumed soon after, TEPCO said.

According to the utility and the Nuclear and Industry Safety Agency, a plant worker discovered that no nitrogen was being injected into the vessels at about 10:55 a.m. It was soon confirmed that the pumps had stopped.

A backup system was started at 12:16 p.m., and nitrogen injections resumed at 12:30 p.m.

Nitrogen is being pumped into the vessels to push highly explosive hydrogen, generated through a radiation-cooling water reaction, out of the vessels.

TEPCO and the agency believe it would take 30 hours without the injections for the hydrogen concentration to rise as high as 4 percent, at which point there is a risk of explosion.

## Can this reassure worried Japanese?

### Nitrogen injection into damaged Fukushima reactors halts for over 2 hrs

<http://mainichi.jp/english/english/newsselect/news/20120405p2g00m0dm053000c.html>

TOKYO (Kyodo) -- The operator of the Fukushima Daiichi nuclear power plant said Wednesday that the injection of nitrogen gas into three crippled reactors ceased for over 2 hours, although it detected no abnormalities that could raise fears of a hydrogen explosion.

Tokyo Electric Power Co. said the interruption occurred possibly because a filter of the supply device was clogged by dust as a result of strong winds seen from Tuesday evening. The nitrogen supply device also stopped in March.

Following checks, the utility, known as TEPCO, found that the device had stopped operating after sounding an alarm at 9:51 a.m. Wednesday. But **it took about an hour for workers to realize** that the injection of the gas into the Nos. 1 to 3 reactors had stopped as **the alarm cannot be detected at the operation center in real time.**

The workers noticed **by chance** through a web camera at the plant's operation center that the measuring gauge for injection was pointing to zero at 10:55 a.m. and resumed nitrogen injection from 12:29 p.m. using different equipment, Tokyo Electric spokesman Junichi Matsumoto told a press conference.

Matsumoto said he will examine if any improvement can be made in monitoring arrangements.

Nitrogen injection into the reactors is vital to prevent a hydrogen explosion, which could result in the

further release of massive amounts of radioactive substances into the atmosphere. The step is intended to keep hydrogen inside the reactors' primary containment vessels at low levels.

Matsumoto indicated that the failure to inject nitrogen would not immediately raise fears of an explosion, saying that it could take 30 to 50 hours until hydrogen concentrations inside the vessels reach dangerous levels.

The Nos. 1 to 3 reactors suffered meltdowns in the early days of the nuclear crisis at the Fukushima plant, triggered by the huge earthquake and tsunami on March 11, 2011.

## Only one thermometer left in No.2!

April 16, 2012

### **Another thermometer at Fukushima No. 2 reactor apparently not working**

<http://mainichi.jp/english/english/newsselect/news/20120416p2g00m0dm050000c.html>

FUKUSHIMA (Kyodo) -- Tokyo Electric Power Co. indicated Sunday another thermometer may be malfunctioning at the bottom of the No. 2 reactor vessel at the tsunami-crippled Fukushima Daiichi nuclear power complex as the plant operator observed abnormal temperature readings the previous day.

The thermometer was deemed unavailable for use when it showed an abnormally high electrical resistance level following a sudden increase of temperatures to 60 C on Saturday morning, **leaving only one temperature measurement device working properly at the bottom of the reactor vessel**, the utility said.

In February, another of the three thermometers at the bottom of the vessel was found to have malfunctioned after showing a surge in temperatures.

"We are able to check temperatures at the vessel's bottom with the remaining one and assess whether a cold shutdown is maintained by monitoring all thermometers, including those at other locations," Tokyo Electric officials said.

A stable cold shutdown is achieved when the temperature inside the reactor is kept below 100 C. The latest incident left unavailable 18 of 36 thermometers placed to measure temperatures at the reactor vessel.

## Getting serious

April 17, 2012

## **Workers prepare No.4 pool for fuel removal**

[http://www3.nhk.or.jp/daily/english/20120417\\_15.html](http://www3.nhk.or.jp/daily/english/20120417_15.html)

Workers will begin preparing the No. 4 reactor building at the damaged Fukushima Daiichi plant on Tuesday for the complex job of removing nuclear rods from its spent fuel pool.

A hydrogen explosion severely damaged the building following last March's massive earthquake and tsunami. Before the structure can be demolished, more than 1,500 fuel rods have to be removed.

On Tuesday, Tokyo Electric Power Company will begin attaching a special crane to take the fuel out of the pool and **constructing a cover to prevent the spread of radioactive materials from the building. The cover will be 31 meters long and 69 meters wide and 53 meters high.**

Unlike the shroud that entirely covers the No. 1 reactor building, **the structure will cover only the upper part of the pool for the No. 4 reactor.**

TEPCO will also install a filter to prevent the spread of radioactive materials.

The cover is expected to be completed by autumn next year. Spent nuclear fuel will then be removed from the pool and stored on the plant compound.

## **A robot in the suppression chamber of No.2**

April 18, 2012

### **Robot to inspect No.2 reactor**

[http://www3.nhk.or.jp/daily/english/20120418\\_03.html](http://www3.nhk.or.jp/daily/english/20120418_03.html)

The operator of the Fukushima Daiichi nuclear plant is to send a robot inside one of the reactors damaged by last year's earthquake and tsunami.

Tokyo Electric Power Company will use an 80-centimeter tall robot mounted with 5 cameras, a dosimeter and an audio recorder. On Wednesday, the robot will be sent through a door of the building housing the No.2 reactor to a scaffold built around the suppression chamber.

The robot will check for any damage to the suppression chamber and the containment vessel above. A



worker in an adjacent building will maneuver the robot through a cable link.

**This will be the first inspection of the suppression chamber by a robot since the nuclear accident.**

The robot will also check an inspection manhole for the suppression chamber and take radiation measurements in the area.

**Any damage to the suppression chamber and the containment vessel will have to be repaired before the vessel is filled with water to retrieve the melted fuel rods. The removal of these rods will be a crucial step in the decommissioning of the reactor.**

## So far so good?

### **TEPCO says no water leaks found at No.2 reactor**

[http://www3.nhk.or.jp/daily/english/20120418\\_34.html](http://www3.nhk.or.jp/daily/english/20120418_34.html)

The operator of the Fukushima Daiichi nuclear plant says inspections using a robot have yet to find serious damage or water leaks at the facility's No. 2 reactor.

Tokyo Electric Power Company, or TEPCO, on Wednesday sent the robot with 5 cameras and a dosimeter into a scaffold around the reactor's suppression chamber.

TEPCO said the robot found no water leaks or traces in manholes on the north and southeast sides of the chamber, where leakage had been suspected.

Workers also maneuvered the robot to check about 90 percent of the upper part of the 125-meter doughnut-shaped chamber, and found no serious damage or deformation.

But TEPCO has not confirmed whether the robot was able to capture images of pipes connecting the suppression chamber and a containment vessel where the company also suspects water leakage.

The level of radioactive water accumulated on the plant's premises keeps increasing. The water is believed to have been injected to cool the reactor, which was damaged by last year's earthquake and tsunami.

Any damage to the suppression chamber and the containment vessel will have to be repaired before the vessel is filled with water to retrieve melted fuel rods inside.

Such removal would be a crucial step in decommissioning the reactor.

## Checking containment vessels

### Why containment vessels must be examined

[http://www3.nhk.or.jp/daily/english/20120418\\_33.html](http://www3.nhk.or.jp/daily/english/20120418_33.html)

An examination of the reactor containment vessels is essential for decommissioning the Fukushima Daiichi nuclear plant.

The biggest challenge in the decommissioning process is finding a way to remove the melted nuclear fuel inside the reactors and on the floor of the containment vessels.

Melted nuclear fuel is too radioactive even for robots to handle. So workers are considering filling the containment vessels with water, which shuts in the radiation.

But highly radioactive wastewater continues to leak out of the No.1 to No.3 reactor containment vessels. Wednesday's examination aimed to pinpoint damages to the No.2 vessel for repair.

The No.2 unit was the first to be inspected because its reactor building is less damaged compared to that of the No.1 and No.3 units, and workers have been able to open the door leading to the suppression chamber at the bottom of the containment vessel.

That door on the No.3 unit had been damaged by an explosion. Inspection at the No.1 unit is being hampered by high levels of radioactive wastewater.

## "We are not guinea-pigs!"

### Official 'decommissioning' of Fukushima reactors brings locals no peace

<http://mainichi.jp/english/english/newsselect/news/20120418p2a00m0na014000c.html>

At the stroke of midnight on April 19, Japan's nuclear reactor count will officially drop from 54 to 50, as the ruined No. 1-4 reactors at the Fukushima No. 1 nuclear plant will be formally retired.

Plant operator Tokyo Electric Power Co. (TEPCO) submitted the decommissioning paperwork to the Ministry of Economy, Trade and Industry at the end of March this year, and the necessary legal procedures have been progressing quietly ever since. While the operational lives of the shattered reactors may be officially over, however, they continue to be the source of significant problems, as well as of a serious threat to the lives and livelihoods of many across Japan.

The load is particularly heavy on those who have been literally dislocated by the March 2011 meltdowns, forced from their homes by radioactive contamination, such as the people of Naraha, Fukushima Prefecture.

"How will you extract the melted fuel from the reactors?" **"How can we believe you when you say, 'It will be safe after decontamination' even while radioactive material leaks continue?"**

These were just a few of the angry comments and questions posed by Naraha townspeople at an April 11 central government information session in the prefectural city of Iwaki, where they now live as nuclear disaster refugees. Most of Naraha is currently covered by the 20-kilometer no-go zone around the Fukushima No. 1 plant, and the entire town was evacuated. The April 11 meeting was held to tell residents they would soon be able to go home, as the entire town -- with local radiation doses at 20 millisieverts per year or less -- was to be re-designated for preparation for lifting the evacuation order.

Happy news, one might think, but residents' anger became obvious during the question and answer section.

"We need safe air and water for our children," one person said. **"We are not guinea pigs!"** cried another. Kensuke Tomita, the government's representative at the meeting and deputy head of the Cabinet's Nuclear Emergency Response Headquarters, finally replied that "TEPCO and the government will take responsibility for restoring local infrastructure, decontamination and (nuclear disaster) compensation," but he emerged from the encounter shocked.

"I never thought there'd be this much of a backlash," he said. The town government, meanwhile, has given up on plans to have Naraha re-designated before the end of April.

**One of the main reasons for the townspeople's anger is the continued problems at the ruined nuclear plant, despite the government's December 2011 declaration that it was in "cold shutdown."**

Just in April, there has been another contaminated water leak (April 5), a breakdown in the No. 4 reactor's spent fuel pool cooling system (April 12), and a halt in the flow of nitrogen gas to the No. 1-3 reactors, necessary to prevent further hydrogen explosions (April 13).

Fukushima Gov. Yuhei Sato told an April 16 meeting of the Nuclear Emergency Response Headquarters that the problems at the plant were "stirring anxiety among the people of the prefecture," and once more demanded the government supervise operations there thoroughly.

The official decommissioning of the plant's No. 1-4 reactors appears to be one step towards fulfilling the prefecture's demands that all nuclear reactors in its jurisdiction be shuttered, but "our goal in demanding reactors be shut down is the protection of our residents' safety," a Fukushima prefectural official told the Mainichi.

## **Matsumara on storage pool in No.4**

April 19, 2012

## **Fukushima Daiichi Unit 4 high-level radioactive waste storage pool at risk of catastrophic fire**

<http://www.beyondnuclear.org/japan/2012/4/19/fukushima-daiichi-unit-4-high-level-radioactive-waste-storag.html>

A recent photo of the Unit 4 reactor building, with workers in white radiation suits (under girders) beside HLRW storage pool surface



Japanese diplomat Akio Matsumura has been warning for many months about the potentially catastrophic risk, as due to another powerful earthquake, of Fukushima Daiichi's damaged and listing Unit 4 high-level radioactive waste (HLRW) storage pool (photo, left) completely collapsing. Robert Alvarez of Institute for Policy Studies (IPS) has documented that the Unit 4 pool contains nearly 10 times the radioactive Cesium-137 (Cs-137) than was released by the Chernobyl nuclear catastrophe. If the pool's floor falls out, or the entire Unit 4 reactor building collapses, the pool's cooling water supply will drain away, and the HLRW could catch on fire within a short period of time. Up to 100% of the volatile Cs-137 would then be discharged directly to the environment in the fire and smoke, as the pool lacks any radiological containment whatsoever. Former Japanese Ambassador to Senegal and Switzerland, Mitsuhei Murata, recently warned not only the Japanese Parliament about this risk, but also the Japanese Prime

Minister and United Nations Secretary-General. There are a total of 7 HLRW storage pools at Fukushima Daiichi, containing 85 times the Cs-137 released at Chernobyl (this figure does not even account for the Cs-137 in the three melted down reactor cores). If Unit 4's pool goes up in flames, it would make the entire site a deadly radioactive zone which would have to be abandoned by workers, risking the other 6 pools also boiling down and catching fire. The "common pool," containing the most HLRW of all on site, is just 50 yards away from Unit 4.

Alvarez et al. (2003) have documented that U.S. Nuclear Regulatory Commission (NRC) studies, carried out by Sandia National Lab (2001) and Brookhaven National Lab (1997), reported that a HLRW pool fire in the US could cause: as many as 143,000 latent cancer fatalities, up to 500 miles downwind; up to 2,700 square miles of agricultural land condemned; and property damage and economic losses due to evacuation and condemnation surmounting \$765 *BILLION* (adjusted for inflation to 2010 dollar figures). Beyond Nuclear and IPS have warned that US irradiated nuclear fuel storage pools, especially those at 24 General Electric Mark I boiling water reactors, are vulnerable to catastrophic accidents or attacks. In fact, most US GE BWR Mark I pools contain more HLRW than Fukushima Daiichi Units 1 to 4 put together. The National Academy of Science confirmed such risks in 2005, yet NRC still does not require pools to be emptied into hardened on-site storage.

U.S. Senator Ron Wyden (D-OR) recently took a fact-finding trip to Fukushima Daiichi -- donning a radiation protection suit and respirator. Wyden revealed that the situation at the rubblized complex is worse than reported, and has called on Japan to open up to international assistance, and on relevant US federal agencies (Energy, State, NRC) to provide it, to prevent even more catastrophic radioactivity releases in the near future than have already taken place over the past 13 months.

Wyden stated: **"The scope of damage to the plants and to the surrounding area was far beyond what I expected and the scope of the challenges to the utility owner, the government of Japan, and to the people of the region are daunting. *The precarious status of the Fukushima Daiichi nuclear units and the risk presented by the enormous inventory of radioactive materials and spent fuel in the event of further earthquake threats should be of concern to all and a focus of greater international support and assistance.*" (emphasis added)**

Please contact your own U.S. Senators and U.S. Representative and urge them to support Sen. Wyden's urgent initiative. Phone your U.S. Members of Congress via the congressional switchboard: (202) 224-3121.

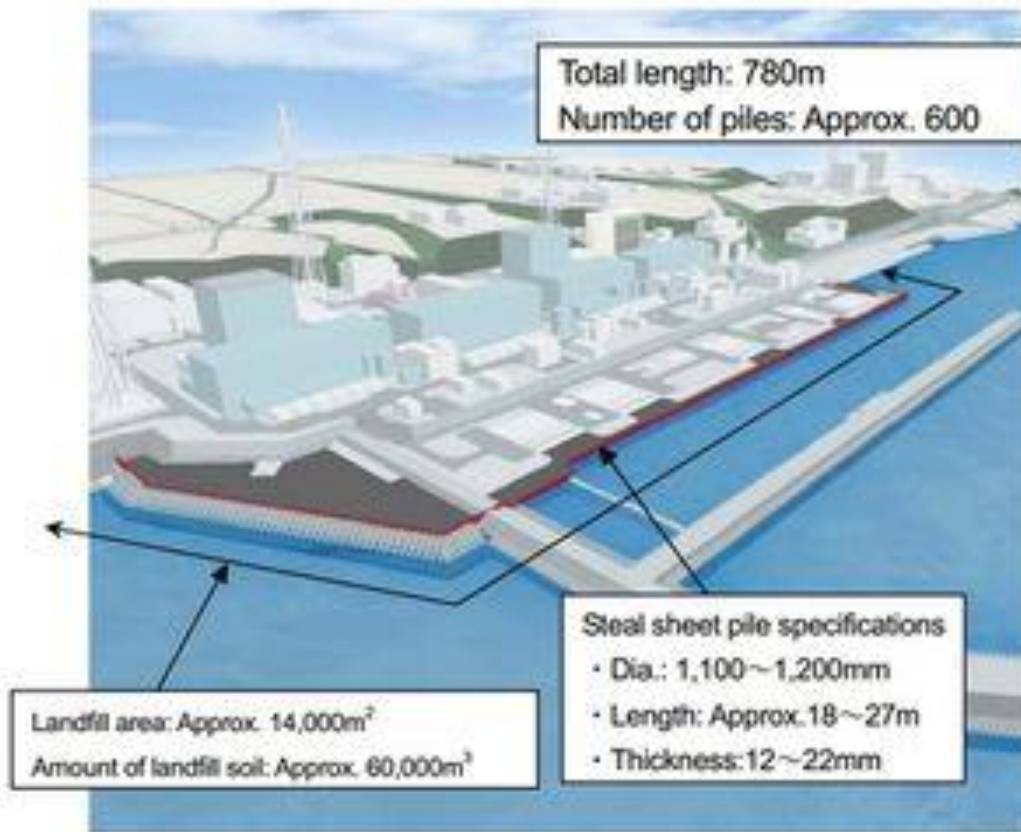
Thom Hartmann hosted Beyond Nuclear's Kevin Kamps on his television program "The Big Picture" on April 18th to discuss these risks.

## Directly from the horse's mouth



## TEPCO's plans for its water shielding wall

[http://www.tepco.co.jp/en/press/corp-com/release/2012/1202600\\_1870.html](http://www.tepco.co.jp/en/press/corp-com/release/2012/1202600_1870.html)



Panoramic View

## A groundwater bypass

April 24, 2012

## **Land water flooding reactors to be diverted**

<http://www.japantimes.co.jp/text/nn20120424x3.html>

Kyodo

Groundwater is seeping into the damaged reactor buildings at the crippled Fukushima No. 1 nuclear plant, and Tokyo Electric Power Co. plans to build about a dozen wells to redirect and halve the flow.

Groundwater from precipitation is mixing with highly radioactive cooling water gathering in the reactor buildings, turbine buildings and basements, increasing the volume of tainted water at the complex.

The utility thus wants to use the wells to direct some of the groundwater into the Pacific Ocean — likely about 1,000 tons per day — before all of it seeps into the reactor buildings and elsewhere.

### **Tepco says it will check the contamination level of any groundwater before releasing it into the sea.**

"By creating a groundwater bypass, the amount of water flowing (into the) reactor buildings is expected to be reduced by about 50 percent," Tepco said in a paper it submitted to the government at a meeting to check its progress on decommissioning the four crippled reactors.

A government official who briefed reporters on the meeting said the bypass is likely to become operational around September or October.

The Fukushima plant generates large volumes of highly radioactive water on a daily basis because it must perpetually cool melted fuel in reactors that are riddled with meltdown holes, as well as the spent-fuel pools sitting on top of them. Since the vessels are leaking, the water keeps the reactor buildings, turbine buildings and their basements flooded.

Some of this coolant water is recycled by reducing its radioactivity through a jury-rigged water-purifying facility set up once the crisis stabilized. But the tanks used to store the processed water could soon become full if they have to store groundwater as well.

Meanwhile, the chief of a government-appointed panel probing the Fukushima disaster said Monday it has questioned Naoto Kan, who was prime minister when the triple calamity hit.

Yotaro Hatamura said it is "not appropriate" to elaborate on what was said at the hearing, but added he felt the nation's scrappy and determined former leader spoke "frankly about his thoughts at that time."

## **Fukushima wall**

April 26, 2012

### **Work on leakage-prevention wall at Fukushima plant fully in progress**

<http://mainichi.jp/english/english/newsselect/news/20120426p2g00m0dm049000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Wednesday that work is now fully in progress to build a wall along the Pacific coast, where the nuclear complex is located, to reduce the risks of further contaminating the sea with radioactive substances.

The wall is intended to prevent highly radioactive water accumulating in the plant's reactor turbine buildings from leaking out into the sea by getting mixed with groundwater, although Tokyo Electric Power Co. believes that such an incident is unlikely to happen.

The utility known as TEPCO plans to finish building the wall, to be made by placing steel pipes in the sea area close to the plant as long as 780 meters, in 2014.

TEPCO has carried out boring surveys and it started full-scale construction work from Wednesday because the Fukushima prefectural government gave the utility necessary permission to start building the wall.

A massive amount of highly radioactive water is accumulating inside the plant's reactor buildings and adjacent reactor turbine buildings as a result of the continuing injection of water to cool the Nos. 1 to 3 reactors, which have suffered meltdowns due to last year's nuclear accident.

## **Fukushima "non-catastrophic"!!!(Washington Post April 23, 2012)**

Reply of Beyond Nuclear to the Washington Post's outrageous statement that the Fukushima disaster is "ultimately non-catastrophic":

[http://www.beyondnuclear.org/storage/documents/WP\\_Editorial\\_April23\\_2012.pdf](http://www.beyondnuclear.org/storage/documents/WP_Editorial_April23_2012.pdf)



See in particular answer n°9 on Fukushima

## **International action**

<http://fukushima.greenaction-japan.org/2012/05/01/an-urgent-request-on-un-intervention-to-stabilize-the-fukushima-unit-4-spent-nuclear-fuel/>

## **Urgent Request to UN Secretary General Ban Ki-moon**

May 1, 2012

To: UN Secretary General Ban Ki-moon

### **An Urgent Request on UN Intervention to Stabilize the Fukushima Unit 4 Spent Nuclear Fuel**

Recently, former diplomats and experts both in Japan and abroad stressed the extremely risky condition of the Fukushima Daiichi Unit 4 spent nuclear fuel pool and this is being widely reported by world media. Robert Alvarez, Senior Scholar at the Institute for Policy Studies (IPS), who is one of the best-known experts on spent nuclear fuel, stated that in Unit 4 there is spent nuclear fuel which contains Cesium-137 (Cs-137) that is equivalent to 10 times the amount that was released at the time of the Chernobyl nuclear accident. Thus, if an earthquake or other event were to cause this pool to drain, this could result in a catastrophic radiological fire involving nearly 10 times the amount of Cs-137 released by the Chernobyl accident.

Nearly all of the 10,893 spent fuel assemblies at the Fukushima Daiichi plant sit in pools vulnerable to future earthquakes, with roughly 85 times more long-lived radioactivity than released at Chernobyl.

Nuclear experts from the US and Japan such as Arnie Gunderson, Robert Alvarez, Hiroaki Koide, Masashi Goto, and Mitsuhei Murata, a former Japanese ambassador to Switzerland, and, Akio Matsumura, a former UN diplomat, have continually warned against the high risk of the Fukushima Unit 4 spent nuclear fuel pool.

US Senator Roy Wyden, after his visit to the Fukushima Daiichi nuclear power plant on 6 April, 2012, issued a press release on 16 April, pointing out the catastrophic risk of Fukushima Daiichi Unit 4, calling for urgent US government intervention. Senator Wyden also sent a letter to Ichiro Fujisaki, Japan's Ambassador to the United States, requesting Japan to accept international assistance to tackle the crisis.

We Japanese civil organizations express our deepest concern that our government does not inform its citizens about the extent of risk of the Fukushima Daiichi Unit 4 spent nuclear fuel pool. Given the fact that collapse of this pool could potentially lead to catastrophic consequences with worldwide implications, what the Japanese government should be doing as a responsible member of the international community is to avoid any further disaster by mobilizing all the wisdom and the means available in order to stabilize this spent nuclear fuel. It is clearly evident that Fukushima Daiichi Unit 4 spent nuclear fuel pool is no longer a Japanese issue but an international issue with potentially serious consequences. Therefore, it is imperative for the Japanese government and the international community to work together on this crisis before it becomes too late. We are appealing to the United Nations to help Japan and the planet in order to prevent the irreversible consequences of a catastrophe that could affect generations to come. We herewith make our urgent request to you as follows:

1. The United Nations should organize a Nuclear Security Summit to take up the crucial problem of the Fukushima Daiichi Unit 4 spent nuclear fuel pool.
2. The United Nations should establish an independent assessment team on Fukushima Daiichi Unit 4 and coordinate international assistance in order to stabilize the unit's spent nuclear fuel and prevent radiological consequences with potentially catastrophic consequences.

30 April 2012

Shut Tomari (Japan)

1-2, 6-4 Higashisapporo, Shiroishi-ku, Sapporo 003-0006 Japan

TEL: +81-90-26951937 FAX: +81-11-826-3796 email: [kaori-izumi@ta3.so-net.ne.jp](mailto:kaori-izumi@ta3.so-net.ne.jp)

Green Action (Japan)

Suite 103, 22-75 Tanaka Sekiden-cho, Sakyo-ku, Kyoto 606-8203 Japan

Tel: +81-75-701-7223 Fax: +81-75-702-1952 email: [info@greenaction-japan.org](mailto:info@greenaction-japan.org)

Endorsed by:

Hiroaki Koide Kyoto University Nuclear Reactor Research Institute (Japan)

Mitsuhei Murata Former ambassador to Switzerland and to Senegal

Board member, Global System and Ethics Society (Japan)

Akio Matsumura Former United Nations diplomat

Robert Alvarez Senior Scholar, Institute for Policy Studies, Washington, D.C. (USA)

Masashi Goto Former Nuclear Plant Engineer (Japan)

Signing organizations: 72 Japanese organizations have signed this petition (as of 30 April 2012)

1. Shut Tomari, Hokkaido
2. Green Action, Kyoto
3. Citizen's Nuclear Information Center, Tokyo
4. Osaka Group against Mihama · Ooi · Takahama Nuclear Power, Osaka
5. Aging Fukushima Nuclear Power Plant Group, Tokyo
6. Stop Hamaoka Nuclear Power Plant!, Shizuoka
7. Espace des Femmes, Hokkaido
8. "Let's learn Pluthermal" Shiribeshi Citizen's Network, Hokkaido
9. Hairo Action Fukushima, Fukushima and Evacuation Areas in Japan
10. STOP MOX! Fukushima, Fukusima
11. Fukushima Moonlight, Fukuoka

12. Yawatahama Women's Group to Protect Children from Nuclear Power Plant, Ehime
13. Ikata People Against Mox, Ehime
14. We Do Not Want Plutonium! , Tokyo
15. Genkai Nuclear Power Pluthermal Trial Support Group, Fukuoka
16. Genkai Nuclear Power Pluthermal Trial support Group, Fukuona
17. Pluthermal and 100 Years of Saga Prefecture Group, Saga
18. No Nuclear Plants! Yamaguchi Network, Yamaguchi
19. Food Policy Center • Vision21
20. Genpatsu Yamenkai, Fukuoka
21. Japan Environmental Law Lawyers Association (JELF)
22. Nonviolent Direct Action Network (HANET)
23. Anti-Nuclear-Power and Nuclear Fuels Reprocessing Protest Advertising Group, Tokyo
24. Kochi Green Citizen's Network, Kochi
25. Kaku-no-Gomi Campaign, Chubu, Nagoya, Aichi
26. Aloha from Hawaii
27. Tohoku Asia Information Center, Hiroshima
28. No-Nukes Citizen's Network, Tokushima
29. No-nukes Net Kushiro, Hokkaido
30. Fukushima Meeting for Environment, Human Rights and Peace, Fukushima
31. FoE (Friends of the Earth Japan), Tokyo
32. Citizen's Group on Nuclear Waste, Horonobe, Hokkaido
33. Team From Now On, Hokkaido
34. No Nukes! Protect Children from Radioactivity
35. Concerned Citizens for Children's Human Rights, Ehime
36. Protect the Sea of Sanriku from Radioactivity, Iwate
37. Iwate Organic Farming Study Group, Iwate
38. Dandelion House, Tokyo
39. Decommission All Nuclear Power! Women's Group for Protection of Kariwa Village, Niigata
40. Sapporo Shoku Machi Network, Hokkaido
41. Citizens Wind for Peace, Tokyo
42. Together with the Earth NPO, Osaka
43. Kawauchi Tsuyukusa Group, Kagoshima
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## New shield material

May 4, 2012

### **One-millimeter resin sheet helps to block radiation**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201205030103>

An Osaka-based corrugated cardboard manufacturer has developed what it says are resin sheets that can be used as radiation shields.

The sheets, co-developed by Rengo Co. and one of its subsidiaries, is both light and flexible. Heavy plates of lead and other metals are customarily used as radiation shields.

A 1-millimeter-thick sheet can reduce gamma ray radiation levels by 3 percent, and stacking multiple sheets can enhance protection, company officials said.

Rengo hopes the sheets will be used as construction material for walls and floors and as storage covers for radioactive waste and contaminated soil.

## **What's the real state of No.4 reactor?**

May 10, 2012

### **Doomsday scenarios spread about No. 4 reactor at Fukushima plant**

[http://ajw.asahi.com/article/behind\\_news/social\\_affairs/AJ201205100051](http://ajw.asahi.com/article/behind_news/social_affairs/AJ201205100051)

By HIDEO SATO/ Shukan Asahi Weekly Magazine

When Ron Wyden, a Democratic senator from the U.S. state of Oregon, visited the Fukushima No. 1 nuclear power plant on April 6, he spent about an hour looking at a building constructed under strict anti-quake standards and observed the facility that processes water contaminated by radiation.

Although he was driven by car past the reactor buildings, he did not actually enter any of the reactor buildings, according to officials of Tokyo Electric Power Co. (TEPCO), the operator of the plant.

But after his return to the United States, Wyden, who sits on the Senate Committee on Energy and Natural Resources, fueled concerns of possible catastrophic events at the No. 4 reactor of the Fukushima plant, specifically what would happen if a huge quake damaged the spent fuel rod pool there.

TEPCO has issued statements reassuring the public that such a disaster would not occur, saying the structure has been reinforced to withstand serious shaking.

**But these days, even politicians may seem more reliable than TEPCO about information concerning nuclear safety.**

Wyden sent a letter dated April 16 to Ichiro Fujisaki, Japan's ambassador to the United States, that said the storage pool holding spent nuclear fuel at the No. 4 reactor could collapse if the reactor building was hit by another major earthquake or tsunami. The senator also warned that emissions of radioactive materials in such an event would be much greater than after last year's accident.

The letter also said that work should be accelerated to remove the nuclear fuel from the pool and stated that the United States was prepared to provide all forms of support for such efforts.

Copies of the letter were sent to U.S. Secretary of State Hillary Clinton and Gregory Jaczko, chairman of the U.S. Nuclear Regulatory Commission (NRC).

In its April 17 edition, the Wall Street Journal ran a story that included Wyden's claim that there was a serious and unresolved understatement of the earthquake risk at the Fukushima No. 1 nuclear plant.

The Huffington Post carried a report that included an analysis by an expert who said that if radiation spewed from nuclear fuel in the No. 4 reactor pool because of insufficient cooling, the total amount of cesium-137 emitted would be at least 10 times the amount released during the Chernobyl disaster.

The Washington Post also ran an article about the dangers of the No. 4 reactor.

Alarms about the No. 4 reactor were also being raised in Japan.

Mitsuhei Murata, 74, a professor emeritus at Tokaigakuen University who once served as Japan's ambassador to Switzerland, said, "The existence of the No. 4 reactor has become a major national security issue for the entire world that does not take a back seat even to North Korea's missile issue."

He had called for a halt to operations at the Hamaoka nuclear power plant even before the Great East Japan Earthquake struck last year, leading to the nuclear crisis.

"If an accident should occur at the No. 4 reactor, it could be called the start of the ultimate catastrophe for the world," Murata said as a witness at an Upper House Budget Committee hearing in March.

According to Murata, his comments at the hearing were translated into English and posted on a blog by Akio Matsumura, who once worked at the United Nations. The post was accessed by individuals from 160 nations.

Compared with the No. 1 to No. 3 reactors at the Fukushima No. 1 nuclear plant, which all experienced

meltdowns, the No. 4 reactor was not seriously damaged by the March 11, 2011, quake and tsunami because it was undergoing a periodic inspection at the time.

However, the No. 4 reactor building houses a storage pool containing 1,535 spent fuel rods, the largest number of any of the reactors.

An explosion and fire at the No. 4 reactor blew away the walls and roof of the steel-reinforced concrete building, so the reactor building was hit by major structural damage.

Moreover, the storage pool is still not covered and remains exposed to the atmosphere. That situation has raised serious questions about what would happen if another quake with an intensity of 7 struck the Fukushima No. 1 nuclear plant.

Murata has his own predictions.

"If the storage pool should collapse and the 1,535 fuel rods began burning in the atmosphere, an endless amount of radiation would be emitted. Of course, that would mean that Tokyo would become unlivable," he said.

Murata continued: "Just 50 meters from the No. 4 reactor is the common pool for the No. 1 to No. 6 reactors. The common pool holds 6,375 spent nuclear fuel rods. If a fire should occur at the No. 4 reactor pool, the common pool would also not stand a chance."

That is the potential crisis at the No. 4 reactor that is causing so much fear around the world. In fact, immediately after last year's accident, the biggest concern raised by the United States was the storage pool at the No. 4 reactor.

A major factor behind the NRC's decision to issue an evacuation recommendation for U.S. citizens within an 80-kilometer radius of the Fukushima No. 1 nuclear plant, much wider than the one set by the Japanese government, was because of information obtained that the storage pool at the No. 4 reactor was empty of cooling water.

That information later proved false. And cooling of the storage pool has now been maintained.

But Arnie Gundersen, a U.S. nuclear engineer who visited Japan in February, has raised other concerns. In an interview with Shukan Asahi at that time, Gundersen said the nuclear fuel pool at the No. 4 reactor still has the power to physically split the Japanese archipelago.

He said the spent nuclear fuel in the No. 4 reactor pool is equivalent to several reactor cores and contains radiation equal to the amount released in the atmosphere by all past nuclear experiments.

Gundersen has also written that the No. 4 reactor building's structure has weakened, the building is tilted, and that he has advised friends in Tokyo to immediately evacuate should the No. 4 reactor collapse.

TEPCO on April 26 issued a press release that disputed Gundersen's claims.

"The No. 4 reactor building is not tilted and it, including the storage pool, will not be destroyed by a quake," it said.

According to the release, measurements were taken to confirm that the floor where the storage pool is located is parallel to the water surface of the pool.

TEPCO officials also explained that the steel support at the base of the pool and concrete wall had been reinforced by last July, which has increased by 20 percent the leeway against a possible quake.

In addition, the utility conducted a simulation exercise using analytical models that showed that even if a lower-6 intensity quake were to strike the plant again, it would not collapse.

TEPCO has also begun work to cover the entire No. 4 reactor building in order to start removing the spent nuclear fuel from the storage pool. Work to remove the fuel rods could begin as soon as next year.

However, one problem is that TEPCO's information is now generally greeted with doubts.

"The trust in the central government and TEPCO which allowed the accident to happen has fallen around the world," Murata said. "There is no nation that wholeheartedly believes those releases."

In the United States, plans have been devised to set up a neutral and independent evaluation committee consisting of experts from around the world to look into the situation at the Fukushima No. 1 nuclear plant and consider ways to resolve the problems there. **Such moves show that many feel TEPCO and the Japanese government can no longer be depended upon to deal with the accident.**

"Since TEPCO is, after all, a for-profit company, it cannot be said to be making every possible effort," Murata said. "There is no time to waste. Knowledge from around the world should be gathered as soon as possible to begin the work of removing the nuclear fuel from the storage pool."

Murata has sent a letter to Prime Minister Yoshihiko Noda asking that action be taken, but so far nothing specific has been done.

## **Only 40 centimeters left in No.1 containment vessel**

May 22, 2012

### **Fukushima reactor vessel may be leaking water**

[http://www3.nhk.or.jp/daily/english/20120523\\_01.html](http://www3.nhk.or.jp/daily/english/20120523_01.html)



Japanese scientists say cooling water may be leaking from a second reactor at the Fukushima Daiichi nuclear plant. They say the water level of the reactor's containment vessel is much shallower than previously thought.

Researchers at the government-backed Japan Nuclear Energy Safety Organization analyzed the internal pressure and other data from the No.1 reactor.

**They say the water in the vessel is about 40 centimeters deep. The plant's operator, Tokyo Electric Power Company, says the water should have a depth of about 2 meters.**

**They say water may be leaking from a hole in a pipe 40 centimeters from the bottom of the vessel. The pipe is connected to the suppression chamber below.** The hole is estimated to be 2 centimeters across.

The power company says that despite the low water level, the nuclear fuel in the vessel is sufficiently cooled at about 30 degrees Celsius.

In March, the utility used an endoscope to find that the water level inside the No.2 reactor had fallen to 60 centimeters.

The water leaks at the two reactors could make the task of decommissioning the plant more difficult. The utility plans to fill the containment vessels with water to remove melted fuel.

## **More problems of radiation in No2 reactor**

June 14, 2012

### **High radiation one floor above reactor**

Tokyo Electric Power Company says it has detected **extremely high levels of radiation on a floor just above the No. 2 reactor at the crippled Fukushima nuclear plant.**

TEPCO sent a robot into the reactor building on Wednesday to take video images and radiation measurements.

The company said a reading of 880 millisieverts per hour of radiation was detected on the fifth floor, which is 4.5 meters above the reactor containment vessel.

TEPCO suspects radioactive substances leaked from the No. 2 reactor moved through the location.

The company said after analyzing the images taken by the robot it could not find the exact route the radioactive substances traveled. TEPCO added no major damage was found on the floor.

During the Fukushima nuclear accident the No. 2 reactor is believed to have released the largest amount of radioactive substances. But the overall route they took has not been determined.

TEPCO needs to find and repair the damaged parts of the reactor to recover melted nuclear fuel before starting to decommission the reactor. But it says high radiation often stops workers from entering the building. **This scenario means it will take a long time to find the problems in the containment vessel.**

## Last report from TEPCO

June 20, 2012

### TEPCO releases final report on Fukushima disaster

[http://www3.nhk.or.jp/daily/english/20120620\\_26.html](http://www3.nhk.or.jp/daily/english/20120620_26.html)

The operator of the Fukushima Daiichi nuclear plant has released the final report of its internal investigation into the crisis following the March 11 disaster last year.

The company admits it failed to adequately prepare for the nuclear emergency, but it also criticizes the government for adding to the unnecessary confusion of the accident.

The report released on Wednesday is based on interviews with about 600 TEPCO employees, on-site inspections, and analysis of other data.

It says the meltdowns at 3 of the plant's 4 reactors were directly caused by a loss of almost all cooling equipment due to a tsunami that was much larger than TEPCO had expected.

The report admits that the company's management of the emergency cooling system, which had been criticized by a government panel, was inadequate. But the company defends itself by pointing to the intense difficulty of responding to the crisis.

The report also blames the government for directly and indirectly interfering with TEPCO's emergency response efforts. It says government officials disregarded what was actually happening on the ground, causing unnecessary confusion.

TEPCO says one lesson it has taken from the accident is the need for an emergency response system that takes into account a nuclear reactor that has lost all its functions. The proposal includes measures to improve the chain of command, information flow and efforts to prevent meltdowns.

But an NHK reporter says TEPCO still doesn't know the extent of radioactivity that has been released since the start of the crisis, or how much damage the reactors suffered from the earthquake independent of the tsunami.

## Solar as replacement

### Big solar power plant to be built in Fukushima

[http://www3.nhk.or.jp/daily/english/20120621\\_05.html](http://www3.nhk.or.jp/daily/english/20120621_05.html)

Japanese electronics maker Toshiba will build several solar power stations in a city near the disabled Fukushima Daiichi nuclear power plant.

Toshiba managing director Takeshi Yokota signed an agreement with the mayor of Minamisoma, Katsunobu Sakurai, on Wednesday.

Under the contract, **the company will build the plants along the coast. The area is designated as a tsunami risk zone**, where construction of new houses has been banned since last year's disaster.

The city plans to buy 1.5 million square meters of land and lease it to a venture set up by **Toshiba** for the project.

**Construction will start in March and the plants will begin operating in 2014.**

They will provide **up to 100 megawatts of electricity**---enough to meet the demands of 30,000 homes.

It will be **the largest solar power plant project in Japan.**

Minamisoma aims to end its dependence on nuclear power and eventually meet the power demands of all homes in the city with renewable energy.

Mayor Sakurai says the project will serve as encouragement to residents as they work toward that goal.

## Start decommissioning a year ahead?

June 27, 2012

## Long process of decommissioning

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201206210100>

Workers at the crippled Fukushima nuclear plant will begin removing fuel rods from a damaged reactors a year ahead of schedule, a government minister said June 21, a move to address concerns about the risk of a new quake that could cause a further accident and scatter more radioactive debris.

"We would like to start taking out undamaged fuel this year. Preparation is now under way," Japan's nuclear crisis minister, Goshi Hosono, told Reuters in an interview.

"Doing it quickly is important. But we also have to make sure those workers out there, who are struggling under harsh conditions, will not be endangered by trying to move things fast."

Tokyo Electric Power Co. (TEPCO), operator of the plant hit by the world's worst nuclear accident since Chernobyl in 1986, had said in April it aimed to begin removing the fuel rods from the No. 4 reactor at the end of next year.

That would have left large quantities of radioactive fuel rods outside the protection of strong containment vessels for two and a half years after the accident.

Experts say the fuel rods, now covered only by water and a white plastic tarp, could present a risk of a knock-on accident if the reactor building collapsed or the water supply used to keep the rods cool were disrupted by another earthquake.

Some 1,535 fuel assemblies -- enough uranium fuel rods to power three reactors -- are being stored in a pool atop the mangled No. 4 reactor building. The reactor, which was shut down for maintenance at the time of the March 2011 earthquake and tsunami, was badly damaged by a series of powerful explosions that followed the disaster as power was cut off to the plant.

Hosono said last month during a visit to the Fukushima plant that he expected workers to begin removing fuel from the No.4 reactor's storage pool next year.

Work began in April to raise what amounts to a giant tent over the building to keep radioactive dust from scattering during the transport of the fuel rods.

TEPCO says its analysis shows the No.4 reactor building would hold up in a strong earthquake. But Japanese safety regulators ordered TEPCO to recheck its findings last month after measurements showed one of the walls of the reactor building was buckling out by about 3 centimeters (1.2 inches).

The removed uranium fuel rods will be placed in another storage pool at the Fukushima plant, 240 km (150 miles) northeast of Tokyo, officials have said.

LONG PROCESS OF DECOMMISSIONING

Hosono also said Tokyo was considering setting up a training facility for nuclear workers, including engineers, to secure specialists for the long process of decommissioning the Fukushima plant and cleaning up radioactive debris.

"It will be 10 years, 20 years, probably even more before decommissioning is complete," Hosono said. "The task will not be sustainable unless we train the next-generation of talent, and the generation after that."

He added: "The government is looking into establishing a place for bringing up such talents. When it comes to a location, Fukushima would make an excellent training ground."

The disaster in Fukushima heightened public concerns about nuclear safety, leaving Japan with no online reactors since May after all 50 went off line for maintenance checks.

To avoid a summertime power shortage, Hosono, the prime minister and two other ministers, earlier in June approved the restart of two reactors in western Japan. They are expected to be back online in July. Hosono said that no other reactors will be restarted until a new regulatory agency is set up by September.

Parliament approved a law on June 20 for a more independent regulatory body. The regulatory agency has up to now been placed under the ministry that also promoted the use of nuclear power, one key factor experts blame for the failure to avert the Fukushima crisis.

REUTERS

June 30, 2012

### **Cooling system suspended at Fukushima nuke plant No. 4 reactor**

<http://mainichi.jp/english/english/newsselect/news/20120630p2g00m0dm049000c.html>

TOKYO (Kyodo) -- The cooling system for a spent fuel pool at the crippled Fukushima Daiichi power plant's No. 4 reactor automatically suspended operation Saturday morning after an alarm issued a warning at around 6:25 a.m., Tokyo Electric Power Co. said.

The water temperature of the pool was 31 C at the time of the suspension, and leakage of water with radioactive materials has not been confirmed, TEPCO said, adding it is unlikely the temperature will rise rapidly.

The cooling system at the No. 4 reactor was previously suspended on June 4.

## What's going on at reactor No.4?

July 1, 2012

### Cooling system for Fukushima Daiichi No. 4 reactor fuel pool shuts down

<http://mainichi.jp/english/english/newsselect/news/20120701p2g00m0dm011000c.html>

TOKYO (Kyodo) -- The cooling system for the spent fuel pool at the crippled Fukushima Daiichi power plant's No. 4 reactor automatically shut down Saturday, Tokyo Electric Power Co. said.

The utility known as TEPCO has been unable to activate a backup cooling system for the pool, officials of the plant operator said later in the day, adding it is unlikely the temperature will rise rapidly.

TEPCO believes a part of power unit of the system's heat exchanger is causing the problem and the company will try to get the system running again on Sunday.

The water temperature of the pool was 31 C when the cooling system shut down around 6.25 a.m., and was rising 0.26 C per hour by late Saturday afternoon, according to the utility.

**If TEPCO continues to be unable to cool the pool, the temperature could reach 65 C, the upper limit designated in the safety regulations, by Tuesday morning.** No leakage of water with radioactive materials has been found, TEPCO said.

The cooling system at the No. 4 reactor was previously suspended on June 4.

## Utilities to buy renewables

### Utilities required to buy renewable energy

[http://www3.nhk.or.jp/daily/english/20120701\\_03.html](http://www3.nhk.or.jp/daily/english/20120701_03.html)

Power companies in Japan will have to purchase electricity generated by renewable energy sources.

Starting on Sunday, utilities will be required by law to buy solar, wind and geothermal energy at fixed prices.

The system is part of efforts to promote the use of recyclable energy and reduce dependence on nuclear power.

The prices are set higher than costs for generating such energy. Solar power is about 50 cents per kilowatt hour.

A number of firms have started renewable energy businesses in anticipation of the new system. Some companies launched their concerns on Sunday.

Major regional power companies plan to increase their prices to cover the costs. An average Japanese household is expected to pay an additional 1 to 1 dollar and 40 cents per month.

## All safe

July 2, 2012

### TEPCO resumes cooling Fukushima Daiichi No. 4 reactor fuel pool

<http://mainichi.jp/english/english/newsselect/news/20120702p2g00m0dm022000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Sunday it has resumed cooling the spent fuel pool of the crippled Fukushima Daiichi power plant's No. 4 reactor following emergency repair work after the cooling system shut down on Saturday.

The water temperature of the pool had risen to 42.9 C when the utility known as TEPCO turned the cooling system back on shortly after 3 p.m., compared with 33.3 C at the time of the shutdown on Saturday morning.

TEPCO had feared that the temperature could reach 65 C, the upper limit designated in safety regulations.

The company believes a part in the emergency power unit for the cooling system caused the problem and plans to replace it soon.

The pool contains 1,535 fuel assemblies, including 204 unused ones. Previously, the cooling system at the No. 4 reactor was suspended on June 4.

## Man-made crisis (Diet Panel)

July 5, 2012

### Regulatory system corrupt; safety steps were rejected

[http://www.japantimes.co.jp/text/nn20120705x1.html#.T\\_XOypFIwpU](http://www.japantimes.co.jp/text/nn20120705x1.html#.T_XOypFIwpU)

By KAZUAKI NAGATA  
Staff writer

The crisis at the Fukushima No. 1 nuclear plant was man-made and not a natural disaster, fundamentally the result of a long-corrupt regulatory system that allowed Tokyo Electric Power Co. to put off critical safety measures, an independent Diet commission investigating the catastrophe concluded Thursday.

"What must be admitted — very painfully — is that this was a disaster 'Made in Japan,' " says an accompanying statement by the panel chairman, Kiyoshi Kurokawa, a professor emeritus at the University of Tokyo. "Its fundamental causes are to be found in the ingrained conventions of Japanese culture: our reflexive obedience; our reluctance to question authority; our devotion to 'sticking with the program'; our groupism; and our insularity."

The report says the Fukushima disaster "was the result of collusion between the government, the regulators and Tepco, and the lack of governance by said parties . . . we conclude that the accident was clearly 'man-made.' "

According to the panel, which submitted the report to the Diet after about six months of investigations that included questioning 1,176 people for a total of more than 900 hours, the Nuclear and Industrial Safety Agency and Tepco were aware of the need to improve safety at Fukushima No. 1 before the March 11, 2011, earthquake and tsunami, but Tepco was reluctant to do so and NISA didn't press for the necessary improvements.

For instance, the government in 2006 revised the standards for earthquake resistance and requested that utilities evaluate their plants. Although it was found that Tepco needed to implement antiseismic reinforcement measures to meet the new standards, the utility kept putting it off and NISA let it slide, the report says.

"From Tepco's perspective, new regulations would have interfered with plant operations and weakened their stance in potential lawsuits. That was enough motivation for Tepco to aggressively oppose new safety regulations," it says.

NISA failed to go after Tepco about undertaking the necessary reinforcement because it lacked nuclear power expertise compared with the utility, in addition to the fact that NISA is part of the Ministry of Economy, Trade and Industry, which promotes the use of nuclear power, it says.

Turning to the government, the panel said its crisis management system was ineffective and failed to stop the crisis from escalating, as its responsibilities and those of Tepco were vague.

As a result, top officials, including then Prime Minister Naoto Kan, became excessively involved during the early stages of the accident and increased the confusion at the plant, the report says.



On the much-disputed question of whether the utility wanted to pull all of its workers out of the crippled plant, the panel said it could not find evidence Tepco executives had this in mind.

Many of the key politicians stationed at the prime minister's office said they thought Tepco was requesting a full pullout, while Tepco has been saying it was planning only a partial evacuation and intended to keep a necessary number of workers at the site.

The panel said "the root causes were organizational and regulatory systems that supported faulty rationales for decisions and actions, rather than issues relating to the competency of any specific individual."

The commission is among several efforts to investigate the causes of the accident. A panel independently launched by experts from the private sector released its final report in February. Tepco's in-house investigation panel disclosed its report last month.

The private-sector panel could not question Tepco executives as the utility refused to cooperate, and many analysts have said Tepco's report is biased because the utility can hardly investigate itself in an objective manner. Its report said the size of the earthquake and tsunami was beyond all expectations and could not reasonably have been foreseen.

The Diet's panel, headed by Kurokawa, a former president of the Science Council of Japan and comprising other experts from the private sector, was given a strong mandate, and it questioned key figures in both Tepco and the government, including Kan and then Tepco President Masataka Shimizu.

### **Report calls Fukushima disaster "man-made"**

[http://www3.nhk.or.jp/daily/english/20120705\\_29.html](http://www3.nhk.or.jp/daily/english/20120705_29.html)

A Diet-appointed expert panel has released a report on the Fukushima Daiichi nuclear accident, calling it "an obviously man-made disaster."

The panel, set up by the Diet last December, submitted the more than 600-page report to both chambers of the Diet on Thursday.

The report says that for years there had been a number of missed opportunities to take steps to prevent the disaster.

It says willful negligence and self-serving inaction by both government regulators and plant operator Tokyo Electric Power Company left the Fukushima plant unprepared for the earthquake and tsunami.

The report also says the Prime Minister's office intervened in emergency work at the plant, causing a breakdown in the chain of command in the first critical hours of the crisis.

The report recommends the creation of a permanent Diet committee to oversee the work of nuclear regulatory authorities.

## Is the earthquake to blame?

### Report says earthquake may be to blame

[http://www3.nhk.or.jp/daily/english/20120705\\_25.html](http://www3.nhk.or.jp/daily/english/20120705_25.html)

An expert panel appointed by Japan's Diet is pointing out that damage caused by quake tremors to the Fukushima Daiichi nuclear facility should not be ruled out as another key cause of the nuclear accident, along with the massive tsunami.

The panel's report released on Thursday raised questions about the earlier conclusion reached by the plant's operator, Tokyo Electric Power Company.

The operator's report said the accident was primarily caused by a higher-than-anticipated tsunami. It ruled out a possibility that the earthquake itself affected any of the plant's key safety equipment.

But the Diet panel criticizes the operator's report, saying that analysis performed by outside experts, and an examination of operational records, do not necessarily lead to such a conclusion.

The panel paid particular attention to the Number One reactor. It says it cannot rule out the possibility that the quake tremors caused tiny cracks in a pipe and led to a loss of the cooling system.

The panel is calling for further examinations to answer many remaining uncertainties.

## The report's "valuable conclusions" must not be ignored

July 6, 2012

### Editorial: Gov't, legislators must take Diet panel's nuclear crisis report seriously

<http://mainichi.jp/english/english/perspectives/news/20120706p2a00m0na002000c.html>

The executive and legislative branches of the government should take seriously a Diet investigative panel's report on the crisis at the Fukushima No. 1 nuclear plant, which concluded that it was a "man-made" disaster.

The Diet's nuclear crisis investigative panel on July 5 released the report on the cause of the disaster and recommendations for measures to prevent a recurrence.

It states that the government and Fukushima No. 1 plant operator Tokyo Electric Power Co. (TEPCO) failed to take preventive measures before the disaster, though they had many opportunities to do so. The report furthermore attributes the accident to the close cooperation between the electric power industry and the government to promote atomic power during the rapid economic growth in the 1960s and 1970s. It also found both sides' sense of responsibility for protecting people's lives and society from nuclear accidents severely lacking.

We appreciate the report, which highlights collusive relations between the government and TEPCO and underlines the historical background behind Japan's longstanding promotion of atomic power. In the report, the Diet panel also makes seven-point recommendations. Among them, the establishment of a third-party panel in the Diet to clarify unresolved issues in the nuclear crisis and how to decommission nuclear reactors, and systematic Diet supervision of the government's nuclear power regulatory bodies and power suppliers.

The report says TEPCO had strongly opposed stiffening nuclear plant safety regulations for fear that this would hinder power station operations and weaken the utility's position in lawsuits against its nuclear plants, adding that the government supported the firm's opposition. Furthermore, TEPCO continued to postpone implementing safety measures to protect its nuclear plants from serious natural disasters, despite being fully aware of the need to better plants' quake resistance and that all external power could be lost to a tsunami. Moreover, its regulator, the Nuclear and Industrial Safety Agency (NISA), gave tacit approval to TEPCO's failure to implement countermeasures.

As TEPCO has far better atomic power expertise than its regulators, their positions were effectively reversed and the regulatory bodies became power suppliers' "slaves," according to the report. This is a good point.

Moreover, the report highlights the Prime Minister's Office and TEPCO's lack of ability to handle a serious nuclear crisis.

The Prime Minister's Office failed to quickly obtain information on the developing disaster and intervened in TEPCO's response to the crisis, causing confusion in the utility's command, control and decision-making process.

While denying that TEPCO had decided to withdraw all workers from the Fukushima No. 1 plant as alleged by the Prime Minister's Office, the report blames TEPCO for triggering excessive government intervention, pointing out that then TEPCO President Masataka Shimizu provided only vague explanations, causing misunderstanding between the two sides.

The report points to the need for the government to create a crisis-management system that does not have to rely on an individual prime minister's abilities or judgment. It is quite right.

How the crisis developed has not been fully clarified. This can't be helped to some extent as high radiation levels have prevented workers from inspecting the shattered reactors and surrounding equipment first-hand.

TEPCO's in-house investigative panel on the accident concluded that the crisis was triggered mainly by the tsunami, while important equipment at the Fukushima No. 1 plant was not damaged by the temblor. However, the Diet panel did not rule out the possibility that the plant was damaged directly by the earthquake, or that the quake caused a cooling water leak. It is necessary to examine all nuclear plants across the country to see if they are sufficiently quake-resistant. The panel's recommendation that a third-party organization to examine nuclear plants' quake-resistance be set up within the Diet is worth considering.

As the report points out, the Fukushima nuclear crisis is ongoing, and continuing to cause damage to local communities and beyond. The Diet's investigative panel stopped short of discussing the pros and cons of reactivating individual nuclear plants, but the government must not allow power suppliers to resume operations at their idled nuclear plants without closely studying the report's valuable conclusions.

## Scathing judgment

### **Diet nuclear accident report brands Fukushima crisis a 'man-made disaster'**

<http://mainichi.jp/english/english/newsselect/news/20120706p2a00m0na006000c.html>

A Diet committee investigating the disaster at the Fukushima No. 1 nuclear plant released a scathing report July 5 stating that the crisis was "clearly a man-made disaster," citing a failure in the nuclear safety process.

In the 641-page report submitted to the heads of both houses of the Diet, the committee criticized government regulatory authorities and the plant's operator, Tokyo Electric Power Co. (TEPCO), for failing to implement earthquake and tsunami countermeasures before last year's magnitude-9.0 temblor despite having numerous opportunities to do so in the past.

Singling out the fundamental cause of the crisis, the report said that TEPCO had formed a cozy relationship with the Ministry of Economy, Trade and Industry and strongly pressured successive generations of regulatory authorities to put off or relax regulations.

"Regulators and the regulated underwent a 'reversal of roles', with regulatory authorities becoming 'captives' of electricity providers," the report stated. As a result of this, the functions of the ministry's Nuclear and Industrial Safety Agency (NISA) as a watchdog of nuclear safety "collapsed," the report said. It added that TEPCO operated like a "behind-the-scenes fixer," shifting responsibility onto the shoulders of government administrators while hiding from the line of fire itself.

The report also incorporated the opinion that the massive earthquake -- not just the tsunami as earlier reports suggested -- may have wiped out backup power at the plant.

An interim report released in December last year by the government's nuclear investigation and verification committee chaired by Yotaro Hatamura, and a report based on an internal TEPCO probe released in June this year concluded that a loss of backup power due to the tsunami was responsible for the crisis. However, the Diet committee's report stated that based on factors including the tsunami's arrival time, it was possible that the loss of backup power for at least the Fukushima plant's No. 1 reactor was not caused by the tsunami. It added that if the vent to decrease pressure inside the reactor's pressure vessel had not been activated, "a small-scale accident involving a loss of the reactor's cooling functions could have occurred due to shaking from the earthquake."

Responding to reports that TEPCO considered pulling its entire staff out from the plant soon after the outbreak of the nuclear disaster, the committee's report stated, "There is no evidence that TEPCO decided internally on a full withdrawal and this is a 'misconception' (by the Prime Minister's Office)." However, it said the misconception could be traced to former TEPCO president Masataka Shimizu's vague communication on the state of the plant, and stated that he lacked autonomy and a sense of responsibility despite being the chief of a private company.

"TEPCO is in no position to criticize misconceptions or excessive intervention by the Prime Minister's Office, as it is chiefly responsible for bringing about this situation," the report said.

The report said that after the outbreak of the accident, the Prime Minister's Office became suspicious of explanations by NISA and TEPCO, and intervened, resulting in confusion because it lacked information. The accident account said this was "the biggest factor in the failure to halt the progress of the disaster and minimize the extent of the damage." It continued, "Politicians in the Prime Minister's Office lacked a true sense of crisis management, and were mistaken over the roles the Prime Minister's Office should play in the crisis."

"The Prime Minister's Office, regulatory authorities and TEPCO management made no provisions and were mentally unprepared, and were unable to stop the damage's spread," it added.

Commenting on then Prime Minister Naoto Kan's visit to the nuclear plant on March 12, 2011, the day after the quake and tsunami, it said, "Rather than boosting morale at the crisis scene, it's possible that he added pressure by venting his irritation."

Based on these conclusions, **the report made seven suggestions including Diet monitoring of regulatory authorities, a review of the government's crisis management system, and prerequisites for a new regulatory body.**

## **Tsunami alone not primary cause**

## **Fukushima nuke disaster investigative panel rejects TEPCO tsunami claims**

<http://mainichi.jp/english/english/newsselect/news/20120706p2a00m0na011000c.html>

The final report released by the Diet's Fukushima nuclear disaster investigative panel has concluded that factors other than the tsunami may have triggered the loss of power at the plant, which aggravated the unprecedented disaster.

In its 641-page report released on July 5, the panel said there is no denying that the Fukushima No. 1 nuclear plant's No. 1 reactor was damaged by the earthquake that struck northeastern Japan on March 11, 2011.

"The primary cause of the disaster should not be attributed to the tsunami alone," the final report said. The report also stated that there is a possibility that the loss of backup power at the plant "may not have been triggered by the tsunami," rejecting the views previously presented by plant operator Tokyo Electric Power Co. (TEPCO) and the government's disaster investigation committee. Because experts' opinions are divided over the issue, calls may arise for further verification.

The panel analyzed the tsunamis' arrival time at the Fukushima No. 1 plant and concluded that the second tsunami wave reached the backup power at the plant at least two minutes later than the tsunami arrival time claimed by TEPCO. The utility has earlier reported that the second wave reached the plant at 3:35 p.m. on March 11, 2011, but the panel said the actual arrival time was observed from 1.5 kilometers off the coast.

As one of the two emergency power sources for the No. 1 reactor is believed to have already lost function between 3:35 p.m. and 3:36 p.m. -- an assumption based on interviews with the plant's workers -- the final report concluded that backup power was lost before the second tsunami hit. There are also doubts about whether the damage to the No. 2 and No. 3 reactors is attributable to the tsunami, the report said, calling for further investigation.

While determining that there was no major quake-induced pipe ruptures in the plant's other important safety equipment, the report said the possibility of coolant water having leaked from minute cracks in the No. 1 reactor cannot be ruled out. The report, meanwhile, did not delve into the operations of the nuclear plant, which was elaborated earlier in the report released by the government's disaster investigation committee.

Takashi Sawada, director at the Atomic Energy Society of Japan, was dismissive of the investigative panel's report.

"From an engineering point of view, the report's judgment is insufficient. If pipes were even only slightly damaged, allowing coolant water to leak, the temperatures and pressure inside the reactor containment vessel would be abnormally high. However, the measurement data released by TEPCO does not indicate anything like this between the time the quake occurred and the tsunami arrived. Further verification is necessary," he said.

## Stop pumping seawater!

### Diet panel report cites TEPCO order to Fukushima plant chief to halt pumping seawater

<http://mainichi.jp/english/english/newsselect/news/20120706p2a00m0na010000c.html>

The Diet investigative panel report on the Fukushima nuclear crisis has revealed the details of a telephone conversation in which a senior official of Tokyo Electric Power Co. (TEPCO) instructed the Fukushima No. 1 nuclear plant chief to stop pumping seawater into one of the stricken reactors on the second day of the crisis.

The heated telephone exchange was between plant manager Masao Yoshida and Ichiro Takeguro -- a TEPCO employee on an executive fellowship assignment to the prime minister's office -- on March 12, 2011. At the time, then Prime Minister Naoto Kan was in discussion with Nuclear Safety Commission of Japan Chairman Haruki Madarame and others over the potential for the seawater to cause recriticality.

"Hey, hey, are you doing that? Stop it!" Takeguro is quoted in the report as telling Yoshida over the seawater injections.

When Yoshida asked why, Takeguro shouted angrily, "You, don't talk back. The prime minister's office is grumbling."

Yoshida then asked Takeguro, "What are they saying?" After that, the call was cut off, according to the report.

Yoshida was quoted in the report as saying later, "I could have talked if it was (TEPCO) headquarters telling me to stop (pumping seawater), but I couldn't discuss the situation if it was the prime minister's office, a complete bystander, telling me to halt the operation. They just ordered me to stop." He said the call from the prime minister's office was confusing, though he did order the plant workers to continue pumping seawater into the reactor.

The Diet investigative panel report stated that TEPCO paid unnecessary attention to Kan, hampering its response to the nuclear disaster as a result.

## Quake-resistance of No.1 reactor questioned

July 7, 2012

## Diet panel hits Tepco assumption that only tsunami killed power

[http://www.japantimes.co.jp/text/nn20120707a5.html#.T\\_hL6pFIwpU](http://www.japantimes.co.jp/text/nn20120707a5.html#.T_hL6pFIwpU)

By KAZUAKI NAGATA  
Staff writer

The 9.0-magnitude quake that rocked the Fukushima No. 1 plant in March 2011 may have knocked out one of the emergency generators at reactor 1 before the site was engulfed by tsunami, according to a Diet panel's final report on the nuclear crisis.

The independent panel's findings, released Thursday, challenge Tokyo Electric Power Co.'s assertion that the tsunami single-handedly disabled all the plant's emergency power generators and that the massive temblor wasn't directly responsible.

**If the diesel generator at the No. 1 reactor was crippled by the megaquake, this would seriously undermine Tepco's claims that the Fukushima No. 1 complex survived its initial impact and also question the quake-resistance of many other old reactors nationwide.**

The government and Tepco should not assume that a "total power loss would have been averted if not for the tsunami," the panel stated in the report.

The power outage halted the critical cooling function in reactor cores, which led to three of the plant's units suffering meltdowns and emitting massive quantities of radioactive materials into the environment.

The panel suggested that some of the emergency generators at reactors 2 and 3 also might have been knocked out by the quake.

Tepco has consistently claimed that the initial tsunami that smashed into the power station at 3:35 p.m. on March 11 knocked out all the emergency generators, resulting in a total power outage.

But the panel pointed out that a wave gauge set up about 1.5 km off Fukushima's coast recorded the first tsunami sweeping by at exactly 3:35 p.m., and estimated that it would have taken at least two more minutes for it to reach the No. 1 plant.

This would mean that the power generators were knocked out sometime after 3:37 p.m.

But it is believed the power generator in question was disabled between 3:35 p.m. and 3:36 p.m., implying the quake rather than the waves was responsible, according to the report.

Reactor 1 had two emergency diesel generators in the basement of its turbine building. Given the massive flooding caused by the tsunami, the generator would still have ceased working eventually, even if it had survived the quake's impact.



But if the panel's findings are correct, tsunami safety measures alone might not have been enough to prevent the loss of emergency power, and therefore the meltdown at reactor 1.

On Thursday, Tepco spokesman Junichi Matsumoto reiterated the utility's view that all the generators at the plant were disabled by the first tsunami that washed ashore, citing the results of worker interviews.

"We did not hear that the diesel generator had stopped before the tsunami," Matsumoto told a new conference Thursday evening.

Unfortunately, it still remains impossible to verify which account is correct.

Sky-high radiation levels inside the plant's wrecked reactors, including the No. 1 unit, have prevented Tepco and the government from sending any workers inside the turbine buildings to visually inspect the damage and determine what actually caused the generators to stop functioning.

The report also pointed out that as Tepco, the Nuclear and Industrial Safety Agency and another independent panel created by the government to probe the nuclear disaster have all assumed the emergency power loss was caused by tsunami, no efforts have been made to further examine the matter.

"(That is) very regrettable, and (the investigators' findings) are insincere," the panel stated in the report.

## Financial hit

Kyodo

The three Tohoku region prefectures hardest hit by last year's devastating earthquake and tsunami took an estimated ¥1.54 trillion hit to their economic output after losing seaside factories and other infrastructure, a government white paper said Friday.

## New photographs of tsunami

July 10, 2012

### **TEPCO discloses more photos of Fukushima tsunami**

[http://www3.nhk.or.jp/daily/english/20120710\\_28.html](http://www3.nhk.or.jp/daily/english/20120710_28.html)

The operator of the Fukushima Daiichi nuclear power plant has released previously unseen photos of the huge tsunami that hit the facility on March 11th last year.

This comes after a parliamentary committee investigating the accident criticized Tokyo Electric Power Company for making public only 17 photos in May last year.

TEPCO said it chose photographs where the arrival of the tsunami was most evident and that it is sorry for its shortcomings in presenting information.

The 33 photos released on Tuesday were taken in sequence by a worker of an affiliated company.

They show the tsunami surging with white wave crests just before it swept over the nuclear plant and a tanker attempting to leave the port.

The wall of muddy water can be seen moving through the plant's grounds and carrying away large containers.

The images also show frightened workers who had evacuated to the roof.

## Change your breaker

July 4th, 2012

### **Breaker, breaker: How to conserve energy without thinking too much**

<http://blog.japantimes.co.jp/yen-for-living/>

by Philip Brasor & Masako Tsubuku



Power trip: electrical panel with 30-ampere main breaker switch

Last Monday the summer setsuden (electricity-saving) campaign started. All the regional utilities except Okinawa's are requesting that customers cut back on their energy use so as not to put a strain on the grid, which has been compromised by the shutdown of so many nuclear power plants in the wake of last year's meltdown at the Fukushima No. 1 reactors. As evidenced by the large anti-nuclear demonstration taking place, a lot of people have strong feelings about atomic energy, but whether you believe it to be too dangerous to handle or an acceptable alternative to carbon-based sources, the best way to address the more pressing issue of energy shortages is to reduce usage.

Though there are many piecemeal methods for saving energy, one way to immediately cut down is to exchange your main circuit breaker, the gatekeeper for the current that flows into your home. Power is measured by means of watts, and the number printed on your breaker, which stands for amperes, represents the maximum amount of wattage that can pass into your home at one time. Different household appliances use different amounts of power. Anything that cooks or produces heat will use more power than other appliances. When the amount of power flowing into your home exceeds the ampere level of your breaker, it automatically trips, causing a blackout, but only in your home. If you use a lot of electricity, then you should install a breaker with a higher ampere number.

In Japan, household breakers come in seven steps, from 10 amperes to 60. The higher the number, the higher the basic charge on your monthly electricity bill. If you are a Tokyo Electric Power Co. customer you pay ¥273 for 10 amperes, ¥409 for 15, ¥546 for 20, ¥819 for 30, ¥1,092 for 40, ¥1,365 for 50 and ¥1,638 for 60. In order to figure out which breaker level is appropriate, take a survey of all your household appliances and how often you use each one.

There is an indication on the appliance and in the accompanying user manual of how many watts the device uses at a given time, though some experts say these tend to be inflated. If you want to know *exactly*, then buy a wattage monitor for anywhere between ¥2,000 and ¥20,000 at an electrical appliance store. You plug your appliance into it and it will tell you how many watts the device uses. Then, if you use the simple calculation of 100 watts per ampere, you can estimate which breaker level is best. A refrigerator, for instance, is on all the time and the average one requires 2 amperes on a continuing basis. A microwave or a rice cooker may require as much as 6 amperes, but they tend to only be used for short periods of time. An air conditioner starts off using a lot of power but eventually levels off to much less.

Utility companies will say you should add up all the amperes required by all your appliances to find out what level you need, but that is hardly a way to figure how to save because you aren't going to use all your electrical devices at one time — or, at least, you shouldn't. To make managing your appliances easier use switchable power strips — extension outlets with switches that cut the current to individual appliances.

According to Asahi Shimbun, there was a 50 percent increase last summer in the number of Tepco customers who requested replacement breakers, and though the report doesn't specify how many increased their amperes and how many decreased theirs, we can probably assume the majority were in the latter category; given the setsuden push last year. One family profiled by Asahi stepped down from 40 amperes to 20, after which they experienced two blackouts because they used the toaster and the microwave oven at the same time. Now they have no problems because they understand how to balance their power usage. More importantly, they say they don't feel inconvenienced at all.

What's notable about this trend is that it was promoted by users, not utilities. When utilities talk about changing breakers, they frame it in terms of household economy — you can save money — not in terms of energy-saving. This seems odd since changing to a smaller breaker is a good way of compelling a household to pay closer attention to the amount of energy it uses. By the same token, having a larger breaker than what a household normally uses could lead to a waste of energy. If promoted on a mass scale, changing to smaller breakers could theoretically prevent the sort of regional blackouts the power companies say are likely to happen during peak usage periods this summer. If all households exchanged their breakers for smaller ones, then the grid would seem to be in less danger of momentary overload because those breakers will trip at lower usage levels. The point is that the resulting outage will only affect the individual household, not the grid. In this way, overall usage is checked.

But maybe that would be too much savings for the power companies. After all, they are profit-making organizations. Last week we called Tepco and asked to have our 40-ampere breaker exchanged for a 30-ampere one. Originally, we were thinking of alternating between a 20-ampere breaker for the summer and a 30-ampere breaker for the winter, since much of our heating is electric, but Tepco says you can only change your breaker once a year since that is the minimum period for a billing contract, so we settled for the 30-ampere. When we talked to the Tepco representative on the phone, she made a point of telling us that 30 might be too small. "You can't use two air conditioners at the same time," she warned. "We don't have any air conditioners," we said. She stopped talking.

Yen for Living is produced by **Philip Brasor**, a freelance writer-for-hire, and **Masako Tsubuku**, a freelance translator and interpreter. They are currently working together on a book about Japanese

housing that will probably never be finished. In the meantime they have their own blog on the subject: Cat Foreheads & Rabbit Hutches. You can read more by Philip at [philipbrasor.com](http://philipbrasor.com).

## "Rosemary", a new robot for Fukushima

July 12, 2012

### **Chiba school unveils new robot for work at Fukushima nuclear complex**

<http://mainichi.jp/english/english/newsselect/news/20120712p2g00m0dm097000c.html>

CHIBA, Japan (Kyodo) -- The Chiba Institute of Technology unveiled Thursday a state-of-the-art robot designed to perform tasks inside the highly contaminated reactor buildings at the stricken Fukushima Daiichi nuclear power plant, possibly from August.

Nicknamed "Rosemary," the robot dedicated for work at nuclear plants can transport much heavier objects than its predecessor robot "Quince" that was designed to assist in disaster control and has been used at the Tokyo Electric Power Co. complex since June last year to check inside the reactor buildings and take photographs, the school said.

At a media event, one Rosemary transported about 60 kilograms in weight, against Quince's maximum load of 10 kg, while another Rosemary equipped with a camera that can stretch up to 3 meters high so it can check pipework near reactor ceilings was shown to reporters.

The new robot "was enabled to perform difficult tasks because its movements have been stabilized," said Eiji Koyanagi, deputy director of the school's Future Robotics Technology Center. "I hope it will collect a lot of information" at the Fukushima complex, he added.

## **Beyond Nuclear on Japanese report**

### **Japanese report: Fukushima catastrophe caused by systemic negligence and "captured regulator"**

<http://www.beyondnuclear.org/japan/2012/7/12/japanese-report-fukushima-catastrophe-caused-by-systemic-neg.html>

In a harshly worded executive report that might as well describe the nuclear cabal in the United States, a Japanese parliamentary panel concluded that the on-going nuclear catastrophe at Fukushima Dai-Ichi is the combined negligence of government, regulators and the nuclear industry. In fact, the panel's finding that "The regulator has been captured by the industry it regulates" serves a clear global warning where increasing reactor power output for greater profit, flawed designs and construction, aging reactors, human error and the steady deterioration of oversight and enforcement are converging on the next nuclear catastrophe.

The panel states, "they effectively betrayed the nation's right to be safe from nuclear accidents. Therefore, we conclude that the accident was clearly 'manmade.'" Without question, this includes the General Electric Corporation. It was GE that manufactured and marketed the seriously flawed reactor design, the Mark I Boiling Water Reactor and its unreliable containment in the first place.

It is a profoundly unsettling but not surprising finding that the "regulators did not monitor or supervise nuclear safety... They avoided their direct responsibilities by letting operators apply regulations on a voluntary basis." In fact, the Japanese regulators and nuclear power industry were mirroring the United States Nuclear Regulatory Commission "regulations" that currently allow 22 Fukushima designed GE Mark I reactors in the US to operate with the original unreliable containment and failed experimental "hardened vent" that was voluntarily installed in 1989. One US Mark I, the Entergy FitzPatrick nuclear power plant in upstate New York, "volunteered" not to install anything on its vulnerable containment.

The collusion of government, the regulator and private industry to promote and shield the nuclear industry's financial interest has always undermined the governance of and protection from its inherent dangers. The result in Japan is now yielding the unacceptable consequence for the public health from the risks of radiation exposure, large population displacements caused by mass evacuations without foreseeable return, the dissolution of families, the broad disruption of lives and livelihoods and the long-term contamination of vast areas of land and resources.

**Update** on July 13, 2012 by admin

See Karl Grossman's article in Counterpunch which discusses the Fukushima findings in light of the US and global nuclear industry and the regulators which fall short in their missions due to "regulatory capture".

## More problems for decommissioning?

July 13, 2012

## **Robot probe detects high radiation at No.3 reactor**

[http://www3.nhk.or.jp/daily/english/20120713\\_10.html](http://www3.nhk.or.jp/daily/english/20120713_10.html)

The operator of the Fukushima Daiichi nuclear plant has detected **high levels of radiation in the basement of the No. 3 reactor, with a maximum dose of 360 millisieverts per hour.**

Tokyo Electric Power Company sent in a robot on Wednesday to the room where the suppression chamber is located. It was **the first robot to probe this area of the plant.**

TEPCO released video taken inside. They show that a door on the southwestern side is broken. There is no other apparent damage or sign of water leakage.

But high levels of radiation were detected. Readings exceeded 100 millisieverts per hour in a number of locations. Average levels were higher than those in the No.2 reactor.

**Engineers lost control of the remote-controlled robot after around 3 hours of operation. They say there are problems with the connecting cable and they've been unable to regain control.**

TEPCO officials say they have no option but to leave the robot where it is for the time being.

**This may pose a problem to the utility's efforts to decommission the reactor. The operators are in a hurry to identify and repair damage to the reactor's suppression chamber and containment**

## **Test run at No.4 spent fuel pool - Soon but date unknown**

### **TEPCO to remove rods from No.4 fuel pool**

[http://www3.nhk.or.jp/daily/english/20120713\\_11.html](http://www3.nhk.or.jp/daily/english/20120713_11.html)

The operator of the Fukushima Daiichi nuclear power plant will soon start test runs for removing fuel rods from a storage pool of the No. 4 reactor.

The Nuclear and Industrial Safety Agency on Thursday approved safety measures for the removal procedure drawn up by Tokyo Electric Power Company.

The reactor's fuel pool contains 1,535 fuel rods -- the highest number at the plant.

TEPCO's trial run is part of efforts to decommission the plant. The test will involve removing 2 unused rods from the pool.

**A crane will be used to pull each of the 2 rods out of the pool, and then place them in a special container on the 5th floor of the reactor building.**

**The container will prevent the fuel from going critical.**

Another crane will lower the container to the ground, where a truck will take it to a facility called a "common pool."

**Using an underwater camera, workers will first measure the radiation of the fuel rods.** This is to ensure that they do not choose highly-radioactive spent fuel for the test run. Four cables will be used to prevent the container from falling.

**TEPCO will also check if there's any damage to the metal container used to store the fuel rods. This is a concern because seawater was used to cool the reactor after last year's accident.**

**TEPCO says it cannot reveal the date of the test for security reasons.**

Full-scale removal of the rods is scheduled to begin sometime next year.

Concerns have been raised about the state of the reactor building and the fuel pool.

## **Japan Times editorial: Diet's report on 3/11 disaster**

July 14, 2012

### **Japan's 'man-made' nuclear fiasco**

<http://www.japantimes.co.jp/text/ed20120714a1.html#.UALtm5FIwpU>

A report released last week by the Diet's Fukushima Nuclear Accident Independent Investigation Commission backs what many members of the public have long believed: The fiasco at Tokyo Electric Power Co.'s Fukushima No. 1 nuclear power plant was "a profoundly man-made disaster — that could have and should have been foreseen and prevented."

The findings of the 19-member commission were based on a six-month investigation that included 900 hours of hearings and interviews with 1,167 people as well as nine visits to the Fukushima No. 1 power plant and three other nuclear power plants. In an unprecedented and most welcome move, the panel sought maximum information disclosure by opening up all 19 of its commission meetings to the public and broadcast all but the first one on the Internet in Japanese and English. The commission also dispatched teams overseas to confer with experts in the United States, Russia, Ukraine, Belarus and France.



The Fukushima nuclear accident, concluded the panel, "was the result of collusion between the government, the regulators and Tepco, and the lack of governance by said parties. They effectively betrayed the nation's right to be safe from nuclear accidents." The commission identified the root causes of the accident as "organizational and regulatory systems that supported faulty rationale for decisions and actions, rather than issues relating to the competency of any specific individual."

The commission asserted that the direct causes of the accident were foreseeable prior to the March 11, 2011, disaster. But Tepco, the regulatory bodies, and the trade and industry ministry promoting nuclear power failed to develop the most basic safety requirements, including assessing damage probability, preparing for collateral damage containment and developing evacuation plans. Both Tepco and the Nuclear and Industrial Safety Agency (NISA) were aware of the need for structural reinforcement at the Fukushima No. 1 plant to meet new guidelines, stated the commission, but rather than demand that it be done, NISA allowed Tepco to act "autonomously" and none of the required reinforcements were done by 3/11.

The commission also found that although NISA and Tepco were aware of the risk of total electricity outages and reactor core damage from tsunamis since 2006, NISA failed to create new regulations and Tepco neglected to take any protective measures.

The commission uncovered evidence showing that the regulatory agencies and Tepco colluded on decisions regarding the implementation of new regulations. It also found that the regulators had "a negative attitude" toward the import of advanced knowledge and technology from abroad, and concluded that if measures implemented in the United States following 9/11 had been put into place in Japan, the Fukushima disaster might have been prevented.

In short, concluded the commission, "There were many opportunities for taking preventative measures prior to March 11. The accident occurred because Tepco did not take these measures, and NISA and the Nuclear Safety Commission (NSC) went along."

The commission also rejected Tepco and the government's effort to portray the tsunami — a "black swan" event — as the sole cause of the nuclear accident in an effort to exclude the foreseeable earthquake. The panel stated there was a possibility that the earthquake "damaged equipment necessary for ensuring safety" and caused a small-scale loss-of-coolant accident in Unit 1.

It identified the quake as the cause of the critical loss of off-site power to the plant, and noted "there was no diversity or independence in the quake-resistant external power systems and the Shin-Fukushima transformer station was not earthquake resistant."

The commission identified "many problems with on-site operations during the accident" that hampered an effective response and blamed them on organizational problems within Tepco, stating that "events made it clear that if there are no response measures for a severe accident in place, the steps that can be taken on-site in the event of a station blackout are very limited."

The commission also concluded that the situation continued to deteriorate because the crisis management system of the Prime Minister's Office, the regulators and other responsible agencies did not function correctly. It pointed out that direct instructions from the Prime Minister's Office to the

Fukushima No. 1 plant caused confusion at the scene and that Prime Minister Naoto Kan's visit to the scene by helicopter caused a loss of precious time for the power plant to cope with the accident.

The commission blamed the chaotic nature of the evacuation — which was plagued by information lags and resulted in some residents fleeing to areas with higher levels of radiation — on the negligence of the regulators who failed to implement adequate measures against a nuclear disaster and the failure of previous governments and regulators to focus on crisis management. Noting that residents in the affected areas continue to suffer from the disaster, the panel accused the government and regulators of failing to act to protect their health and restore their welfare, and called on the government to draw up measures to improve their lives.

Accusing the regulators of failing to supervise nuclear safety, Tepco of exploiting its cozy relationship with the regulators to take the teeth out of regulations, and criticizing existing laws and regulations for lacking mechanisms to ensure that the latest technological findings from overseas are utilized, the commission stated that the safety of nuclear energy in Japan and of the public cannot be ensured unless the nuclear plant operators, the regulators and the laws and regulations undergo substantial reform.

It must not be forgotten that the nuclear disaster festers on 16 months after it started and that some 160,000 people are still living away from their homes because of the accident. Japan's nuclear power establishment — the government, regulators and operators — must be forced to change its culture to one that places top priority on the public's safety. That the commission cited the earthquake as a possible contributing factor to the accident is hugely important in a country where earthquakes are commonplace and present a threat to nuclear power plants. In a welcome move, Tepco decided to disclose the video recordings of meetings between officials at its head office and officials on site at the Fukushima No. 1 plant. This will facilitate further investigation into this matter. The Atomic Energy Society of Japan should also lend its full support to the investigation.

Efforts by the government and Tepco to reduce radiation levels in affected communities are hampered by an inflexible bureaucratic approach. Red tape must be slashed and local concerns heeded. Evacuees must be made fully aware of compensation options and receive enough data to make an informed decision on whether they should return home or resettle elsewhere.

Both the government and the power industry should strive to address and eliminate the problems cited by the commission. The Diet should follow the panel's recommendation and establish a permanent committee to oversee the nuclear power industry and ensure the public's safety. In addition, the new Nuclear Regulatory Commission to be established this autumn should have the capability to give effective technical advice to personnel at nuclear power plants in the case of severe accidents.

## **Why Fukushima No.2 plant fared better than No.1**

July 16, 2012

## No. 2 N-plant 'responded better to crisis' / Report outline also hits care of patients

The Yomiuri Shimbun

<http://www.yomiuri.co.jp/dy/national/T120715002261.htm>

The initial response made by staff at the Fukushima No. 1 nuclear power plant following last year's March 11 earthquake and subsequent tsunami was inadequate compared to that by their counterparts at the nearby Fukushima No. 2 nuclear power plant, according to an outline of the final report by a government panel.

The Yomiuri Shimbun obtained the outline of the report, which is scheduled to be released July 23, by the panel charged with investigating the nuclear crisis at the No. 1 plant.

Looking into measures taken at the two plants--both operated by Tokyo Electric Power Co.--following the disaster, the final report will criticize the No. 1 plant for not taking sufficient measures compared to No. 2, which minimized the damage caused by the tsunami.

The final report is also set to refer to delays in evacuating inpatients and others from a hospital near the No. 1 plant following the outbreak of the crisis. **It blames a lack of communication between the Fukushima prefectural government and the Self-Defense Forces for the deaths of several dozen patients.**

Workers at the No. 1 plant manually shut down the No. 3 reactor's emergency cooling system in the early hours of March 13. Cooling of the reactor remained suspended for more than six hours because they failed to secure an alternative way to inject water.

At the No. 2 reactor, workers did not measure the pressure and temperatures in its pressure suppression pool--which is the lower portion of the reactor's containment vessel--until the early hours of March 14. This failure eventually caused the plant to be unable to lower the pressure in the reactor--a necessary step to inject water.

Meanwhile, the No. 2 plant--about 10 kilometers south of the No. 1 plant--found its sea water pumps and other equipment were damaged after it was hit by tsunami as high as nine meters.

**"The No. 2 plant almost suffered the same fate as No. 1," plant chief Naohiro Masuda has recalled. Nonetheless, the plant was able to continue cooling its reactors.**

The panel's investigation found that workers at the No. 2 plant confirmed they would be able to take subsequent steps before they changed how they injected water into the reactors. They also kept an eye on the pressure and temperatures of the pressure suppression pools.

One TEPCO employee working there at the time of the disaster told the panel it was "natural" for the plant to take those measures.

"The No. 1 plant's initial responses were less adequate than those by the No. 2 plant, regardless of the fact they faced different situations--such as whether external power supply was available," the final report is

set to conclude. It will also call for these lessons to be reflected in reviewing measures to prevent the recurrence of a nuclear crisis.

The panel also examined the deaths of about 40 people at Futaba Hospital in Okuma, Fukushima Prefecture, following the outbreak of the crisis.

When the hospital evacuated its patients on March 14, the prefectural government's disaster response headquarters failed to secure suitable vehicles to carry bedridden people, forcing the hospital to look for different vehicles.

Moreover, the prefectural government's division for the disabled found institutions that could accept the hospital's patients, but it did not provide this information to the headquarters.

As a result, the hospital's patients were forced to travel more than 200 kilometers from Futaba.

The panel also found the SDF had insufficient communication with the prefectural government, which resulted in it being unable to coordinate with the hospital's director.

To make matters worse, the SDF failed to discover 35 patients in the hospital's annex when it conducted rescue operations on March 15. They were left behind until the early hours of March 16.

The final report is set to conclude that then Prime Minister Naoto Kan confused workers at the No. 1 plant through his intervention, while also saying it was wrong for the Economy, Trade and Industry Ministry's Nuclear and Industrial Safety Agency to deny there had been meltdowns at the plant when it held press conferences during the early days of the crisis.

## Impact of small-scale renewable power "very meaningful"

### Gov't renewable energy stats nearly 7 million kilowatts short

<http://mainichi.jp/english/english/newsselect/news/20120716p2g00m0dm090000c.html>

The **exclusion of small energy producers** has left government renewable energy generation statistics about 7 million kilowatts short, it has been learned.

Unofficially, excluding hydroelectric power generation over 1,000 kilowatts, Japan pumped out some 10.1 million kilowatts of renewable energy in fiscal 2011, according to Agency for Natural Resources and Energy statistics based on data from the Japan Wind Power Association and other renewable energy groups. However, the agency's official statistics, based only on reporting from large electricity producers, say Japan is generating just 3.04 million kilowatts in renewables.

The reason for the gap is that producers of less than 1,000 kilowatts do not need to report their generating statistics. The reasoning was that the tiny amounts of energy put out by small operations would have very little effect on the total. With the rapid advance of self-sufficient, small-scale energy generation, however, these small producers can no longer be ignored.

The energy agency estimates that 2.5 million kilowatts in new renewable energy generation capacity will go on-line in fiscal 2012 -- **equivalent to starting up 2.5 nuclear reactors**. Around 60 percent of this comes in the form of home solar power systems that produce just a few kilowatts each, meaning the gap between official and actual renewables generation will continue to widen.

In one of the three scenarios for Japan's energy future presented recently by the government, 25-35 percent of the country's power would come from renewable sources by 2030. In order to get to that level in an organized way, however, statistics reflecting actual output are needed. In particular, as weather and regional conditions affect the amount of power that can be generated by solar and wind, a lack of accurate data could hamper analysis of which regions are best suited to which types of generation and what kinds of renewable energy to promote.

The gap shows "how sloppy the understanding of the status of renewable energy has been under the government's policy focused on large-scale power generation, such as nuclear energy," says Chiba University special instructor Takeshi Magami, who studies the introduction of renewable energy on the municipal level. "If the reporting procedures of the various power companies are expanded, (the statistics) will be in better shape."

Consistency of the statistics is another consideration, and the energy agency does not currently plan to review its methods. However, "Even if individual renewable energy producers generate power on a small scale, when connected by a network they are very meaningful indeed," says Kazuhiro Ueta, professor of environmental economics at Kyoto University. "I think it's time to consider changes to the statistical methodology that fit the times."

(Related link)

Japan Wind Power Association: [http://jwpa.jp/index\\_e.html](http://jwpa.jp/index_e.html)

## Support for renewables

July 17, 2012

### Editorial on renewables

<http://www.japantimes.co.jp/text/ed20120717a1.html#.UAVKh5FIwpU>

A feed-in tariff system to accelerate investment in renewable energy sources started on July 1. It is hoped that it will lead to the establishment of renewable energy facilities across Japan, thus helping revitalize local economies and reduce Japan's dependence on nuclear power.

Under the system, the nation's major power companies have to buy in principle electricity generated by solar, wind, geothermal and medium- to small-scale hydro power and biomass at fixed prices for up to 20 years. For example, the prices per kWh and the purchase periods are ¥42 for 20 years for a solar power facility with the output of 10 kW or more, ¥57.75 for 20 years for a less than 20 kW wind power facility, ¥42 for 15 years for a less than 15,000 kW geothermal facility, ¥25.2 for 20 years for a more than 1,000 kW hydro power facility and ¥17.85 for 20 years for biomass using waste materials.

In fiscal 2010, renewable energy including large-scale hydro power accounted for only 11 percent of Japan's total power generation. The government plans to raise that percentage to a maximum 35 percent in fiscal 2030. To achieve the goal, electricity generated by solar, wind and geothermal power must increase 20 to 30 times.

The feed-in tariff rates are reviewed every year. But their relative stability will help encourage the entry of newcomers into renewable power generation. It will be necessary to set the rates at optimum levels to encourage both investment in renewable energy sources and efforts to reduce power generation costs.

Since electricity from renewable sources is relatively expensive, increases in electricity bills are inevitable. This is the cost households and enterprises have to shoulder to help spread renewable energy. In fiscal 2012, the monthly electricity bill for households will rise an average ¥87. The government has not yet estimated how much the bill will rise when the percentage of renewable energy reaches 35 percent of the total electricity generation.

On Oct. 1, the environment tax will be introduced, imposed on fossil fuels in accordance with their carbon dioxide emissions. In three and a half years, the average household's burden will increase by about ¥100 a month. The government should work out a program to use the revenues to strengthen power generation based on renewable energy sources.

The government also must end the monopoly of power transmission and distribution by the nation's major power companies so that renewable energy entities can use transmission lines without restrictions. It also should consider how to better utilize Japan's abundant geothermal power resources. Geothermal has the potential to generating more than 20 million kW nationwide compared with the current 540,000 kW — only the No. 8 in the world.

## Test run starts at No.4

July 18, 2012

### TEPCO removes unused fuel rods from pool

[http://www3.nhk.or.jp/daily/english/20120718\\_13.html](http://www3.nhk.or.jp/daily/english/20120718_13.html)

The operator of the damaged Fukushima Daiichi nuclear power plant has begun removing two unused fuel rods from a storage pool in the No. 4 reactor.

Tokyo Electric Power Company, or TEPCO, began the work on Wednesday as a test for eventually removing all 1,535 fuel rods stored in the pool, including 204 unused ones.

Workers are carefully monitoring radiation levels and footage from underwater cameras to **make sure they remove unused fuel rods, instead of a highly radioactive spent one.**

This is the first time fuel rods are being removed from the storage pool since the plant was damaged in the earthquake and tsunami last March 11th.

In late August, TEPCO will check if there's any damage and corrosion to the metal container used to store the fuel rods.

**If workers can successfully remove the 2 fuel rods, the utility plans to extract the remaining rods beginning in December 2013, as the first step in decommissioning four of the reactors at the Daiichi plant.**

The building housing the reactor was heavily damaged by a hydrogen explosion following the earthquake and tsunami. This has raised concerns that fuel rods in the pool on the fifth floor of the building could pose a threat in the event of another earthquake.

## "A key step" toward decommissioning Fukushima Daiichi

July 19, 2012

**Trial transfer: Work to remove a nuclear fuel assembly is under way Wednesday atop the heavily damaged building of reactor 4 at the Fukushima No. 1 nuclear plant. KYODO**





## **Fuel rods removed from Fukushima plant pool**

<http://www.japantimes.co.jp/text/nn20120719a2.html#.UAgsUqBIwpU>  
Jiji, AFP-Jiji

Tokyo Electric Power Co. on Wednesday removed one of two unused nuclear fuel assemblies from the spent-fuel pool of reactor 4 at its Fukushima No. 1 power station.

Television footage showed dozens of workers, all wearing white protective suits, atop the heavily damaged unit 4 building, extracting the fuel rods with a crane. TV crews used helicopters to film the operation, defying requests from Tepco.

The operation is a trial ahead of the planned transfer of all the fuel assemblies now in the spent-fuel pool



to a common pool in another part of the stricken plant. The transfer is expected to start by the end of 2014.

During the work, Tepco removed one of two unused fuel assemblies, which emit relatively low levels of radiation. The other assembly is expected to be removed Thursday.

Tepco will scrutinize the two to see if and how they have been affected by a hydrogen explosion at reactor 3 and the use of seawater to cool the fuel assemblies.

Reactor 4 had no fuel in its core when the 9.0-magnitude quake and tsunami hit the plant in March last year. The reactor had been shut down for maintenance.

At the time disaster struck, 1,535 fuel assemblies were stored in the spent-fuel pool. Of the total, 1,331 were spent fuel assemblies while 204 were unused.

## **2nd unused nuclear fuel assembly taken from Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20120719p2g00m0dm062000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. took out an unused nuclear fuel assembly from a spent fuel pool at the No. 4 reactor of its Fukushima Daiichi power plant Thursday, after removing another fuel assembly Wednesday, sources close to the matter said.

The operation came as the utility examines the extent of damage to the stored fuel before starting the full removal of fuel assemblies at the plant in December 2013.

It marks a key step in the process toward decommissioning the Nos. 1 to 4 units at the plant, which was crippled by the March 2011 earthquake and tsunami.

As was the case with the first nuclear fuel assembly taken out Wednesday, TEPCO used a crane to remove the second one from the pool on the fifth floor of the reactor building, cleaned it with pure water and put it into a special container, the sources said.

The fuel assemblies in the special containers will be transferred to a so-called shared pool in a different building at the plant. **Each assembly is about 4 meters long, weighing some 300 kilograms.**

The utility has refused to disclose any information on the operation, citing nuclear security concerns.

The sources said the utility did not find any major abnormality with regard to the radiation level and to the external appearance of the initially removed fuel.

The removal of the two unused fuel assemblies leaves 1,533 used and unused ones still in the pool of the No. 4 reactor.

When the fatal quake and tsunami hit the plant on March 11 last year, the No. 4 reactor was offline for

maintenance work and its fuel was stored in the spent fuel pool. The Nos. 1 to 3 reactors suffered meltdowns in the accident.

## New unmanned tractor for Fukushima

July 20, 2012

### Remote-controlled decontamination tractor unveiled in Fukushima

<http://mainichi.jp/english/english/newsselect/news/20120720p2a00m0na007000c.html>



An unmanned tractor is remotely manipulated from a white station wagon, background, while residents look on from afar, in Iitate, Fukushima Prefecture, on July 19. (Mainichi)

IITATE, Fukushima -- A remote-controlled tractor and other agricultural machinery designed to decontaminate farmland tainted with radioactive materials while protecting farmers from radiation were unveiled here on July 19.

Some 40 residents of the Fukushima Prefecture village of Iitate, which has been entirely evacuated

following the nuclear disaster at the Fukushima No. 1 Nuclear Power Plant, witnessed a demonstration of the vehicles by developers including a farm machinery manufacturer.

One of the eight varieties of machinery unveiled was an unmanned, remote-controlled tractor capable of scraping the topsoil off rice paddies without exposing farmers to dust tainted with radioactive materials.

Another tractor has a lead-covered enclosure around the driver's seat to minimize the driver's exposure to radiation.

## Removed by hand

A lot more information on the removal of the assemblies from the pool at Unit 4 is available on Iori's site (fukushima-diary.com)

### **[Dream technology] Fuel assemblies are hung up by human workers**

Posted by Mochizuki

Following up this article..[Reactor4] Photos and videos to take out the new fuel assemblies  
Actual Fukushima worker Happy11311 commented fuel assemblies are hung up manually. There are 1535 fuel assemblies in SFP4. Human workers may have to take them out 1535 times.

続き 4:新燃料の吊上げは、多分ほとんどの人が最初から最後までクレーンで吊上げたと思ってるだろうけど、それは違うでし。ラックから引き上げるまでは手動のチェインブロックで作業員が吊上げるでし。

—ハッピーさん (@Happy11311) 7月19, 2012

Probably most of the people think new fuel assemblies are hung up by a crane, but it's not true. To pull an assembly out of the rack, human workers hang it up by chain block manually.

続き 5:吊上げる作業員は巻き上げるチェインから伝わる感覚と水中カメラの映像でスティック(ひっかかる)してないか確認しながら吊上げるでし。炉内の水中作業はクレーンで最初から引き上げる事はしないでし。

—ハッピーさん (@Happy11311) 7月19, 2012

The human worker to hang up an assembly keeps checking the underwater camera and how heavy they feel the chain is. When you pull up an assembly inside of vessel, it must be hung up manually at the beginning.

## TEPCO to review the 3 reports on the disaster

July 21, 2012

### Tepco to review Fukushima report amid contradictions

<http://www.japantimes.co.jp/text/nn20120721a4.html#.UArEjaBlwpU>

Jiji

NIHONMATSU, Fukushima Pref. — Tokyo Electric Power Co. next week plans to reassess its final report on the Fukushima nuclear disaster to address contradictions with the final report recently released by an independent Diet panel, a Tepco official said.

The official, Yoshiyuki Ishizaki, said Thursday in Nihonmatsu, Fukushima Prefecture, that the findings released by the Diet panel formed to investigate the cause of the disaster clash with Tepco's in-house report. The Diet panel effectively said the crisis was man-made, due to a corrupt regulatory system and lack of safety awareness, and not due to a natural disaster.

Another key government committee will announce its own report on the disaster Monday.

Once the second panel's report is released, Ishizaki said Tepco will form a team of in-house legal and technical experts to examine the three reports on the crisis, which was triggered when the March 11 earthquake and tsunami damaged Tepco's aging and poorly protected Fukushima No. 1 power plant.

Tepco needs to correct its own report if mistakes are found during the review process, he said, without specifying when the review would be completed.

Tepco's final report, published June 20, said the meltdown of reactor 1 occurred after its cooling system was knocked out by the tsunami caused by the 9.0-magnitude earthquake on March 11.

As the direct cause of the meltdowns of reactors 2 and 3, the report said the utility was not able to cool the reactors stably because of the deteriorating environment caused by the hydrogen explosion in reactor 1.

The report denied that the 40-year-old power plant was damaged by the earthquake itself.

The Diet panel said in its report July 5 that it could not rule out the possibility that the tremor compromised the plant's key facilities. It suggested a reactor 1 emergency power generator may have broken down in the moments before the tsunami hit.

Ishizaki said he believes the Tepco report findings but added it is the firm's duty to analyze the differences among the reports.

## **No redress exemption**

Kyodo

The Tokyo District Court ruled in a lawsuit Thursday that the government's decision not to exempt Tokyo Electric Power Co. from having to pay compensation for nuclear accidents caused by natural disasters is legitimate.

"The government's interpretation of the exemption in an extremely limited way was reasonable to some extent," Judge Masatoshi Murakami said in handing down the ruling.

The suit, filed by an individual investor over the fall in Tepco's share price, focused on whether the state should have applied the exemption to the utility in connection with the Fukushima nuclear disaster triggered by the March 2011 earthquake and tsunami.

The law on compensation for nuclear accidents includes a waiver clause stipulating that the government, rather than an atomic plant operator, would pay compensation for damage caused by a nuclear accident resulting from "an unusually huge natural disaster or a social upheaval."

Murakami said: "There are various interpretations (of the clause) and it is difficult to draw a primary meaning."

Given that the purpose of the law is to protect disaster victims, the government's understanding that the exemption should be applicable to absolutely unimaginable situations is reasonable, the judge added. The court rejected a demand for ¥1.5 million in state compensation by the plaintiff.

## **TEPCO mishandled its response**

July 23, 2012

### **Government panel issues Fukushima accident report**

[http://www3.nhk.or.jp/daily/english/20120723\\_22.html](http://www3.nhk.or.jp/daily/english/20120723_22.html)

A government panel investigating the nuclear accident at the Fukushima Daiichi plant says the operator of the plant lacked a sense of crisis and imagination for possible tsunamis. It says Tokyo Electric Power

Company should realize that Japan is prone to natural disasters and change its attitude toward disaster-preparedness.

The panel of government-appointed experts submitted its final report on Monday.

The report criticized the way the utility handled the accident at the Daiichi plant.

It compared the Daiichi plant with another nearby plant, the Fukushima Daini plant, which avoided a nuclear accident although its reactors were also hit by tsunami.

It says workers at the Daini plant kept monitoring the pressure and temperature of the reactor containment vessels, and prepared for alternative ways to inject water.

The panel also examined whether it was appropriate for the Prime Minister at the time, Naoto Kan, to discuss with TEPCO officials whether to inject seawater into the reactors to prevent them from reaching criticality again.

It determined that the government should not have intervened in the matter before the power company had made a decision.

The report also points out that TEPCO had urged a government taskforce on earthquake research to change its wording about a powerful earthquake that hit northeastern Japan 1,100 years ago.

TEPCO said the report could be interpreted as meaning the area was regularly hit by strong earthquakes.

The report says the utility's lack of a sense of crisis was one of the main reasons behind the accident.

The panel is urging the government to continue its probe. It says the cause of the accident has not been fully disclosed.

Apart from the government, private-sector experts and the Diet have also released their own reports on the nuclear accident.

### **TEPCO mishandled nuclear crisis, 'overly confident' of safety: gov't panel**

<http://mainichi.jp/english/english/newsselect/news/20120723p2g00m0dm081000c.html>

TOKYO (Kyodo) -- A government-appointed panel investigating the Fukushima Daiichi nuclear power plant disaster concluded Monday that Tokyo Electric Power Co. mishandled its response to the crisis and nuclear regulators failed to prepare sufficient disaster-mitigation measures as they were "overly confident" about the safety of nuclear power.

"The utility and regulatory bodies were overly confident that events beyond the scope of their

assumptions would not occur...and were not aware that measures to avoid the worst situation were actually full of holes," the panel said in its final report, submitted to Prime Minister Yoshihiko Noda the same day.

The panel was skeptical that the magnitude 9.0 earthquake on March 11, 2011, caused catastrophic damage to key facilities of the Nos. 1 to 3 reactors before tsunami hit the nuclear complex. It called on the state and TEPCO to continue investigating the entire accident, saying many points remain unexplained, such as how radioactive substances leaked outside.

The panel also claimed that then Prime Minister Naoto Kan's involvement in matters to contain the nuclear crisis had "more harmful effects" than changing the situation for the better, because it might have caused "confusion" among workers at the plant or resulted in wrong decisions being made.

Upon receiving the report from the panel's head Yotaro Hatamura, a professor emeritus at the University of Tokyo, Noda said, "We will take all possible measures to prevent recurrences."

The nearly 450-page report centers on the new findings after the panel released its interim report in December, including an analysis on what was wrong about the country's largest utility.

Under the belief that an accident that would result in core meltdown would not occur in Japan, TEPCO had "weak" ability to respond to a crisis because employees were not trained to think flexibly nor deal with a situation in which power supply to multiple reactors is lost for days.

"TEPCO has said that losing nearly all power sources due to an earthquake and tsunami was beyond the scope of assumption. But it was because the company simply decided not to include the event within its assumption, based on a groundless safety myth," the report said. The power loss led to the failure to keep reactors cool and resulted in the meltdown of the Nos. 1 to 3 units.

To highlight the poor response seen at the Fukushima Daiichi complex, the report compared how workers at the Fukushima Daini plant, located about 12 kilometers south of the Daiichi plant, worked to keep cooling the reactors after the quake and tsunami.

For example, the water injection into the Daiichi's No. 3 reactor was suspended for more than six hours because operators on duty manually suspended a high pressure coolant injection system without first preparing an alternative method to cool the reactor.

But at the Daini plant, workers only switched to the next water injection method after first checking whether it would actually function, the report said, noting one employee involved in the Daini plant operation told the panel that "it is a matter of course to make such preparation."

While workers at the Daini plant may have been more composed because external power supply was available there, the handling of the Fukushima Daiichi crisis "lacked appropriateness," the report said.

Nuclear regulators were also obsessed with the safety myth of nuclear power, the panel said. It noted the Nuclear and Industrial Safety Agency strongly opposed a plan in 2006 to enhance preparedness against a

nuclear disaster, fearing such a move would raise concerns about the safety of nuclear power among residents living near atomic plants.

The report also gave a poor grade to the government's response to the accident. It questioned whether Kan, the supreme commander, had no other way to address a lack of information about the on-site situation than visiting the plant himself on March 12, the day after the crisis began.

Residents living around the Fukushima plant may also have been able to keep exposure to minimum if the government had effectively used a computer system to predict the spread of radioactive materials, even though data on the damaged reactors were not available, the report said.

The panel's assessment on the System for Prediction of Environmental Emergency Dose Information, or SPEEDI, is different from that presented by another accident investigation panel appointed by the Diet. It said in a report earlier this month that the calculation results by SPEEDI would not have been accurate enough to use as grounds for setting evacuation zones in the absence of plant data.

On the controversial issue of whether TEPCO had an intention to withdraw all workers from the plant in the early days of the crisis, the report said that it was not able to determine that the utility had intended to do so.

The panel also said the utility's analysis of the process of how the reactor cores suffered damage did not necessarily reflect the actual situation. It condemned TEPCO's in-house investigation as "not sufficient in figuring out" what happened in the world's worst nuclear crisis since the 1986 Chernobyl disaster.

Based on the lessons learned from the accident, the panel proposed the government and utilities take safety steps regardless of the probability of tsunami and other events that could have a potentially strong impact, and review disaster reduction measures when important new findings are revealed.

## A damning report

### **Fukushima disaster caused by human error that could have been prevented: gov't panel**

<http://mainichi.jp/english/english/newsselect/news/20120723p2a00m0na037000c.html>

A final report released July 23 by a government panel investigating the ongoing nuclear crisis in Fukushima has concluded that the disaster could have been prevented.

The Investigation Committee on the Accident at the Fukushima Nuclear Power Stations of Tokyo Electric Power Company zeroed in not only on the missteps of Tokyo Electric Power Co. (TEPCO), the operator of the stricken Fukushima No. 1 nuclear plant, and the Japanese government following the onset of the nuclear disaster, but also on pre-disaster efforts and the organizational and societal backdrop against which the disaster broke out.



What has emerged, as a result, is the conclusion that the disaster was not caused by tsunami of unanticipated proportions, but by human error.

The committee placed its emphasis not on pinpointing who is responsible for the disaster, but on preventing future incidents to draw out honest testimony from those involved. Because of this, the panel's final report differs from that of the Diet's Fukushima Nuclear Accident Independent Investigation Commission (NAIIC), in that it refrains from using the term "jinsai," or man-made calamity.

Other phrasing in the report also betrayed the panel's cautiousness, including: "It is difficult to assess whether the hydrogen explosions could have been prevented if the cooling capacity of reactors had been restored at an earlier time."

Despite such circumspect language, however, in bringing up the plant's bungled operation and the administration's botched initial handling of the crisis, the report hints at the likelihood that much of the damage could have been prevented if the main players had acted differently.

The report elaborates upon the fact that TEPCO officials had failed to take precautionary measures even though they had been aware of the possibility of massive tsunami hitting the plant. But such a pre-disaster approach was not limited to TEPCO. It extended to the way nuclear regulatory bodies took -- or failed to take -- on their roles.

In June 1993, the Nuclear Safety Commission of Japan (NSC) compiled a report on station blackout (SBO), which refers to a state in which a nuclear plant has lost power. However, according to the investigative panel's findings, the report had been based on a write-up by TEPCO on why a long-term SBO was implausible, a document the NSC itself had requested.

The panel viewed this as problematic, stating in the report: "While the NSC did not completely copy off of TEPCO's response (to its request), the content remains similar. Requesting a document from a power company was inappropriate action for a regulatory body to take."

In January 2009, the NSC held a meeting on accident management for the No. 3 reactor at Hokkaido Electric Power Co.'s Tomari Nuclear Power Plant. The NSC stated the importance of considering "external phenomena (such as earthquakes and tsunami)," and noted in reference materials distributed at the meeting that accident preparedness should be based on the possible effects of major quakes, as well as the composite damage that could result from quakes and fires.

However, the topic was not discussed at the meeting, nor was it addressed at a later date. In his testimony to the government investigation panel, then-NSC head Atsuyuki Suzuki said that "the task would've been gargantuan and impossible to bring under control," and that "it's true that the implementation of international methods was put off."

Following the Sept. 11, 2001 terrorist attacks, in 2002, the U.S. Nuclear Regulatory Commission (NRC) ordered all U.S. nuclear plants to reinforce their safety measures and prepare against possible terrorist

attacks. In 2007, the NRC announced a similar regulation requiring plants to ensure cooling capabilities in the case of aircraft crashes.

Officials with the Japanese Ministry of Economy, Trade and Industry's Nuclear and Industrial Safety Agency (NISA) visited the NRC in 2008, where they exchanged views on aircraft crashes on nuclear plants with their U.S. counterparts. Between 2009 and 2010, NISA deliberated its policy on the issue within the agency, and in January 2011, decided to discuss the issue further with additional counsel from the NRC.

A NISA official told the government investigation panel that such developments were not reflected in NISA's regulation of the nuclear industry because "since terrorism in Japan was less likely than in the U.S., it couldn't be helped that things would progress at a slower pace," and that "the effectiveness of the measures were unclear."

Meanwhile, the reactivation of two reactors at the Oi Nuclear Power Plant this month brought Japan's non-nuclear period to an end after two months. Both the government and power companies say they've taken the measures necessary to prevent a crisis similar to the one still unfolding in Fukushima. However, the Oi restarts have taken place before completion of probes into the slapdash manner in which fault screenings were conducted where nuclear plants currently stand, and before the Oi plant's quake-proof administrative buildings -- which would serve as command and restoration headquarters in the case of an accident -- were ready for operations.

## The myth of nuclear safety

### State panel: Entities unprepared to prevent, handle Fukushima nuclear disaster

By KAZUAKI NAGATA

Staff writer

<http://www.japantimes.co.jp/text/nn20120724a1.html>

The meltdowns that took place at the Fukushima No. 1 nuclear plant after the March 11, 2011, megaquake and tsunami were caused by a government and a utility that were ill-prepared for an emergency because they were devoted to the myth of nuclear safety, an independent panel concluded Monday.

The report submitted by the panel, commissioned by the government, seemed to echo the July 5 conclusion reached by a Diet-commissioned panel that blamed the crisis on government complicity with regulators and suggested that the quake, and not just the tsunami, crippled the plant, leading to three core meltdowns.

The Diet panel thus concluded the disaster was "man-made."

The government panel said it found no physical evidence linking the quake to the loss of the cooling

systems at the 40-year-old plant. Tokyo Electric Power Co. claims the tsunami caused the damage, not the temblor.

"Because the government and the power utilities, including Tepco, were biased by the safety myth, thinking they would never ever face such a serious accident, they were unable to realize that such a crisis could occur in reality. This appears to be the fundamental problem," the panel said in its final report.

Tepco thus failed to prepare adequate tsunami defenses or crisis management procedures to deal with a station blackout, the panel's report said.

It further faulted an inadequate legal system for nuclear crisis management, a crisis-command disarray caused by the government and Tepco, and possible excess meddling on the part of the prime minister's office in the early stage of the crisis.

The panel, headed by Yotaro Hatamura, professor emeritus at the University of Tokyo, submitted the report to Prime Minister Yoshihiko Noda on Monday afternoon.

In the final report, which adds more findings and analyses to its interim report released last December, the panel said that while workers at the Fukushima No. 2 plant managed to avoid a meltdown at that facility, the way engineers at No. 1 worked to cool the reactors was inappropriate.

Workers at reactor 3 tried to cool its nuclear fuel via a high-pressure core injection system and failed to prepare an alternative cooling method. They could not cool the reactor for six hours while the high-pressure core injection system was down, while workers at Fukushima No. 2 confirmed there was an alternative way to cool the reactors, which safely shut down, the report said.

It noted that the situation at Fukushima No. 2 was better than No. 1 because it did not suffer a station blackout, but faulted the handling at the stricken plant and its lack of emergency training.

The panel also faulted Tepco for not preparing sufficient tsunami defenses and said it lobbied the government to not impose stricter safety guidelines, and said nuclear regulators were also to blame for not requiring the utility to better gird for natural disasters.

The worst nuclear disaster since the 1986 Chernobyl accident in Ukraine overwhelmed the crisis management system, which assumed that, in the event of an emergency, an off-site center about 5 km from the plant could act as the local crisis headquarters. At Fukushima, that facility proved inoperable, after it lost its power and was subjected to high radiation levels.

"The prime minister's office had to make important decisions without having any contact with the off-site center that was supposed to collect crucial information," the report said.

The panel also said the government failed to handle the disaster professionally, again noting that then Prime Minister Naoto Kan may have added to the chaos by questioning the injection of seawater, confusing workers at the plant desperate for any way to cool the reactors.

As for whether Tepco wanted to withdraw all its workers from the No. 1 plant, the panel said it could not find evidence the utility seriously considered that option.

The report also said the government failed to give a detailed announcement about what was happening and how it might affect people living nearby.

The Nuclear and Industrial Safety Agency was reluctant to inform the media that reactor 1's fuel rods possibly melted, although it knew that was quite likely.

Then Chief Cabinet Secretary Yukio Edano repeatedly said radiation would not have "immediate" harmful effects on people's health, but that vagueness only raised public concerns, the report said.

The panel also said because of poor communication among Fukushima officials, the police and Self-Defense Forces personnel, the evacuation of Futaba hospital and its nearby health care facility for the elderly, located just 5 km from the damaged plant, was delayed.

As the government panel has now finished what it set out to do, investigation efforts into the accident have reached a milestone, but more efforts are needed.

Both the government panel and the Diet-appointed panel said there are still many unresolved questions, especially what really happened inside the reactors and reactor buildings, so the investigation should continue.

## **Efforts to lower core pressure at No.2 caused largest radioactivity**

July 24, 2012

### **Causes of largest radioactive leaks may be found**

[http://www3.nhk.or.jp/daily/english/20120724\\_26.html](http://www3.nhk.or.jp/daily/english/20120724_26.html)

Experts say work to lower the core pressure at one of reactors may have led to the largest radioactive leaks from the Fukushima Daiichi nuclear plant in March last year.

Among the 4 reactors at the Fukushima plant, the No. 2 reactor leaked the largest amount of radioactivity according to nuclear disaster monitoring.

Researchers from the University of Tokyo, the Japan Atomic Energy Agency and other experts have examined the crisis response log at the reactor facility. They also checked radiation levels in surrounding areas.

They found radiation levels rose sharply 3 times at monitoring posts 10 kilometers south of the plant over a period of 5 hours during the night of March 14th.

These rises came 1 hour after each time workers at the No. 2 reactor released steam from the core to lower its pressure. The plant employees did so to protect the reactor.

But it is believed that by that time the nuclear fuel in the core had already melted down and its containment vessel was also full of radioactive substances.

The experts assume that the radioactive plume escaped from cracks in the containment vessel after steam was released from the core. It was carried south by the wind.

They say the amount of the radioactivity leaked from the No. 2 reactor was 10 to 20 times higher than other reactors, following their hydrogen explosions.

The Japan Atomic Energy Agency's Masamichi Chino says the leaks were serious and need to be further studied even though they occurred as a result of work to protect the reactor.

Tokyo Electric Power Company, the operator of the Fukushima Daiichi nuclear power plant, says opening the valve was the only solution at the time.

It says there was a need to prevent radioactive substances from leaking massively due to damage to the reactor.

TEPCO also says it will examine how the radioactive leaks occurred.

## Edano's regrets

### Edano to give "serious" thought to Fukushima probe panel's findings

<http://mainichi.jp/english/english/newsselect/news/20120724p2g00m0dm054000c.html>

TOKYO (Kyodo) -- Economy, Trade and Industry Minister Yukio Edano, who was chief Cabinet secretary when the Fukushima nuclear accident occurred on March 11 last year, said Tuesday he would give serious thought to the findings of a government-appointed panel investigating the disaster.

"I think I have to give serious thought to the matters pointed out through the investigations and the verification of various situations," Edano told reporters.

In concluding its investigation, the panel gave a poor grade to the government's response to the accident at the Fukushima Daiichi nuclear power plant and judged that nuclear regulators failed to prepare sufficient disaster-mitigation measures.

"I think I have done my utmost (in dealing with the situation), but at the same time I have been thinking that I could have done more," Edano said, adding he "feels sorry" for people in Fukushima and other prefectures still facing difficulties in the wake of the disaster.

As for the responsibility of the Nuclear and Industrial Safety Agency, under the wing of the industry ministry, Edano said the fact that the agency will be dissolved in conjunction with the upcoming launch of a new nuclear regulation authority is a significant step "based on our sincere regret."

When asked how individual officials at the nuclear safety agency should take responsibility for the nuclear crisis, Edano declined to comment and said he would "thoroughly examine the report" of the investigative panel.

## "Buddhist saints in hell"

July 25, 2012

### **Ex-Fukushima Daiichi chief praises workers' dedication in crisis**

<http://mainichi.jp/english/english/newsselect/news/20120725p2g00m0dm038000c.html>

TOKYO (Kyodo) -- The former chief of the crippled Fukushima Daiichi nuclear power plant praises subordinates who strove to contain the disaster in video footage, made available to Kyodo News on Tuesday, that will be aired at an upcoming event.

Masao Yoshida, 57, describes the workers as "Buddhist saints in hell" and says he thought he could have died in the crisis and the "workers cooling the reactors at the plant could not leave the site" in the 30-minute video with English subtitles for a symposium to be held in the city of Fukushima on Aug. 11.

It will be the first time for Yoshida to discuss in detail how he felt during the critical period following the start of the nuclear disaster triggered by the March 2011 earthquake and tsunami.

Yoshida was relieved of his post last December due to treatment of esophageal cancer.

The video was recorded at a Tokyo hotel on July 10 for the symposium, according to the Nagano Prefecture publisher organizing the event.

At the beginning of the footage, Yoshida apologizes to the people of Fukushima for "causing great trouble."

Yoshida says that right after a hydrogen explosion occurred in a reactor building at the plant, his subordinates "rushed to" the site.

Yoshida says in the footage that he told his subordinates to write their names on a whiteboard to let people know who "remained at the site until the last minute to fight" the nuclear disaster.

Tokyo Electric Power Co., the operator of the Fukushima Daiichi complex, has been criticized for allegedly proposing to the government that all workers at the plant be withdrawn due to safety concerns, but Yoshida denies making such a suggestion.

"Basically, I was thinking how to stabilize the power plant. I thought no one engaged in cooling the reactors could leave," Yoshida says. "I never said a word about withdrawal to (Tokyo Electric's) head office."

Yoshida says debris from an explosion in the No. 3 unit on March 14 last year flew into the building housing the control room where he was in command, adding he was fearful something more catastrophic would happen.

In the video, Yoshida converses with Hideki Yabuhara, a human resources consultant who provides counseling to senior officials of the plant operator, known as TEPCO.

## **Futaba to carry out its own study of the disaster**

### **Fukushima town to conduct own study on nuclear disaster**

<http://mainichi.jp/english/english/newsselect/news/20120725p2a00m0na002000c.html>

The town of Futaba in Fukushima Prefecture will conduct its own study of the Fukushima No. 1 Nuclear Power Plant disaster and release its own report, the mayor told the Mainichi Shimbun on July 24.

Mayor Katsutaka Idogawa said of the national government's final report on the disaster, "Why is it a 'final' report when tens of thousands of people are still evacuated and the disaster is ongoing?"

On the report's denial that cooling equipment in the reactor buildings was damaged by the earthquake, Idogawa said, "Why can they say that for sure when they cannot do a sufficient study of the inside (of the reactor buildings)? I cannot trust the report and don't feel like reading it."

"If we don't study why we had to suffer from this disaster, Futaba's history will be erased. It is natural that we do it ourselves," he added. Idogawa indicated that the town will study how the national government and the Tokyo Electric Power Co. (TEPCO) dealt with the town, and it will study the evacuation of its citizens.

On June 20, when TEPCO's disaster study committee released its report, Idogawa said, "They don't have any awareness that they caused the disaster."

## **Interesting?**

August 4, 2012

### **'Eco-house' cut electricity purchases by 88% in year**

<http://www.japantimes.co.jp/text/nb20120804a5.html>

Kyodo



OSAKA — Annual electricity costs at an experimental housing unit were cut 88 percent by using solar panels, a storage battery and a fuel cell, Osaka Gas Co. and Sekisui House Ltd. have reported.

From July 2011 to June 2012, the three-member household reduced its power costs to 584 kwh, from 4,830 kwh during the prior 12 months after their house was refitted with the panels, the firms said Thursday. Osaka Gas and Sekisui House aim to begin marketing the "eco-house" system by 2015, after lowering the equipment costs, particularly for the storage batteries, which cost around ¥10 million.

Automatic regulators to operate fans and power curtains also contributed to cost reduction by bringing cool air into the 138.8 sq.-meter house in the summer, and opening curtains during the day in winter to take advantage of the sunlight, the companies said.

## Go for wind power!

August 8, 2012

### **Editorial: Make maximum use of wind power's potential**

<http://mainichi.jp/english/english/perspectives/news/20120808p2a00m0na012000c.html>

The Japanese public is urged to make better use of wind power's potential as the country needs to promote the introduction of renewable energy because of the ongoing Fukushima nuclear crisis and global warming.

The installation of wind power generators requires time and effort, and it is difficult to install one at every house. Still, the number of such eco-friendly power generators has been markedly growing on a global scale. The world's wind power generation capacity increased 10-fold over the past decade.

**Japan is ranked 13th in the world in terms of cumulative wind power generation capacity. Japan's capacity is only one-25th that of China, which is ranked top in the world.** The ratio of wind power to Japan's total power generation stands at a mere 0.4 percent. These figures show that Japan lags far behind many other major countries in the introduction of wind power.

Japan is not without areas suitable for wind power generation. The potential of wind power generation on the ground and the ocean in Japan is more than 10 times that of solar power generation excluding electricity generated by household solar panels. Japan must make full use of the potential of wind power. In particular, such potential in the Hokkaido and Tohoku regions is quite high. Energy-related businesses

are increasingly interested in wind power as a system under which utilities are required to buy renewable energy at fixed prices. Nevertheless, there are stumbling blocks to the introduction of such energy.

Many of the areas suitable for the installation of wind power generators are situated in sparsely populated areas and adequate power grids have not yet been laid in these areas. Moreover, electric power companies are reluctant to incorporate such unstable power sources into their power grids. Under these circumstances, upper limits are set on the amount of renewable energy that utilities are required to purchase. Therefore, even if individuals and businesses are enthusiastic about using eco-friendly power generators to generate electricity, utilities often refuse to buy such power. In Hokkaido, the amount of electricity that local residents and businesses generate using eco-friendly energy sources and that which they have applied to sell has come to more than 1.5 times the upper limit set by Hokkaido Electric Power Co. The situation is the same as Tohoku Electric Power Co.

**The government has declared that it will extend assistance for the construction and improvement of infrastructure for electric power, such as power grids. It should promptly implement such measures.**

Electric power suppliers should also proactively build and improve their power grids and other relevant facilities in efforts to promote wind power and other renewable energy sources. The technology of adjusting unstable outputs of wind power generators while forecasting weather and efficiently using thermal power to make up for a power shortage can obviously be developed in Japan.

Areas suitable for the installation of wind power generators are limited in Japan where there are many hills. However, the potential of sea-based wind power generation is quite high because Japan has long coastlines. Sea-based wind power accounts for 80 percent of the total potential of introducing wind power. It is necessary for businesses to cooperate closely with local communities in proactively building such power generators.

Windpower, a wind power generation company based in Kamisu, Ibaraki Prefecture, has built seven wind power generators along the Pacific coast near Kashima Port, generating electric power for consumption by approximately 7,000 households. The company aims to install and begin operating eight more wind power generators by the end of the current business year ending in March 2013. The company's ultimate goal is to build 100 such generators off the coast there to generate electric power equal to the output of a medium-sized nuclear generator.

Sea-based wind power generators can efficiently use wind because there are no obstacles on the ocean, and they hardly cause any low-frequency noise pollution inherent in such power generation. At the same time, however, there are many hurdles that must be overcome before introducing sea-based wind power generators, such as fishing rights over the sea and environmental assessment. Windpower spent much time on efforts to build mutual trust with local fishermen affected by its project. The company also uses generators manufactured in Ibaraki Prefecture.

Each wind power generator consists of 10,000 to 20,000 parts and the installation of such generators can lead to the promotion of local industries and the creation of jobs for local residents. If electric power companies and local businesses cooperate in building wind power generators, it will lead to increased money flow in the region, vitalizing the local economy.

Some business leaders said such expectations are overly optimistic. However, now is the time for us to pay attention to the advantages of wind power generation rather than disadvantages. As a late starter in the introduction of such environment-friendly energy, Japan should learn from examples overseas.

## "It was like hell"

August 12, 2012

### **Aftermath in Fukushima No. 1 was like hell, says nuclear plant chief**

Jiji

<http://www.japantimes.co.jp/text/nn20120812x2.html>

FUKUSHIMA — The immediate aftermath of the nuclear disaster at Fukushima No. 1 in March 2011 was hellish, the former chief of the stricken Tokyo Electric Power Co. plant said in a recent interview.

"It was like hell," Masao Yoshida said in an interview screened at a symposium in the city of Fukushima on Saturday.

The interview, conducted in Tokyo on July 10 was filmed by a publishing firm from Nagano Prefecture. Speaking about the hydrogen explosions that ripped through some of the reactor buildings soon after the crisis began, Yoshida said he felt that "something catastrophic might be happening."

"Myself and all of the staff at the Seismic-Isolated Building might have died," he said. The building served as a base for the containment team.

As for charges that Tepco proposed evacuating all staff from the plant in the midst of the crisis, Yoshida said: "We should never leave the plant. I didn't mention withdrawal even once in my talks with officials from head office."

Yoshida, who led the on-site containment team, thanked all of the workers for their strenuous efforts to bring the plant under control despite the high levels of radiation released by the melted reactor cores.

"The staff went to work although they had reached their physical limits due to lack of sleep and food. The plant has recovered to its current state thanks to them," he said.

The Fukushima No. 1 crisis is the world's worst nuclear disaster since Chernobyl. After losing all electricity in the March 2011 earthquake and tsunami, three of the plant's reactors overheated and suffered core meltdowns, tainting much of the prefecture and beyond with radiation.

Yoshida, who was recently diagnosed with cancer, said: "The most important task is to stabilize the plant further."

Yoshida complained that the workers often cannot get their real voices heard if their testimony is collected by investigation committees.

Yoshida stepped down as Fukushima No. 1's manager at the end of November last year after being diagnosed with esophagus cancer. Tepco said it is unlikely his cancer emerged as a result of radiation from the crisis.

## Yoshida's interview

August 13, 2012

### **TEPCO's Fukushima nuke plant exec recalls hydrogen blast as greatest shock**

<http://mainichi.jp/english/english/newsselect/news/20120813p2a00m0na019000c.html>



Masao Yoshida, former head of the Fukushima No. 1 Nuclear Power Plant, speaks during a video interview.

A Tokyo Electric Power Co. (TEPCO) executive, who headed the Fukushima No. 1 Nuclear Power Plant when it was hit by the earthquake and tsunami in March 2011, has recalled that the greatest shock in the accident was one of the hydrogen explosions.

"What had the greatest impact during the accident was a hydrogen explosion at its No. 3 reactor building," he said in a video. "It would have been no surprise if workers including myself had died in the blast. I actually thought at the time that about 10 workers might have died."

Masao Yoshida, 57, made the remarks in a video in which he was interviewed about his feelings at the time of the outbreak of the nuclear disaster. The video was shown at a symposium in Fukushima on Aug. 11, which was organized by Bunya, a publishing house in Nagano Prefecture.

It was the first time that Yoshida had talked about his feelings at the time of the accident after he quit his position.

"I thought it'd be unfair for me to talk about the accident before investigations by the government and other accident investigative committees have ended," he said at the beginning of the videotaped interview.

Yoshida said TEPCO should place top priority on efforts to bring the crippled nuclear plant under control. "The company should clarify its responsibility for the crisis, but the most important thing is to bring the No. 1 nuclear power station under control."

He recalled that he wrote down the names of plant workers on a whiteboard as a substitute for grave markers for them in case they died.

Yoshida described how his exhausted subordinates went into the plant despite high radiation levels as being like a scene from hell. "There were many workers who went inside the plant even though they were exhausted, and were unable to sleep or eat enough. Amid such a hellish situation, I felt as if these compassionate souls appeared from the surface of the ground like saviors, just as depicted in the Lotus Sutra (of Buddhism) that I've been reading for long."

The interview was conducted on July 10 shortly before he underwent emergency surgery for a brain hemorrhage on July 26.

## Can biomass make the difference?

### **Editorial: Biomass could turn tables around for renewable energy**

<http://mainichi.jp/english/english/perspectives/news/20120813p2a00m0na007000c.html>

Renewable energy sources are commonly believed to be incapable of offering a stable power supply, but biomass, made from wood and animal-based materials such as livestock waste, is a source that has the potential to put those expectations on their heads.

Japan has a particularly high volume of latent wood biomass -- around 20 million cubic meters per year -- in the form of timber resulting from and abandoned after forest thinning and other processes. Indeed, approximately 70 percent of Japan's land area is covered in forest.

Could we not, then, effectively combine solar and wind-powered energy, whose outputs can vary according to weather, with energy produced with leftover wood biomass, to achieve a renewal of degraded forest land and a revitalization of local communities?

In July, Green Hatsuden Aizu Co. began operations of Kawahigashi power station, fueled by woody biomass, in the Fukushima Prefecture city of Aizuwakamatsu. Its output of around 5,000 kilowatts is the equivalent of energy consumed by approximately 10,000 average households. The plant requires some 60,000 tons of wood chips per year as fuel, which can be covered by unused wood thinnings and other timber collected from within a 50-kilometer radius of the plant.

Timber remaining after wood thinnings had heretofore been abandoned on mountainsides because the cost of transporting them outweighed the benefits. As a result, maintenance remains lacking in an increasing area of forested areas.

Under a feed-in tariff (FIT), the Kawahigashi plant can offer 400 to 500 million yen per year to forestry businesses as payment for wood chips. In addition, the 12 operators at the plant were hired locally. Allocation of funds on maintenance work of the mountains will promote forestation and cultivation. Of course, care must be taken to avoid using high-quality timber as fuel, or encourage any excessive logging, but if done well, the process could become a way to promote the cycle of forest resource regeneration.

If used only as a fuel in generating electricity, woody biomass has less than 30 percent energy availability. But if the heat produced in the process of generating power is used for air-conditioning or water heating systems -- a process called cogeneration or combined heat and power (CHP) -- the energy availability of woody biomass rises to about 80 percent.

While Germany's feed-in-tariff gives preferential treatment to cogeneration, Japan's does not. Japan should find a way to promptly put this generated heat to good use. For example, setting up wood biomass stations in mountainous areas and creating small-scale CHP distribution systems would undoubtedly be effective in achieving both community independence and disaster preparedness.

The Fukushima prefectural city of Minamisoma and village of Kawauchi are considering integrating wood biomass into their power policy, with the secondary goals of promoting forest thinnings and radiation decontamination. The respective municipal governments are investigating the viability of such an undertaking, the potential exposure of forestry workers to radiation and management of radioactive materials, among other factors.

The Environment Ministry has released a statement saying that "the need to decontaminate whole forests is lacking." But the Kawauchi Municipal Government argues that the government fails to understand the feelings of the villagers, who live in a village covered 90 percent by forest land. The ministry must lend an ear to such voices.

We understand that the road to forest decontamination is a rocky one. But the government must not hold back in institutional, technical, or financial assistance toward a future with a concrete power policy.

## Not again!

August 14, 2012

### **Water leak found at Fukushima Daiichi plant**

[http://www3.nhk.or.jp/daily/english/20120814\\_26.html](http://www3.nhk.or.jp/daily/english/20120814_26.html)

Tokyo Electric Power Company has reported a radioactive water leak at the Fukushima Daiichi nuclear plant's Number 4 reactor.

The utility says a worker patrolling on Tuesday morning found water one-centimeter deep across a 350-square-meter room on the first floor of the turbine building.

The water apparently comes from a pipe running along a corridor outside the room. The pipe carries contaminated water from the adjacent Number 3 reactor to a storage facility.

Workers later detected radioactive cesium at about 77,000 becquerels per milliliter in the water. TEPCO says there is no evidence the water has escaped into the environment.

Also on Tuesday morning, TEPCO workers found white smoke rising from a pump in a storeroom. The room houses equipment to filter radioactive substances from water. The workers used an extinguisher to put out the fire. The company is investigating the cause.

## Cost-cutting: No mental health help for plant workers

### **TEPCO workers face mental health crisis after cost cuts: counselor**

<http://www.japantimes.co.jp/text/nn20120814a2.html>

By KAZUAKI NAGATA

Staff writer



After toiling under hazardous conditions for 17 months to contain the crisis at Fukushima No. 1, the nuclear plant's workers are full of stress and unable to get proper counseling due to lack of funding, a communications counselor warned Monday.

Despite the dangers and uncertainty they face, Tokyo Electric Power Co. isn't providing enough psychological support because the utility is under immense cost-cutting pressure, said Hideki Yabuhara, president of Kyoto-based Wamon Inc.

Wamon provides mental health expertise to companies, organizations and individuals and helps improve to employee communications skills. Last October, Yabuhara began volunteering his skills once a month at Fukushima No. 1.

The responsibility that Tepco's employees feel in Fukushima Prefecture is overwhelming, Yabuhara said.

"I do not think it's inconceivable that some of them may consider taking their own lives" if proper mental support isn't provided, he said.

Speaking at the Foreign Correspondents' Club of Japan in Tokyo, Yabuhara said the workers have to bear with the tough reality of being employed by the utility responsible for the triple-meltdown crisis. Tepco, which was effectively nationalized last month, will have to pay huge damages to residents and businesses and foot the cost of decommissioning the crippled reactors. The utility plans to cut trillions yen of costs, including by slashing salaries 20 to 30 percent.

Yabuhara said some of the workers are people who actually lost their families and homes in the March 11 disasters but have been unable to reconcile the conflicting mentalities of both victim and villain.

Meanwhile, despite the government's claim that working conditions at the plant are improving, Yabuhara said they remain poor.

For instance, workers still sleep in temporary housing units with walls "as thin as a paper" that allow them to hear their coworkers sleeping next door, he said.

It is unclear why the utility would subject its workers to such poor conditions, given the dire task they face. But Yabuhara said cost-cutting might be to blame.

"This is my personal opinion, but I think because of the harsh bashing by the media, Tepco cannot spend a lot of money (on improving mental support and working conditions)," he said.

Since last October, Yabuhara has spoken with about 250 workers. At first, he went to give emotional support to Masao Yoshida, who was then chief of the No. 1 plant, but Yoshida also asked him to provide counseling to the rest of the staff.

When the crisis started, "my instinct told me that the contribution I can make as a therapist is to provide mental support to on-site workers," said Yabuhara.

He has given one-on-one counseling sessions to executives at the plant and now hosts group sessions with managerial workers to improve their communications skills so they can more smoothly communicate with their fellow workers, resulting in more efficient workflow.

Yabuhara said he wanted to offer his help right after the crisis started, so he contacted then-Finance Minister Yoshiko Noda, the current prime minister, with whom he had personal connections. But Noda told him he could not go to the crippled plant because the situation there was too chaotic at the time.

Later on, he asked a friend who used to work for Tepco and was introduced to the utility's former president, Nobuya Minami, who introduced him to a plant executive.

He said Tepco has offered to at least pay for his transportation, but he declined to take any money from the utility, because "I don't want to be perceived as being under Tepco's control," he said.

## **Energy: exploit all options**

### **Editorial: Explore all options for stable and affordable energy sources**

<http://mainichi.jp/english/english/perspectives/news/20120814p2a00m0na008000c.html>

In the debate over Japanese energy policy heading toward the year 2030, how much of our energy supply will be comprised by nuclear power and how much by renewable energy have attracted the most attention. Meanwhile, however, thermal power generation still makes up the majority, at 50 to 65 percent, and natural gas has constituted a higher percentage of that than it ever has in the past.

It is crucial that we find a reliable way to procure natural gas at low prices. This is a make-or-break issue for stability of the Japanese economy and the lives of the people.

Power companies and gas companies that are ordinarily pitted against each other in attracting customers should consider jointly purchasing natural gas. Moreover, we urge them to consider participating in natural gas development overseas.

It is time for the East Asian countries of Japan, China and South Korea to deal with gas-rich countries cooperatively, instead of trying to outflank each other. Japan would be ideal to take the lead in organizing collaboration. It is important also to think about laying gas pipelines with the Eurasian continent with an eye to accessing natural gas in Sakhalin and Siberia. South Korea has already embarked on pipeline construction with Russia. By expanding our options, we can increase leverage in price negotiations.

None of this is easy, and if we were to compile a list of the difficulties that lie ahead, it would be a long one. We have yet to find a clear future vision for electricity, and the circumstances surrounding Japan and its environs are trying, making international cooperation difficult. However, challenges are ours to confront and overcome. Let us carefully calculate the risks, and pursue various possibilities toward cost reduction.

According to the Institute of Energy Economics, Japan (IEE Japan), in 2012, in the wake of the Fukushima nuclear plant disaster, nuclear power generation has dropped to below 2 percent of all power generation. Meanwhile, thermal power generation comprises close to 90 percent, of which natural gas makes up the largest proportion, at 35 percent. Among fossil fuels, demand for natural gas continues to rise rapidly as it performs well across the board in cost, carbon dioxide emissions, and the political stability of its producer nations.

That procurement of natural gas has gone smoothly is what has allowed Japan to avoid large-scale power outages during periods of no nuclear power generation and small-scale nuclear power generation. With the rapid development of shale gas in the U.S., natural gas from Qatar that was headed for the U.S. was freed up for purchase by Japan. It was a close call, and we cannot continue to rely on such games of chance.

With the sudden rise in natural gas imports and other factors, Japan is set to spend 4.6 trillion yen more on fossil fuel imports in fiscal 2012 than in fiscal 2010, before the Fukushima nuclear crisis broke out. Our trade balance has been tipping toward the unfavorable. With the decline in the number of children and a rapidly aging population, it's unavoidable that we succumb to a current-account deficit several years

down the line. There is concern that the government bond market will turn turbulent. As such, it would be wise to bring down the import price of natural gas and other energy sources to as low as possible.

## **Rotten pipes**

[http://www.tepco.co.jp/en/nu/fukushima-np/images/handouts\\_120814\\_02-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/images/handouts_120814_02-e.pdf)  
see photo and diagram

## **Water leak at no.4 reactor**

August 16, 2012

(why did it take so long for the Mainichi to mention this leak?)

## **Water leak found at Fukushima N-plant**

Jiji Press

Tokyo Electric Power Co. on Tuesday morning discovered possibly highly radioactive water on the first floor of the No. 4 reactor turbine building at its disaster-crippled Fukushima No. 1 nuclear power plant.

The company believes the water leaked from a pipe that is transferring highly radioactive water from the basement of the No. 3 reactor's turbine building.

A TEPCO worker found the water on the floor of a power control room in the No. 4 reactor turbine building at 11:15 a.m. The company confirmed that the leak had stopped by about 1 p.m. after the radioactive water transfer was suspended at 12:20 p.m.

According to TEPCO, a puddle of water about one centimeter deep had collected on the floor of the 350-square-meter power control room. There was no water leak outside the room, the company added.

The water is estimated to contain tens of thousands of becquerels of radioactive cesium per cubic centimeter, according to the firm.

## Say good bye to Nos. and 6 too

August 18, 2012

### No. 1, 2 plants' reactors written off

<http://www.japantimes.co.jp/text/nn20120818a7.html>

Jiji

FUKUSHIMA — National policy minister Motohisa Furukawa has said that reactors 5 and 6 at the Fukushima No. 1 nuclear plant and the nearby No. 2 power station should never be restarted.

Furukawa made the remarks Thursday while meeting evacuees from the village of Kawauchi during a visit to Fukushima Prefecture, Mayor Yuko Endo said.

The gathering was held at a temporary housing complex in the city of Koriyama, where Kawauchi residents are currently living after being forced to evacuate because of the nuclear crisis. The village is located close to the stricken No. 1 power plant.

Of the facility's six reactors, Tokyo Electric Power Co. plans to decommission reactors 1 through 4. However, Tepco has not clarified its plans on the remaining two units or the four reactors at Fukushima No. 2, which has been idled since March 2011.

## TEPCO checks No. 4 rod

August 27, 2012

### TEPCO examines fuel rods at Fukushima plant

[http://www3.nhk.or.jp/daily/english/20120828\\_03.html](http://www3.nhk.or.jp/daily/english/20120828_03.html)

The operator of the Fukushima Daiichi nuclear plant is studying how to safely remove fuel rods from the crippled facility.

More than 1,500 used and unused fuel assemblies remain in the water pool of the No. 4 reactor. Tokyo

Electric Power Company will have to remove them before it can fully decommission the reactor.

TEPCO on Monday examined one unused assembly to ascertain the extent of the damage to the fuel rods.

It removed 2 fuel assemblies in mid-July for the checks. Officials selected unused ones as they are safer to handle.

**The utility says it found no significant damage or change in the rods' shape. The utility plans to examine the fuel pellets inside the rods in a few days.**

The fuel pool at the No. 4 reactor building was badly damaged by last March's hydrogen explosion.

TEPCO plans to begin removing the fuel assemblies in December next year.

## Just a bit of rust

August 29, 2012

### Fukushima fuel rods show no visible damage

[http://www3.nhk.or.jp/daily/english/20120830\\_02.html](http://www3.nhk.or.jp/daily/english/20120830_02.html)



The operator of the crippled Fukushima Daiichi nuclear power plant says there is no visible damage to the surface of fuel rods from the No.4 reactor.

Tokyo Electric Power Company completed a 3-day examination of the rods on Wednesday. The utility is preparing to remove them from the reactor in December next year.

Two trial sets of rods were taken out of the spent fuel pool last month.

The firm said that apart from some rusting, it could see no damage or corrosion to the rod surface or the handle of the rod containers.

But concrete pieces up to 2 centimeters in diameter were found in the rods. They are believed to be fragments of the reactor building from the hydrogen blast that tore it apart in March last year.

The utility suspects that similar radioactive fragments may be scattered over a wide area of the spent fuel pool, complicating the removal process.

The pool contains 1,533 rods, the largest number of all 6 reactors at the plant

## **Not enough water to cool the reactors - Why?**

August 31, 2012

### **Fukushima reactors briefly did not get enough coolant water: TEPCO**

<http://mainichi.jp/english/english/newsselect/news/20120831p2g00m0dm023000c.html>

TOKYO (Kyodo) -- The operator of the Fukushima Daiichi nuclear power plant said Thursday that the amount of water injected into the crippled Nos. 1 to 3 reactors temporarily dropped below the level regarded as necessary to keep the fuel inside cool.

Tokyo Electric Power Co. said the drop in the volume of the water did not affect the temperature of the reactor pressure vessels, while adding that the company is investigating the cause of the incident.

The utility known as TEPCO noticed that the three reactors were not getting enough water injection at 3 p.m. Thursday. Workers took measures to increase the water volume and they confirmed at about 4:30 p.m. that it recovered to the necessary level.

The Nos. 1 to 3 reactors need water injection between 4.3 tons and 6.1 tons per hour, but the volume stood at between 4.0 and 5.6 tons per hour at 3 p.m.

The three reactors suffered meltdowns in the nuclear crisis, triggered by the March 2011 massive quake and tsunami.

## What is going on?

### **Water levels at 3 damaged reactors fall twice**

[http://www3.nhk.or.jp/daily/english/20120831\\_15.html](http://www3.nhk.or.jp/daily/english/20120831_15.html)

Coolant water levels at 3 damaged reactors at the Fukushima Daiichi nuclear plant briefly fell below the necessary level twice on Thursday.

Tokyo Electric Power Company says the incidents do not pose an immediate threat to the safety of the reactors, but it will quickly take steps to identify and deal with the problem.

Workers found that the water levels of the first 3 reactors were about 10 percent below the necessary level on Thursday afternoon. The levels recovered later, after workers opened valves to add more water.

TEPCO says it noticed the reactors were not getting enough water again at about 8:00 PM on Thursday. The necessary level of water was restored at about 10:30 PM.

TEPCO is investigating the incident. It suspects that something may be wrong with 2 pumps on higher ground that sent decontaminated water back into the reactors. It is now using spare pumps.

The water levels of the 3 damaged reactors simultaneously fell below the necessary level for the first time since they were declared to be in a stable condition last December.

The reactors suffered meltdowns following the March 11th quake and tsunami last year.

TEPCO also says the spent fuel pool and the building of the No. 4 reactor are strong enough to resist a quake of 6 plus on the Japanese seismic scale.

The No.4 reactor was idle at the time of last year's disaster, but the building was damaged in a hydrogen explosion. Its pool is full of fuel rods, and the risk of further quake damage is a major concern.

TEPCO is trying to improve the quake-resistance of the facilities. The utility is also preparing to remove the fuel rods from the pool, with the goal of starting the operation in December next year.



## Boosting wind, geothermal, biomass and tidal energy sixfold

### Renewable energy plan sees no nukes

<http://www.japantimes.co.jp/text/nn20120831x1.html>

Kyodo, Jiji

Environment Minister Goshi Hosono released a new strategy Friday to boost power generation capacity by more than sixfold for four renewable energy categories by 2030 to make it possible to eliminate all nuclear power plants.

Announcing the promotion strategy after the day's Cabinet meeting, Hosono said his ministry plans to increase the combined annual capacity of electricity generation using offshore wind, geothermal, biomass and tidal power sources to as much as 19.41 million kw by 2030, compared with 2.96 million kw in fiscal 2010.

Specific targets were set at 8.03 million kw for offshore wind power, 3.88 million kw for geothermal power, 6 million kw for biomass power, and 1.5 million kw for tidal power.

In fiscal 2010, offshore wind power generation totaled 30,000 kw, geothermal power 530,000 kw, biomass power 2.4 million kw and tidal power zero.

While the government is studying options to cut nuclear energy's share of total power generation to zero, 15 percent, or 20 to 25 percent by 2030 in light of the Fukushima nuclear crisis, the strategy is designed to allow for the zero percent option.

Hosono said floating ocean wind power generators should be developed by 2020 to achieve the target of generating the same output as eight nuclear reactors.

## **Nuclear panel limbo**

Jiji

The Diet may not vote on appointments to the new nuclear regulatory commission before the legislative session ends Sept. 8.

A vote is unlikely in the current session, a senior Diet affairs official in the ruling Democratic Party of Japan confirmed Thursday.

This is because some DPJ members, including ex-Prime Minister Yukio Hatoyama, oppose appointing Shunichi Tanaka, former acting chairman of the Atomic Energy Commission, as head of the regulatory body, describing him as pronuclear.

There is concern within the DPJ that forcing the votes could cause more lawmakers to quit the party.

Another DPJ executive said holding the votes would be difficult as the opposition parties have boycotted deliberations since the opposition-controlled Upper House passed a censure motion against Prime Minister Yoshihiko Noda on Wednesday.

The government has until Sept. 26 to set up the nuclear regulatory body. If the Diet doesn't act, Noda has the power to appoint the commission's members as a stopgap measure.

## **New strategy on renewable energy announced**

[http://www3.nhk.or.jp/daily/english/20120831\\_30.html](http://www3.nhk.or.jp/daily/english/20120831_30.html)

Japan's Environment Ministry has unveiled a new energy strategy aimed at boosting power generation from renewable resources by a factor of 6 by 2030.

Environment Minister Goshi Hosono announced the strategy to promote renewable energy resources on Friday as the government continues to review national energy policy after the Fukushima nuclear accident.

It aims to generate about 8 million kilowatts of electricity from offshore wind power and 6 million kilowatts from biomass by 2030. Geothermal power will be used to generate 3.9 million kilowatts and ocean energy, 1.5 million kilowatts.

The combined power output from the 4 sources is projected at 19.4 million kilowatts. That's about 6 times the level of fiscal 2010.

The government will encourage the use of floating equipment for offshore power generation. This method is said to be especially suitable for Japan. The strategy also seeks to improve the efficiency of geothermal power plants.

Hosono says the 4 types of power generation have considerable potential, and the government will carefully nurture the industry.

## Water injection problems not resolved

September 1, 2012

### TEPCO facing difficulties in water injection at Daiichi plant

<http://mainichi.jp/english/english/newsselect/news/20120901p2g00m0dm002000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant on Friday continued to face difficulties in controlling the amount of water being injected into the three crippled reactors at the plant, which is critical to keeping the melted fuel inside cool.

The amount of water injected into the reactors dropped below the minimum required level twice on the previous day. **Workers have operated valves to increase the coolant, but the water flow is falling from time to time compared with the initially set level.**

Tokyo Electric Power Co. has yet to nail down the cause, but **it suspects something may be stuck inside the pipes, hampering the flow of water.**

The temperature of the reactor pressure vessels has remained unaffected so far, the utility added.

The current water injection system was set up after the nuclear disaster triggered by the March 2011 earthquake and tsunami.

The three reactors suffered meltdowns. The fuel is believed to have melted through the pressure vessels and been accumulating in the outer primary containers, but detailed conditions remain unknown.

## Where was the emergency equipment?

September 5, 2012

### **TEPCO videos: Sans equipment, staff, Fukushima crisis spun out of control**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201209050060>

Operators could have prevented two meltdowns at the Fukushima No. 1 nuclear power plant last year if the site had more powerful emergency equipment and if supervisors had been able to more directly command workers, according to an analysis of staff teleconference videos by The Asahi Shimbun.

Plant operator Tokyo Electric Power Co. was late in obtaining additional fire engines, crews and fuel, and at one point ran short of essential supplies because it apparently lacked the ready cash with which to buy them, according to the videos released by the company, which show conversations between plant staff and managers in Tokyo as the reactors overheated.

In one case, fire engines summoned to the plant instead drove to another, 10 kilometers away. About 18 hours after TEPCO officials decided to dispatch those vehicles, one official explained: "It was pitch-black. Drivers could not confirm if they were on the right road so they turned back."

On March 11, 2011, a 9.0-magnitude earthquake and tsunami knocked out cooling systems at the plant, causing reactors 1, 2 and 3 to overheat and their fuel rods to collapse in a molten heap inside the reactor pressure vessels.

Operators could only act by opening main steam safety relief valves to release the pressure and let fire engines spray water inside.

Those valves required power from 10 12-volt automotive batteries connected in series. But on the morning of March 13 there were insufficient batteries at the plant.

Then on March 14 water was the problem. Although the plant stands on Japan's Pacific shore, it had no fire engines capable of pumping water over the 10-meter elevation from the ocean. Instead, engineers cooled reactors 1 and 3 by pumping pools of seawater left by the tsunami. The pools shrank, and at 1:10 a.m. on March 14, water pumping ceased.

The No. 2 reactor was left overheating for longer because engineers were unable to find a water source to begin cooling work.

The videos show TEPCO depended upon an affiliate to provide crews for fire engines and other heavy machinery. Crisis management was hampered by the inability to give direct orders to those staff.

At 7:30 a.m. on March 13, senior crisis managers at TEPCO headquarters decided to dispatch fire engines from conventional thermal power plants in the Tokyo metropolitan area, roughly 200 kilometers away.

But TEPCO was unable to marshal the crews directly because they worked for Nanmei Kosan, a TEPCO affiliate responsible for fire engines at its power plants.

The delay continued early the next morning.

Fire trucks from one plant drove to the wrong location, reaching the comparatively undamaged Fukushima No. 2 power plant instead of the crisis-hit No. 1 plant. At 3:01 a.m. on March 14, a TEPCO official at company headquarters said the driver had been unable to navigate at night.

TEPCO executive Sakae Muto shot back: "I understand passenger cars had no problem getting there." Muto, an executive vice president, was among managers gathered at the government's nuclear disaster control center in the vicinity of the No. 1 plant.

Then, at 3:05 a.m., a member of the control center staff reported a problem with the Nanmei Kosan crews. "They are getting nervous, worried that radiation levels are extremely high," he said, and urged managers to ease the crews' concerns.

"Officials at TEPCO headquarters should explain that the work does not involve risk," he said. "But I think it important, too, that our most senior managers talk directly to the company and kindly ask for cooperation."

At 3:15 a.m., the TEPCO headquarters told the site: "You, too, should begin a polite discussion with Nanmei Kosan. We are in the middle of doing so with its main office."

Two minutes later, the headquarters added: "Nanmei Kosan has awoken its employees and is telling them, 'Get going now! Don't look, just do it.' "

At 3:22 p.m. on March 14, an official at the TEPCO headquarters asked Masao Yoshida, plant chief, if the site needed additional fire engine operators, saying four at the Hirono thermal plant were available.

"Yes, we need them very much," Yoshida replied in a forced tone of voice.

Four employees of Nanso Service, a Nanmei Kosan subsidiary, came to the rescue.

Yoshida later said TEPCO had no choice but to ask for help.

"We cannot even handle fire engine pumps without Nanmei Kosan," he said on the afternoon of March 14. TEPCO was facing a crisis in getting the necessary equipment and goods to the plant.

On the morning of March 13, TEPCO began discussing whether it needed to establish a logistics base. The government's Nuclear and Industrial Safety Agency briefed it about radiation and told TEPCO to prepare to send extra vehicles and staff into the precautionary exclusion zone.

One possible site for a base was J-Village, a soccer training facility in Naraha, about 9 kilometers south of the plant.

But this was adjacent to the Fukushima No. 2 plant, which suffered a partial power loss after the tsunami, and, at that time, a precautionary exclusion zone stretched beyond the soccer center.

They finally settled on the Onahama coal center, a TEPCO storage base within Onahama port, 60 km from the No. 1 plant.

At 10:15 a.m. on March 13, it was reported that 800 liters of gasoline were on their way to the coal center. But a problem arose. TEPCO could not secure trucks and drivers to transport the fuel any farther because of fears over radiation.

The fuel reached Onahama, and there it stayed.

Confusion continued on March 14, when at 8:50 p.m., it was reported that the plant had still received no gasoline.

"Wasn't it arranged that gasoline would be delivered to the plant?" asked Akio Takahashi, a senior official at TEPCO headquarters, in a surprised tone.

An official at headquarters in charge of transport said 17 barrels with a 200-liter capacity had been fixed for delivery. But he said the gasoline was still sitting in Onahama.

Takahashi pressed for details and the official replied: "I will find out."

TEPCO headquarters reported the gasoline barrels were stuck in Onahama because no trucks were available to transport the gasoline.

"It has not left yet," an official said. "We were told there were no trucks, but we will get it there."

Still the other main transport problem persisted: getting water to the overheated reactors.

TEPCO turned to Japan's Self-Defense Forces.

But on March 13, the SDF stayed out of the plant. "SDF members headed to the plant with water yesterday (March 12) at our request, but they returned after seeing the explosion," explained a TEPCO official at 9:15 a.m., referring to a hydrogen explosion at the No. 1 reactor building. "They received high radiation doses after being exposed to radioactivity and contamination."

At 1:25 p.m., TEPCO headquarters reported that the SDF informed it of conditions it must meet if it wanted troops to help at either plant. TEPCO employees would have to come to the nearby government response center, to brief the troops and let them judge what gear and equipment to take.

By March 14, the situation at the No. 1 plant had not improved.

TEPCO received a report that seven SDF tankers, carrying 35 tons of water in all, arrived at the plant at 10:57 a.m.

Four minutes later, a hydrogen explosion ripped apart the No. 3 reactor building. Four SDF members were injured.

At 1:41 a.m. on March 14, a TEPCO headquarters official handling contact with government ministries and agencies began speaking with these words: "We've got something urgent."

It was about NISA's repeated instruction to inject water into the No. 2 reactor.

Water injection there was under way early on March 14 because the core cooling system, called the isolation cooling system, had pumps that could function without batteries.

But the pumps might soon shut down.

NISA officials wanted TEPCO to switch as soon as possible to the injection of water from outside sources.

There arose a serious obstacle to letting that happen: There was little seawater available nearby in pools, and the fire engine pumps at the plant were incapable of pumping seawater from the ocean because they had insufficient power to lift water over the 10-meter elevation from sea level.

So operators used what seawater was available in pools left by the tsunami, and at 3 a.m. on March 14, Muto and Yoshida discussed ways of pumping it from the ocean below.

“Can’t we, for example, lift seawater by putting many fire engines in a line?” Muto suggested.

Work to do that got under way at 9:05 a.m. on March 14 when large fire engines from thermal plants in the metropolitan area arrived and were connected in series.

(This article was compiled from reports by Toshihiro Okuyama, Takashi Sugimoto and Hideaki Kimura.)

## **Unit 4 remains a sleeping dragon, says Gundersen**



September 8, 2012

**Sleeping dragon: Reactor 4 at the Fukushima No. 1 power plant is seen July 18, the day Tepco removed an unused nuclear fuel assembly from the spent-fuel pool to check the extent of damage its fuel rods sustained in the March 2011 disasters. KYODO**



## Global help urged to avert reactor 4 pool fire

### **U.S. expert appalled by Tepco's attitude over 'sleeping dragon' risk**

<http://www.japantimes.co.jp/text/nn20120908f1.html>

By ERIC JOHNSTON

Staff writer

KYOTO — The risk of a fire starting in reactor 4's spent-fuel pool at the Fukushima No. 1 plant continues to alarm scientists and government officials around the world, prompting a leading U.S. nuclear expert to urge Japan to tap global expertise to avert a catastrophe.

**Go global: U.S. nuclear expert and opponent Arnie Gundersen addresses an audience Monday in Kyoto, after traveling to Japan to meet with Diet members and citizens' groups over conditions at the Fukushima No. 1 power plant.** MICAH

GAMPEL

Arnie Gundersen, a nuclear engineer and former executive in the nuclear power industry who is now one of its foremost critics in the United States, has been monitoring the No. 1 plant since the March 2011 triple meltdowns through his Vermont-based Fairewinds Energy Education nonprofit organization.

During a trip to Japan in late August and early September, Gundersen met with Diet members, lawyers and citizens' groups to discuss conditions at the wrecked power station and told an audience in Kyoto on Monday that fears over the spent-fuel pool in reactor 4 remain high.

"The spent-nuclear-fuel pool at Fukushima No. 1's unit 4 remains a sleeping dragon. The situation and possibility of a fuel pool fire in reactor 4 in the days (immediately) after the (March 2011) quake was the reason the U.S. government recommended that the evacuation zone be (set at) 80 km," said Gundersen, who served as an expert witness during the federal investigation into the 1979 Three Mile Island disaster in Pennsylvania.

This evacuation recommendation was based on studies the U.S. conducted more than a decade earlier at New York's Brookhaven National Laboratory, which is owned by the U.S. Department of Energy and researches atomic energy.

"In 1997, the laboratory did a study showing that if a nuclear-fuel pool were to boil dry, it would release enough radiation to cause the permanent evacuation of those living within an 80 km radius (of the complex).

**"The Fukushima plant's reactor 4 (pool) has 1,500 fuel bundles. That's more cesium than was released into the atmosphere from all of the nuclear bombs ever exploded, (which total) more than 700 over a period of 30 years. That's also why the U.S. recommended an evacuation with an 80 km radius,"**Gundersen explained.

But even today, concerns persist among experts worldwide that reactor 4's pool is still at risk of boiling dry. If this were to occur, it would necessitate a massive and immediate evacuation of the surrounding area.

Nuclear fuel rods are extremely thin and clad with zircaloy, a zirconium alloy that contains a tiny amount of tin and other metals. But zircaloy burns if it is exposed to air, as shown in a test conducted at the Sandia National Laboratory in New Mexico just two weeks before the Great East Japan Earthquake devastated the Tohoku region.

The facility is wholly owned by Sandia Corp., a subsidiary of Lockheed Martin Corp., and undertakes research for the Department of Energy's National Nuclear Security Administration.

"Last week, I showed slides of the Sandia lab experiments to some Diet members. Afterward, Tokyo Electric Power Co. officials presented their plan to empty the nuclear fuel from the reactor pool," Gundersen said.

"I told Tepco that while I realized they hoped and believed that there will always be water in the nuclear fuel pool, I had to ask whether or not they had (already prepared and stationed) any chemicals to put out a nuclear fuel pool fire in the event they were wrong.

**"Tepco's response was that there was nothing in the fuel pool that could burn,** a statement I find appalling."

In July, Tepco announced it had removed two unused nuclear fuel assemblies from reactor 4's pool, the first of more than 1,500 that will have to be retrieved. If everything goes according to plan, the utility will

begin extracting the remaining assemblies, used to store spent fuel rods, from December 2013 and **complete the task within three years.**

But the state of the fuel pool and the lack of preparations to deal with a possible fire has drawn intense criticism not just from experts like Gundersen but also from some senior officials in the U.S.

Sen. Ron Wyden, a member of the Senate Committee on Energy and Natural Resources who visited Fukushima Prefecture in April, sent a letter to Japan's ambassador in Washington upon his return urging Tokyo to tap the expertise and knowhow of the United States and other countries to complete the cleanup work more quickly.

"Tepco's Dec. 21 remediation road map proposes to take up to 10 years to complete spent-fuel removal from all of the pools on the (Fukushima No. 1) site," Wyden wrote.

"Given the compromised nature of these structures due to the events of March 11, this schedule carries extraordinary and continuing risk if further severe seismic events were to occur.

"Many nations possess expertise in nuclear energy technology and its full breadth should be made available to Japan in dealing with" the Fukushima disaster, the letter said.

Later that month, 72 domestic antinuclear groups, along with former Ambassador to Switzerland Mitsuhei Murata and ex-U.N. diplomat Akio Matsumura, called on the United Nations to establish a nuclear security summit to specifically focus on the spent-fuel pool at reactor 4 and to also establish an independent assessment team to investigate the matter.

However, Gundersen said he is still awaiting signs from the Japanese government or Tepco officials indicating they're ready to canvass a broad range of experts around the world over how best to deal with not only the unit 4 situation, but the larger question of what to do with the Fukushima No. 1 plant.

"Japan's Nuclear and Industrial Safety Agency and Tepco claim they are getting outside expertise from the International Atomic Energy Agency, but Article II of the IAEA's charter states its mission is to promote nuclear power. There is a real need for experts who think outside the box," Gundersen said.

## Pressing challenges for Fukushima Daiichi

September 9, 2012

### Fukushima plant clean-up efforts face challenges

[http://www3.nhk.or.jp/daily/english/20120910\\_03.html](http://www3.nhk.or.jp/daily/english/20120910_03.html)

Efforts to deal with problems at the Fukushima Daiichi nuclear power plant in northeastern Japan still face many challenges more than a year after the meltdown.

Tuesday will mark one and a half years since the earthquake and tsunami that caused the accident. But the leaking of tainted water and other troubles still plague the clean-up efforts.

Experts say one of the pressing challenges is how to ensure the reliability of emergency facilities built to cool the troubled reactors.

In the aftermath of the March 11th, 2011 disaster that crippled the plant, its operator, Tokyo Electric Power Company, hastily built a system to treat highly contaminated waste water and circulate it as coolant for the reactors.

The government announced last December that the reactors had been brought to a state of cold shutdown.

While the reactors' temperatures and pressures have since remained generally stable, troubles have plagued the cooling water circulation system.

So far, **56 instances of tainted water leaks** have been reported. Facilities to decontaminate water have stopped 12 times due to leaks and power supply problems.

On August 30th, coolant water being poured into the 3 crippled reactors temporarily fell below the necessary levels.

Troubles have also increased with equipment and facilities that were installed before the accident.

Of the No. 2 reactor's 41 thermometers, only 16 are working properly. The remainder cannot be used due to malfunctions and other glitches.

High radiation levels have prevented the utility from replacing the thermometers.

Contaminated water levels have continued to rise at a pace of about 400 tons a day due to groundwater

inflow. That has filled almost 90 percent of the plant's storage tanks.

Tokyo Electric plans to add tanks with a total capacity of 470,000 tons to store the water for 3 years. But the work will require the cutting of trees at the plant.

September 10, 2012

## Opening Unit 4

<http://photo.tepco.co.jp/en/date/2012/201209-e/120910-03e.html>

## Current situation of Fukushima Daiichi by TEPCO

[http://www.tepco.co.jp/en/nu/fukushima-np/images/handouts\\_120910\\_01-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/images/handouts_120910_01-e.pdf)

## Still many problems to overcome

### One and half years after Fukushima accident

[http://www3.nhk.or.jp/daily/english/20120911\\_04.html](http://www3.nhk.or.jp/daily/english/20120911_04.html)

One and a half years have passed since the accident at the Fukushima Daiichi nuclear power plant. Tokyo Electric Power Company has **many problems to overcome** before achieving its promise to decommission the crippled plant in about 40 years.

TEPCO has been testing the spent fuel rods in the No.4 reactor pool over the past 2 months. The building structure at the No.4 reactor became fragile after the explosion and possibly unsustainable to more earthquakes in the future.

TEPCO is preparing to remove the rods from the pool in December next year. But the **debris scattered in the pool** could hamper workers from taking them out.

The operator also faces difficulty in handling the melted fuel in the No. 1 to No. 3 reactors.

It hopes to fill water in the containment vessels to cool down the fuel and is now using endoscopes and robots to find cracks and holes in the vessels. But high-levels of radiation are disrupting these operations.

**TEPCO also wonders if it can secure enough workers for the next 5 years. It said it will see a**

**shortage of workers unless it finds ways for them to avoid exposure to radiation.**

But the utility said apart from a few places in the plant, most areas now register radiation levels below 3 millisieverts per hour, compared with 100 millisieverts per hour soon after the accident.

## **New equipment to better survey seabed cesium**

September 11, 2012

### **New device developed for seabed cesium surveys**

<http://www.yomiuri.co.jp/dy/national/T120910003618.htm>

Jiji Press

A research team said it has developed equipment that will drastically change the way surveys of radioactive cesium deposits on the seabed are carried out.

Undersea cesium surveys have become necessary due to last year's crisis at Tokyo Electric Power Co.'s Fukushima No. 1 nuclear power plant, which experienced three reactor meltdowns.

So far, such surveys have been conducted only at chosen points separated by a few kilometers, the team said Thursday, which includes the University of Tokyo's Institute of Industrial Science and the National Maritime Research Institute.

But the new equipment, which can be towed by boat, will increase the overall area that can be surveyed, according to the team, whose members include University of Tokyo Prof. Tamaki Ura and Thornton Blair, an associate professor.

The equipment consists of radiation-detecting and recording devices packed into a container that can withstand pressure at a maximum depth of 500 meters below the surface.

The container is put in an 8-meter weighted rubber tube that can be towed by a vessel.



The equipment estimates cesium densities on the seabed based on the radiation levels it detects on a second-to-second basis, enabling continuous surveys along the boat's course.

In August, the team carried out experiments in waters off Iwaki, Fukushima Prefecture, the host prefecture of the crippled nuclear plant, and Kita-Ibaraki, Ibaraki Prefecture.

The equipment provided cesium density readings in line with the results of analyses of seabed soil samples collected during the experiments.

The team found that cesium levels gradually declined when the equipment was towed further offshore.

The equipment weighs about 135 kilograms and is easy to tow for a 20-ton fishing boat. The production costs are estimated at several million yen.

## **Better late than never**

September 12, 2012

### **TEPCO releases 600 photos taken after disaster**

[http://www3.nhk.or.jp/daily/english/20120912\\_09.html](http://www3.nhk.or.jp/daily/english/20120912_09.html)

The operator of the troubled Fukushima nuclear plant has released hundreds of photos taken in the aftermath of last year's disaster.

Tokyo Electric Power Company disclosed 600 photos taken during an 18-day period from March 11th last year, the day the earthquake and tsunami hit the plant.

A Diet panel investigating the nuclear accident pointed to the presence of the unreleased images. TEPCO says it asked employees and contractors to contribute the photos.

Some of the pictures depict workers fleeing just after the earthquake. Others show the tsunami receding from the plant.

There are also photos of the water pools in the power source rooms in the turbine buildings for 2 of the reactors.



TEPCO says a lack of in-house coordination delayed the release of the images. But the utility adds it does not believe the photos will directly impact the outcome of the investigations into the accident.

## **Lid removed from reactor no.4**

September 13, 2012

### **Detached pressure vessel lid at Fukushima nuke plant removed**

<http://mainichi.jp/english/english/newsselect/news/20120913p2a00m0na003000c.html>

Tokyo Electric Power Co. (TEPCO) removed a detached pressure vessel lid from a reactor building at the crippled Fukushima No. 1 Nuclear Power Plant on Sept. 13.

Around 30 workers used a large crane to remove the 65-ton lid to open work space for removing fuel from the spent-fuel pool of the No.4 reactor. According to TEPCO, the radiation exposure during the work is estimated to have been no more than 0.8 millisieverts.

The No. 4 reactor was undergoing a regular inspection at the time of the Great East Japan Earthquake, so it does not contain nuclear fuel, and the lid of the pressure vessel had been lifted off and set on the reactor building. There are, however, 1,533 nuclear fuel rods in the spent-fuel pool. TEPCO says it will start work to remove them before the end of next year.

## **Whiteboards and shock troops**

September 20, 2012

### **Whiteboards detail tense response to nuclear crisis**

<http://www.yomiuri.co.jp/dy/national/T120919003207.htm>

The Nuclear Safety Commission has released 230 photos of two whiteboards covered in handwritten records of its desperate initial response to the Fukushima nuclear crisis, including the formation of "shock troops" to conduct ventilation operations.

The minute-by-minute notes reveal the tension and urgency among the panel's members as they scrambled to cope in the days after the crisis began at the Fukushima No. 1 nuclear power plant in Fukushima Prefecture.

The commission was disbanded Tuesday and replaced by the new Nuclear Regulatory Commission, which was launched Wednesday as the organization responsible for regulating the nation's nuclear power policy.

The defunct commission recently made public the whiteboard photos taken soon after the nuclear plant was crippled by the Great East Japan Earthquake and subsequent tsunami on March 11, 2011, until April 1 that year. About half were taken during the week after the nuclear crisis began.

One photo shows a sentence written at 7:57 a.m. on March 12 that reads: "Shock troops to be formed at the Fukushima No. 2 nuclear power plant to perform ventilation operations [of the No. 1 plant's reactors]." About seven hours later, a hydrogen explosion wrecked the No. 1 reactor building at the No. 1 plant.

At that time, radiation levels within the plant's premises had been sharply rising. A white haze had begun filling the reactor buildings. The photo reveals a tough decision was made to send workers into the buildings, even though their lives could be at risk.

The following day, Goshi Hosono, then a special adviser to the prime minister, made a request to hold an explanatory meeting with the board. Hosono had been considering how the government should respond to the explosion. A sentence marked 6:46 p.m. says: "There was a request for a lecture on a rough outline of the Chernobyl accident. Checking whether we can respond [to the request] by the end of today."

Analysis of results of the Education, Sports, Culture, Science and Technology Ministry's System for Prediction of Environment Emergency Dose Information (SPEEDI) appear occasionally on the boards from March 11. However, the information was not used for evacuating residents and other purposes until the committee announced the results March 23, nearly two weeks after the crisis began.

The Nuclear Safety Commission has made information on the nuclear crisis available on its website when necessary.

## Accident at No.3

September 22, 2012

### Steel beam gets knocked into No. 3 fuel pool

[http://www3.nhk.or.jp/daily/english/20120923\\_01.html](http://www3.nhk.or.jp/daily/english/20120923_01.html)

A 7-meter long steel beam was accidentally knocked into a spent nuclear fuel pool during work in the No. 3 reactor building at the crippled Fukushima Daiichi nuclear power plant.

The plant operator, Tokyo Electric Power Company, says it has not discovered any serious problems as a result of the accident and the cooling system is working normally.

The accident occurred on Saturday, while workers were operating a large crane to remove debris at the No.3 reactor building. The end of the crane accidentally hit a 470 kilogram steel beam, knocking it into the cooling pool where 566 spent fuel rods are stored.

TEPCO says the dosimeter at the pool showed no irregularities. It confirmed that radiation and water levels have remained constant.

However, the plant operator plans to use an underwater camera to check if any fuel rods have been damaged.

The government's new nuclear regulatory agency says this is a grave mistake and it will investigate the accident.

## Renewable energy - A good start

September 27, 2012

### New renewable energy generation program gets off to promising start

<http://www.japantimes.co.jp/text/nb20120927a4.html>

Kyodo

Japan's new renewable energy program is off to a smooth start, the industry ministry said Wednesday, noting that **generation capacity has already exceeded its fiscal 2012 target by more than 50 percent.**

The capacity of facilities approved by the Ministry of Economy, Trade and Industry has reached around

1.3 million kw in the two months since the feed-in tariff scheme began July 1. METI aims to raise that to 2.5 million kw through next March.

"We have seen a fairly good start," METI said in a document, though it noted that not all of the facilities approved will start selling power this fiscal year because of the time needed to build them.

METI said the capacity generated by facilities that got off the ground between April and Aug. 31 came to 683,000 kw.

Of the 1.3 million kw approved, solar power plants account for 1.03 million kw (about 80 percent), wind power plants about 262,000 kw, and biomass plants 6,000 kw. Not geothermal plants were approved.

The number of solar power plants apparently surged because they are easier to install. Under the feed-in tariff scheme, utilities must purchase all electricity generated by renewable sources at preset premiums for up to 20 years, with the costs passed on to consumers.

## **Honda's new generator**

JJI

Honda Motor Co. will start selling in November a new household gas engine cogeneration unit via gas utilities across Japan.

Unlike conventional models, which rely on electricity from the regular power grid, the Micro Combined Heat and Power unit, or MCHP1.0R, has a starter unit so it can be used during blackouts.

As long as there is a supply of household gas or liquefied propane gas, electricity can be generated during a power outage.

But because the output capacity is limited to 980 watts, it can't power several electrical devices at the same time.

## **Lithium carbonate rights**

Kyodo

NAGOYA — Toyota Tsusho Corp., a trading house of Toyota Motor Corp., said Wednesday it has acquired lithium carbonate exploitation rights with Australian resource development firm Orocobre Ltd. in Argentina's Olaroz salt lake.

Toyota Tsusho said it will also wholly acquire the sales rights for the resources, used in lithium ion batteries, and plans to procure all lithium carbonate for domestic companies, including automakers and electronics firms.

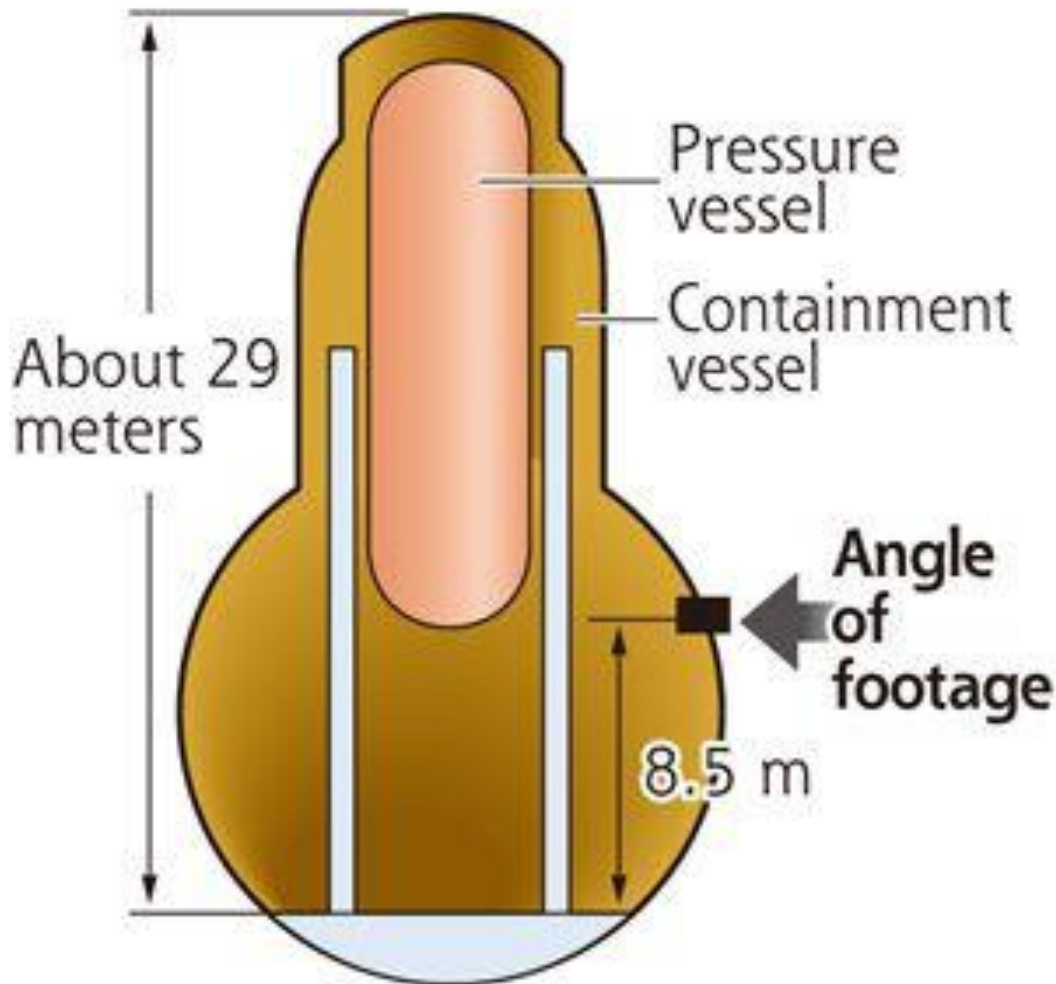
## **New video of inside of No.1 reactor**

September 29, 2012

### **TEPCO shows video taken inside N-reactor**

<http://www.yomiuri.co.jp/dy/national/T120928003442.htm>

# Structure of No. 1 reactor at Fukushima No. 1 nuclear power plant



Tokyo Electric Power Co. has released video footage taken inside the damaged containment vessel of the No. 1 reactor at its Fukushima No.1 nuclear power plant, the first such footage the utility has released since the crisis that erupted at the plant in March of 2011.

The video, taken Wednesday using an endoscope, shows an area around a pipe that sits about 8.5 meters from the bottom of the containment vessel. The scattered debris that is visible is believed to be damaged parts of the vessel's internal structure.

To insert the endoscope, a hole was drilled through a 30-centimeter-diameter pipe that had become blocked by a steel plate and other debris.

The investigation revealed that a 7.5-centimeter-thick lead plate had disappeared from inside the vessel, presumably lost after the hydrogen explosion March 12.

Temperatures inside the containment vessel rose to more than 700 C three days after the explosion, meaning the plate probably melted. The melting point of lead is 327 C.

TEPCO plans to conduct further research in October by measuring such things as the water level, temperature and radiation levels inside the vessel using a thermometer, camera and an instrument to collect water.

## **Noda at Fukushima Daiichi on October 7**

October 1, 2012

### **PM to visit Fukushima nuclear plant Oct. 7**

<http://www.yomiuri.co.jp/dy/national/T120930002749.htm>

Jiji Press

Prime Minister Yoshihiko Noda is planning to visit Tokyo Electric Power Co.'s Fukushima No. 1 nuclear power plant on Oct. 7, it has been learned.

By choosing the plant as the destination for his first official trip following a Cabinet reshuffle expected to take place Monday, Noda aims to show his intention to continue putting priority on tackling the crisis, and resolving related issues, sources said.

The prime minister last visited the nuclear power station in Fukushima Prefecture on Sept. 8 last year, about six months after a triple meltdown at the complex triggered by the March 11, 2011, megaquake and tsunami.

October 2, 2012

## **Drone checking radiation near Fukushima plant**

[http://www3.nhk.or.jp/daily/english/20121002\\_30.html](http://www3.nhk.or.jp/daily/english/20121002_30.html)

A Japanese nuclear research agency has begun using an unmanned helicopter to measure radiation levels in areas within a 3-kilometer radius of the crippled Fukushima Daiichi nuclear power plant. Detailed studies haven't been conducted there so far.

The survey has been commissioned by the government. The Japan Atomic Energy Agency invited media to observe it conducting the survey on Tuesday. The survey is taking place in Futaba Town about 2 kilometers from the plant on Tuesday.

The agency decided to use the unmanned helicopter as it is not regulated by the aviation law which bans airplane flights within a 3-kilometer radius of nuclear plants.

The helicopter covers a one-kilometer square area in 2 hours, and will be able to measure radiation levels over mountains and forests, which are very difficult to access.

The drone flies at an altitude of between 30 to 100 meters and has the advantage of accurately determining the locations of so called radiation "hot spots."

Radiation data is directly transmitted from the helicopter to a personal computer and plotted on a map, color-coded according to radiation levels.

The agency plans to compile a report by the end of the month.

## **Removing fuel at reactor no 4 (Fukushima Daini)**

**This article is actually about the Daini nuclear plant (Fukushima No. 2)**

October 3, 2012

**Delicate work: A nuclear fuel assembly is removed by an overhead crane from the No. 4 reactor at the Fukushima No. 2 power plant, 12 km north of the cripple No. 1 plant, on Tuesday. KYODO**





## **Tepco removing fuel from reactor at Fukushima No. 2**

<http://www.japantimes.co.jp/text/nn20121003b7.html>

Kyodo

Tokyo Electric Power Co. started Tuesday removing fuel from one of the reactors at the Fukushima No. 2 nuclear plant, allowing the media to observe part of the process.

It is the first time Tepco has removed fuel from one of the reactors since the facility was damaged in last year's earthquake and tsunami.

Tepco plans to move 764 fuel assemblies inside the No. 4 reactor to the spent fuel pool next to it. The utility will also check whether there is damage inside the reactor by using an underwater camera.

Fukushima No. 2, located about 12 km south of the crippled No. 1 plant, was damaged by the earthquake and tsunami of March 11, 2011, with three of the four reactors temporarily losing key cooling functions.

The damage was far less than at the No. 1 facility and workers achieved a cold shutdown of the reactors several days after the natural disasters.

Also in <http://mainichi.jp/english/english/newsselect/news/20121003p2g00m0dm009000c.html>

## **Drone to check radiation in no-fly zone**

### **Remote-controlled helicopter measures radiation in Fukushima no-fly zone**

<http://mainichi.jp/english/english/newsselect/news/20121003p2a00m0na005000c.html>

FUKUSHIMA -- A remote-controlled helicopter was used to take radiation measurements above the Fukushima Prefecture town of Futaba on Oct. 2, a no-fly zone within three kilometers of the stricken Fukushima No. 1 Nuclear Power Plant.

It was the first time for measurements to be taken over the restricted zone from the air. People and vehicles have previously taken measurements on the ground in lines and at specific points within the zone.

The aerial testing was performed by the Japan Atomic Energy Agency (JAEA) at the request of the Ministry of Education, Culture, Sports, Science and Technology. Officials plan to create a map on the spread of radiation based on data collected from the air during the tests, which are due to continue until Oct. 8.

The unmanned helicopter is equipped with a camera, radiation measuring equipment, and a global positioning system. It is controlled from computers on the ground.

On Oct. 2, the helicopter zigzagged along the coast of Fukushima Prefecture about two kilometers north of the Fukushima No. 1 Nuclear Power Plant at an altitude of about 50 meters. It also hovered upward in 10-meter increments to take measurements.

"We want to thoroughly collect basic data for use in predicting future radiation levels so that it can be applied in decontamination work and other tasks," said Toshiro Nakai of the JAEA's Fukushima Environmental Safety Center.

## Progress

October 4, 2012

### **Crippled Reactor 2 in Fukushima No. 1 gets new thermometer**

<http://www.japantimes.co.jp/text/nn20121004a6.html>

Kyodo

Tepco installed a new thermometer Wednesday at the bottom of the No. 2 reactor pressure vessel at the Fukushima No. 1 nuclear plant, succeeding in increasing the number of devices that can properly monitor the temperature of that area to two.

The thermometers are important for Tokyo Electric Power Co. to check the condition of the reactor, which has suffered a meltdown, as six of the seven thermometers at the bottom of the vessel have not been functional.

The new thermometer showed that the temperature was 42.6 degrees as of 11 a.m., not much different from the data taken by the remaining device, which stood at 46.1 degrees.

Reactors 1 and 3, which also contain melted fuel, each have more than five normally functioning thermometers at the bottom of their pressure vessels.

Tepco also compiled a report on an incident Sept. 22 when a 7-meter-long iron frame dropped inside the spent fuel pool of the No. 3 reactor while removing debris from the upper floor of the reactor building.

Tepco concluded the incident did not damage the fuel assemblies stored in the pool after confirming through an underwater camera that the iron frame is not directly touching them.

It also said the incident occurred partly because workers did not notice that the iron frame was moving from its original position when they were trying to cut another iron frame.

The upper part of the reactor building was severely destroyed by a hydrogen explosion that occurred in the early days of the nuclear crisis in March 2011.

### **Fukushima plant's reactor No.2 has new thermometer**

[http://www3.nhk.or.jp/daily/english/20121004\\_15.html](http://www3.nhk.or.jp/daily/english/20121004_15.html)

The operator of the Fukushima Daiichi nuclear power plant has installed a new thermometer inside its Number 2 reactor. Monitoring efforts continue at the facility that was declared in a state of cold shutdown last year.

Tokyo Electric Power Company fitted the thermometer on Wednesday. Only one device out of the existing 5 has been working properly near the bottom of the reactor's pressure vessel.

The thermometer showed 42.7 degrees Celsius. An existing device nearby has been measuring 45.8 degrees.

The company says it will use the new device for regular monitoring after ensuring its reliability.

## **Giant active fault**

### **New giant active fault blamed for 3/11 tsunami**

[http://www3.nhk.or.jp/daily/english/20121004\\_06.html](http://www3.nhk.or.jp/daily/english/20121004_06.html)

A research team says a newly discovered undersea fault may have magnified the massive tsunami that struck northeastern Japan last year.

The March 11th earthquake triggered tsunami measuring more than 20 meters, which swallowed large swaths of Pacific coastline along Japan's Tohoku region.

Scientists originally thought the series of tsunami were triggered mainly by the movement of an ocean plate and the overlying plate carrying northeastern Japan.

But the displacement of the tectonic plates alone failed to explain why a 20-meter high tsunami was generated along the northern part of the Tohoku coast, including Iwate prefecture.

The research team led by Hiroshima University Professor Emeritus Takashi Nakata discovered a previously unknown active fault lying some 500 kilometers north to south along the coast of Iwate to Ibaraki Prefectures.

The team says if movement occurred along this fault, the height of the tsunami in northern Tohoku would reach about 20 meters, which actually happened.

Scientists say a number of undersea faults have also been discovered in other areas off the Pacific coast of Japan, where mega-quakes are predicted.

Professor Nakata says more research is needed into undersea plates to better prepare for possible future tsunami.

## **Another 6 hour video from TEPCO**

October 5, 2012

### **TEPCO releases more Fukushima conference footage**

[http://www3.nhk.or.jp/daily/english/20121005\\_25.html](http://www3.nhk.or.jp/daily/english/20121005_25.html)

Tokyo Electric Power Company has released more footage of its teleconferences from the early days of the Fukushima nuclear accident last year.

The utility released a 6-hour-long video on its website on Friday at the request of media.

The video shows exchanges between the Fukushima Daiichi nuclear power plant and the firm's head office in Tokyo during the 5 days from March 11th, 2011, after a massive earthquake and tsunami disabled the plant.

The video shows the plant's head Masao Yoshida trying to contact the prime minister's office early on March 13th. Yoshida was apparently unable to fully engage in emergency operations because of government intervention.

Late at night on March 14th, an executive in Tokyo ordered plant officials to quickly open valves to lower

the pressure inside the plant's Number 2 reactor, without realizing the grave situation there. The officials told the executive not to obstruct their work.

The video has been edited to avoid identifying people other than the utility's executives.

The video is part of 150 hours' worth of footage Tokyo Electric allowed media to see for one month from August. Media were not allowed to make copies.

The utility had distributed to media an edited 90-minute video. But media and experts complained that it was not enough to convey what happened at the plant and how the firm responded.

Media have been asking Tokyo Electric to release all videos of its teleconferences from the 5 days, but the utility says it has no plan to do so.

## **Prime Minister in Fukushima**

### **Noda visiting Fukushima**

[http://www3.nhk.or.jp/daily/english/20121007\\_14.html](http://www3.nhk.or.jp/daily/english/20121007_14.html)

Prime Minister Yoshihiko Noda is visiting Fukushima Prefecture to inspect the latest efforts at the disaster-stricken nuclear power plant.

On Sunday morning, Noda visited the J-Village athletic center, an operation base for repair and clean-up efforts at the nuclear plant. He had talks with 8 workers, including employees of Tokyo Electric Power Company who worked at the plant immediately after the nuclear accident.

After being briefed on the accident, the prime minister said he wants to express gratitude for their efforts despite fear and harsh conditions. Noda asked for their continued cooperation in carrying out procedures to decommission the plant and other recovery efforts.

Noda earlier held talks with police officers assigned to the evacuation zone. He said he finds them reliable in being devoted to maintaining security in the zone day and night.

Noda is to visit the Daiichi plant in the afternoon.

### **Noda in Fukushima to inspect disaster-hit nuclear plant**

<http://mainichi.jp/english/english/newsselect/news/20121007p2g00m0dm013000c.html>

FUKUSHIMA (Kyodo) -- Prime Minister Yoshihiko Noda arrived in Fukushima, northeastern Japan, on Sunday to inspect the disaster-stricken Fukushima Daiichi nuclear power plant.

Noda will inspect the No. 4 reactor of the plant, which was damaged by the magnitude 9.0 earthquake and tsunami in March last year, to see the progress in the decommissioning project for the reactor.

The premier also plans to look at decontamination work and other recovery efforts. It is his second inspection of the plant operated by Tokyo Electric Power Co.

Ahead of the inspection, Noda met with police in charge of patrolling the evacuation zone near the plant.

## **Decontamination must be priority**

October 7, 2012

### **Noda orders speeding up of decontamination**

[http://www3.nhk.or.jp/daily/english/20121007\\_20.html](http://www3.nhk.or.jp/daily/english/20121007_20.html)

Prime Minister Yoshihiko Noda has instructed Environment Minister Hiroyuki Nagahama to speed up the decontamination of the area affected by the Fukushima Daiichi nuclear accident.

Noda visited the Fukushima Daiichi plant on Sunday. This was his second visit since he assumed office.

Noda spoke to approximately 200 workers at the plant. He said there will be no revival for Japan without a revival of Fukushima prefecture. He said he wants everyone to work harder to achieve the goal of decommissioning the reactors.

Noda wore protective gear when he entered the building housing the number 4 reactor, which caused a hydrogen explosion in March last year.

He went up to the roof and heard from officials of the Tokyo Electric Power Company about the preparations being made to remove spent nuclear fuel.

Noda visited the control rooms at the number 1 and number 2 reactor buildings to learn about the situation at the time of the nuclear disaster. The lights were turned off and flashlights were used to recreate the tense atmosphere of that time.

Prime Minister Noda also visited Naraha Town to inspect the decontamination work at an elementary school and the temporary storage sites where contaminated soil is being kept.

Noda told reporters he was able to see the progress being made, but added that there is still a long way to go.

He said the work must be carried out with a sense of tension until the very end.

**Noda said decontamination is the basic requirement for Fukushima's recovery and revival, and it needs to be expedited.**

He said he instructed Nagahama to quickly draw up new measures that include delegating his ministry's authority to its Fukushima branch to speed up the decontamination work. He added that local residents should be kept informed about the progress.

## **Noda meets some of the "Fukushima 50"**

October 8, 2012

### **Trip to facility possibly pre-election publicity stunt**

<http://www.japantimes.co.jp/text/nn20121008a1.html>

By REIJI YOSHIDA  
Staff writer

OKUMA, Fukushima Pref. — Wearing a full-face mask and white protective suit, Yoshihiko Noda visited the Fukushima No. 1 nuclear plant Sunday, becoming the first politician to inspect the central control room and the first prime minister to enter one of the four wrecked reactor buildings.

**Prime Minister Yoshihiko Noda, wearing a white protective suit, pauses for the photographers at the Fukushima No. 1 nuclear plant Sunday, before inspecting the central control room at one of the four wrecked reactor buildings. KYODO**





Noda also visited the nearby base camp for plant employees and met eight of the "Fukushima 50" — the heroic workers who stayed at the plant at the height of the nuclear crisis and barely averted a catastrophic disaster that could have contaminated much of eastern Japan, including Tokyo.

"Thanks to your dedication, we have Japan as it is today," Noda told the eight men at J-Village, a sports facility now used as a base camp for about 3,000 plant workers who travel to the Fukushima plant every day.

Among the eight were Masatoshi Fukura and Atsufumi Yoshizawa, both 54. Fukura was leader of the operations team for units 1 to 4 of the crippled power station, while Yoshizawa headed the team for units 5 and 6. The remaining six workers declined to be identified.

"First, I'd like to apologize to the people" of Japan for failing to prevent the nuclear accident, Yoshizawa said at the outset of the meeting.

Each of the eight men then briefly talked about their appalling experiences at the No. 1 complex, which saw three of its six reactors melt down following the Great East Japan Earthquake, leading to a massive release of radioactive materials into the environment.

"The (power generators) were knocked out by water from the tsunami. I thought it was all over," said one of the plant workers. "I thought, 'This is it; this is the end of it all.' "

When the monster quake hit the plant on March 11 last year, the workers successfully shut down all of the reactors and averted a catastrophic nuclear chain reaction. But after the ensuing tsunami crippled the reactor cores' critical power and cooling systems, the remaining decay heat from the melted nuclear fuel eventually burned through the pressure vessels.

"I asked my staff to repair the power facilities. But the night was dark, and they could have been electrocuted. . . . They were scared and asked me sternly, "Will we be able to return safely if we go out now?" " the worker recalled.

"My body still shakes when I remember the (hydrogen) explosion at reactor 3. The ground rocked with a massive 'Bang!' " another of the Fukushima 50 said.

Desperate to find a source of power to switch on critical meters to determine the condition of the reactors, he and his coworkers pulled batteries from their own cars and carried them to the central control room, even though each of them weighed 20 to 30 kg and the plant was being repeatedly rocked by strong aftershocks.

"My colleagues and I did our best," he said.

Later Sunday, Noda also visited nearby communities to check on ongoing decontamination work and radiation monitoring of locally grown rice before shipment to retailers.

The Fukushima trip may be an attempt by Noda to shore up his dwindling popularity before the next Lower House election. This is the second time he has inspected the Fukushima No. 1 plant, following a visit in September 2011.

A group of reporters were allowed to enter the complex with Noda, who even climbed to the top of the damaged building housing the No. 4 reactor.

Experts say that over the past year, the risk of another serious accident at the plant has considerably lessened, although long-term concerns about the durability of equipment and facilities remain since decommissioning the reactors could drag on for up to 40 years.

Plant workers are now speeding up work to remove about 1,500 nuclear fuel assemblies stored in a spent-fuel pool on the fourth floor of the No. 4 reactor building, which suffered extensive damage from a hydrogen explosion.

**Tepco now plans to start extracting the fuel assemblies by the end of next year, and to finish moving them to another spent-fuel pool designed for long-term storage by the end of 2015.**

Once accomplished, the likelihood of another serious accident will be even slimmer, according to Kyoto University professor Hajimu Yamana, who also sits on the committee overseeing the long-term management of the power plant.

"There won't be any more serious trouble unless something extraordinary happens," Yamana said, pointing out that simulations by plant operator Tokyo Electric Power Co. showed the **reactor 4 building can withstand an earthquake measuring upper 6 on the Japanese seismic intensity scale of 7.**

But it's better to move all the spent fuel to the second pool, which is more resistant to earthquakes and has a better cooling system, Yamana noted, because "you can't totally deny the possibility of (another) gigantic earthquake" striking the area.

**Meanwhile, the remaining decay heat from the nuclear fuel in the damaged reactor cores is estimated to have fallen to 1 megawatt from 2.35 megawatts over the past year** as radiation is emitted, according to calculations by Tepco.

This has considerably reduced the risk of another disaster at the complex "and as time passes, (Tepco) will get greater scope" to fix the critical water coolant system, Yamana said.

The decay heat is expected to fall to 0.61 megawatt by next October and to 0.42 megawatt a year later, according to Tepco's data.

## Enough water to cool reactor no.1 but radiation still lethal

October 10, 2012

### TEPCO: Water level high enough to cool reactor-1

[http://www3.nhk.or.jp/daily/english/20121011\\_07.html](http://www3.nhk.or.jp/daily/english/20121011_07.html)

The operator of Japan's crippled nuclear plant says melted fuel at the bottom of the No.1 reactor is being kept cool. Tokyo Electric Power Company says its latest probe reveals the water level in the reactor's containment vessel is at 2.8 meters - enough to stop the fuel from overheating.

TEPCO used endoscopes to look inside the vessel at the Fukushima Daiichi nuclear power plant.

Footage from the probe shows **steam in the vessel but no dripping water**. That means damaging humidity is lower than in an earlier test on the No.2 reactor.

But the footage highlights problems. **The surface of scaffolding inside the container vessel is corroded. The probe revealed a 30-centimeter long metal rod lying on the scaffold and polluted water underneath. TEPCO says it detected radiation of over 11 sieverts per hour in some parts of the container. That's high enough to kill in 40 minutes of exposure.**

But it adds that melted fuel rods lying at the bottom of the reactor are stable, thanks to the water level.

The find means that TEPCO's schedule for decommissioning the reactor is still on course.

## Fukushima's quiet heroes

October 11, 2012

## 'Fukushima 50' recount quiet heroism

<http://www.japantimes.co.jp/text/nn20121011f2.html>

By REIJI YOSHIDA  
Staff writer

NARAHA, Fukushima Pref. — Some of the "Fukushima 50" — the dozens of workers who stayed at the Fukushima No. 1 power plant at the height of the nuclear crisis in March last year — spoke out for the first time in a public event Sunday, meeting Prime Minister Yoshihiko Noda during his visit to the still-troubled plant and related facilities.

Overseas media praised the "50" — the actual number is unknown but fluctuated as the crisis wore on — as dedicated heroes who braved three core meltdowns and three hydrogen explosions as they struggled to save Japan from a true nuclear catastrophe.

Their demeanor Sunday, however, was far from swaggering and at the start of their meeting with the prime minister they even apologized to the public.

The workers have drawn much admiration from the public, as seen in the multitude of letters and banners from children pinned on a wall in J. Village, the sports facility that has served as the base camp for about 3,000 people laboring at Fukushima No. 1.

Many of the children's messages thank them for "working for Japan" and stopping the meltdown crisis from spiraling out of control.

But on Sunday, each of the eight representatives calmly described their desperate efforts during the height of the emergency, and some repeated their apology to people who suffered fear because of the nuclear crisis.

"From the bottom of our heart, we'd like to apologize for causing (serious) anxiety and trouble" to people across the country, said Atsufumi Yoshizawa, who headed the operation team for reactor units 5 and 6 when the crisis broke out.

Six of the eight men declined to be identified by the media. These six are still working at Fukushima No. 1, taking part in the effort to decommission the damaged reactors and related facilities.

The scariest moment for one of the six, who was struggling to repair the critical power equipment needed to cool the reactors, was when a hydrogen explosion in the building housing reactor 3 ripped apart the entire top floor.

He had assigned his staff to work near the building. Later, he learned that a car they had driven there was flattened by debris from the blast.

"The staff had a narrow escape," he said. "Tears welled up in my eyes when I finally made contact with them."

Masatoshi Fukura, then the operation chief of reactors 1 through 4, said about 40 key personnel stayed in the two central control rooms during the first 48 hours of the crisis.

With the power supply completely cut off, the workers struggled in darkness to revive critical instruments to find out what was happening in the out-of-control reactors.

"When the (hydrogen) explosion occurred at reactor No. 1, (workers in the control rooms) felt as if strong jolts were knocking up through the floor. All the veneer fell from the ceiling, and rooms were all covered with white dust," Fukura said.

Breathing in dust contaminated with radioactive materials is extremely dangerous, so the workers were forced to wear full face masks with filters at all times throughout the crisis, even though it made breathing difficult.

"The situation was very severe," Fukura said.

According to Yoshizawa, more than 6,000 workers were on duty when the monster earthquake first shook the plant. The vast majority evacuated.

"First, I worried if (those 6,000) people could evacuate safely. Tsunami eventually came less than one hour after the earthquake, but even in normal times" it takes 20 to 40 minutes for everyone simply to get out of the plant's compound, Yoshizawa said.

The most agonizing experience for another of the six who declined to be identified was trying to persuade his staff to go outside to repair the damaged power equipment in the dead of night.

"We knew the reactors were unstable. . . . But the night was dark, and they could have been electrocuted. There was no means of communications" such as cellphones, he said.

"My staff were too scared to go. They asked me sternly, 'Will we be able to return safely if we go out now?' " the man recalled.

One of the representatives headed a firefighter squad at Fukushima No. 1.

"I was injured by the (hydrogen) explosion at reactor No. 1," he said. "All of the glass windows in our fire engine were shattered, and debris hit my hand and broke the bones."

He was sent away from the facility for treatment. He said he still feels guilty about leaving his fellow firefighters, who struggled on for weeks.

"I was the head of the squad," he said. "Everyone else had a really hard time."

**Serious trouble not expected at reactor no.4 "unless something extraordinary happens"...**

**Prime Minister Yoshihiko Noda (second from right) is briefed by Tepco officials the same day on top of the badly damaged reactor 4 building. KYODO**





## **Noda lauds work to ease reactor 4 fuel threat; fears remain**

### **Progress seen toward extraction but big quake could derail process**

<http://www.japantimes.co.jp/text/nn20121011f1.html>

By REIJI YOSHIDA and KAZUAKI NAGATA

Staff writers

OKUMA, Fukushima Pref. — The highlight of Prime Minister Yoshihiko Noda's trip to the Fukushima No. 1 plant Sunday was his inspection of the reactor 4 building, one of the public's chief sources of concern since



it contains over 1,500 dangerous fuel assemblies left exposed to the environment since the roof was blown off by a hydrogen explosion last year.

**Twisted: The shattered structure housing reactor 3 is seen Sunday at the Fukushima No. 1 plant. KYODO**



Tokyo Electric Power Co. workers escorted Noda to the building's 11-meter-deep spent-fuel pool to demonstrate that its surface remains horizontal, in a bid to ease fears that the structure is tilting. Noda listened to the guides attentively, nodding several times as they explained the pool's current status.

More than 1½ years since three of the facility's reactors suffered core meltdowns following the Great East Japan Earthquake and tsunami that overran the complex, **many experts across the world remain alarmed about the possibility of the reactor 4 building collapsing in the event of another major temblor, releasing even more catastrophic amounts of radioactive fallout.**

The government and Tepco have repeatedly assured that such a nightmare scenario will not occur, claiming the structure has been significantly reinforced with steel pillars and concrete walls that mean it can now withstand a quake measuring as high as upper 6 on Japan's seismic intensity scale to 7.

**By clambering to the roof, Noda demonstrated to the public that radiation levels — which peaked at 400 microsieverts per hour during his inspection — are not severe enough to prevent entry to or work inside the building.**

Tepco employees have been working on the fourth floor, where the spent-fuel pool is situated, in order to begin removing the 1,533 fuel assemblies by the end of next year and to transfer all of them to another spent-fuel pool designed for long-term storage by the end of 2015.

Most debris had been removed by July, and **workers are currently laying the foundations for a specially equipped crane that will delicately extract each fuel assembly from the pool.**

"I felt there has been steady progress toward decommissioning the (crippled) reactors," Noda told reporters later the same day, aiming to ease public fears about reactor 4. "We need to maintain a sense of tension until the very end (of the work), paying all requisite attention to safety at the No. 1 plant and to the health of the workers."

Removing all of the fuel assemblies from the spent-fuel pools in the four wrecked reactors is projected to take around 10 years, but decommissioning reactors 1 through 3 by removing melted fuel from their cores could last more than 40 years, according to the government's long-term plan for the facility.

Experts say the risk of another disaster on a par with the March 2011 meltdowns has considerably decreased over the past year, with the focus increasingly shifting to the long-term risks, such as the durability of on-site equipment and the possibility of powerful quakes jolting the area in the near future.

**"There won't be any more serious trouble unless something extraordinary happens,"** said Hajimu Yamana, a Kyoto University professor who sits on the committee overseeing the power station's long-term management.

Still, "you can't totally deny the possibility of (another) gigantic earthquake" striking the site, he warned.

In addition to unit 4, the buildings housing reactors 1 and 3 also were heavily damaged by hydrogen explosions but only their fifth floors were destroyed. The rest of the two structures, including the fourth floors housing spent-fuel pools, survived virtually intact, Yamana said.

However, the blast in the reactor 4 building extensively damaged the fourth floor as well, and **despite the reinforcement work, the overall structure is not as strong as before,** he said.

"So **we need to speed up work as far as unit 4 is concerned,**" Yamana added.

The spent-fuel pool Tepco plans to relocate the 1,533 fuel assemblies to by the end of 2015 was constructed on the ground level of a separate structure on the compound, and is therefore considered more resilient if another major temblor were to occur. The long-term storage pool also has an enhanced and more robust cooling system.

The group of reporters allowed to accompany Noda on his visit Sunday noticed many changes compared with the first media tour of the No. 1 plant, which authorities organized last November, including some that may suggest a considerable improvement in safety conditions.

For example, decay heat from the spent-fuel pools and the damaged reactor cores has significantly declined as the fuel rods continue to emit radiation.

Decay heat from the pool of reactor 4 has dropped to 0.7 megawatt, down from 2.26 megawatt in March last year, and is forecast to fall to 0.51 megawatt in 2013 and to 0.43 the year after. Decay heat from the reactor cores, meanwhile, has fallen to 1 megawatt from 2.35 megawatts over the past year, according to Tepco data.

The ever-decreasing heat levels are gradually reducing the risk of the reactors suffering another disaster because Tepco will have more time to repair their critical coolant water systems.

Most of the vulnerable hoses that carried coolant water inside the compound, which total around 4 km in length, already have been replaced with more durable pipes made of polyethylene, and Tepco plans to have all the remaining hoses replaced by the end of December.

Most mainstream scientists are meanwhile in agreement that the level of radioactive materials discharged by the three wrecked reactors, though unprecedented in scale in Japan, are unlikely to cause major health problems to Fukushima Prefecture residents and are even less likely to affect those farther afield.

"Few people will develop cancer as a consequence of being exposed to radioactive materials released from the Fukushima No. 1 plant last year — although those who do will never know for sure what caused their disease," an article in the online edition of Nature, a leading scientific journal, claimed May 23.

"These conclusions are based on two comprehensive, independent assessments of the radiation doses received by Japanese citizens, as well as by the thousands of workers who battled to bring the shattered

nuclear reactors under control," the article said, citing findings by the U.N. Scientific Committee on the Effects of Atomic Radiation and the World Health Organization.

But many members of the public, especially those calling for the complete abolition of nuclear plants, worry about the long-term durability and quake-resistance of key equipment and facilities at the No. 1 plant.

For instance, five of the six thermometers fixed to the bottom of the reactor 2 pressure vessel — critical devices as they enable Tepco to glean more information about the condition of the reactor core — have suffered technical glitches since December for as yet undetermined reasons, raising questions as to the durability of various equipment necessary to support the decades-long decommissioning process.

On Oct. 3, Tepco barely managed to set up a new thermometer at the bottom of the massively contaminated pressure vessel, but 45 workers were exposed to radiation of up to 2.2 millisieverts in the process.

And on Sept. 22, a remote-controlled crane dropped a 470-kg iron beam that plunged into the spent-fuel pool of reactor 3.

After measuring radiation levels and examining the water quality, Tepco concluded that its fuel assemblies probably did not sustain serious damage.

Still, the incident renewed fears of major accidents taking place during the lengthy process of decommissioning the reactors.

In an interview Friday with The Japan Times, Lower House lawmaker Sumio Mabuchi, who headed a project to reinforce the reactor 4 building, declined comment on the structure's current quake-resistance since he hasn't seen the latest data from Tepco or the government.

But Mabuchi — who served as special adviser to then-Prime Minister Naoto Kan at the very height of the nuclear crisis from March to June 2011 — also pointed out that his team had originally considered a more drastic measure to reinforce the building: plugging every available space on the lower floors with concrete.

"The reinforcement steps (adopted) were a first-aid measure, and I kept saying we should buttress the building with permanent measures" instead, said Mabuchi, a member of the ruling Democratic Party of Japan.

"We believed (flooding the reactor 4 building) with concrete was necessary as a permanent measure, and held discussions about the subject," he said. "But right now, I don't have any knowledge of current conditions."

But the government eventually gave up on the proposal because it would have taken about a year to complete the work and aftershocks as high as magnitude 7 were repeatedly rocking the No. 1 plant at the time.

### **Water level in Fukushima No. 1 reactor higher than expected**

<http://mainichi.jp/english/english/newsselect/news/20121011p2g00m0dm035000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Wednesday the water level inside the No. 1 reactor's primary containment vessel is higher than expected.

Tokyo Electric Power Co. spokesman Masayuki Ono said following its latest survey that it is difficult to accurately determine where melted fuel inside the vessel is located, but stressed that the utility does not expect to change its plan for decommissioning the reactor.

During the investigation conducted Wednesday, workers found the surface of the water was around 2.8 meters from the bottom of the flask-shaped vessel, about 80 centimeters higher than expected.

As for radiation levels, which workers measured by lowering a dosimeter into the vessel, the area of insertion logged 11.1 sieverts per hour, while at the water surface the radiation level fell to as low as 0.5 sievert per hour.

The utility also showed video footage from a camera inserted in the vessel the previous day.

A bolt about 10 millimeters in diameter was found on a foothold inside the reactor, but Ono said it is unlikely to have dropped from a large object because the size of the bolt is small.

Ono said the interior of the vessel looks "in good shape," although the iron foothold and other areas showed signs of corrosion.

TEPCO is carrying out a series of assessments on the vessel from Tuesday. It also plans to take a sample of water from inside the reactor on Friday, the first such attempt since the disaster at the plant erupted in March last year.

The No. 1 unit is one of the three reactors at the plant to have suffered a meltdown, and its fuel is believed to have melted through the pressure vessel and accumulated in the outer primary container.

TEPCO has continued to inject water into the three crippled reactors to keep the fuel inside cool, but a large portion of the coolant is believed to be leaking from the vessels.

## **Water in reactor no.1"higher than expected" says TEPCO**

October 12, 2012

### **Reactor 1 water level higher than expected**

<http://www.japantimes.co.jp/text/nn20121012a4.html>

Kyodo

The water level inside reactor 1's primary containment vessel at the Fukushima No. 1 nuclear plant is higher than expected, Tokyo Electric Power Co. said.

**Screw loose: Video camera footage released Wednesday by Tokyo Electric Power Co. shows a loose bolt about 10 mm in diameter resting on a foot grate inside the Fukushima No. 1 power plant's reactor 1. Tepco inserted the camera into the vessel to gauge the damage from the March 2011 meltdown disaster. TEPCO / KYODO**



Spokesman Masayuki Ono said it is difficult to accurately determine where melted fuel inside the vessel is located but stressed that Tepco doesn't expect to change its plan for decommissioning the reactor.

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Tepco continues to inject water into the three crippled reactors to keep the fuel inside cool, but a large amount of the coolant is believed to be leaking out.

### **Terrorism defenses**

The Nuclear Regulation Authority said Wednesday it plans to ask utilities to take measures to protect the nation's atomic power plants against catastrophic damage from terrorist attacks as it moves to craft new safety standards for reactors.

Due to the Fukushima No. 1 nuclear plant disaster that started last year, the government plans to legally require utilities to take steps to prevent both accidents that could cause serious damage to reactor cores and the consequent massive radioactive fallout.

The agency, which was inaugurated last month, is expected to outline the new safety standards by March 31 and finalize them by July.

In addition to terrorist attacks, the authority also agreed to consider situations in which nuclear facilities are hit by natural phenomena greater than they are designed to withstand.

During a meeting of the five members of the authority, Kenzo Oshima, former ambassador to the United Nations, said there is a need to accelerate the compilation of safety standards.

"Japan has lagged behind internationally in severe accident measures," he said. "We must create standards that broadly cover situations such as natural phenomena, terrorist acts, and that go ahead (of other countries)."

### **Cesium in tobacco**

Jiji

Japan Tobacco Inc. says radioactive cesium levels in some dried tobacco leaves harvested this year in Fukushima Prefecture exceeded the company's limit of 100 becquerels per kilogram.

JT said Tuesday it will cancel the purchase of some 4.5 tons of leaves found to be contaminated. Cultivation of tobacco leaves was suspended last year in Fukushima Prefecture due to radioactive contamination from the crippled Fukushima No. 1 nuclear power station.



## 1st sample of water at Fukushima Daiichi: not so bad?

October 13, 2012

### TEPCO succeeds in taking water sample from crippled No. 1 reactor

<http://mainichi.jp/english/english/newsselect/news/20121013p2g00m0dm010000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant succeeded Friday in taking a sample of water from the No. 1 reactor's primary containment vessel, the first such attempt since the accident at the plant occurred last year.

Considering the water's radiation level and other data, Tokyo Electric Power Co. said the fuel, which is believed to have melted through the pressure vessel and accumulated in the outer primary container, does not appear to be releasing large amounts of radioactive substances because it is kept cool.

The water contained 19,000 becquerels of cesium 134 per cubic centimeter and 35,000 becquerels of cesium 137, lower than the density levels of the water accumulating at the building housing the reactor.

From Tuesday, TEPCO has inserted cameras and other devices into the primary containment vessel of the No. 1 reactor to check the interior condition of one of the plant's three reactors which have suffered a meltdown in the accident. The amount of the water sample it took was about 250 cc.

TEPCO also unveiled footage taken by a camera on Thursday but it could not capture the fuel debris.

TEPCO has continued to inject water into the three reactors, but a large portion of the coolant is leaking from the containers. The utility is carrying out the investigation as part of the process to decommission the reactors.

## Support for Fukushima

October 14, 2012

## **DPJ to set up 4 working teams to support Fukushima**

[http://www3.nhk.or.jp/daily/english/20121014\\_03.html](http://www3.nhk.or.jp/daily/english/20121014_03.html)

Japan's ruling Democratic Party plans to set up 4 working groups to accelerate the recovery of areas affected by last year's nuclear accident in Fukushima.

Policy Research Council Chief Goshi Hosono announced the plan on Saturday. Nuclear contamination in Fukushima Prefecture has slowed progress in reconstruction efforts.

The 4 teams will each be assigned a separate task.

The first will work on supporting local people's lives, the second promoting decontamination work, the third protecting sales of farm produce from unfounded rumors, and fourth creating new communities for evacuees living outside their hometowns.

Hosono said team members will visit affected areas, talk to local people and find out what they most urgently need. Then the teams will make proposals based on interviews and research, and assist the government in implementing them.

## **Switch to renewable energy, says symposium**

October 16, 2012

## **Japan urged to shift focus to renewable energy after Fukushima disaster**

<http://mainichi.jp/english/english/newsselect/news/20121016p2a00m0na015000c.html>

Japanese and foreign energy experts are calling for Japan to accelerate its shift from nuclear power to renewable energy in the aftermath of the Fukushima nuclear disaster triggered by the March 11, 2011 Great East Japan Earthquake and tsunami.

During an international symposium on "Global Energy Policy at a Crossroads" at the German & East Asia Cultural Research Center in Tokyo on Oct. 15, Amory Lovins, chairman and chief scientist of the Rocky Mountain Institute, a Colorado-based nonprofit group advocating efficient and restorative use of resources, laments that Japan gets only 3 percent of its electricity from new renewable sources of energy.

"The trouble is that Japan is the only major industrial country where electric companies can decide who is allowed to come onto their wires and compete with their power stations," he said in a keynote speech. He expressed hope that the Japanese government will set up "a truly independent" system operator who buys the cheapest electricity on behalf of all customers.

"And then with transparent pricing, competition can drive the prices down to international levels," Lovins said, adding Japan's newly launched feed-in tariff program for renewable energy is at three or four times the level of Germany but will fall very rapidly, as it has in Germany and other European countries. He is a longtime adviser to the energy industry and other sectors in more than 50 countries, including Japan, as well as the U.S. departments of energy and defense and offers a recipe for efficient and healthy economic growth in a book called "Reinventing Fire: Bold Business Solutions for the New Energy Era."

Although the government of Prime Minister Yoshihiko Noda has decided to phase out nuclear power in the 2030s, it has stopped short of fully embracing the objective.

Miranda Schreurs, professor of comparative politics and director of the Environmental Policy Research Centre at Free University of Berlin, said, "The single best response to greenhouse gas emissions to energy independence is reducing energy use through energy efficiency improvement."

Saying the nuclear disaster at the Fukushima No. 1 Nuclear Power Plant had a very big impact on Germany, she said renewable energy now accounts for 25 percent of electricity production in Germany from only 6 percent in 2000. "If Germany can do that, Japan can do that," she added.

The Fukushima nuclear disaster led Germany to phase out nuclear energy by the end of 2022. Schreurs served as a member of an ethic commission on the future of safe energy which was created by Chancellor Angela Merkel shortly after the Fukushima disaster.

The author of "Environmental Politics in Japan, Germany, and the United States," Schreurs emphasized that the public's understanding of a shift away from nuclear energy is essential. "You can't do this kind of transition unless society is coming along with you," she said. "Public participation is a new buzzword in Germany. Everybody is talking about how to increase public participation in the decision-making structure."

Hisashi Kajiyama, senior research fellow of Fujitsu Research Institute's Economic Research Center, said during a panel discussion with Lovins and other experts that Japan lags behind Germany and other industrial countries in terms of energy efficiency.

He noted that energy consumption and industrial production in Japan have been almost parallel for the last 20 years while Germany's production level has risen significantly despite a stable level of energy consumption. He cited heavy energy consumption by Japan's transportation sector as one clear-cut example.

The symposium was co-sponsored by nippon.com, a multilingual news website operated by the Nippon Communications Foundation, and the Friedrich Ebert Foundation of Germany and attended by about 150 people. (By Shiro Yoneyama, Staff Writer)

## **Not to worry, says TEPCO, the fuel hasn't been damaged**

October 17, 2012

### **Cameras spot reactor 3 pool debris; fuel intact**

<http://www.japantimes.co.jp/text/nn20121017a5.html>

By JUN HONGO

Staff writer

Remote-controlled underwater cameras have located parts of a 35-ton fuel transfer apparatus that fell into reactor 3's spent fuel pool in March 2011 in the early days of the Fukushima No. 1 crisis, Tokyo Electric Power Co. said.

**Inconvenient debris: Broken heavy equipment lies in the spent fuel pool of reactor 3 at the Fukushima No. 1 nuclear power plant, as seen by a remote-controlled underwater camera. TEPCO / KYODO**



According to Tepco officials, an inspection of the storage pool last Thursday and Friday showed parts of the equipment that broke off following the hydrogen explosion that ripped through the building three days after the complex was overrun by tsunami from the Great East Japan Earthquake.

"We now know approximately where the equipment fell," an official at the utility told reporters Monday, adding the spent fuel rods in the pool apparently were not damaged by the impact.

The fractured fuel-handling machinery had been used for carrying fuel assemblies between the reactor and the spent fuel pool, which sits on the fourth floor of the reactor building.

Images released by Tepco showed a motorized device, concrete blocks and steel beams spread over the racks that contain the spent fuel rods. The hydrogen explosion that took place in reactor 3 is believed to have been larger than the blasts that occurred at reactors 1 and 4.

According to Tepco, the temperature of reactor 3's spent fuel pool remains stable at about 20 degrees. But the area around the reactor still has high levels of radiation 18 months after the disaster started, and the removal of debris surrounding the pool, carried out with remote-control machines, has been time-consuming.

Last month Tepco divulged the complexity of the cleanup process when it said a steel beam weighing 470 kg had fallen into the reactor 3 pool while an operator was trying to remove it.

The pool contains 566 spent fuel assemblies. Tepco has said it hopes to take away enough debris inside and begin removal of the fuel rods within fiscal 2014.

## Radars to check tsunamis before they hit the coast

October 18, 2012

### Radars installed off Wakayama to observe tsunami

[http://www3.nhk.or.jp/daily/english/20121018\\_16.html](http://www3.nhk.or.jp/daily/english/20121018_16.html)

Japanese researchers have erected large radar systems in the sea off Wakayama Prefecture, western Japan, in a bid to observe tsunami at an early stage.

A research group led by Japan's land ministry and Kansai University developed the radars based on aviation control tower technology. The group on Thursday briefed local government officials on the system.

Installed **60 kilometers off the coast of Mihama Town, the radars are designed to observe the height and speed of tsunami before the wave hits the coast.**

Tsunami measuring up to 18 meters high are predicted to strike Mihama Town in the event of a large earthquake in the Nankai Trough off Japan's Pacific coast.

Kansai University Professor Tomoyuki Takahashi says marine observation using the radar will eventually yield more accurate tsunami predictions.

The massive devastation caused by the huge tsunami that hit northeastern Japan last year has been blamed on overly optimistic predictions released before tsunami hit the coast.

The group will refine the radar over the next 2 years to improve its accuracy, before putting it to practical use.

## Muon detectors to look inside damaged reactors

October 19, 2012

## Cosmic rays eyed to locate nuke fuel melt

<http://www.japantimes.co.jp/text/nn20121019a1.html>

Kyodo

WASHINGTON — Researchers from Los Alamos National Laboratory have developed a method to use cosmic rays to locate molten nuclear fuel within the crippled reactors at the Fukushima No. 1 nuclear power plant, the U.S. institute said Wednesday.

Monitoring data for a month or two by placing a pair of muon particle detectors in front of and behind the reactor buildings and the containment vessels will provide detailed images of the inside of the damaged reactors, it said.

A team from the New Mexico-based laboratory visited the Fukushima plant in May and confirmed they were able to place the detectors — about 3 to 5 meters wide and tens of centimeters thick — near the damaged reactors 1 and 2.

According to the U.S. laboratory, the team took note of muons that are generated when cosmic rays collide with atoms in the upper regions of the Earth's atmosphere. Massive numbers of muons shower the Earth every second.

Since muons are very light particles, they penetrate everything on Earth. But they change direction when they pass through heavy substances such as uranium and plutonium. Analyzing how they scatter can show what materials they passed through.

The newly devised method will allow images to be taken of the nuclear materials inside the reactors **based on the scattering of muons.**

Japan is struggling with decommissioning the Fukushima reactors due to the high amount of radiation at the power plant, which was crippled by the March 11 earthquake and tsunami last year.

Haruo Miyadera, a member of the research team, said the new method will lessen human exposure to the high radiation as it can show conditions in the reactor cores while workers stay outside.

"If we find where the molten nuclear fuel is located, it will give us a clue to understand what happened inside the reactors and help accelerate the decommissioning work," he said.

In addition to its potential utility at the Fukushima nuclear plant, the muon radiography method has been deployed to detect potential smuggling of clandestine nuclear materials in the United States, the institute said.

## The Choshi coast windmill

October 22, 2012

### **Giant off-shore wind turbine becomes Japan's latest renewable energy addition**

<http://mainichi.jp/english/english/newsselect/news/20121022p2a00m0na011000c.html>





A new, 80-meter-tall wind turbine is seen off the coast of Choshi, Chiba Prefecture, on Oct. 22. (Mainichi)

Members of the media got their first formal look at one of Japan's largest wind turbines on Oct. 22, the giant machine towering some 80 meters above the sea off the coast of Chiba Prefecture.

The government's New Energy and Industrial Technology Development Organization (NEDO) put on the tour to show off the new addition to Japan's renewable energy generating base. The turbine, with its three 46-meter-long blades, has a **maximum output of 2,400 kilowatts** of electricity from its spot embedded in the sea floor about 3 kilometers from the prefectural city of Choshi. **The location was chosen for its relatively high winds and because noise pollution was a minor concern so far off-shore.**

The project cost some 3.5 billion yen, two-thirds of which was borne by NEDO and the remaining one-third by Tokyo Electric Power Co. (TEPCO) **The turbine will begin feeding power into the TEPCO grid in January next year.**

As of the end of fiscal 2011, there were 1,870 wind turbines operating in Japan, each producing in the range of 1,000 to 2,000 kilowatts of electricity for a total of some 2.5 million kilowatts -- equivalent to the output of two to three nuclear reactors.

Off-shore wind farms are "wind power's trump card" in Japan, where mountainous country severely limits areas suitable for land-based wind farms, a NEDO representative stated.

In the case of the Choshi turbine, a foundation for the turbine was planted in the sea floor 12 meters below the surface. Testing of floating wind turbines, meanwhile, began in August this year with a 1,000-kilowatt capacity generator near Kabashima Island in Goto, Nagasaki Prefecture.

## Checking reactor No.1

October 25, 2012

### Survey balloon flown inside Fukushima reactor

[http://www3.nhk.or.jp/daily/english/20121025\\_10.html](http://www3.nhk.or.jp/daily/english/20121025_10.html)

The operator of the defunct Fukushima Daiichi nuclear plant has flown a balloon inside the No.1 reactor building to check the upper part of the structure.

Tokyo Electric Power Company on Wednesday launched a balloon from the first floor, to about 30 meters

up inside the building.

The 2 meter wide balloon was equipped with 4 cameras and a device to monitor radiation.

Photos showed concrete debris from a hydrogen explosion scattered on the upper floors. **But the crane for pulling out fuel rods, and a device for exchanging them, remained intact and had not fallen into the pool for spent fuel rods, as had been feared. [???**

Radiation levels registered at 150 millisieverts an hour around the building's second floor and 54 millisieverts an hour around the topmost fifth floor.

A previous attempt to check the upper floors with a balloon in August this year failed because it became snagged on debris. This time, workers redesigned the balloon.

The utility says it will make use of the photos to draw up a plan to scrap the reactor.

## What to do with so much contaminated water?

October 27, 2012

New treatment system could see discharges into Pacific as storage space rapidly runs out

### No. 1 radioactive water tanks maxed

<http://www.japantimes.co.jp/text/nn20121027x2.html>

By MARI YAMAGUCHI

AP

Workers at the Fukushima No. 1 plant are struggling to find space to store tens of thousands of tons of highly contaminated water used to cool its crippled reactors, the manager of the water treatment team said.

About 200,000 tons of radioactive water — enough to fill more than 50 Olympic swimming pools — are being stored in hundreds of gigantic tanks built around the complex. Tokyo Electric Power Co. has already felled trees to make room for more tanks and predicts **the volume of water will more than triple in three years.**

"It's a pressing issue because our land is limited and we would eventually run out of storage space," the water-treatment manager, Yuichi Okamura, told AP.

Tepco is close to starting a new treatment system that could make the water safe enough to discharge into the ocean. But its tanks are filling up in the meantime, mostly because cracks in reactor buildings are allowing groundwater in.

Experts worry the highly radioactive water could have a lasting impact on the environment, and fear that because of the reactor leaks and water flowing from one part of the facility to another, this is already happening.

Nuclear engineer and college lecturer Masashi Goto said the contaminated water buildup poses a long-term health and environmental threat. He worries the radioactive water in the reactor buildings' basements may already be seeping into the groundwater system, where it could travel far beyond the plant and possibly into public water supplies and the Pacific.

"You never know where it's leaking out and once it's out you can never put it back in place," he said. "It's just outrageous and shows how big a disaster the accident is."

The concerns are less severe than the nightmare scenario Tepco faced in the weeks after the March 11, 2011, earthquake and tsunami knocked out power and cooling systems at the power station, causing hydrogen explosions and three reactor core meltdowns in the world's worst nuclear disaster since Chernobyl.

The plant released radiation into the atmosphere, soil and ocean, and displaced more than 100,000 local residents who are uncertain when — or even if — they will be able to return home.

Dumping massive amounts of water into the stricken reactors was the only way to avoid an even bigger catastrophe.

Okamura remembers frantically trying to find a way to get water to the spent-fuel pools located near the top of the 50-meter-high reactor buildings. Without water, the spent nuclear fuel likely would have overheated and melted, dispersing radioactive smoke over a vast area and potentially affecting millions of people.

"The water would keep evaporating and the pools would have dried up if we had left them alone," Okamura said. "That would have been the end of it."

Attempts to dump water from helicopters were ineffective, and spraying water from fire trucks into the pools didn't work either. Okamura then helped bring in a huge, German-made pump normally used for concrete with a remote-controlled arm long enough to spray water into the fuel pools.

The plan worked — just in time, Okamura said.

Those measures and others helped bring the plant **under tenuous control**, but it will take decades to clean up the radioactive material emitted by the three wrecked reactors. And those desperate steps created another huge headache for Tepco: What to do with all the radioactive water that leaked out of the reactors and gathered in the basements of the buildings housing them and nearby facilities.

Some of the water ran into the Pacific, raising concerns about contamination of marine life and seafood. Waters within a 20-km zone are still off-limits, and high levels of contamination have been found in seabed sediment and fish tested in the area.

Okamura was tasked with setting up a treatment system that would make the water clean enough for reuse as a coolant, and was also aimed at reducing health risks for workers and environmental damage.

At first, Tepco shunted the tainted water into existing storage tanks near the reactors. Meanwhile, Okamura's 55-member team scrambled to get a treatment unit up and running within three months of the disaster — a project that would normally take about two years, he said.

"Accomplishing that was a miracle," Okamura said, noting a cheer went up from his men when the first unit started up.

Using that equipment, Tepco was able to circulate reprocessed water back into the reactor cores. But even though the reactors are now being cooled exclusively with recycled water, the volume of contaminated water is still increasing, **mostly because groundwater is seeping through cracks into the reactor building basements.**

Next month, Okamura said his group plans to flip the switch on new purifying equipment using Toshiba Corp. technology that is supposedly able to decontaminate the water by removing strontium and other nuclides potentially below detectable levels.

Tepco claims the treated water from this new system is clean enough to be released into the ocean, although it hasn't said whether it would actually do so. At any rate, that would require the permission of authorities and local consent and would also likely trigger harsh criticism at home and abroad.

To deal with the excess tainted water, the utility has channeled it to more than 300 huge storage tanks placed around the plant. Tepco has plans to install storage tanks for up to 700,000 tons — about three more years' worth of contaminated water. If those facilities were to be maxed out, it could build additional space for roughly two more years' worth of radioactive water, said Mayumi Yoshida, a Tepco spokeswoman.

But these forecasts hinge on plans to detect and plug holes in the damaged reactors to minimize leaks over the next two years. Tepco also plans to take steps to keep groundwater from seeping into the reactor basements.

Both are tasks Tepco is still unsure how to accomplish, as those areas remain so highly radioactive it is unclear how humans or even robots can operate in them.

There's also a risk the storage tanks and jury-rigged pipe system connecting them could be damaged if the area is struck by another powerful quake or tsunami.

Goto, the nuclear engineer, believes it will take far longer than Tepco's goal of two years to repair all the holes in the reactors. The plant also would have to deal with contaminated water until all the melted fuel and other debris is removed from the reactors — a process that will easily take more than a decade.

He described Tepco's road map for dealing with the problem as "wishful thinking," adding that "the longer it takes, the more contaminated water they get."

## **TEPCO fully aware of consequences**

November 2, 2012

### **Worker files legal complaint against Tepco - Nuclear crisis crew not told of danger**

<http://www.japantimes.co.jp/text/nn20121102a1.html>

By MARI YAMAGUCHI

AP

IWAKI, Fukushima Pref. — Tepco knew full well of the risks from highly radioactive water at the Fukushima No. 1 plant following the tsunami-triggered meltdowns but sent in crews without adequate protection or warnings anyway, one worker has alleged in a legal complaint.

The actions by Tokyo Electric Power Co. led to radiation injuries, said the contract worker, who was with a six-member team working at the crippled power plant's reactor 3 in the early days of the nuclear crisis.

The worker gave a rare public account of what happened at the complex after the disaster struck, speaking on condition that he be identified only as Shinichi, his given name.

Shinichi, 46, described a harrowing scene of darkness and fear, wading by the lights from their helmets into a basement flooded with steaming radioactive water that felt warm even through boots. "It was outrageous. We shouldn't even have been there," he said.

He said his crew was sent to lay electric cables in the basement of the unit 3 turbine on March 24 last year, just 10 days after its reactor building exploded, spewing massive amounts of radiation into the environment. Their mission was to restore power to pumps to inject cooling water into the overheating spent-fuel pool.

Shinichi said Tepco and Kandenko, its primary subcontractor, never warned them even though water leaks had been found elsewhere at the site.

Asked about Shinichi's allegations, Tepco spokesman Yoshimi Hitosugi claimed the utility was aware of water leaks elsewhere at the plant but couldn't anticipate the problem in the basement of reactor 3, which had suffered a meltdown.

Shinichi's radiation exposure that day alone exceeded half the government's annual dose limit, and he had to stop working at the plant soon afterward.

Out of fear of harassment of his family due to the tendency of some Japanese to stigmatize those perceived as different or as troublemakers, Shinichi agreed to speak with AP and several Japanese reporters on condition his face not be photographed.

On Tuesday, he filed a complaint with a labor standards office in Fukushima, asking authorities to confirm Tepco's safety violations and issue improvement orders. He also is seeking penalties — up to six months in jail or fines of up to ¥500,000 under the Industrial Safety and Health Law — against the company that supervised him.

Shinichi's direct employer, Kandenko, stopped calling him for jobs in March, just telling him to stand by. He now works on radiation decontamination of hot spots in Fukushima Prefecture.

"So I decided I've had enough of this unjust treatment. That's why I decided to come forward," he said.

On the morning of March 24, 2011, Shinichi's team gathered at the Fukushima No. 1 power station's emergency command center to be briefed about the day's work. They donned double-layer coveralls underneath waterproof hazmat suits, charcoal-filtered full-face masks and double-layered rubber gloves.

Each picked up a pocket dosimeter with an alarm set to 40 times the dose detected the day before, expecting only a moderate increase of radioactivity. The actual reading was 400 millisieverts that day — high enough to cause a temporary, but not life-threatening, decline in white blood cells.

The March 2011 earthquake and tsunami destroyed power and crucial cooling systems at the complex, sending three reactors into core meltdowns and releasing huge amounts of radioactive fallout. Tons of cooling water were pumped into the overheated and damaged reactors and leaked right out, pouring into the basements of the buildings housing them and nearby facilities.

**Shinichi recalls a simple instruction: Just go in and connect the first floor and basement electrical switchboards. The radioactivity might be a bit high, but shouldn't be a problem.**

**"There was no mention of the water," he said.**

So the men wore whatever boots were available. Only two wore knee-high rubber boots, and four others, including Shinichi, wore short ones. With only lamps on their helmets to light the way, they entered the building from a hole cut into the wall, since the electric door was still inoperable. Three men hired by two other contractors went into the basement, while Shinichi and his two other colleagues waited on the first floor. Looking down, he saw water, with steam rising from the surface, and heaps of debris and mangled equipment.

"It was eerie," he recalled. "If you're a nuclear plant worker, you know that water on the floor is bad news. You just don't touch it."



The dosimeter alarms — set to beep five times before reaching a maximum — sounded several times shortly after they entered the site.

Seconds after the three workers started going into the basement, the dosimeters began ringing loudly and then went silent, a sign the intended limit had been exceeded, though the team's leader said it must be an error. The three workers in the basement waded through ankle-deep water to check the wall-mounted switchboard and came back up, saying the water felt warm through their rubber boots.

Another team sent in to do other tasks rushed back out without doing any work, ignoring Shinichi's team, after measuring dangerously high radioactivity in the basement.

But his group stayed, making several more trips into the flooded basement. Two workers wearing short boots got their feet soaked and suffered beta-ray burns that were not life threatening. The three men who stayed there the longest were exposed to about 180 millisieverts — nearly four times the annual safe limit, according to a government report released in July. Shinichi refused to help tie up the dangling cable in the basement because of his short boots, and a colleague wearing long boots volunteered to do the task instead, saving Shinichi from injury.

Tepco spokeswoman Mayumi Yoshida said the team leaders later told officials they had decided to remain because they took their mission very seriously and might have been too occupied to think carefully about the water. But the utility should have thought more carefully, she conceded.

Shinichi's radiation exposure from 13 days of working at the plant was just over 20 millisieverts, not considered a serious health risk, though he still worries.

His lawyers, who are representing several nuclear plant workers in other cases, say Tepco and Kandenko illegally sent him and five other men into areas with radioactivity far exceeding the allowable limit without full protection.

"Just sending the workers into the harsh environment and putting them at risk of exposure to dangerously high radiation is a labor safety violation," said Taku Yamazoe, a lawyer representing Shinichi. "Even if Tepco didn't anticipate the consequences of all that water it had pumped in, it clearly lacked consideration for the workers' safety."

Shinichi's experience was typical of the inadequate protection received by workers laboring in the extremely harsh conditions at the plant, though Yamazoe said the multitiered subcontracting system used at nuclear plants can obscure who is directly responsible in the event of an accident.

Probes by the government, the Diet and private groups have faulted Tepco for its inept crisis management, inadequate emergency training and miscommunication with authorities.

**The Diet investigation took Tepco to task for failing to deal with leaking contaminated water until the two workers suffered beta-ray burns in reactor 3, concluding the operator was fully aware of the consequences of massive spraying and pumping of water into the units and spent-fuel pools from the start.**

Shinichi said that when he finished work at the nuclear plant each day, he would take off his clothes before entering his home to minimize the risk of exposing his 5-year-old son to radiation.

"I don't have education, and I'm already over 40. There is little choice," he said. "I was dumped. I worked hard, sacrificed my family and my child, and this is how I ended up."

## **Situation at Fukushima Daiichi very fragile**

### **Nuclear Watch on NHK: Still struggling**

<http://www3.nhk.or.jp/nhkworld/english/movie/feature201211022000.html>

## **What's a subcontractee's life worth?**

November 3, 2012

### **TEPCO admits 4th worker exposed to radiation in early days of disaster**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201211030052>

A full one year and eight months after the Fukushima nuclear disaster, plant operator Tokyo Electric Power Co. has acknowledged that four workers, not three as it had maintained, were exposed to varying levels of radiation soon after the crisis unfolded.

It said the men were working in the basement of the turbine building for the No. 3 reactor at the Fukushima No. 1 nuclear power plant.

TEPCO and its business partner Kandenko Co. had previously said that only three workers waded through highly contaminated water on March 24, 2011.

That story held up until last month. A different worker revealed during a Nov. 1 news conference that he had refused to go to the basement but someone else went there.

TEPCO and Kandenko confirmed the veracity of the man's statement on Nov. 2.

It emerged that a team of six workers was dispatched to the turbine building to lay cables as part of emergency procedures following explosions and reactor meltdowns triggered by the magnitude-9.0 Great East Japan Earthquake of March 11 and the massive tsunami it spawned.

Of the six, two were Kandenko employees. One was an employee of a first-tier subcontractor. The other three worked for a second-tier subcontractor.

The two Kandenko employees and the man working for a first-tier subcontractor ventured to the basement and went about their tasks while ignoring dosimeters clicking ever faster due to the high radiation levels.

The three were exposed to about 180 millisieverts of radiation--a dangerously high level--that required immediate medical treatment.

According to the explanation given by TEPCO and Kandenko on Nov. 2, the three employees of the second-tier subcontractor were ordered by Kandenko to go to the basement just as the cable work was finishing.

One of the three, who was wearing protective rubber footwear, spent five to 10 minutes there and was exposed to 56 millisieverts of radiation, not a high enough level to cause health problems, TEPCO said.

When pressed about the discrepancy, TEPCO said there was no deliberate attempt to cover up the facts.

"It was our understanding that the worker in question was carrying out a different task from other three who were in the basement for a long time. There was no deliberate attempt to conceal this fact (that a fourth worker was exposed as a result of wading through contaminated water)."

A Kandenko official added: "Nobody forced the worker to go to the basement against his will. We filed a report with the government that said, in addition to the three men, another worker went to the basement."

It turns out that was not the end of the matter.

While the three workers toiled away in the basement, a separate team measured high radiation of 400 millisieverts per hour near the water surface there and immediately tried to flee the area. The members of that team told the Kandenko workers to evacuate immediately.

It was before this chaotic rush that the fourth worker ventured to the basement, according to TEPCO and Kandenko.

However, a worker who gave a news conference on Nov. 1 offered a different version of events.

"After the other team called on the (Kandenko-led) team to flee, the fourth worker was ordered down to the basement," he said.

However, the man, fearful of entering an area with high radiation levels, did not follow the instruction.

November 7, 2012

### **Fukushima Daiichi plant given special status for enhanced oversight**

<http://mainichi.jp/english/english/newsselect/news/20121107p2g00m0dm062000c.html>

TOKYO (Kyodo) -- Japan's nuclear regulatory authority on Wednesday designated the Fukushima Daiichi nuclear power plant as a facility that requires special management, a move aimed to enhance regulators' oversight of the complex hit by a meltdown disaster.

The Nuclear Regulation Authority also decided on a set of measures plant operator Tokyo Electric Power Co. should take so that safety will be ensured through the decades-long process to decommission four severely damaged units at the plant in northeastern Japan.

It also asked the utility to maintain the stable condition of the remaining two reactors that achieved cold shutdown after the plant was hit by a massive earthquake and tsunami on March 11, 2011, which triggered the nuclear crisis.

"This is work that may continue for generations. We will seek to ensure that the experiences (on safety measures) are passed on," NRA Chairman Shunichi Tanaka told the meeting of the authority's members.

Following the designation, the utility known as **TEPCO is expected to submit a plan by Dec. 7 on how it will implement the measures requested by the regulators.**

November 15, 2012

### **New camera shows radiation levels**

[http://www3.nhk.or.jp/daily/english/20121115\\_49.html](http://www3.nhk.or.jp/daily/english/20121115_49.html)

Japan's space agency and a leading machinery maker have developed a camera for use at the crippled Fukushima nuclear power plant. The device is designed to help in cleaning up leaked radioactive materials.

The Japan Aerospace Exploration Agency and Mitsubishi Heavy Industry unveiled a prototype of the camera on Thursday. The device has a sensor for high radiation.

The camera shows levels of radioactivity on a monitor in red, yellow or green for different levels of contamination.

The developers say it will help protect people working on decontamination and check the effectiveness of their work.

The device can capture views of 180 degrees -- much wider than those of other cameras.

The makers plan to market the product by next March.

## **New camera shows radiation**

November 17, 2012



No longer invisible: A Mitsubishi Heavy Industries Ltd. official shows off a special video camera Thursday in Tokyo that can record and visualize the distribution of radioactive fallout. KYODO

### **Mitsubishi Heavy develops camera for real-time visualization of radiation**

<http://www.japantimes.co.jp/text/nb20121117a3.html>

Jiji

Mitsubishi Heavy Industries Ltd. said it has developed a special video camera that can record and visualize the distribution of radioactive materials, in collaboration with the Japan Aerospace Exploration Agency.

Mitsubishi Heavy hopes the video camera will be used in decontamination work in areas polluted with radioactive substances from the Fukushima No. 1 nuclear plant, the company said Thursday.

The video camera allows real-time observation of radioactive substances accumulated on the ground or rooftops and the directions of airborne substances.

It can shoot at a wider range compared with conventional cameras as it is equipped with a superwide-angle lens that can film 180 degrees horizontally and vertically.

It works in tandem with a personal computer. The amount of radioactive materials and the type of materials are shown by different colors on the PC screen.

The video camera, which will cost several million yen, will be released by the end of March. Prefectural governments and power companies are expected to be main buyers, the firm said.

## Loans for renewable energy multiplied by 4

November 20, 2012

### Renewable energy loans surge

<http://www.japantimes.co.jp/text/nb20121120a3.html>

Jiji

Japan Finance Corp. saw its loans for projects related to renewable energy surge 4.1-fold from a year before in the April-September period thanks to the introduction of a new feed-in tariff system in July, according to sources.

The government-affiliated lender extended ¥10.761 billion in such loans in the first half of fiscal 2012, the sources said, adding that the number of projects involved doubled year on year, reaching 925.



In fiscal 2011, main borrowers of the lender's renewable energy promotion loans were real estate companies seeking to install solar panels at condominium complexes under their management amid concerns about electricity shortages amid the nuclear power shutdown.

But in the current fiscal year, loans to small and midsize companies and self-employed people have been increasing as they started power generation businesses using renewable energy on the back of the feed-in tariff system, the sources said.

In the first half, the lender's renewable energy loans shot up 28.7-fold in sunny Kyushu. Loans increased 10.6-fold in the Kinki region and 2.5-fold in the Tokai region, according to the sources.

Japan Finance is also active in providing loans in fields other than solar power. By June, it had extended loans jointly with Toho Bank, a regional bank in Fukushima Prefecture, to Green Hatsuden Aizu Co. in Aizuwakamatsu. The firm produces wood biomass for generating power.

## A new robot for Fukushima Daiichi

November 21, 2012

### 4-legged robot developed to search inside reactor

[http://www3.nhk.or.jp/daily/english/20121121\\_32.html](http://www3.nhk.or.jp/daily/english/20121121_32.html)

Japanese electronics manufacturer Toshiba has developed a 4-legged robot to inspect the inside of damaged reactors at the Fukushima Daiichi nuclear power plant.

The radio-controlled robot stands about 1 meter tall. It has four 70-centimeter-long legs, 6 video cameras and a radiation detector.

The robot can step over obstacles up to 40 centimeters high and climb up and down stairs.

Riding atop the robot is a small vehicle with a camera attached. The robot uses its arm to unload the vehicle so it can inspect tiny spaces like the undersides of pipes.

Toshiba says the robot can work for 300 days in a high-radiation environment.

The company has proposed that the operator of the Fukushima plant, Tokyo Electric Power Company, use

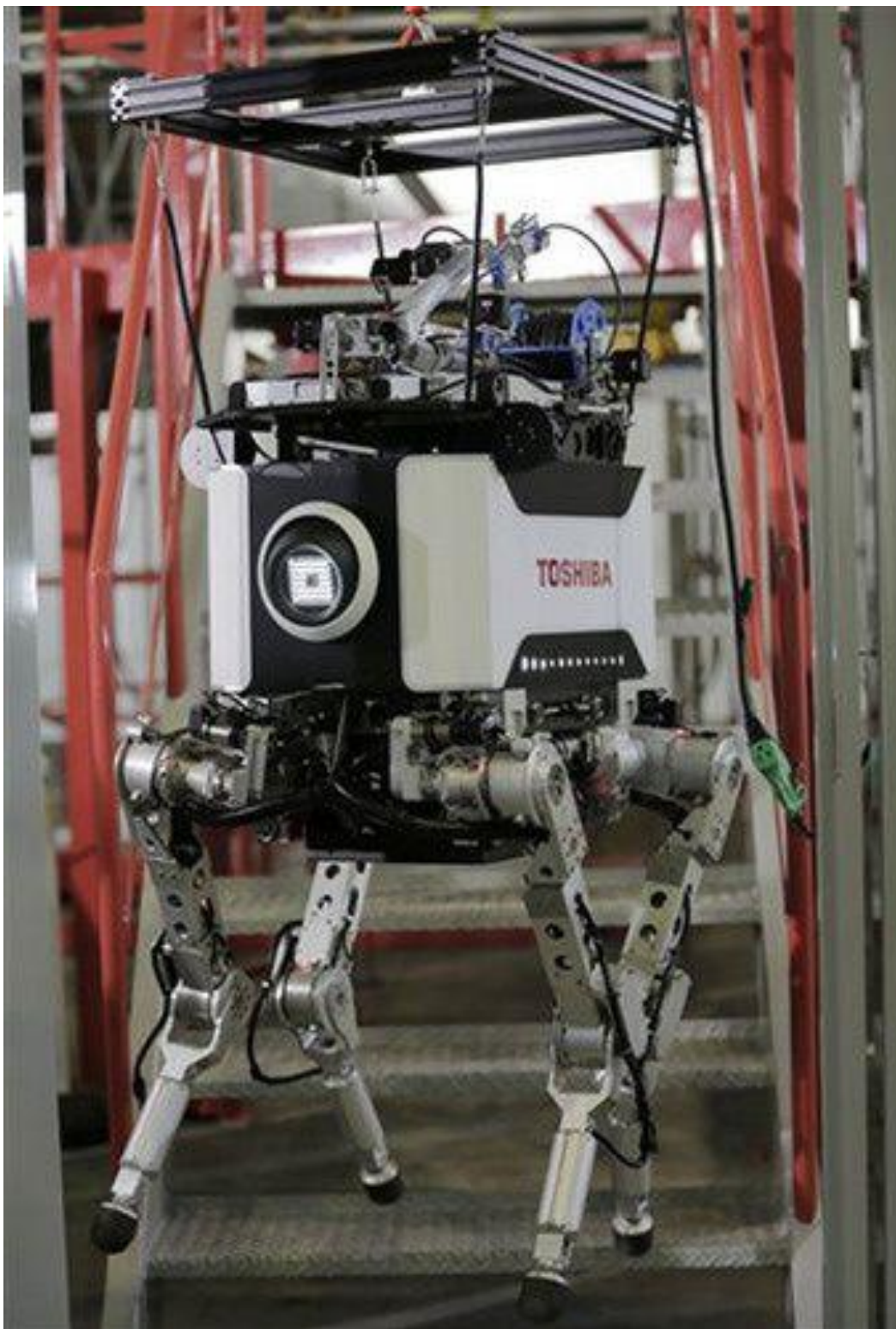
the machine in research related to scrapping the damaged reactors. That job is expected to take 30 to 40 years to complete.

Goro Yanase of Toshiba says he wants to develop robots that can carry heavy loads or carry out more complex tasks.

November 22, 2012

### **Toshiba shows off robot meant to help at nuke site**

<http://mainichi.jp/english/english/newsselect/news/20121122p2g00m0dm024000c.html>



Toshiba Corp.'s nuclear inspection robot is set on stairs before climbing them during a demonstration at a Toshiba factory in Yokohama on Nov. 21, 2012. The four-legged robot is designed to help at the meltdown-crippled Japanese nuclear plant, climbing over debris and venturing into radiated areas off-limits to human workers. (AP Photo/Itsuo Inouye)

YOKOHAMA, Japan (AP) -- Toshiba Corp. has developed a robot it says can withstand high radiation to work in nuclear disasters, but it's not clear what exactly the robot is capable of doing if and when it gets the go-ahead to enter Japan's crippled Fukushima Dai-ichi nuclear plant.

The four-legged robot can climb over debris and venture into radiated areas off-limits to humans. One significant innovation, Toshiba said, is that its wireless network can be controlled in high radiation, automatically seeking better transmission when reception becomes weak.

But the machine, which looks like an ice cooler on wobbly metal legs, also appears prone to glitches. The robot took a jerky misstep during a demonstration to reporters, freezing with one leg up in the air. It had to be lifted by several people and rebooted.

The robot was also notably slow in climbing a flight of eight steps, cautiously lifting its legs one by one, and taking about a minute to go up each step.

With obstacles that aren't as even and predictable as steps, such as the debris at the Fukushima plant, it may need as much as 10 minutes to figure out how to clear the object, Toshiba acknowledged. And if it ever falls, it will not be able to get up on its own.

Still, Tokyo Electric Power Co. said it might use the robot to inspect the suppression chamber of the nuclear plant where a devastating meltdown occurred after a mammoth tsunami slammed into northeastern Japan on March 11, 2011.

Toshiba began developing the robot with hopes it would prove useful in helping to decommission the plant. No human has been able to enter the highly-radiated chamber since the tsunami disaster.

"We need this to go in and first check what is there," Toshiba Senior Manager Goro Yanase said Wednesday.

It was unclear when a decision on the robot's use would be made, according to TEPCO, which operates the nuclear plant.

Although what Toshiba showed was top-notch robotics, what the machine might be able to do appeared limited in the face of the disaster's magnitude and complexity.

Japan boasts among the world's most sophisticated robotics technology, exemplified in the walking, talking human-shaped Asimo robot from Honda Motor Co. The inability of such gadgetry to help out with the Fukushima disaster was widely criticized.

Part of the reason is that robots, although suited for tasks such as greeting visitors at dealerships, are too delicate. Their wireless remote-controlled networks are not designed to endure high radiation. Honda has acknowledged Asimo would not have been able to withstand the environment at Fukushima, as some had suggested.

Toshiba's Yanase said the new robot, which has a dosimeter to measure radiation and six cameras, can stay in a 100 millisievert environment for about a year and can tolerate even higher radiated areas for shorter periods. At 100 millisieverts, the rise in cancer cases caused by radiation becomes statistically detectable, although even lower dose radiation is not advisable for people.

The suppression chamber was 360 millisieverts the last time it was measured, TEPCO said. Decommissioning Fukushima Dai-ichi is expected to take decades.

## Another nuclear disaster robot

November 25, 2012

### **N-disaster robot Rosemary struts its stuff in Asakusa**

<http://www.yomiuri.co.jp/dy/national/T121124002995.htm>

Rosemary, a robot developed by the Chiba Institute of Technology for use in nuclear disaster rescue operations, was demonstrated in the Asakusa district of Taito Ward, Tokyo, on Friday.

The demonstration was held on the Asakusa Sushiya-dori shopping street to show how the robot responds to various obstacles by climbing over wood and other objects representing disaster debris.

The robot, the latest to be developed by the university, is set to be deployed at Tokyo Electric Power Co.'s crippled Fukushima No. 1 nuclear power plant in Fukushima Prefecture.

There are high expectations that the robot, which can be controlled remotely using a video-game controller, will take photos and record radiation levels inside reactor buildings that are inaccessible to humans.

Equipped with belt-covered wheels similar to those of military tanks, the robot can mount slopes as steep as 60 degrees, according to the university.

The demonstration by the university's robot development team was held as part of the shopping arcade association's customer appreciation festival. Residents and tourists watched the robot show its moves.

## **Fire in reactor No.4 on March 15?**

November 30, 2012

### **New View from Inside Fukushima: Chaos and Uncertainty**

<http://green.blogs.nytimes.com/2012/11/30/new-view-from-inside-fukushima-chaos-and-uncertainty/?smid=tw-share>

By HIROKO TABUCHI

Even in the early days of the disaster at the Fukushima Daiichi Nuclear Power Plant in March of last year, as the reactors spiraled out of control, the terse statements issued by the operator felt like an exercise in denial. Radiation readings were “higher than the ordinary level” (about 100 times higher), and a “loud noise and white smoke” had hit the No. 4 reactor (a possible hydrogen explosion).

Now, footage released by the operator from the crisis's early days – the second set of recorded teleconferences between the command center of the tsunami-hit plant and the company's headquarters in Tokyo – demonstrates just how little those announcements reflected the chaos and uncertainty on the ground. The gap between the initial assurances given by company and government officials, and the ultimate scale of the nuclear disaster, has helped fuel a crippling public mistrust of government.

The 300 hours of grainy video made public by the Tokyo Electric Power Company on Monday pick up where a previous batch of videos left off, on March 15, five days after the tsunami knocked out the plant's power. By then, the plant had been rocked by two explosions and the cores of three reactors had melted down, prompting Masao Yoshida, the plant's unflappable chief, to warn of “acute danger.”

In the early hours of March 15, Mr. Yoshida raised a new concern, this time about flames sighted deep within the building housing the No. 4 reactor, which was shut down at the time of the disaster. But the reactor building housed almost 1,500 highly radioactive spent fuel assemblies in a pool of water, and it was the second fire spotted there in less than 24 hours.

“We would go put out the flames if we could, but we don’t have the tools. We have nothing,” Mr. Yoshida pleaded with headquarters. He inquired whether there was any truth in speculation that the United States Army – which had a presence in Japan – might send a helicopter to help douse the flames with water. With the plant’s phone lines down, he enlisted the help of personnel at a neighboring nuclear power plant in alerting the local fire brigade, but its calls went unanswered.

Tokyo headquarters soon suggested the company would have to issue a statement: TV networks with cameras trained on the plant could broadcast fire or smoke, leading to panic.

After some tweaking, Tokyo Electric issued a statement saying that a fire had been spotted at the No. 4 reactor building, and that the site personnel were attempting to put out the blaze.

**“Calling the fire department counts as attempting to put out the blaze, right?”** an official at headquarters said wanly.

The plant personnel were just as evasive when they finally got through to local firefighters, choosing to say nothing about high radiation readings at the plant.

“There’s no use in us telling the fire department. That’s a conversation that needs to happen at higher levels,” an official at headquarters said.

That lack of disclosure backfired, however, when the fire brigade, learning of high radiation levels at the plant’s gates, initially refused to venture in, and even pulled some men back.

The footage also shows that an operation to drop water from military helicopters onto another reactor at the site – hailed at the time by Tepco officials as a success – was received by plant workers with far less enthusiasm.

There was initially tangible excitement in the plant’s control room as workers huddled to watch live TV footage of the helicopters approach one of the reactors. “There it goes” and “Go! Go!” officials can be heard shouting.

But much of the water appeared to miss the reactor, dissipating in a mist of white. “Uhh...,” a chorus of disappointed voices cried out.

“That was just a quick misting,” said an abject voice off camera. “It didn’t hit at all.”

December 1, 2012

## "...idly waiting for death" - How much radioactive water flowed into the sea?

### TEPCO failed to respond to dire warning of radioactive water leaks at Fukushima

- Previous Article Tests show normal rate of thyroid cysts in Fukushima children
- Next Article Fukushima plant chief defied TEPCO headquarters to protect workers

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201212010037>

Tokyo Electric Power Co. dawdled on measures to prevent leaks of highly radioactive water during the Fukushima nuclear crisis, despite the plant manager's warning that "we are idly waiting for death."

The radioactive water from the Fukushima No. 1 nuclear plant eventually flowed into the sea.

TEPCO's inaction was revealed in a second batch of videos shown to journalists on Nov. 30. The videos cover 335 hours and 54 minutes of TEPCO's in-house teleconferences from March 16-23 and from March 30 through April 6 during the early phases of last year's disaster.

Masao Yoshida, general manager of the crippled nuclear plant, had been calling for the installation of cameras in the turbine buildings of the No. 1 through No. 4 reactors to gauge water levels. He feared that radioactive coolant water was leaking out of the reactors.

About 100,000 tons of water had accumulated in the basements of turbine buildings as frantic efforts to cool off the damaged reactors continued.

On March 27, water was found leaking into a pit between a turbine building and the sea. The water level in the pit was several dozen centimeters short of overflowing and pouring into the sea.

"I can't help but feel that we are idly waiting for death," the footage showed Yoshida telling officials at TEPCO headquarters in Tokyo at 6:38 p.m. on March 30.

His pleas continued at a teleconference that started at 8:20 p.m. the same day.



"It's like my heart could stop at any moment when I think about the water levels," he said. "I request quick installation of a mechanism to monitor water level variations both remotely and accurately."

But Ichiro Takekuro, a senior official at the head office, only gave a halfhearted response.

"I think we will probably be able to discuss things tomorrow, including setting really concrete goals," he said.

The cameras were not installed before workers at the Fukushima plant reported a disturbing development to the TEPCO head office around 11 a.m. on April 2. They discovered radioactive water was leaking into the sea from a crack in the wall of a working pit near the water intake of the No. 2 reactor.

"We have confirmed a worst-case situation," a plant official said. "Water with very high radiation levels, exceeding 1,000 millisieverts per hour, is flowing into the sea."

The leak was plugged at dawn on April 6, after a chemical agent was injected into the crack to vitrify sand. TEPCO said an estimated 520 cubic meters of radioactive water leaked into the sea from the pit.

TEPCO's release of the videos followed earlier disclosure in August of 150 hours and 42 minutes of recordings from March 11-15, 2011. The meltdowns at the Fukushima plant were caused by the Great East Japan Earthquake and tsunami on March 11 that year.

The first three hours or so in the March 16 footage lacked sound.

For both disclosures, journalists were allowed to view the footage but could not make audio or video recordings. They were also told not to publish individuals' names that were not mentioned in TEPCO's disaster investigation report.

(This article was written by Takashi Sugimoto and Hideaki Kimura.)

## TEPCO shows Fukushima footage leading to tainted water release

<http://mainichi.jp/english/english/newsselect/news/20121201p2g00m0dm008000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co., the operator of the crisis-hit Fukushima nuclear power plant, disclosed Friday additional video recordings of its in-house teleconferences in the early phase of the 2011 disaster, showing tense exchanges between its employees prior to the controversial release of radioactive water into the sea.

A part of about 336 hours of the footage, recorded between March 16 and 23 and March 30 and April 6, 2011, uncovered the difficulties faced by TEPCO to deal with tainted water building up in the basements of the No. 5 and No. 6 reactors.

Former chief of the plant Masao Yoshida told the head office in Tokyo on April 4 that there would not be enough time to make tanks to store radioactive water.

"Please make some kind of decision," Yoshida said in the footage. "Handling the water is an urgent issue." In response, a TEPCO executive, Ichiro Takekuro, said, "We would have to make an important decision. After this meeting is over, we would immediately discuss."

After the conversation, TEPCO, the Nuclear and Industrial Safety Agency and the Nuclear Safety Commission, as an emergency step, decided to release low-level radioactive water, which met with strong criticism at home and abroad.

The actual decision-making process was not recorded in the footage made available to the media on Friday. The utility said that the decision was made in a separate room that had no teleconference connections.

Since the Fukushima disaster, triggered by the March 11 earthquake and tsunami, **TEPCO estimates that 18,000 terabecquerels of radioactive materials have been released by the end of September into the Pacific Ocean.**

## **Radioactive water into Pacific**

[ see articles from the previous day in the same section ]

December 2, 2012

## **New footage shows discussions leading to release of radioactive water into Pacific after Fukushima nuclear meltdowns**

<http://www.japantimes.co.jp/text/nn20121202a8.html>

Kyodo

Tepco has disclosed additional video footage of its in-house teleconferences during the early stage of the nuclear disaster at its Fukushima No. 1 complex, showing tense exchanges between the utility's employees prior to the controversial discharge of radioactive water into the Pacific.

The roughly 336 hours of footage made available by Tokyo Electric Power Co. to the media Friday — recorded last year from March 16 to 23 and March 30 to April 6 — show the difficulties the company faced in handling the volume of highly contaminated water that was rapidly building up in the basements of reactors 5 and 6.

The recordings show Masao Yoshida, chief of the Fukushima No. 1 power plant at the time, telling Tepco's head office in Tokyo on April 4 that there wouldn't be enough time to build tanks to store all of the radioactive water.

"Please make some kind of decision," Yoshida is seen pleading with senior Tepco officials in the new footage. "Handling the water is an urgent issue."

In response, Tepco executive Ichiro Takekuro says: "We have to make an important decision. After this meeting is over, we will immediately discuss it."

After the conversation, Tepco, the now-defunct Nuclear and Industrial Safety Agency and the Nuclear Safety Commission decided — as an emergency step — to release water contaminated with relatively low levels of radioactive materials into the Pacific Ocean. The move met with harsh criticism both at home and abroad.

The actual decision-making process was not captured in the footage released Friday. Tepco said the decision was reached in a separate room that lacked teleconferencing facilities.

The utility estimates that 18,000 terabecquerels of radioactive materials were spewed into the Pacific between the start of the triple-meltdown crisis at the No. 1 plant on March 11, 2011, and this September.

## Public concern pushes TEPCO to accelerate its plans

December 3, 2012

### TEPCO speeds up removal of spent fuel rods

[http://www3.nhk.or.jp/daily/english/20121203\\_22.html](http://www3.nhk.or.jp/daily/english/20121203_22.html)

Tokyo Electric Power Company and the Japanese government have decided to accelerate the removal of spent fuel rods from one of the reactor buildings at the crippled Fukushima Daiichi nuclear power plant.

TEPCO and government officials on Monday reviewed their medium- and long-term plan aimed at eventually decommissioning all the reactors at the plant, which was damaged by the March 11th earthquake and tsunami last year.

They agreed to complete the removal of the fuel rods from a storage pool at the No. 4 reactor building by December of 2014, a year earlier than initially scheduled. They say this is possible because of improved procedures.

To achieve this goal, work to remove the fuel rods will start in November of next year, a month earlier than initially planned.

The officials regard the removal of the fuel rods from the No. 4 reactor building as the first important step toward decommissioning the facility.

In Monday's meeting, officials reported a 3-month delay in installing new equipment for removing various kinds of radioactive contaminants from the water used to cool the damaged reactors.

### TEPCO speeds up removal of spent nuclear fuel rods

[http://www3.nhk.or.jp/daily/english/20121203\\_08.html](http://www3.nhk.or.jp/daily/english/20121203_08.html)

The operator of the crippled Fukushima Daiichi nuclear power plant says it will speed up the removal of spent nuclear fuel rods from the No.4 reactor, to respond to safety concerns.

Tokyo Electric Power Company and the government will likely endorse the decision on Monday as they review their schedule for scrapping all damaged nuclear reactors at the plant.

The removal of spent fuel rods from the No.4 reactor is viewed as the important first step of the entire procedure.

Under the revised plan, removal is scheduled for November 2013, one month earlier than the original plan, and completion for December 2014, one year earlier.

The move came after **growing public concern over the earthquake resistance of the fuel pool** at the No.4 reactor, which suffered a hydrogen explosion shortly after the massive earthquake and tsunami last year.

The utility says the process could be further accelerated by increasing the number of steel containers to store the spent fuel rods after they are removed from the pool.

Attention is focused on whether TEPCO and the government can hold to the overall decommissioning schedule, while ensuring the safety of workers and the procedure.

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## Speeding up fuel removal at No.4

December 4, 2012

### **Tepco moves up nuclear salvage schedule for Fukushima fuel rods to 2014**

<http://www.japantimes.co.jp/text/nn20121204a4.html>

Kyodo

Tokyo Electric Power Co. and the government said Monday they will attempt to remove all 1,533 fuel assemblies in the spent-fuel pool perched atop reactor 4 at the crippled Fukushima No. 1 plant by the end of 2014.

The schedule was moved up by a year amid lingering concerns about the condition of the unit, where hundreds of fuel assemblies had been stored before last year's quake and tsunami triggered three core meltdowns at the Fukushima plant and damaged four of its six reactors.

The upper part of the building housing reactor 4 was severely damaged by a hydrogen explosion caused by the meltdowns, sparking **concern the remaining structure might collapse in another big quake and dump the pool and its rods onto the ground.**

The fuel rods, exposed to the air, might then burn up and release massive amounts of radiation into the atmosphere. Some experts dispute this possibility.

Nevertheless, the issue at unit 4 caused enough concern to have the structure holding up the pool reinforced and a lid put on it.

Tepco plans to start extracting the fuel assemblies in November 2013, a month earlier than scheduled, because debris clearance in the upper part of the building went well enough that it can skip some of the preparatory work that was deemed necessary earlier.

To hasten the process, the utility plans to use two containers instead of one as earlier planned to transport the assemblies to a so-called common pool in a different building at the site. This is expected to provide more stable conditions for keeping the fuel cool.

The operation is part of the process of dismantling units 1 to 4.

When the plant was rocked by the offshore earthquake and its tsunami on March 11, 2011, unit 4 was offline for maintenance and its fresh fuel had been stored in the spent-fuel pool.

The pool contains 1,331 spent fuel assemblies and 202 fresh ones. The utility has already succeeded in taking out two unused assemblies in a trial.

See also:

### **TEPCO aims to end Fukushima No. 4 unit's fuel removal in 2014**

<http://mainichi.jp/english/english/newsselect/news/20121204p2g00m0dm021000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. and the government said Monday they will seek to complete the removal of all fuel assemblies inside the No. 4 unit of the crippled Fukushima Daiichi nuclear plant by the end of 2014, a year earlier than initially planned.....

## **Closing the port of Fukushima to keep radioactive fish in**

## TEPCO considers net in nuke plant port to prevent irradiated fish from heading seaward

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201212040094>



By MASAKAZU HONDA/ Staff Writer

Tokyo Electric Power Co. may string nets across its port at the stricken Fukushima No. 1 nuclear power plant to prevent fish contaminated with radiation from reaching the sea.

In surveys conducted through October, greenling caught in the littoral zone of the Otagawa river, about 20 kilometers north of the crippled plant, showed relatively low figures, with 1,350 becquerels per kilogram the maximum. Many greenlings had readings of around 100 becquerels.

But TEPCO also found in the port that species of Conger eel had 15,500 becquerels and other species of fish had 4,200 becquerels, sources said. Conger eels from outside the port posted 100 becquerels or lower.

One hundred becquerels is the standard [read the top limit] for common foodstuffs

At the request of local fishery cooperatives, TEPCO has been studying ways to contain fish in the port.

Sources said the company is considering setting up a 2-kilometer net at the mouth of the port and along the inside of the port's levees. The measure would be accompanied with dredging of mud in the port.

A similar net was rigged up in 1974 in Minamata Bay to prevent mercury-tainted fish from spreading outside the bay. The net stretched 4.4 kilometers at one point. It was removed after the bay was declared safe in 1997.

At Fukushima, a vast amount of contaminated water that includes radioactive substances has been discharged into the sea since the nuclear disaster triggered by the March 11, 2011, Great East Japan Earthquake and tsunami.

"We have been asking TEPCO to close the port after receiving data showing high levels of contamination," said an official at a local fisheries cooperative. "There are openable nets that will allow dredgers to enter. TEPCO's response is too slow."

By MASAKAZU HONDA/ Staff Writer

## ALERT FUKUSHIMA

December 7, 2012

### **Magnitude 7.3 quake hits northeast Japan**

[http://www3.nhk.or.jp/daily/english/20121207\\_47.html](http://www3.nhk.or.jp/daily/english/20121207_47.html)

A strong earthquake has hit northeastern Japan.

The Meteorological Agency says the 7.3-magnitude quake occurred at 5:18 PM Friday, Japan time.

The quake's focus was 10 kilometers under the seabed off the Sanriku coast. The area was hit by a magnitude-9 quake and tsunami on March 11th last year.

At 6:02 PM, a 1-meter-high tsunami was observed in Ishinomaki City, Miyagi Prefecture.

At 6:10 PM, a 20-centimeter tsunami was observed at Ofunato Port in Iwate Prefecture.



Shortly after 7 PM, the Meteorological Agency lifted all tsunami warnings and advisories for the region.

The quake had an intensity of 5-minus on the Japanese scale of zero to 7 in parts of Aomori, Iwate, Miyagi, Ibaraki and Tochigi prefectures.

Smaller jolts were felt in Tokyo and other areas.

## **UPDATE: Strong earthquake strikes off northeastern Japan**

Previous Article: Google offers online panoramic views inside tsunami-ravaged buildings  
[http://ajw.asahi.com/article/0311disaster/quake\\_tsunami/AJ201212070090](http://ajw.asahi.com/article/0311disaster/quake_tsunami/AJ201212070090)

### THE ASAHI SHIMBUN AND WIRE REPORTS

A magnitude-7.3 earthquake struck off the coast of northeastern Japan in the same region that was hit by a massive earthquake and tsunami last year. Tokyo high-rises swayed for minutes, one city reported a small tsunami and at least two people were reported injured.

The Japan Meteorological Agency said the earthquake had a preliminary magnitude of 7.3 and struck in the Pacific Ocean off the coast of Miyagi prefecture at 5:18 p.m. on Dec. 7. The epicenter was 10 kilometers (6.2 miles) beneath the seabed and 240 kilometers (150 miles) offshore.

The tsunami warning was issued for Miyagi Prefecture, while tsunami advisories were issued for the prefectures of Aomori, Iwate, Fukushima and Ibaraki. The warning and advisories were canceled at 7:20 p.m.

According to the Nuclear Regulation Authority, no reports had been submitted about problems at the Fukushima No. 1 nuclear power plant, operated by Tokyo Electric Power Co., the Onagawa nuclear power plant, operated by Tohoku Electric Power Co., or the Tokai No. 2 nuclear power plant, operated by Japan Atomic Power Co.

TEPCO officials held a news conference and said there were no irregularities at the Fukushima No. 1 or No. 2 nuclear plants. Monitoring posts also did not detect any unusually high radiation readings.

The Nuclear Regulation Authority also said there were no problems at the nuclear fuel reprocessing facility at Rokkasho, Aomori Prefecture, operated by Japan Nuclear Fuel Ltd.

After the quake, which caused buildings in Tokyo to sway for at least a minute, authorities issued a warning that a tsunami potentially as high as 2 meters could hit. Ishinomaki, a city in Miyagi, reported that a tsunami of 1 meter hit at 6:02 p.m.

Traffic was being stopped in some places to check on roads.

Shortly before the earthquake struck, NHK television broke off regular programming to warn that a strong quake was due to hit. Afterward, the announcer repeatedly urged all near the coast to flee to higher ground.

The quake and tsunami warning forced Prime Minister Yoshihiko Noda to cancel campaigning in Tokyo ahead of a Dec. 16 election. Noda was on his way back to his office, but there was no immediate plan to hold a special Cabinet meeting.

Public spending on quake-proofing buildings is a big election issue.

Japanese were posting photos of their TV screens with tsunami warnings on Facebook, asking each other whether they were safe and confirming their whereabouts.

“It shook for a long time here in Tokyo, are you guys all right?” posted Eriko Hamada, inquiring about the safety of her friends.

Phone lines were overloaded, and it was difficult to contact residents in Miyagi.

“Owing to the recent earthquake, phone lines are very busy, please try again later,” the telephone operator said.

## **Why should we worry about an earthquake in Japan?**

<http://fukushima.over-blog.fr/article-an-urgent-appeal-to-avoid-another-global-nuclear-disaster-108329137.html>

If you think Eastern Japan is a long way away – and that you are fairly safe if you don’t live there – please take a minute to read/read again this article on the Blog de Fukushima.

The swimming pool in reactor No.4 remains a terrifying threat. And not just for the Japanese.

## **ALERT FUKUSHIMA 2**

articles from the main Japanese newspapers about today's earthquake

No problems so far with any of the nuclear facilities in the area... but TEPCO has a long history of hiding facts or downplaying the risks.

## Japan earthquake sparks tsunami scare

<http://www.bbc.co.uk/news/world-asia-20638696>

The BBC's Rupert Wingfield Hayes said he felt his building shake "violently"

A 7.3 magnitude quake has struck off Japan's eastern coast, triggering a small tsunami and sparking evacuations.

A one-metre wave hit Ishinomaki in Miyagi Prefecture and many people heeded calls to move to higher ground before all alerts were later lifted.

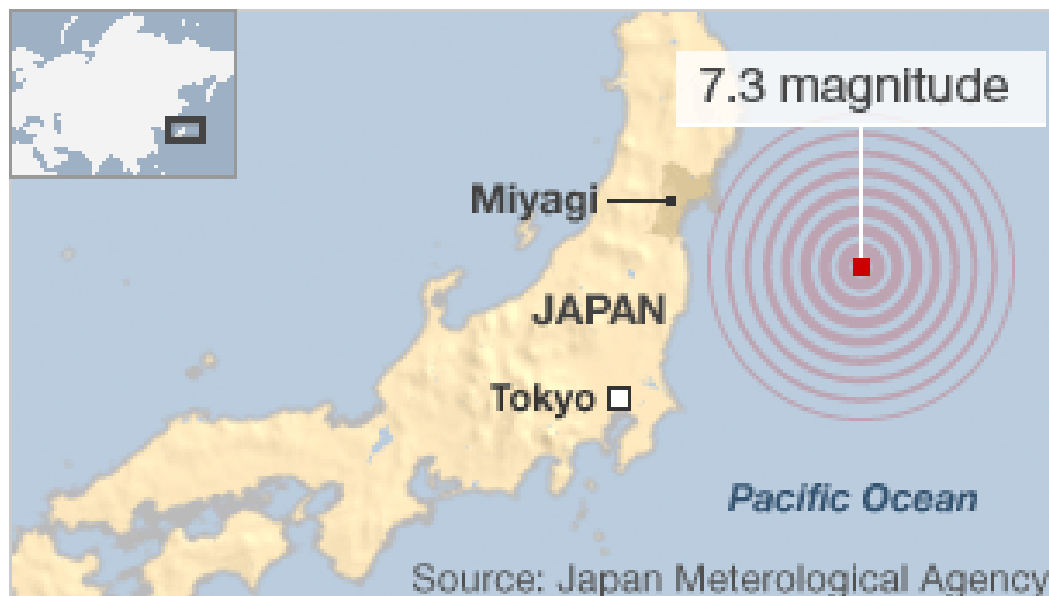
The quake epicentre was about 245km (150 miles) south-east of Kamiashi at a depth of about 36km, the US Geological Survey (USGS) said.

Miyagi was hit by a devastating earthquake and tsunami in March 2011.

### **Swaying violently**

The US-based Pacific Tsunami Warning Center had said there was no threat to the wider Pacific Ocean but had warned a local tsunami could be destructive for local coastlines.

There have been no reports of deaths, injuries or serious damage, and all tsunami warnings were cancelled at 19:20 local time (10:20 GMT), broadcaster NHK said.



Warnings of the tsunami height had varied between 50cm and 2m.

The BBC's Rupert Wingfield Hayes in Tokyo says any such height would represent a far lower risk of devastation than the tsunami of up to 11 metres that struck in 2011 but that, since then, the country has clearly become jittery about any shaking of the earth.

The tsunami warnings had extended from the top of the main island of Honshu down towards Tokyo and evacuations were ordered from some of the affected areas.

With Japan's early warning system, NHK was able to break off its regular programming and issue an alert about the earthquake shortly before it struck.

A presenter on state broadcaster NHK then told viewers: "Remember last year's quake and tsunami. Call on your neighbours and flee to higher ground now!"

Buildings swayed violently in Tokyo.

## Analysis

Jason Palmer Science and technology reporter, BBC News

Friday's earthquake has been a showcase for Japan's early warning system, first tested in 2004. Many on the ground say they received warning alerts on their mobile phones tens of seconds before the earthquake hit.

Japan's network of seismometers detects the arrival of one of two types of quake waves - the faster-moving but much less damaging "P waves". That surely allows precious seconds to seek shelter but in reality it is only detecting a quake, not predicting one.

The science behind longer-term predictions - hours, days or weeks in advance - is the subject of intense research. This ranges from using satellites to detect tiny deformations of the Earth's surface through purely mathematical approaches to harnessing animals' purported ability to sense coming quakes. But scientists are still some way from making reliable predictions - and avoiding the damaging risk of false alarms.

Prime Minister Yoshihiko Noda cancelled campaigning for the 16 December election to return to his office.

Communications to Miyagi have proven difficult, with the high volume of telephone calls. Trains in the prefecture were halted and the runway at Sendai airport closed.

English teacher John Heritage, who is in Tagajo in Miyagi Prefecture, told the BBC the earthquake was not as powerful as some he had experienced but was worrying as it went on so long.

He said: "The students were kind of worried. Normally they're pretty calm, but they looked concerned. Then the tsunami alarm started going off and we evacuated to higher ground."

Jamie El-Banna, founder of It's Not Just Mud - a volunteer disaster relief organisation - said he joined the evacuation in Ishinomaki.

He told the BBC: "We live less than a kilometre from the water so we went calmly as far back from the water as possible, which is what the advice is if you can't get to higher ground. Everyone evacuated in a calm, orderly way."

Other people reported being alerted to the earthquake prior to its arrival by Japan's mobile phone-based warning system.

One tweeted that he was given 10 seconds and was able to slow his car before the shaking struck.

The USGS reported at least six aftershocks, the strongest of which was 6.2 in magnitude.

The 9.0 magnitude quake that struck on 11 March 2011 caused a devastating tsunami and left more than 15,000 people dead, with more than 3,200 missing.

That quake triggered a meltdown of fuel rods at the Fukushima nuclear plant, causing radiation leaks and mass evacuations.

The plant's operator, Tokyo Electric Power, told Agence France-Presse there were no reports of problems there this time, although workers had moved to higher ground.

Are you in Japan? Have you been affected by the earthquake? Please tell us your story using the form below.

*Send your pictures and videos to [yourpics@bbc.co.uk](mailto:yourpics@bbc.co.uk) or text them to **61124 (UK)** or **+44 7624 800 100 (International)**. If you have a large file you can upload here.*

## **Magnitude 7.3 quake hits northeast Japan**

[http://www3.nhk.or.jp/daily/english/20121207\\_47.html](http://www3.nhk.or.jp/daily/english/20121207_47.html)

A strong earthquake has hit northeastern Japan.

The Meteorological Agency says the 7.3-magnitude quake occurred at 5:18 PM Friday, Japan time.

The quake's focus was 10 kilometers under the seabed off the Sanriku coast. The area was hit by a magnitude-9 quake and tsunami on March 11th last year.

At 6:02 PM, a 1-meter-high tsunami was observed in Ishinomaki City, Miyagi Prefecture.

At 6:10 PM, a 20-centimeter tsunami was observed at Ofunato Port in Iwate Prefecture.

Shortly after 7 PM, the Meteorological Agency lifted all tsunami warnings and advisories for the region.

The quake had an intensity of 5-minus on the Japanese scale of zero to 7 in parts of Aomori, Iwate, Miyagi, Ibaraki and Tochigi prefectures.

Smaller jolts were felt in Tokyo and other areas.

## **Tsunami warning lifted for strong Japan earthquake**

<http://mainichi.jp/english/english/newsselect/news/20121207p2g00m0dm078000c.html>

TOKYO (AP) -- Japan's Meteorological Agency has lifted a tsunami warning for the country's northeastern coast.

The warning was issued after a magnitude 7.3 quake struck offshore at 5:18 p.m. (0818 GMT) Friday, swaying buildings across much of Japan. There were no immediate reports of serious damage but two people were reportedly hurt.

After the quake, authorities issued a warning that a tsunami potentially as high as 2 meters (2.2 yards) could hit. Ishinomaki, a city in Miyagi, reported that a tsunami of 1 meter (1 yard) hit at 6:02 p.m. (0902 GMT).

About two hours after the quake struck, the tsunami warning was cancelled.

## **7.3-magnitude temblor triggers tsunami alert**

## **Long, deep quake off Tohoku rocks buildings in capital; Tepco reports no reactor problems**

<http://www.japantimes.co.jp/text/nn20121207x1.html>

AFP-Jiji, Kyodo

Authorities issued a tsunami alert for the northeast coast Friday after a powerful 7.3-magnitude undersea earthquake struck, setting buildings in Tokyo swaying violently.

They said tsunami up to 1 meter high could sweep ashore in areas badly hit by the March 2011 tsunami that devastated a large swath of the Tohoku region coast, killing thousands.

A 1-meter wave was seen in the Ayukawa district in Ishinomaki, Miyagi Prefecture, shortly past 6 p.m., NHK said. In addition, a 20-cm wave was logged by a tsunami gauge off Kinkazan in Miyagi. It wasn't immediately clear if the waves caused any damage.

Residents in cities along the Sanriku coast were advised to evacuate to higher ground. Those include Rikuzentakata, Ofunato, Yamada in Iwate Prefecture, as well as Miyagino and Wabayashi wards in Sendai and Ishinomaki and Iwanuma in Miyagi Prefecture.

Telephone operator NTT said the network in the areas was jammed with the weight of calls. A presenter on NHK repeatedly told viewers to get to safety.

"Remember last year's quake and tsunami," he said. "Call on your neighbors and flee to higher ground now!"

The U.S. Geological Survey put the quake's magnitude at 7.3. It said the temblor struck a relatively deep 36 km under the Pacific.

The epicenter was 284 km east of Sendai, or 459 km northeast of Tokyo, according to the USGS. There was no threat of a Pacific-wide tsunami, U.S. monitors based in Hawaii said. Officials in both Indonesia and the Philippines said there was no threat of a localized tsunami.

Tokyo Electric Power Co. said there were no reports of any problems at its crippled Fukushima No. 1 nuclear plant.

"No abnormalities have been recorded on instruments at the Fukushima No. 1 nuclear plant's six reactors," a Tepco spokesman said. "All workers were ordered to take shelter inside buildings at the Fukushima plant.

"No abnormalities were confirmed with the radiation monitoring posts at the Fukushima plant. No abnormalities were seen with the water processing facilities."

Prime Minister Yoshihiko Noda rushed to his office to monitor the situation.

East Japan Railways Co. (JR East) temporarily suspended all services in Miyagi Prefecture.

Bullet train services on the Tohoku and Joetsu shinkansen lines were also halted to check for damage. The Tokaido Shinkansen Line briefly suspended services between Tokyo and Odawara, Central Japan Railway Co. (JR Tokai) said.

Haneda Airport in Tokyo was reported to be operating normally but Sendai airport was closed. The tsunami warning was lifted at around 7:20 p.m.

### **Friday's jolt probably aftershock of March quake**

[http://www3.nhk.or.jp/daily/english/20121207\\_41.html](http://www3.nhk.or.jp/daily/english/20121207_41.html)

Japan's Meteorological Agency says the powerful earthquake that occurred off northeastern Japan on Friday is thought to be an aftershock of the massive quake that hit the region in March of last year.

The Agency says the latest quake took place on the east side of the Japan Trench, where two plates collide and one slides under the other.

### **1-meter high tsunami wave observed in Ishinomaki**

[http://www3.nhk.or.jp/daily/english/20121207\\_45.html](http://www3.nhk.or.jp/daily/english/20121207_45.html)

The Meteorological Agency says a 1-meter high tsunami wave was recorded at 6:02 PM Japan Time in the Ayukawa District in Ishinomaki City, Miyagi Prefecture.

Miyagi was one of the areas hard-hit last year by the March 11th earthquake and tsunami.

The agency issued a tsunami advisory for the region after a powerful earthquake occurred off northeastern Japan at 5:18 PM on Friday.

### **Utilities: Quake did not affect nuclear plants**

[http://www3.nhk.or.jp/daily/english/20121207\\_44.html](http://www3.nhk.or.jp/daily/english/20121207_44.html)

Nuclear power plant operators in areas hit by Friday's earthquake say they have received no reports of danger at their facilities.



Tohoku Electric Power Company says all three of the reactors at its Onagawa plant in Miyagi Prefecture were offline before the quake.

The company also says monitoring posts near the plant show no abnormal levels of radiation.

The utility says another nuclear power plant in Aomori Prefecture shows no signs of trouble.

Tokyo Electric Power Company says the quake did not affect its Fukushima Daiichi and Fukushima Daini nuclear plants.

Fukushima Daiichi was severely damaged by the March 2011 earthquake and tsunami.

The utility says it has told nuclear plant workers to move to higher ground or buildings as a tsunami advisory has been issued to Fukushima Prefecture.

The company says radiation levels near the plants have not changed.

### **Expert: Friday jolt is normal fault type quake**

[http://www3.nhk.or.jp/daily/english/20121207\\_43.html](http://www3.nhk.or.jp/daily/english/20121207_43.html)

A Japanese expert says the powerful earthquake that occurred off northeastern Japan on Friday is thought to have been triggered when the inside of the Pacific Plate was pulled apart as a result of the massive quake in March last year in the same region.

University of Tokyo Emeritus Professor Katsuyuki Abe says this type of earthquake is known as a normal-fault type quake.

This occurs when the Pacific Plate sinks under the continental tectonic plate.

Professor Abe says the latest quake had a big risk of triggering a tsunami. He added that precautions need to be kept in place until warnings or advisories are lifted.

Abe says the frequency and magnitude of aftershocks from last year's massive quake are on the decline, though **there is still a chance of another tremor as powerful as Friday's.**

Abe advises people to remain on the alert.

## **Magnitude 7.3 quake hits northeast Japan**

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The quake had an intensity of 5-minus on the Japanese scale of zero to 7 in parts of Aomori, Iwate, Miyagi, Ibaraki and Tochigi prefectures.

Smaller jolts were felt in Tokyo and other areas.

## **Mitsubishi's new robot**

### **Robot with deft arms developed for decommissioning**

[http://www3.nhk.or.jp/daily/english/20121207\\_01.html](http://www3.nhk.or.jp/daily/english/20121207_01.html)

A Japanese company has developed a robot that can accomplish complex tasks despite high radiation. This kind of robot is necessary to decommission reactors at the crippled Fukushima Daiichi nuclear power plant.

Mitsubishi Heavy Industries unveiled the robot in Kobe, western Japan on Thursday.

The robot is built on a platform with tracks on the side. These enable it to move over debris.

The robot is equipped with 2 arms that can perform work as complicated as human arms are able to do. The arms can be fitted with various tools to sever and remove broken pipes and rubble at the damaged Fukushima reactors.

It can cut off parts of concrete walls soaked with radioactive water and examine radiation levels. This is necessary in order to ascertain the level of contamination at the reactor's inner facility.

Jinichi Miyaguchi, chief of the firm's machinery designing division, said the Fukushima plant still has spots where strong radiation hampers people from entering. He said he hopes the robot will contribute to a swifter decommissioning of the disabled reactors.

## Too much solar for Hokkaido?

December 8, 2012

### Solar plant glut seen headed for Hokkaido

<http://www.japantimes.co.jp/text/nb20121208a4.html>

Kyodo

Japan has seen a rapid increase in solar power facilities since the incentives were launched five months ago to promote investment in clean energy, but Hokkaido is facing a glut, trade minister Yukio Edano said Friday.

The number of solar power facilities nationwide rated at over 1,000 kw and approved by the Ministry of Economy, Trade and Industry were providing about 1.8 million kw of capacity in October. About 341,000 kw of that is scheduled to be installed in Hokkaido, the ministry said.

The imbalance apparently emerged as Hokkaido is blessed with plenty of land priced relatively cheap, it said.

But the capacity of its power lines and related facilities is relatively low, which means capacity might be limited to between 400,000 and 600,000 kw.

At the same time, Hokkaido is a promising area for wind power, and the ministry has pointed to the need to leave room available for such facilities.

"Mega solar power systems can be installed anywhere in the country, and there is sufficient room to establish them in regions other than Hokkaido," Edano said.

Under the feed-in tariff scheme that kicked off in July, utilities are required to buy all electricity generated by renewable sources, such as solar, wind, water and geothermal energy, at preset premiums for up to 20 years, and are allowed to pass the costs onto consumers.

## **FIT system no panacea**



A megasolar plant operated by Softbank in the village of Shinto, Gunma Prefecture, is pictured from a Mainichi helicopter on June 30. Under the new FIT system, the sale of energy was introduced in Japan on July 1. (Mainichi)

## **Few parties focus on negative side of renewable energy expansion**

<http://mainichi.jp/english/english/newsselect/news/20121208p2a00m0na010000c.html>

Many of the political parties fielding candidates in the upcoming Dec. 16 House of Representatives election are calling for a breakaway from nuclear power generation and the expansion of renewable energy as an alternative power source in their campaign promises.

"We will push through an energy revolution," one of the party slogans says, while another says, "We will develop local industries through renewable energy and expand employment." However, only few parties underscore the negative side of renewable energy -- the possibility of electricity bills being further raised if such energy is expanded.

The **feed-in tariff (FIT) system** to promote renewable energy was introduced in Japan in July, under which power companies purchase the total amount of electricity generated by renewable energy and shift the cost on to electricity bills. As the government set high tariffs, an array of business operators are making forays into the renewable energy market, such as megasolar plants.

However, **the cost of solar power generation is slightly over 30 yen per kilowatt hour, which is about threefold of that of state-of-the-art thermal power generation, according to calculations by the Ministry of Economy, Trade and Industry.** Amid a series of electricity bill raises by major power companies slated for next year and beyond due to deteriorating profits as a result of a suspension of nuclear power plants, industry insiders have voiced strong concerns over further cost increases.

The Japan Iron and Steel Federation estimates that FIT-driven energy bill increases could boost costs in the iron and steel industry by 123 billion yen a year. "It could deliver a third blow to the industry, on top of the yen's appreciation and deflation," said a federation representative.

Industry circles are specifically concerned with a precedent in Germany, where the FIT system was introduced in 2000 and the subsequent soaring of household electricity bills became a big issue as the renewable energy market expanded. The additional cost from renewable energy resulted in an almost three-fold increase in monthly electricity bills from 442 yen in 2009 to 1,205 yen in 2011, inviting a backlash from the general public. In response, the German government lowered the tariffs by 20-29 percent in March this year.

Q-Cells, the world's biggest solar-cell maker based in Germany, collapsed because megasolar plant operators introduced Chinese-made cheaper cells in an attempt to curb power generation costs. The bankruptcy triggered criticism among opposition parties, which insisted that renewable energy adversely affected industry and low-income earners. The FIT system has emerged as one of the points of contention in the upcoming general election in Germany slated for next fall.

The Japanese government has defined renewable energy as one of the country's growth strategies and is planning to inject 120 trillion yen in measures to support solar panel makers and other entities. However, Chinese products already account for some 70 percent of the global solar panel market. Because solar panels "can be produced without much know-how if the necessary equipment is available," according to

an official with the Agency for Natural Resources and Energy, **Chinese makers dominate the market due to cheap labor.**

"It would be desirable if the expansion of renewable energy leads to the creation of new industries. However, as Japanese solar cell manufacturers have been engaged in price competition with their counterparts in emerging countries, the government is concerned that promotion of renewable energy would only push up electricity bills and wouldn't lead to economic revitalization," said Hideaki Matsui, senior researcher at the Center for the Strategy of Emergence at the Japan Research Institute.

**At stake now is whether the government can establish a framework under which support for renewable energy can lead to Japan's economic growth while avoiding placing an excessive burden on electricity consumers. None of the energy policies advocated by political parties for the upcoming general election even present the blueprint for that grand design.**

## **Larger aftershocks still to come?**

### **Dec. 7 quake: larger aftershocks possible**

[http://ajw.asahi.com/article/0311disaster/quake\\_tsunami/AJ201212080041](http://ajw.asahi.com/article/0311disaster/quake_tsunami/AJ201212080041)

The magnitude-7.3 temblor that rocked northeastern Japan on Dec. 7 is now considered an aftershock of last year's Great East Japan Earthquake--and it may not be the last.

At least one expert has warned of a potentially larger temblor still to come.

"The 2011 magnitude-9.0 earthquake could be followed by a magnitude-8 aftershock," said Yoshimitsu Okada, president of the National Research Institute for Earth Science and Disaster Prevention. "The Dec. 7 event should be taken as a warning for that."

Last year's giant quake was followed by many aftershocks, but these gradually diminished in frequency. The Dec. 7 quake was the first magnitude-7 or greater seismic event since July 2011. It shows that major aftershocks can lag the main event by more than 20 months.

Seismic activity in the area has yet to return to normal levels.

The Dec. 7 earthquake arose from what is known as a "normal-fault" mechanism, which involves slippage along a geological fault line under tensile stress. Experts said it could have occurred at any time.

The stress arose because the March 2011 quake caused tectonic plates to shift against each other, turning compressive stress in the oceanic plate into tensile stress.

Parts of the crust in the "outer rise," a topographical protuberance farther off the coast from the plate boundary, were under this tensile stress when they slipped Dec. 7.

An earthquake of the same type occurred in January 2007, following a November 2006 quake along the oceanic trench off the Kuril Islands, near Hokkaido. And the same mechanism was seen in the Showa Sanriku earthquake of 1933, which some experts described as an aftershock of the 1896 Meiji Sanriku earthquake.

A normal-fault earthquake in the outer rise carries a high tsunami risk. Slippage in pieces of crust under tensile stress generally results in large vertical movement. The seabed is deformed and much water is displaced. The tsunami risk remains even if the seismic source happens to be far from land.

The Dec. 7 quake resulted in a 1-meter tsunami in Ishinomaki, Miyagi Prefecture.

The quake made itself felt in Tokyo with slow and sustained shaking, despite the capital's considerable distance from the seismic source.

"That was presumably because the shallow seismic source gave rise to long-period 'surface waves,' which travel close to the Earth's surface," said Hiroshi Tsuruoka, an associate professor of seismology at the Earthquake Research Institute of the University of Tokyo.

Giant earthquakes of magnitude 8 or greater may involve ground movement of long oscillation periods, causing high-rise buildings to sway, experts say.

The Japan Meteorological Agency has called for continued vigilance.

## Vulnerable nuke workers "like kamikaze pilots"

### Worker wants new government to secure safety at Fukushima plant

[http://ajw.asahi.com/article/behind\\_news/politics/AJ201212090052](http://ajw.asahi.com/article/behind_news/politics/AJ201212090052)

A man in his 50s hopes that a new government to be formed after the Dec. 16 Lower House election will protect the health of workers like himself at the stricken Fukushima No. 1 nuclear plant, many of whom fear for their jobs.

**"Many people work without seeing a doctor because they fear they might be told not to come anymore from the next day," he said. "It is a distortion caused by the layers of subcontractors involved. I want the government to protect us."**

He plans to return to his home in Yamanashi Prefecture to cast his ballot when he is off.

About 3,000 people are toiling each day at the Fukushima No. 1 plant in an attempt to stabilize its crippled reactors.

According to a man in his 40s, who worked at the plant until recently, **all the workers assigned to high-radiation areas around the reactor buildings were from subcontractors**, and employees of plant operator Tokyo Electric Power Co. went around the areas only occasionally.

He said he never saw officials from regulatory government agencies in those areas.

"I doubt whether any politician is giving serious thoughts on how to bring the crisis under control," he said. "It seems that political parties are calling for a move away from nuclear power only to attract votes."

The man said workers at the Fukushima No. 1 plant are being exploited.

"Workers come from around the country because they are willing to work even at a nuclear plant due to the economic slump," he said. "Many businesses siphon off part of their wages, taking advantage of their vulnerable positions."



A man in his 40s came to the Fukushima No. 1 plant from western Japan because he lost his job at a nuclear plant in the region after last year's earthquake and tsunami.

He said he is frightened about high radiation levels at the site but he cannot make a living without a job at a nuclear plant.

He hopes that idled reactors will be brought back online throughout the nation at an early date.

The man voted for the ruling Democratic Party of Japan in the 2009 Lower House election, which was dominated by a call for a change in government from the Liberal Democratic Party.

He said he is attracted by the appeal of Osaka Mayor Toru Hashimoto, who formed the Japan Restoration Party, for speaking out for what he believes. But he has no plans to vote in the upcoming election.

"I do not want to spend money returning home to vote," he said.

A TEPCO employee in his 20s who grew up in Fukushima Prefecture has become an opponent of nuclear power after the accident at the Fukushima No. 1 plant.

"I was told to work at the plant like a kamikaze pilot," said the man, who is evacuating from Fukushima Prefecture due to high levels of radiation he received. "I have no idea about how much radiation I was exposed to."

He said a large number of his colleagues left the company during the past year.

"I wonder if we can raise children," he said. "I want the government to control our health as its responsibility."

The employee has doubts about whether decontamination efforts will be able to remove radioactive materials in his hometown.

In a municipal assembly election, he cast a ballot for a candidate who ruled out plans to rebuild the town where it originally stood. He plans to vote for someone who takes a similar position in the Lower House election.

(This article was written by Miki Aoki and Toshio Tada.)

## Radioactive leak in reactor No.3

December 11, 2012

### [Leakage for 2 continuous days] 15m<sup>3</sup> of contaminated water leaked in reactor3 turbine building

Posted by **Mochizuki** on December 11th, 2012 · No Comments

On 12/11/2012, **15m<sup>3</sup>** of contaminated water leaked again in reactor3 turbine building.

The radioactive density in the leaked water was

Cs-134 : 4.2E+7 Bq/m<sup>3</sup>

Cs-137 : 7.4E+7 Bq/m<sup>3</sup>

< Reference >

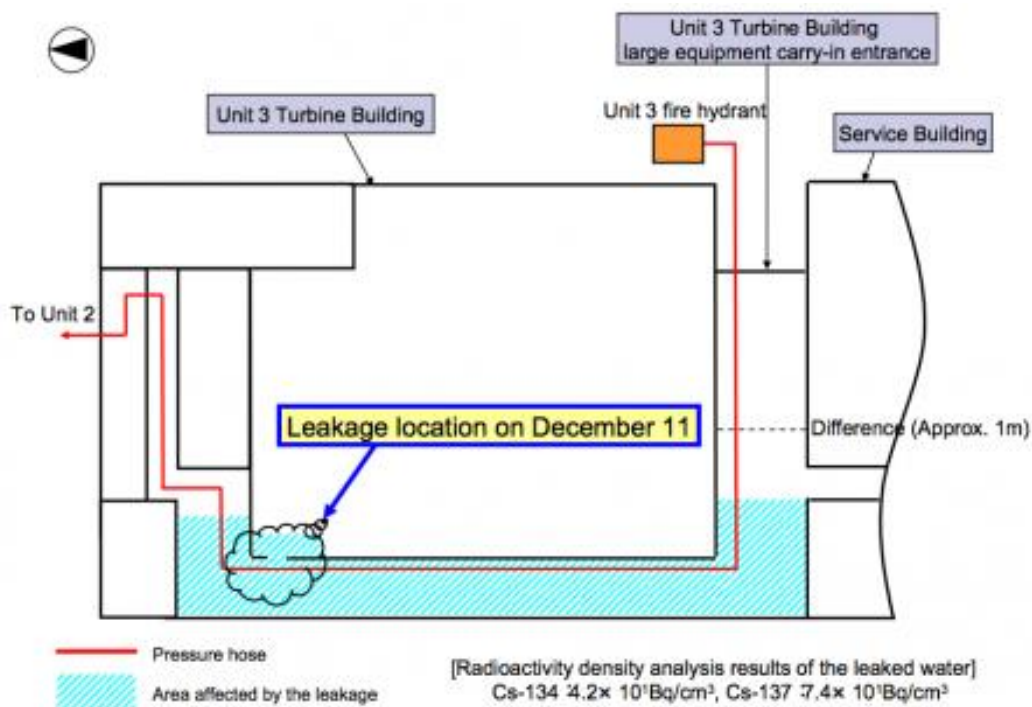
December 11, 2012

Tokyo Electric Power Company

### Water Leakage in Unit 3 Turbine Building at Fukushima Daiichi Nuclear Power Station

#### Outline

- At around 11:08 AM on December 11, 2012, a cooperative company employee found a water puddle on the aisle in the west side on the first floor of Unit 3 Turbine Building at Fukushima Daiichi Nuclear Power Station.
- Upon site investigation by a TEPCO employee, the entire aisle was found to be affected by the leakage and the amount was approx. 15m<sup>3</sup> (Approx. 750m<sup>2</sup> x 0.02m (depth))
- The leaked water has not flowed out of the Turbine Building.
- As the leakage location is near the pressure hose used in the pressure test for (newly installed) Unit 1 polyethylene pipe, the leaked water is assumed to be filtrate water.
- The preparation for the pressure test was terminated at around 10:50 AM since filtrate water had not flowed in Unit 1 side. At 11:30 AM, the leakage was confirmed to have stopped.



## TEPCO admits to its "bad habits" and lack of safety culture

December 14, 2012

### Japanese operator in most frank admission over nuclear disaster

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201212140093>

REUTERS

The operator of a Japanese nuclear power plant that blew up after a tsunami last year said on Dec. 14 its lack of safety and bad habits were behind the world's worst nuclear accident in 25 years, its most forthright admission of culpability.

The operator, Tokyo Electric Power Co, said it accepted the findings of a parliamentary inquiry into the Fukushima nuclear disaster that accused the company of "collusion" with industry regulators.

An earthquake on March 11 last year generated a tsunami that smashed into the nuclear plant on Japan's northeast coast and triggered equipment failures that led to meltdowns and the spewing of large amounts of radiation into the air and sea.

Takefumi Anegawa, the head of a company reform task force, told a news conference the report by a parliamentary committee contained "so many descriptions about the lack of a safety culture and our bad habits".

"We admit, we completely admit, that part of the parliamentary report," Anegawa, told a news conference at the Foreign Correspondents Club of Japan.

He was responding to a question on whether the company accepted the parliamentary committee's findings that the disaster was preventable and the result of "collusion" between the company and regulators.

TEPCO President Naomi Hirose said several months ago he was baffled by criticism of the company, which until recently has denied it could have foreseen the scale the tsunami and earthquake that knocked out cooling and power at the plant, despite warnings from scientists.

The once well-respected utility, now under government control, has been widely castigated for its failure to prepare for the disaster, and lampooned for its inept response as the crisis unfolded.

In October, 18 months after the disaster, the company admitted for the first time it could have been avoided.

## **TRYING TO CHANGE**

Anegawa, who has worked at the Fukushima plant, said there were some misunderstandings in the "technological part" of the report.

"But (for) most of the investigation of our organisation culture, we admit that, and we will try to change," he said.

Anegawa was speaking at the news conference with outside monitors TEPCO appointed two months ago to oversee its reforms.

Asked to give an example of a step TEPCO had taken to improve since he was appointed, Dale Klein, a former chairman of the U.S. Nuclear Regulatory Commission, would only say the company carried out a critical self-assessment and was sharing information.

Those were similar to comments he made in a Reuters interview in October.

Three reactors melted down at the plant, causing the worst radiological release since Chernobyl in 1986, contaminating wide areas of land and forcing about 160,000 people from their homes. Many of those people are unlikely to ever go home.

All of Japan's 50 nuclear reactors were shut down for safety checks after the disaster and only two have resumed operating.

The government's decision this year to restart the two units to avoid possible summer power cuts galvanized the country's anti-nuclear movement, prompting regular mass demonstrations.

The current government, led by the Democratic Party of Japan, is aiming to phase out nuclear energy by the end of the 2030s.

But the business-friendly Liberal Democratic Party is expected to return to power in an election on Sunday and it says only that it will take the next 10 years to figure out Japan's "best energy mix".

But even the LDP, which promoted atomic energy during its nearly six decades in power, is not expected to revive a plan to increase nuclear power's share of Japan's electricity supply to more than half by 2030 from nearly 30 percent before the Fukushima disaster.

## **New info on radiation from the NHK**

December 16, 2012

### **Radiation measured in the waters and air ( Fukushima No.1 Plant )**

<http://www9.nhk.or.jp/kabun-blog/500/141120.html#more>

Data will be posted each Sunday from now on. The following are the results of observations during the Dec.9 week.

On Dec. 13, Cs-137 density was found to be **3.3 Bq/L** in the samples collected 30 meters north of the Unit 5-6 outlets.

On the other six days, no noticeable amount of radioactive iodine or cesium was detected from sea water near the outlets of the Fukushima No.1 plant. Radiological dose in the air of the plant site, measured this day, is posted on the following page. (Source: TEPCO)

“ND” means the density of I-131, Cs-134 or Cs-137 was below the respective measurable limit of 0.41~0.48Bq/L, 0.96Bq/L or 1.3Bq/L. Those limits vary with the duration in which the instrument is in contact with samples and collective volumes of the samples.

In the event the seawater contains more than two nuclides, the density of each nuclide is scaled against its allowable limit. Thereafter the sum of the scaled densities of all nuclides is gauged against 1.

**【No.1 Plant :Radioactive substances detected in the waters】**

**【A】** From samples collected 30 meters north of the Unit 5-6 outlets at 07:05 Dec. 13.

Iodine 131: **ND ( --- times the limit)**

Cesium 134: **1.3Bq/L ( 0.02 times the limit)**

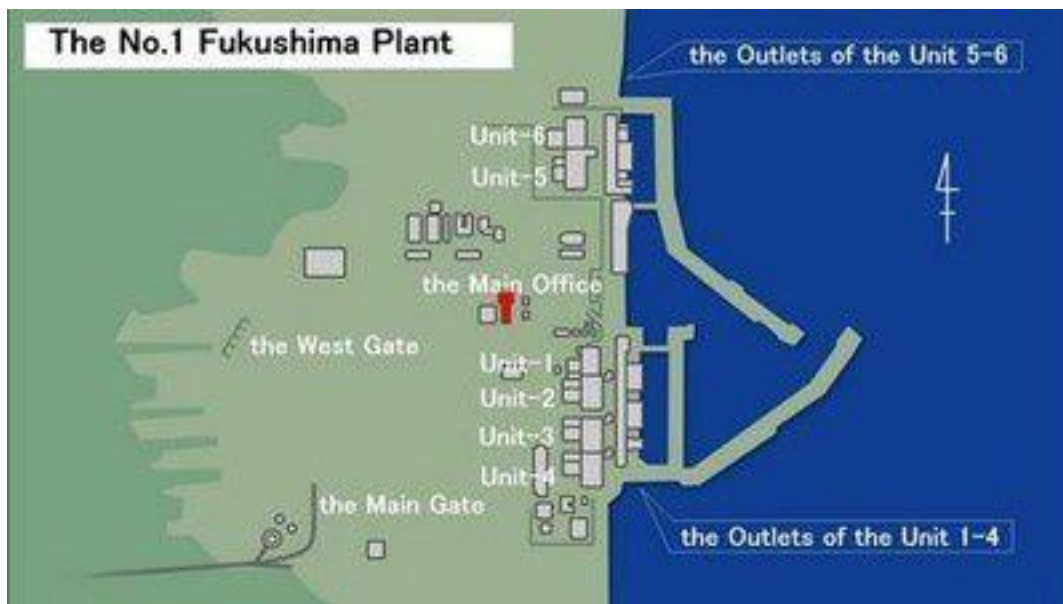
Cesium 137: **3.3Bq/L ( 0.04 times the limit)**

**【B】** From samples collected 330 meters south of the Unit 1-4 outlets at 07:30 Dec. 13.

Iodine 131: **ND ( --- times the limit)**

Cesium 134: **ND ( --- times the limit)**

Cesium 137: **ND ( --- times the limit)**



MAP <http://www3.nhk.or.jp/news/genpatsum-fukushima/houshasen/index2.html>

▼southern side of The main office: 500 meters north-west of the Unit 2 .

208  $\mu\text{Sv/h}$  Time:09:00 Dec. 14, 2012

▼near the West Gate : 1,100 meters west of the Unit 2 .

6.8  $\mu\text{Sv/h}$  Time:09:00 Dec. 14, 2012 Winds: south-southwesterly 3.3 m/s

There was no neutron dose detected.

**【No.1 Plant : Air dose 】**

## TEPCO's video tour of Fukushima No.1

On December 14, 2012, TEPCO posted on its site a video tour of Fukushima Daiichi:  
<http://photo.tepco.co.jp/en/date/2012/201212-e/121214-01e.html>

Play Video / Download (298MB)

Video by TEPCO

## Problems galore a year after "cold shutdown"

December 18, 2012

### Fukushima plant situation 'volatile,' a year after cold shutdown declared

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201212180087>

By NAOYA KON/ Staff Writer

Workers are nowhere close to determining the state of melted fuel at the Fukushima No. 1 nuclear plant, a year after the government declared the damaged reactors were in a "cold shutdown" state.

Storage tanks at the site are nearing capacity for radioactive water. A makeshift system is still being used to cool the nuclear fuel. And leaks of contaminated water and quake-induced collapses of plant facilities remain a threat.

Although progress has been made in clearing rubble and reducing the amount of radioactive substances released from the plant, NRA Chairman Shunichi Tanaka acknowledged that preparations to decommission the reactors are only slowly getting under way.

"Workers have been obliged to respond with highly stopgap measures," Tanaka said. "Many devices, such as a purifier for radioactive water, have been installed with no time for sufficient design considerations and safety screenings.

**"The situation surrounding the decommissioning process is volatile, so there is a need for constant reviews in securing safety."**

The No. 1, No. 2 and No. 3 reactors at the Fukushima plant melted down after the Great East Japan Earthquake struck off the coast of northeastern Japan on March 11, 2011, spawning a tsunami that devastated coastal communities and knocked out power to the plant.

After a furious battle to bring the situation under control, Prime Minister Yoshihiko Noda on Dec. 16 last year declared that the three reactors at the plant had reached a state of cold shutdown, a term used when a normally operating reactor is taken offline and remains at a cool temperature on a stable basis.



But the decommissioning process, including the No. 4 reactor that contained no fuel at the time of the disaster due to a regular inspection, is expected to take decades to complete.

The decommissioning work also represents an imminent challenge for the Liberal Democratic Party, which will control the government following its victory in the Dec. 16 Lower House election.

The government and Tokyo Electric Power Co., the plant operator, presented a road map on Dec. 21 last year that established landmarks for the eventual decommissioning of the four reactors.

Goals for the period to spring 2013 included endoscopic inspections of the interiors of reactor containment vessels and a reduction in the length of pipes used in the "circulating water cooling" system, which recycles radioactive water to cool down the melted reactors.

Endoscope surveys of the containment vessels at the No. 2 reactor in January and the No. 1 reactor in October found radiation levels high enough to kill a human within one hour. Specifically, up to 73 sieverts per hour was detected inside the No. 2 reactor and 11 sieverts per hour inside the No. 1 reactor.

**But TEPCO cannot determine the state of the melted fuel because cameras can only be inserted for a limited time period in the extremely hazardous environment.**

One immediate problem facing TEPCO is the accumulation of radioactive water used to cool down the melted fuel. TEPCO says it will mobilize robots and take other measures to locate where the radioactive water is leaking from the reactors.

Storage tanks on the plant's premises have a total capacity of 257,000 tons. As of Dec. 11, the tanks contained 237,000 tons of radioactive water.

TEPCO plans to build additional tanks on deforested land to expand the total capacity to 700,000 tons within three years.

Groundwater flowing into the reactor buildings is exacerbating the radioactive water problem. TEPCO said it will dig wells west of the reactor buildings to pump up the groundwater and reduce the inflow, but little is known about groundwater flow variations, sources said.

The 4 kilometers of pipes in the "circulating water cooling" system were installed on a temporary basis in the frantic battle to keep the melted fuel submerged. They remain in the same state, and the risk of radioactive water leaking from damage on the pipes remains.

TEPCO is preparing full-scale operations of a device that can eliminate 62 varieties of radioactive substances from the contaminated water. But the device is still being tested for durability, and the government's Nuclear Regulation Authority has yet to give the green light for its use.

Rubble has been removed from the No. 4 reactor building, which was severely damaged in a hydrogen explosion in the early stages of the disaster and received relatively light contamination from radioactive substances.

TEPCO removed two nuclear fuel assemblies from the No. 4 reactor building's storage pool on a trial basis in July. The assemblies showed no signs of damage or deformities, and the utility plans to start removing the remaining fuel in November 2013.

Still, about 3,100 nuclear fuel assemblies, including unspent ones, are now sitting in the storage pools of the No. 1 through No. 4 reactor buildings.


The amount of radioactive substances released from the reactor buildings has remained low since February. In November, a maximum of 10 million becquerels were leaking from the No. 1 through No. 3 reactors per hour, only one-sixth the discharge rate in December 2011.

But Fumiya Tanabe, a former chief research scientist at the now-defunct Japan Atomic Energy Research Institute, said **persistent danger surrounds the plant's reactors.**

"Despite the (officially declared) cold shutdowns of the reactors, the cooling functions have been maintained there with no knowledge of where the melted fuel lies and in what state," Tanabe said. "There is a risk of unforeseen circumstances arising if another major earthquake hits."

**Current situation at Fukushima No. 1 nuclear power plant**

Additional 18,260 tons of unprocessed radioactive water lies in basements of other buildings.



		No. 1 reactor building	No. 2	No. 3	No. 4
Reactors	Temperatures at bottom of pressure vessels (as of Dec. 14)	23.7 degrees	35.2 degrees	36.6 degrees	No fuel at time of accidents due to regular inspections
		Circulating water cooling under way			
Radioactive water accumulated in basements (as of Dec. 11)		14,000 tons	22,900 tons	22,500 tons	17,100 tons
Major achievements during past year		Surveys of containment vessel and reactor building	Surveys of containment vessel and reactor building basement Installation of thermometer near pressure vessel	Removal of rubble from reactor building Surveys of spent fuel storage pool	Removal of rubble from reactor building Measurements of tilts in reactor building
Projects to come		Decontamination of reactor building	Decontamination of reactor building	Installation of canopy over reactor building to prepare for fuel removal	Installation of canopy over reactor building to prepare for fuel removal

## Clearing debris (and crane) from No.3

December 21, 2012

### Fukushima nuke plant workers remove dropped beam from spent fuel pool

<http://mainichi.jp/english/english/newsselect/news/20121221p2a00m0na007000c.html>



A crane (right) lifts a steel beam out of the Fukushima No. 1 nuclear plant's No. 3 reactor spent fuel pool on Dec. 20. (Mainichi)

FUKUSHIMA -- Workers at the Fukushima No. 1 nuclear plant corrected a potentially dangerous mistake on Dec. 20 when they carefully pulled out a large steel girder dropped in the No. 3 reactor spent fuel pool in September.

The 7-meter-long, 470-kilogram girder was pulled carefully from beneath the pool water by a scissor-like hydraulic cutter mounted on a crane. The girder had ended up in the pool on Sept. 22, when a crane operator clearing wreckage from the top section of the building accidentally dropped it.

Spent fuel is still kept in the No. 3 building pool, and workers had been practicing on a mock-up of the girder since November to make sure the operation went off without a hitch.

The No. 3 reactor building -- along with buildings 2 and 4 -- were blown apart by hydrogen explosions near the beginning of the nuclear crisis in March 2011, and much of the wreckage remains.

### **TEPCO ready to restart debris removal from No. 3 reactor building**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201212210048>

THE ASAHI SHIMBUN

Tokyo Electric Power Co. said Dec. 20 it recovered a steel frame from a spent fuel pool, enabling a resumption of debris removal from the Fukushima No. 1 nuclear plant's No. 3 reactor building.

According to TEPCO, the steel frame is 7 meters long and weighs 470 kilograms. It was dropped into the fuel pool by mistake during the debris removal operation on Sept. 22.

At that time, workers used a remote controlled crane to seize the frame, but dropped it into the pool. TEPCO believes the steel frame did not damage the fuel.

TEPCO has not changed its plans to complete the debris removal by March.

## **New test makes cesium glow**

December 23, 2012

### **New test identifies radioactive cesium in the environment**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201212230009>

By TOMOYUKI YAMAMOTO/ Staff Writer

TSUKUBA, Ibaraki Prefecture--Researchers at the National Institute of Materials Science have developed a spray that can help detect radioactive cesium, potentially providing an efficient new tool for workers involved in decontamination work.

Workers spray the liquid on a material needing testing and then turn on an ultraviolet lamp. If radioactive cesium is present, it glows with a bluish-green light.

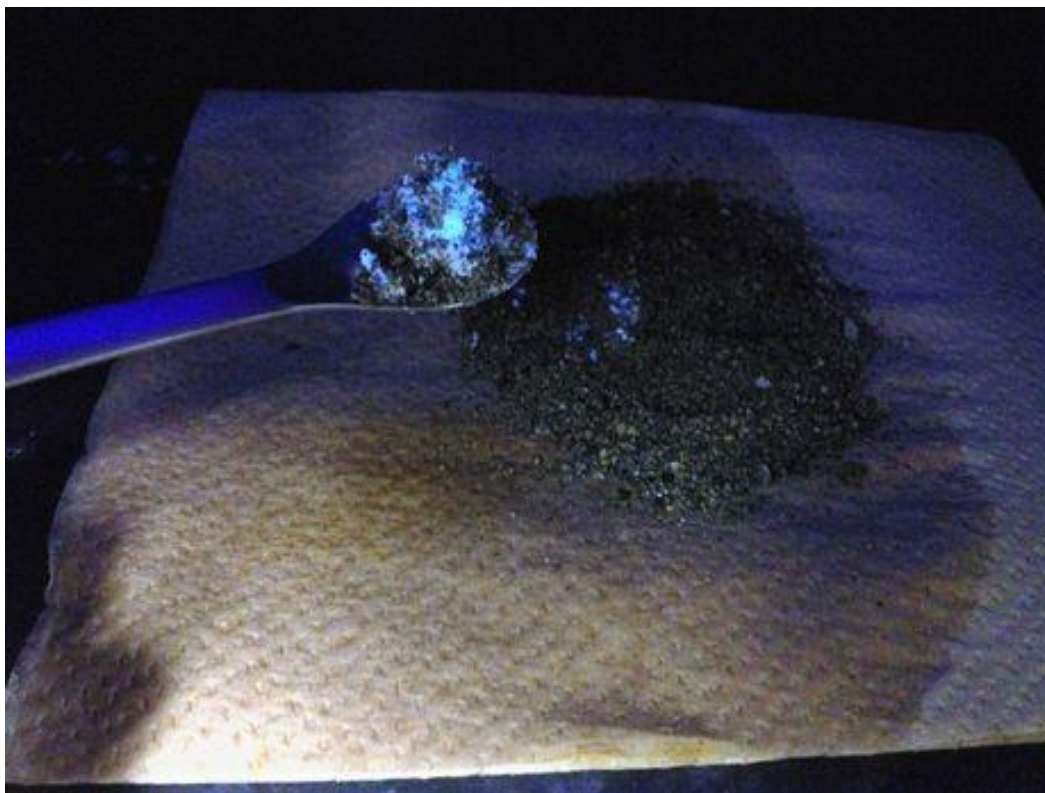
"After more in-depth studies on its effect on humans and the environment, we hope to produce the product commercially within two to three years," said a member of the research team.

The liquid comprises three common chemicals found in retail outlets, including ethylene glycol, which is used in antifreeze. The reagents are mixed together and dissolved in alcohol to create a sprayable consistency.

The test can detect minute traces of cesium. It can even be used to confirm in which organs of a fish the potentially harmful isotope has accumulated.



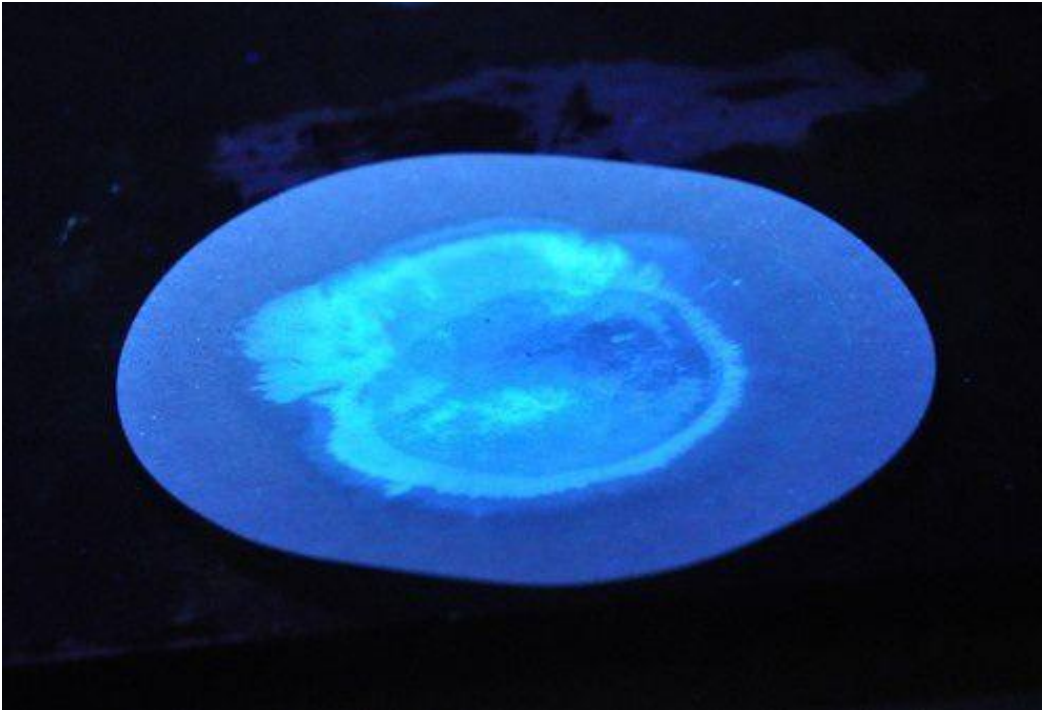
It currently costs about 2,500 yen (\$30) to create the liquid needed to test one square meter of soil for cesium contamination. However, officials said the cost could come down to a few tens of yen under mass production. The ultraviolet lamps needed similarly run to several thousands of yen



Dirt containing cesium gives off a blue-green light when illuminated with ultraviolet rays after being sprayed with a liquid developed by researchers. (Provided by National Institute of Materials Science)  
December 21, 2012

### **Japanese researchers make radioactive cesium glow in dark with new compound**

<http://mainichi.jp/english/english/newsselect/news/20121221p2a00m0na003000c.html>



Cesium glows pale blue under ultraviolet light after being sprayed with a new chemical compound. (Mainichi)

Japanese scientists unveiled a chemical compound on Dec. 20 that causes cesium to glow pale blue when exposed to ultraviolet light -- possibly making detection and cleanup of the radioactive element from the Fukushima nuclear disaster more efficient.

"We can now confirm contaminated spots that hitherto went undetected, and also bring down decontamination costs significantly," said Taizo Mori, a researcher at the National Institute for Material Science (NIMS) in Tsukuba, Ibaraki Prefecture, where the compound was developed.

Cesium 137 was one of the primary radioactive contaminants released in the nuclear disaster, triggered by the March 2011 Great East Japan Earthquake and tsunami.

The NIMS research team created the compound from three chemicals including nitrobenzene. The compound molecules form chains that then bind to cesium ions. The team diluted the compound in alcohol and sprayed it on cesium grains sprinkled on a sheet of filter paper, and found that the cesium-contaminated parts of the paper glowed when hit with ultraviolet light.

The researchers furthermore confirmed that contaminated areas could be determined to the nearest millimeter using the compound, which if put to use in decontamination operations would mean being able



to detect cesium concentrations of about 1,000 becquerels per kilogram of contaminated soil. NIMS will now partner with a private sector firm to develop a camera that can see even low cesium concentrations in the field.

The compound used in the NIMS experiment cost some 20,000 yen per gram, but the researchers say that could be reduced to just dozens of yen if the compound was mass-produced.

## Has Shinzo Abe never heard of the previous (official) investigations?

December 24, 2012

### **Abe calls for reviewing nuclear crisis at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20121224p2g00m0dm004000c.html>

TOKYO (Kyodo) -- Japan's incoming Prime Minister Shinzo Abe said Sunday his government, set to be formed Wednesday, will thoroughly review the cause behind the nuclear crisis at the Fukushima Daiichi power plant.

**"The root cause of the (nuclear) accident was not fully uncovered so there is a need to make clear whether this was a man-made disaster or not,"** Abe said during a television program appearance.

Abe, who heads the Liberal Democratic Party, said he will also begin procedures in the next ordinary Diet session to formalize the appointments of current members of the Nuclear Regulation Authority, which was set up in response to the nuclear crisis following the March 2011 earthquake and tsunami.

Abe said **the government will reassess the crisis at the Fukushima Daiichi plant and consider if nuclear reactors should be restarted or not** but did not elaborate when or how the review will be done.

His remarks apparently indicate his government will aim to find out whether the crisis broke out due to human error or structural problems of the plant, with an eye to using the information to deal with the divisive issues of restarting nuclear reactors and building new reactors.

Abe said a decision will be made on the restart for all reactors in the country within three years based on the authority's evaluation.

At present, 48 of the nation's 50 commercial nuclear reactors remain offline due to safety concerns.

Abe is also expected to look again into how the government led by the Democratic Party of Japan and Tokyo Electric Power Co., operator of the Fukushima Daiichi plant, responded to the crisis, political pundits said.

But with regard to the authority's appointments, the LDP chief will back the DPJ's action to appoint five members to the NRA including Chairman Shunichi Tanaka, saying he will take steps toward seeking Diet approval.

The Cabinet, under outgoing Prime Minister Yoshihiko Noda of the DPJ, agreed last month to deter parliamentary approval of its appointments of Chairman Shunichi Tanaka and the panel's four other members amid opposition to the personnel.

## Storage tanks for radioactive water too "flimsy"

December 26, 2012

### Flimsy waste tanks cause new delay in Fukushima plant decontamination

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201212260032>

Tanks designed to hold radioactive filtrate at the Fukushima No. 1 nuclear plant are proving too fragile to be used, and the operator has announced a **further delay in starting up machinery that cleans contaminated water.**

Multinuclide removal equipment was originally slated to begin operation at the plant in September. But on Dec. 25, Tokyo Electric Power Co. said vessels that receive the machinery's radioactive discharge were failing drop tests and could not be relied upon.

Officials said reinforcing the tanks and testing them anew will take some time, so they are unable to predict when the equipment may finally come online.

The vessels are hoisted and lowered as they are filled and replaced by empty containers. In the event of an accident, they need to be strong enough to withstand a fall without releasing their radioactive contents.

TEPCO confirmed that the vessels could sustain a fall from a height of 6 meters in an upright position. But tests found the tanks were breaking and spilling their contents when dropped on from a height of only 3 meters in an upside-down position.

The findings were presented to a joint council on the mid- to long-term decommissioning of nuclear reactors, a body comprising government representatives and TEPCO officials.

The council decided that TEPCO should reinforce the vessel design and then hold more tests. TEPCO hopes to be ready to perform the tests in January.



Part of the multinuclide removal equipment to be installed at the Fukushima No. 1 nuclear plant. (Asahi Shimbun file photo)

## **TEPCO sees delay in new water treatment facility at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20121226p2g00m0dm022000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. is seeing a delay in starting operation of a new water treatment facility that can remove more radioactive substances than the one currently being used at the crippled Fukushima Daiichi nuclear power plant, government officials said Tuesday.

The facility was expected to be introduced by the end of September as part of the utility's efforts to deal with a massive amount of contaminated water created as a result of continuing water injection into the damaged reactors.

But the utility still needs to check the strength of containers it plans to use to store radioactive waste generated through the water treatment process, the officials said following a meeting between the government and TEPCO to confirm progress toward decommissioning the reactors.

The utility plans to reinforce the containers so they can withstand the impact of possible accidents, such as a fall from a crane in transporting them. The officials did not elaborate on when they expect operation of the facility to actually start.

The current water processing facility has mainly worked to reduce the density of cesium, but the new facility can reduce that of about 60 types of radioactive substances such as strontium, the officials said.

Strontium tends to accumulate in bones and is feared to cause bone cancer and leukemia.

The water, after being cleaned, is recycled as a coolant for the three reactors which were crippled amid the nuclear crisis, triggered by the March 2011 massive earthquake and tsunami.

## **Extra budget reserved for decommission**

### **Motegi: Budget earmarked to decommission Fukushima nuclear reactors**

[http://ajw.asahi.com/article/behind\\_news/politics/AJ201212290052](http://ajw.asahi.com/article/behind_news/politics/AJ201212290052)

The Abe administration will earmark **several tens of billions of yen in this fiscal year's supplementary**

**budget** as research and development costs for decommissioning reactors at the damaged Fukushima No. 1 nuclear power plant.

The decision was revealed Dec. 28 by Toshimitsu Motegi, industry minister, in an interview with The Asahi Shimbun and other media.

The supplementary budget will be compiled in January, he added.

It will be the first time that the government will earmark a budget specifically for decommissioning reactors.

He also said that by using technologies and equipment developed with the funds, the government will also support electric power companies in the event they will phase out aging reactors.

After the nuclear accident at the Fukushima plant in March 2011, the Noda administration allocated 2 billion yen (\$25 million) mainly for studies to safely decommission reactors.

With the next extra budget, the government will embark on supporting the decommissioning process.

Under the new plan, the government will develop advanced technologies by constructing facilities to study the decommissioning of reactors. It is also considering forming a group of experts for research or building facilities for experiments.

Tokyo Electric Power Co. has decided to decommission its No. 1 to No. 4 reactors at its Fukushima No. 1 plant, and has allocated about 900 billion yen for the work.

Motegi said the government will support TEPCO's decommissioning of the four reactors.

"It is important to accelerate the decommissioning of reactors," Motegi said. "The government must perform its roles to a maximum extent, including the utilization of a supplementary budget."

The program to support the decommissioning of reactors will be used not only for the reactors at the Fukushima No. 1 nuclear plant, but also for aging reactors throughout the country.

Japan has three nuclear reactors more than 40 years old. Fourteen additional reactors are more than 30 years old. They are scheduled to eventually be decommissioned.

Motegi presented the idea that electric power companies will decommission reactors while the government will support them by offering technologies for the work.

“It is necessary to divide roles between what the utility companies will do and what the government will do,” Motegi said.

However, if the government allocates money to support the decommissioning of reactors, it means that taxpayers indirectly shoulder part of the costs for that process.

**Although the electric power industry says that nuclear power generation is cost-effective, the costs to decommission reactors will be passed on in higher taxes in addition to more expensive electric bills for consumers.**

(This article was written by Mari Fujisaki and Eiji Zakoda.)

## 5.0 quake in Fukushima on Saturday

December 29, 2012

### **M5.0 quake jolts Fukushima, vicinity**

<http://mainichi.jp/english/english/newsselect/news/20121229p2g00m0dm028000c.html>

TOKYO (Kyodo) -- An earthquake with a preliminary magnitude of 5.0 jolted Fukushima Prefecture and its vicinity Saturday afternoon, the Japan Meteorological Agency said.

No tsunami warning was issued following the 4:19 p.m. quake, which registered 4 on the Japanese seismic intensity scale of 7 in Iwaki, Naraha and Kawauchi, all in Fukushima, and 3 in several observation points in Miyagi, Fukushima, Ibaraki and Tochigi prefectures, according to the agency.

The focus was off the coast of Fukushima at a depth of around 50 kilometers, the agency said.

January 3, 2013

## **TEPCO prepares to remove spent fuels**

[http://www3.nhk.or.jp/daily/english/20130103\\_15.html](http://www3.nhk.or.jp/daily/english/20130103_15.html)

Tokyo Electric Power Company plans to start removing spent fuel rods from the crippled Fukushima Daiichi nuclear plant this year. It will be the first major step in a decommissioning process that is expected to take 40 years.

The March 11, 2011 earthquake and tsunami triggered meltdowns in three reactors, and a hydrogen explosion damaged the structure that houses a fourth reactor. During the initial stages of decommissioning, TEPCO workers will need to remove the spent fuel and dismantle reactor buildings, all while keeping melted fuel cool.

The first step in that process involves the removal of 1,533 spent fuel rods stored in the pool in the reactor 4 building. There is more used fuel there than in any other reactor building at the plant.

It will be a delicate operation, made even more sensitive by the fact that the hydrogen explosion raised **concerns about the earthquake resistance of the structure.**

**TEPCO workers plan to begin the work in mid-November, with the aim of finishing it by the end of 2014.** They have already started bringing in parts of cranes and other heavy machinery needed for the job.

But high levels of radiation at the site and other problems have continued to slow the decommissioning process.

Last September, workers accidentally dropped a steel beam weighing 470 kilograms into the fuel pool of the reactor 3 building.

Nearly two years after the Fukushima accident, TEPCO must also speed up a survey in preparation for its plan to remove the melted fuel within 10 years.

In addition, it needs to accelerate efforts this year to develop remote-controlled robots that will help with that work.

## **Almost two years but still no solution for contaminated water**

January 5, 2013

## **No solution to tainted water at Fukushima plant**

[http://www3.nhk.or.jp/daily/english/20130105\\_05.html](http://www3.nhk.or.jp/daily/english/20130105_05.html)

Nearly 2 years have passed since a massive earthquake and tsunami damaged the Fukushima Daiichi nuclear power plant.

But since then, no drastic solution has yet been found to manage the plant's growing amounts of contaminated water.

Each day about 400 tons of underground water has been flowing into reactor buildings since a nuclear accident triggered by the disaster on March 11th, 2011. The water becomes contaminated with radioactive materials.

The tainted water needs to be safely managed after being rid of radioactive substances.

But the volume of the water is continuing to rise, increasing radiation levels at the plant. If it leaks outside, it could contaminate the environment.

The plant's operator, Tokyo Electric Power Company, initially aimed to start operating a new water treatment facility last September.

It's designed to remove 62 kinds of radioactive elements from the contaminated water, including radioactive strontium, which could not have been removed before.

The facility has been already completed, but TEPCO is significantly delaying the start of its operation.

That's because containers to store radioactive waste from the facility were found to be of insufficient strength. The government is requiring Tokyo Electric to conduct additional tests and to strengthen the containers.

TEPCO says it wants the facility to begin operating as early as possible this year. But no clear date has yet been set.

The company plans to pump underground water to prevent it from flowing into reactor buildings. It will also install steel walls underground to block contaminated water from leaking into the sea.

TEPCO is also facing a series of problems with a currently operating treatment facility.

Glitches have frequently forced the utility to halt the facility. TEPCO also discovered contaminated water leaking from the facility.

## **Cover over No.4 started**



January 9, 2013

## **Installment of cover for fuel removal begins at Fukushima plant reactor**

<http://mainichi.jp/english/english/newsselect/news/20130109p2a00m0na001000c.html>



The No. 4 reactor at the Fukushima No. 1 nuclear plant where installment of a cover for fuel removal has begun. (Photo courtesy of TEPCO)

FUKUSHIMA -- Workers began installing a special cover to be used in the removal of spent nuclear fuel from the No. 4 reactor at the stricken Fukushima No. 1 Nuclear Power Plant.

The installment began Jan. 8 as part of efforts by the government and plant operator Tokyo Electric Power Co. (TEPCO) to decommission the nuclear plant, and is expected to be completed around October. Removal of fuel rods from the spent fuel pool is slated to begin the following month.

The greatest number of fuel rods of the plant's reactors, some 1,533 rods -- 1,331 spent and 202 unspent -- are currently being stored in the No. 4 reactor fuel pool.

The roof of the cover will be approximately 53 meters high. The interior is fitted with a ceiling crane, which will require 87 steel columns for support, and a fuel handling machine, which will require 18 support columns. Two steel columns were installed on Jan. 8.

The fuel removed from the No. 4 reactor fuel pool will be stored temporarily in a separate pool on the plant grounds with a maximum capacity of 6,840 fuel rods, of which some 6,375 spent fuel rods have been stored there since before the nuclear crisis. An additional fuel storage facility will be constructed on the plant grounds, where previously stored fuel rods will be transported via dry casks to make room for the fuel from the No. 4 reactor fuel pool.

## Quake in Fukushima

January 11, 2013

### **M5.0 hits Fukushima, vicinity**

<http://mainichi.jp/english/english/newsselect/news/20130111p2g00m0dm010000c.html>

TOKYO (Kyodo) -- An earthquake with a preliminary magnitude of 5.0 shook Fukushima Prefecture and its vicinity Thursday night, the Japan Meteorological Agency said.

No tsunami warning was issued following the 9:48 p.m. quake, which registered 4 on the Japanese seismic intensity scale of 7 in the coastal town of Shinchi in Fukushima, and 3 at some observation points in Fukushima and Miyagi prefectures in northeastern Japan, according to the agency.

The agency said the quake's focus was off the coast of Fukushima at a depth of around 40 kilometers.

## Plan to triple geothermal power output on island

January 13, 2013

## Tokyo gov't plans to increase geothermal power output on Hachijo Island

<http://mainichi.jp/english/english/newsselect/news/20130113p2a00m0na002000c.html>

The Tokyo Metropolitan Government plans to increase the output of a geothermal power station on Hachijo Island in the Pacific Ocean south of Tokyo by three times by fiscal 2018 to generate 80 percent of locally consumed power, Gov. Naoki Inose says.

The metropolitan government is set to establish a study panel on the project comprised of experts and local officials. Construction work will commence in fiscal 2014, and be completed in fiscal 2018.

If the plan materializes, it will be the first time in Japan for a majority of electric power consumed in a single municipality to be generated through renewable energy. The island is under the jurisdiction of the Hachijo Municipal Government.

"We'll promote the local production of electric power for consumption on the island, and diversify energy sources," says Gov. Inose.

A geothermal power station with an output of 2,000 kilowatts, which Tokyo Electric Power Co. (TEPCO) built in 1999, supplies 25 percent of total electric power consumed on the island with a population of some 8,000. The remainder is generated by a diesel power generator.

However, the geothermal plant needs to be either reconstructed or repaired as its service life will end within the next decade.

Under the plan, the metropolitan government will serve as the coordinator of the project, and solicit private companies to undertake the work. The output of the new geothermal power station will be 6,000 kilowatts, three times the current one.

Construction costs are estimated to be in the billions of yen, but the metropolitan government says the project will be profitable if power is sold to TEPCO for 42 yen per kilowatt per house under the government's feed-in-tariff system for renewable energy.

TEPCO can substantially reduce its fuel costs at the diesel power plant if its ratio to the total amount of power consumed on the island declines sharply. The project will also help reduce carbon dioxide emissions.

## Overworked and overdosed

January 14, 2013

## Worker shortages revealed at nuclear plant after disaster

<http://www.yomiuri.co.jp/dy/national/T130113003104.htm>

Jiji Press

A manager's calls for reinforcements to help contain a series of crises at Tokyo Electric Power Co.'s Fukushima No. 1 nuclear power plant were ignored, newly released TEPCO teleconference footage has revealed.

Although Masao Yoshida, then manager of the plant damaged by the March 11, 2011, earthquake and tsunami, repeatedly asked TEPCO headquarters in Tokyo to send more workers, the request was not met in a timely manner. As a result, the plant's workers suffered extreme fatigue and heightened radiation exposure, the footage showed.

On the morning of March 16, 2011, five days after the start of the crisis, the plant reported to headquarters that it had 177 TEPCO employees and four workers on staff from TEPCO partner companies.

Hydrogen explosions occurred at the No. 1 reactor building on March 12, at the No. 3 reactor building on March 14 and the No. 4 reactor building on March 15.

As the condition of the No. 2 reactor continued to deteriorate, many workers had already been evacuated, with only about 70 remaining.

The number of workers then started to recover, but Yoshida continued to feel there were shortages in manpower.

"Don't expect extra workers from the plant." This was the reply Yoshida gave when asked by the headquarters to provide workers as drivers for vehicles to transport equipment to fix a motor and power panels flooded with seawater.

In the early morning of March 17, Yoshida asked the headquarters to realize there was a limited number of workers at the plant to carry out operations to bring the nuclear crisis under control.

The next morning, his patience finally ran out. **"I can no longer force my employees to continue working," Yoshida declared, saying many of them had received high doses of radiation.**

## Strontium again

January 23, 2013

## **Strontium-90 detected from near the water discharge channel of reactor1~6**

<http://fukushima-diary.com/2013/01/strontium-90-detected-from-near-the-water-discharge-channel-of-reactor16/>

According to Tepco's "Nuclides Analysis Result of Radioactive Materials in the Seawater" published on 1/23/2013, **Strontium-90 was detected from 30m of the discharge channel of reactor5 and 6 and 330m of the discharge channel of reactor 1~4**, where Cs-134/137 were detected to be lower than 1.0 and 1.3 Bq/L.

Tepco acknowledged it is due to the nuclear accident.

[http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/seawater\\_130123-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/f1/smp/2013/images/seawater_130123-e.pdf)

## **New robots for nuclear plants**

January 24, 2013

### **Robot facility aims to aid nation in nuclear crisis**

<http://www.japantimes.co.jp/news/2013/01/23/national/robot-facility-aims-to-aid-nation-in-nuclear-crisis/#.UQBGxvL1tEs>

by Kazuaki Nagata

Staff Writer

Japan Atomic Power Co. on Wednesday opened a facility in Tsuruga, Fukui Prefecture, that will station remote-controlled robots and dispatch them in the event of a crisis at the nation's nuclear power plants.

The facility, which faces Wakasa Bay and is close to several nuclear power plants, will also train engineers to control the robots.

Two types of robots that can work in highly radioactive environments will be housed at the facility, where a total of 15 full-time officials will be stationed. About 100 engineers from utilities across the country will also be trained there.

“(The utilities) must not cause nuclear accidents, but we will train engineers to the level where they can handle any kind of accident,” said Sunao Tomimori, head of the facility, which was set up after a request by the Federation of Electric Power Companies, a Tokyo-based organization comprised of 10 regional utilities.

Remote-controlled robots have been indispensable to the ongoing work at the Fukushima No. 1 plant, which has numerous areas where humans cannot venture because of dangerously high radiation levels.

Based on lessons learned from the Fukushima triple-meltdown disaster, the federation is aiming to establish one or two similar facilities in fiscal 2015 to help in the event of atomic disasters.

The facility in Tsuruga will be stationing and managing two types of robots, both of which are manufactured by U.S.-based iRobot Corp. and have been used at the Fukushima No. 1 plant.

One, named Packbot, can measure radiation levels and shoot video, while the other, called Warrior, is capable of removing debris. The robots can be used if leaks are detected in containment vessels and radiation levels surge dangerously. Two Packbots and one Warrior will be placed at the facility.

## **Alarm goes off at Fukushima Daiichi**

### **Press Releases**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1224362\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1224362_5130.html)

## **Dumping contaminated soil next to source**

## **Radioactive soil from decontamination dumped beside the tapwater source in Nihonmatsu city Fukushima**

<http://fukushima-diary.com/2013/01/radioactive-soil-from-decontamination-dumped-beside-the-tapwater-source-in-nihonmatsu-city-fukushima/>

Posted by **Mochizuki**

According to journalist Kirishima, contaminated soil produced from decontamination is **dumped** beside Yamanoiri dam in Nihonmatsu city Fukushima, which is the **tapwater source**.

It's dumped on the heights even without leakage isolation sheet.

<http://zasshi.news.yahoo.co.jp/article?a=20130118-00000008-sasahi-soci>

## **Clean water?**

January 25, 2013

## **Tepco plans to dump 'cleaned' Fukushima No. 1 water**

Kyodo

<http://www.japantimes.co.jp/news/2013/01/25/national/tepcoplans-to-dump-cleaned-fukushima-no-1-water/#.UQK3bPL1tEs>

Tokyo Electric Power Co. plans to dump contaminated water from its crippled Fukushima No. 1 nuclear plant into the Pacific Ocean after removing radioactive substances to reduce contamination to legally permissible levels.

Tepco said Thursday the measure is necessary because the utility fears it will eventually run out of capacity to store radioactive water that continues to accumulate at the plant due to water being injected to help cool the three reactors that experienced core meltdowns in March 2011.

Despite the plan, the utility acknowledged it needs the approval of local governments and other parties before it actually discharges the water into the ocean. "Nothing specific has been decided at this moment," one Tepco official said.

Water that has been used to cool the damaged reactors is recycled and used as coolant after radioactive levels in it have been lowered in a water-processing facility. But the total amount of contaminated water is increasing because the existing water flow allows an influx of about 400 tons of groundwater a day.

Tepco is increasing the number of storage tanks to deal with the situation, but warns they will eventually reach full capacity.

As a key step in the water release, Tepco will operate a new facility that can remove about different 60 types of radioactive substances, more than the existing water processing facility that has mainly worked to reduce the concentration of cesium. But as the new facility is not capable of removing radioactive tritium, an official said Tepco will consider diluting the processed water before releasing it to the sea.

## **TEPCO reports water leaks at water treatment building**

January 26, 2013

### **Coolant water leaked 3 times only within 1 week due to the bad installation and freezing "Same as last year"**

<http://fukushima-diary.com/2013/01/coolant-water-leaked-3-times-only-within-1-week-due-to-the-bad-installation-and-freezing-same-as-last-year/>

Posted by **Mochizuki**

On 1/19/2013, Tepco employee found a water leakage at the water treatment building. Due to this accident, they got to have to feed water to skimmer surge tank of reactor1 by a fire pump car. However, they had a water leakage then again.



Also, they had another water leakage at the chemical tank of decontamination equipment on 1/24/2013. These are due to the freezing water and in appropriate installation of the valves, which shows they had no improvement since last year.

It is estimated they are going to have 38 more winters to decommission Fukushima nuclear plants.

**Tepco report:** [http://www.tepco.co.jp/en/press/corp-com/release/2013/1224405\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1224405_5130.html)

- From 1:54 PM to 2:22 PM on January 24, Unit 1 spent fuel pool alternative cooling system was suspended while feeding water to the skimmer surge tank of Unit 1 spent fuel pool by a fire pump car. The spent fuel pool water temperature when the cooling system was restarted was 10.0°C, which was the same as that of when the cooling was suspended. (Though usually water is fed into Unit 1 spent fuel pool skimmer surge tank via the filtrate water pipe, a fire pump car was used instead since the main valve of the filtrate water pipe is closed due to leakage from the valve installed on the filtrate water pipe header found on January 19.) While feeding water into the skimmer surge tank by a fire pump car, water (filtrate water) leakage was found at the flange of the water feeding pipe installed in the large carry-in entrance at Unit 1 Reactor Building. The amount of leaked water is approx. 2L (Affected area: Approx. 2mx1m with a small depth). The leakage stopped after water feeding into the skimmer surge tank was stopped. From 2:42 PM to 3:05 PM on January 25, Unit 1 spent fuel pool alternative cooling system was suspended in order to feed water into the skimmer surge tank by a fire pump car after the leakage area was repaired. The spent fuel pool water temperature when the cooling was restarted was 10.5°C (the same as when the cooling was suspended). No problem was found with the leakage location.

- At around 1:15 PM on January 19, a TEPCO employee found filtrate water leaking in the form of a mist from the filtrate water header valve used for feeding water to the spent fuel pool which is installed in the former Water Treatment Building. The area affected by leakage is approx. 1mx1m when the leakage was first found. The leaked water is kept in the building and has not flowed to the outside. After closing the valve located in the upstream side of the filtrate water pipe, the leakage amount was reduced to 2 drops per second. As a result of inspection, a crack was found on the filtrate water header valve where the leakage was found. As a result of investigation performed afterwards, it was found that though the valve of concern is installed inside the building, the installation condition is the same as those installed outside considering that the outer walls of the building were damaged due to the earthquake and no insulation material was installed on or near the valve. Under such installation conditions, the water remaining in the pipe froze and the pipe got expanded causing the valve to be damaged. As the valve and the pipe on which the valve is installed are not planned to be used, the valve has been removed and a closure panel has been installed on the flange in the upstream side of the pipe. Insulation material was also installed on the pipe to prevent freezing. After implementing these measures, water dripping was stopped. We will check the valve for leakage and install insulation material on the valves installed in the building. The incident has no impact on feeding water to the spent fuel pool.

- On January 24, after replacing the gasket of the flange on the pipe which feeds water into the chemical tank of the decontamination equipment (flange located on the tank side of the reducer), a TEPCO employee found filtrate water leaking from the reducer at around 3:10 PM while checking for leakage using fire hydrant water (filtrate water). The leakage stopped after closing the main valve of the fire hydrant. The amount of leakage was approx. 20L (affected area: approx. 3mx3mx2mm in depth) and the leaked water remains in the dam of the chemical tank. Considering that a crack was found on the reducer

and no insulation material was attached on it, the crack is assumed to have been caused by freezing. The damaged reducer will be repaired with insulation material attached on it.

## "Talking" dosimeters for the blind

January 28, 2013

### **Dosimeter for the blind still in demand a year later**

[http://ajw.asahi.com/article/0311disaster/life\\_and\\_death/AJ201301280102](http://ajw.asahi.com/article/0311disaster/life_and_death/AJ201301280102)

By TERUHIKO NOSE/ Staff Writer

FUKUSHIMA--Masahiko Nakamura quickly grasped that dosimeters with displays were of virtually no use to visually impaired residents of Fukushima Prefecture after the nuclear disaster in March 2011. So he decided to do something about it.

Nakamura, 66, developed a dosimeter that provides voice readings on radiation exposure levels.

He developed the "talking" dosimeter in the aftermath of the reactor meltdowns at the Fukushima No. 1 nuclear power plant. Hundreds of the devices have been sold in the year since they became available.

When a user presses an orange button, the device reads out hourly radiation doses in a woman's voice. The readings are in 0.01 microsievert.

Nakamura, who holds a senior position at the Fukushima prefectural association of the blind, worked closely with a local manufacturer to develop the device.

"My aim is for the device to reach more disabled people," said Nakamura, who formerly taught at a school for people with disabilities.

Nine days after the Great East Japan Earthquake, which spawned towering tsunami that devastated northeastern Japan and triggered the nuclear disaster, Nakamura quit his post as a professor at a junior

college so he could offer support to survivors and their families. He drove more than 10,000 kilometers in three months, providing the help that people needed.

He contacted the manufacturer after learning that visually impaired people were desperate to measure radiation doses themselves, rather than rely on others to inform them when they were in danger.

Nakamura visited the company more than 20 times to discuss all sorts of details, such as the color and location of the button that activates the voice reading and whether a man's or woman's voice is more effective.

His dosimeter went on sale last January. Since then, about 350 units have been sold in Fukushima Prefecture and elsewhere. The price was lowered from 50,000 yen (\$550) to 38,000 yen this month.

The Japan Federation of the Blind donated 104 of them to Nakamura's association on Jan. 18. It was an emotional moment as 30 or so visually impaired persons were gathered there at the time. They broke into applause when the device said "0.12 microsievert."

A number of people with disabilities, including his former students, perished in the tsunami. Nakamura tormented himself with questions about why they could not be saved.

This resulted in a book, "Ato Sukoshi no Shien ga Areba" (Had there been a little more support), based on interviews with more than 100 individuals, including former students. The book explains how people with disabilities evacuated and the ordeal they faced.

Nakamura often visits the homes of people with disabilities. He assists them in applying for compensation over radioactive fallout from the stricken Fukushima power plant, and also explains documents on rebuilding efforts.

"Many disabled people have put up with (difficulties) without uttering a word," Nakamura said. "I want to speak up for them."

## **Groundwater bypass (by TEPCO)**

## Progress Status of Groundwater Bypass - Construction and Future Schedule

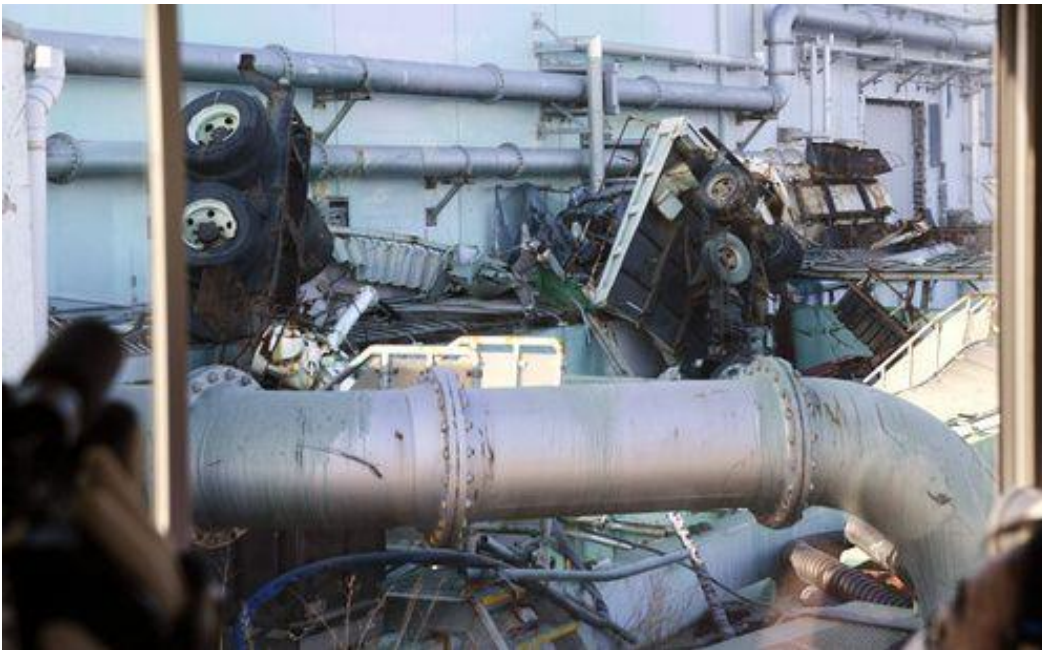
[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130128\\_04-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130128_04-e.pdf)

### Signs of progress and persistent destruction

January 29, 2013

#### March 11 destruction still scars Fukushima nuke plant

<http://mainichi.jp/english/english/newsselect/news/20130129p2a00m0na009000c.html>



The twisted remains of a truck destroyed in the March 11, 2011 earthquake and tsunami are seen at the Fukushima No. 1 nuclear plant on Jan. 28. (Mainichi)

A year and some 10 months after three reactor meltdowns at the Fukushima No. 1 nuclear plant, the power station remains marked by striking signs of destruction.

Tokyo Electric Power Co. (TEPCO) opened the plant to the news media on Jan. 28 to give the world a glimpse at the ongoing effort to deal with the worst nuclear disaster since Chernobyl. What the reporters saw was a mixture of progress and persistent signs of destruction, with toppled power lines and wrecked vehicles still lying where the March 11, 2011 earthquake and tsunami left them.

Except for a visit to the plant's emergency response office -- housed in a quake-resistant building -- TEPCO kept the reporters aboard a bus for the entire tour. Stops included wells being dug along the edge of the reactor buildings -- where pumps will be installed as part of efforts to prevent reactor coolant water from contaminating groundwater -- and at an incomplete building that will house new water decontamination equipment.

TEPCO is planning to move the fuel rods in the spent fuel pool atop the plant's No. 4 reactor -- one of three reactor buildings that exploded soon after the meltdowns -- to a new pool nearby. Some of the spent rods already in the new pool will eventually be moved into air-cooled "dry casks." Construction of temporary storage buildings for the casks, as well as cranes designed to lift them, are now under way.

Radiation levels in the tour bus peaked at 1.3 millisieverts per hour near the No. 3 reactor's turbine building. A portable dosimeter carried on the tour registered a total radiation dose of 38 microsieverts over the three-hour visit.

## Gov't increases decommissioning budget

January 30, 2013

### Japan gov't to fund speeding up of Fukushima reactor decommissioning

<http://mainichi.jp/english/english/newsselect/news/20130130p2g00m0dm031000c.html>

TOKYO (Kyodo) -- The Japanese government earmarked Tuesday 156.4 billion yen for the industry ministry to accelerate efforts to scrap the Fukushima Daiichi nuclear power plant's stricken reactors and support companies seeking to export nuclear technologies in the initial draft budget for the next fiscal year.

The nuclear power-related budget to be allocated to the Economy, Trade and Industry Ministry increased 12.4 percent from the initial budget for the current fiscal year, with the government seeking to pour in more funds to help the country recover from the 2011 Fukushima crisis and improve the safety of its nuclear power plants.

Prime Minister Shinzo Abe has vowed to accelerate the difficult task of scrapping the reactors that suffered core meltdowns, saying that the work cannot be left up to plant operator Tokyo Electric Power Co. and that the state will be "at the forefront" of such efforts.

About 4.2 billion yen was allocated to support projects aimed at developing remote-controlled devices and other technologies to facilitate the decommissioning work in areas where the radiation level is high,

while 2.2 billion yen was set aside for subsidies to projects that will contribute to the safety of nuclear plants.

**The industry ministry is also expected to spend some 1 billion yen to support companies that conduct geological surveys for plans to build nuclear power plants in other countries, in an apparent effort to maintain the level of Japan's nuclear technology at a time when building new reactors inside the country is difficult. [nukes are good enough for other countries...]**

While most of the nuclear reactors in Japan currently remain offline amid safety concerns in the wake of the Fukushima crisis, a total of 96.8 billion yen was set aside as subsidies to be handed to local governments hosting nuclear plants, down only 1.7 percent from the fiscal 2012 initial budget.

Separately from the budget allocated to the industry ministry, a total of 72.5 billion yen was earmarked to enhance the country's nuclear regulations and nuclear disaster-mitigation measures.

Of the funds, the government plans to use about 13.8 billion yen to improve the radiation protection functions of facilities designated as emergency response centers **when nuclear accidents occur. [clearly expecting new disasters]**

## Graphene oxide

January 31, 2013

### **Graphene Oxide Could Help With Radioactive Remediation, Say Researchers**

<http://www.nucnet.org/all-the-news/2013/01/31/graphene-oxide-could-help-with-radioactive-remediation-say-researchers>

31 Jan (NucNet): Graphene oxide, a two-dimensional material that contains pure carbon, has “a remarkable ability” to quickly remove radioactive material from contaminated water and could be used in cleaning up contaminated sites such as the Fukushima-Daiichi nuclear plant, researchers at Rice University in Texas and Lomonosov Moscow State University have found.

Microscopic, atom-thick flakes of graphene oxide bind quickly to natural and human-made radionuclides and condense them into solids, Rice University said in a statement. The flakes are soluble in liquids and easily produced in bulk.

An abstract of the research published online said the results point towards “a simple methodology” to mollify the severity of nuclear waste contamination, leading to effective measures for environmental remediation.

The experimental results were reported in the Royal Society of Chemistry journal ‘Physical Chemistry Chemical Physics’.

The discovery, said Rice University chemist James Tour, “could be a boon in the cleanup of contaminated sites like the Fukushima nuclear reactors damaged by the 2011 earthquake and tsunami”. It could also cut the cost of hydraulic fracturing – known as fracking – for oil and gas recovery and help the mining of rare earth metals, he said.

Graphene oxide’s large surface area defines its capacity to adsorb toxins, said Stepan Kalmykov of Lomonosov Moscow State University. “So the high retention properties are not surprising to us,” he said. “What is astonishing is the very fast kinetics of sorption, which is key.”

The researchers focused on removing radioactive isotopes of the actinides and lanthanides – the 30 rare earth elements in the periodic table – from liquids, rather than solids or gases. “Though they don’t really like water all that much, they can and do hide out there,” said Steven Winston, a former vice-president of Lockheed Martin and Parsons Engineering and an expert in nuclear power and remediation who is working with the scientists. “From a human health and environment point of view, that’s where they’re least welcome.”

Mr Tour said that capturing radionuclides does not make them less radioactive, just easier to handle. “Where you have huge pools of radioactive material, like at Fukushima, you add graphene oxide and get back a solid material from what were just ions in a solution,” he said. “Then you can skim it off and burn it. Graphene oxide burns very rapidly and leaves a cake of radioactive material.”

The low cost and biodegradable qualities of graphene oxide should make it appropriate for use in permeable reactive barriers, a fairly new technology for in-situ groundwater remediation, he said.

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## **Robots to clean Nos.1 to 3**

February 1, 2013

## **Fukushima reactor buildings to be cleaned by robots from late July**

<http://mainichi.jp/english/english/newsselect/news/20130201p2g00m0dm026000c.html>

TOKYO (Kyodo) -- The operator of the tsunami-hit Fukushima nuclear power plant said Thursday it will use robots from late July to accelerate work to reduce radiation levels in buildings housing three crippled reactors.

The method, decided by Tokyo Electric Power Co. and the government, is aimed at making the buildings more accessible for workers to conduct preliminary investigations necessary to decommission the reactors that contain melted fuel.

The details of conditions inside the reactor containers are currently unknown. Under the plan, **remote-controlled robots are expected to clean the interior of the Nos. 1 to 3 reactor buildings with high-pressure water and other means.**

The robots are now being used on a trial basis at the Fukushima Daini plant, located near the Daiichi plant that was devastated by the March 2011 earthquake and tsunami, to check whether their functioning can be improved.

The government and the utility plan to spend up to around 40 years to scrap the four reactor units severely damaged during the nuclear crisis, three of which suffered core meltdowns.

## **On Air: Inside Fukushima (NHK)**

<http://www3.nhk.or.jp/nhkworld/english/movie/feature201302012000.html>

## **TEPCO releases new pictures of disaster**

February 2, 2013

## **Photos show workers' eye views of Fukushima disaster aftermath**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201302020046>



The operator of the Fukushima No. 1 nuclear plant has released a barrage of images, many taken by workers themselves, showing chaos at the site as three reactors were going into partial meltdown.

Among the 2,145 photos are images of the No. 3 reactor building littered with debris from a hydrogen explosion on March 14, 2011.

Others show damage wrought by the tsunami, which struck on March 11.

And some portray efforts by emergency workers to spray water into the No. 4 reactor building, where fuel rods lying in a storage pool were losing their critical covering of coolant.

One image shows a part of the site where someone had marked the ground with a chilling warning: The spray-painted word reads "Kiken," or "Danger!"

The photos date from March 15 to April 11, 2011. Plant operator Tokyo Electric Power Co. gathered them from various sources after asking employees and subcontractors to submit any photos they themselves had taken.

Releasing the images is an apparent bid to convince the public of conditions faced by those workers and the difficulty of recovery work.

The company said it received many more photos than those released, but decided to withhold 849, citing "protection of sensitive data" related to nuclear technology.

It is the largest release of images since the utility published a first batch of 600 photos in September 2012. Some of the images can be seen at the TEPCO website, where they first went live Feb. 1.

## **New fuel?**

February 4, 2013

### **Japan begins world's first offshore test mining of methane hydrate**

<http://ajw.asahi.com/article/economy/technology/AJ201302040070>

By MARI FUJISAKI/ Staff Writer

Government-affiliated Japan Oil, Gas and Metals National Corp. has begun the world's first offshore test mining of methane hydrate from seabed layers, in an effort to tap into a potential new fuel resource.

According to the company, the deep-sea drilling vessel Chikyu departed Jan. 28 for the eastern Nankai Trough, 70 kilometers off the Atsumi Peninsula in Aichi Prefecture.

Methane hydrate, known as "burning ice," has been drawing much attention as a possible abundant natural fuel resource.

The company drilled an offshore well last year at a depth of 1,000 meters to a methane hydrate stratum 300 meters under the seabed where the production testing is being conducted.

It now plans to extract natural gas by inserting a pipe into the well and separating methane hydrate into methane gas and water. The extraction will begin as early as March, if the operation goes according to schedule.

The company plans to extract up to 10,000 cubic meters of gas per day over a two-week period.

It is estimated that Japan's coastal waters hold 100 times the amount of natural gas that is used annually in the nation.

The industry ministry also plans to conduct surveys in the Sea of Japan, where the existence of methane hydrate is expected.

## Please remove those cranes

### Minor debris removed from SFP of reactor3

<http://fukushima-diary.com/2013/02/minor-debris-removed-from-sfp-of-reactor3/%E3%82%B9%E3%82%AF%E3%83%AA%E3%83%BC%E3%83%B3%E3%82%B7%E3%83%A7%E3%83%83%E3%83%88%EF%BC%882013-02-04-19-18-31%EF%BC%89/>

Posted by **Mochizuki**

On 2/4/2013, Tepco reported they removed the minor debris from SFP of reactor3.

The removal of steel truss debris is planned for early February but it's not started yet.

## Shale gas from the US

February 6, 2013

### TEPCO to buy US shale gas

[http://www3.nhk.or.jp/daily/english/20130206\\_45.html](http://www3.nhk.or.jp/daily/english/20130206_45.html)

Tokyo Electric Power Company says it plans to buy shale gas from the United States to help cut down on fuel costs.

The utility says it has reached a broad agreement with 2 major Japanese trading houses to purchase 800-thousand tons of shale gas every year. The trading houses will buy from the US.

The 20-year-contract would begin in 2017.

TEPCO also says it's in the final stages of negotiations with other businesses to purchase 1-point-2-million tons of shale gas per year.

The utility says using shale gas, which is somewhat cheaper than conventional natural gas, would help cut overall fuel costs by around 530-million dollars a year.

Since the nuclear accident at the utility's Fukushima Daiichi power plant, rising costs of fuel for thermal power generation have been weighing on the company's finances. Thermal power fuel costs are likely to reach around 30-billion dollars this business year.

## Natural gas for Fukui Pref.

February 7, 2013

### Fukui Prefecture looks to replace nuclear plants with natural gas

<http://mainichi.jp/english/english/newsselect/news/20130207p2a00m0na009000c.html>

The Fukui Prefectural Government will establish a new group on Feb. 8 to consider promoting liquefied natural gas (LNG) plants as a replacement for nuclear energy.

Fukui Prefecture holds 14 nuclear reactors, but with reactivation delayed and the possibility of active faults lying underneath the facilities, the prefectural government appears to be strongly concerned about the local economies, as regional incomes have fallen and employment has suffered.

However, Fukui Gov. Issei Nishikawa has said that "nuclear plants continue to be an important power source base."

The new group will consist of 11 people, including Nishikawa and economic experts. They will look into possible locations for LNG bases and thermal power plants, effects on local economies, and other factors. Officials from the Ministry of Economy, Trade and Industry, and Special Advisor to the Cabinet Secretariat Satoshi Fujii, who has called for the need for better disaster-preparedness, will also join the group. Their participation may be due to the national government's desire to secure non-nuclear energy sources on the Sea of Japan coast in preparation against a Nankai Trough quake.

## Did it smash any fuel assembly?

February 8, 2013

### **TEPCO accident causes new problem at Fukushima**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201302080063>

The operator of the Fukushima No. 1 nuclear plant has admitted dislodging broken equipment weighing 1.5 tons and sending it falling further into a pool where fragile nuclear fuel rods lie.

The debris is part of a heavy-duty hoist formerly used to move fuel assemblies within the No. 3 reactor building. The hoist collapsed into the pool after a hydrogen explosion in March 2011.

Until now, it lay only partially submerged and was believed to have done little damage to the fuel rods beneath.

But on Feb. 7, Tokyo Electric Power Co. officials said work a day earlier to shift an unrelated steel frame nearby caused "vibrations" which dislodged the hoist. It fell, disappearing beneath the water surface.

TEPCO now plans to drop a video camera into the pool to **check whether the hoist has smashed fuel rods below.**

Officials say **566 fuel assemblies** are currently lying in the pool at the No. 3 reactor building.

They insisted there has been no significant change in radioactive concentrations measured in the pool and in the atmosphere since before the latest incident.

### **Possibility of Debris (Assumed to be the Fuel Handling Machine Mast) Sinking in the Spent Fuel Pool at Debris Removal from the Upper Part of the Unit 3 Reactor Building at Fukushima Daiichi Nuclear Power Station**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_120208\\_01-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_120208_01-e.pdf)

Tokyo Electric Power Company

Before steel truss debris removal (Photo taken on February 4, 2013)

At the steel truss debris removal from the upper part of the spent fuel pool performed on February 6, 2013, the debris assumed to be the fuel handling machine mast\* which was present before the steel truss removal was found to be missing in the image taken after the removal work. On February 7, we judged that there is a possibility that the missing debris has sunk into the pool.

\*Fuel handling machine mast: Extendable pole used to lift the grip up and down when moving the fuel assemblies (Length: Approx. 5- 23m, Weight: Approx. 1.5 tons)

**Once the preparation is complete, we will investigate the condition of the sunken debris when we perform investigation of the inside of the spent fuel pool utilizing an underwater camera.**

## **New panel for Fukushima decommissioning**

### **New gov't panel to oversee decommissioning of Fukushima reactors**

<http://mainichi.jp/english/english/newsselect/news/20130208p2g00m0dm057000c.html>

TOKYO (Kyodo) -- The Japanese government decided Friday to form a new panel to oversee the decommissioning of the four reactors at the accident-stricken Fukushima Daiichi complex, comprised of related ministries, the plant operator Tokyo Electric Power Co. and domestic plant makers.

The establishment of the panel follows the launch of a new government led by Prime Shinzo Abe, who has vowed to accelerate the decommissioning work that will involve technology development to remove the melted fuel left inside three crippled reactors.

The government and TEPCO have held meetings to work together on the issue at irregular intervals, but government officials said **the new panel will be held regularly and will not only decide on the work schedule toward the decommissioning but also confirm the progress.**

**The panel will be chaired by the economy, trade and industry minister. Members will include top officials of TEPCO and the Japan Atomic Energy Agency as well as Toshiba Corp. and Hitachi Ltd., which were involved in the construction and designing of the Fukushima plant.**

The first meeting of the panel is expected to be held later in the month, the officials said.

During the Fukushima crisis, triggered by a huge earthquake and tsunami in March 2011, the Nos. 1 to 3 reactors suffered core meltdowns and the building housing the No. 4 reactor has been severely damaged by a hydrogen explosion.

Under the current work schedule, TEPCO and the government expect the decommissioning work to take up to about 40 years.

## Alternatives

February 10, 2013

### **Tokyo ward preparing to set micro hydro project afloat**

<http://mainichi.jp/english/english/newsselect/news/20130210p2a00m0na004000c.html>

Tokyo's Koto Ward is gearing up for a local micro hydro power project -- the first among the capital's 23 wards -- earmarking 7.4 million yen to investigate the project in its draft budget for fiscal 2013.

The upper and lower reaches of rivers in the ward, which faces Tokyo Bay, have only a small height difference and the amount of electricity that can be generated is also small, but the ward hopes to use the project to help children learn about the environment as society moves toward increased use of renewable energy.

Micro hydro is a small-scale type of hydroelectric power producing up to 100 kilowatts of electricity. Seven young workers in the Koto Ward Government's global warming countermeasures section proposed the project under a worker suggestion contest this fiscal year, and were awarded the top prize.

Officials will survey three sites -- Sendai Borigawa Park, Yokojikken river water park and Furuishiba river water park -- to find the most efficient location to set up a micro hydro project, probing the amount of electricity than can be generated and the cost of setting up the system. The height difference of the highest and lowest points of rivers in all three locations is less than 1 meter, but officials say that if water turbines that can generate power from only slight water drops and small water flows are used, the project will be able to generate electricity.

Officials estimate that the project could produce enough power for 17 to 88 10-watt light-emitting diode street lights. The ward aims to complete its survey and begin construction in fiscal 2013.

## **Fukushima Daiichi plant - New photos**

To view all the photos click on the link below or check on Pierre Fetet's blog <http://fukushima.over-blog.fr/article-voir-fukushima-47-115176481.html>

[http://english.kyodonews.jp/photos/japan\\_quake/](http://english.kyodonews.jp/photos/japan_quake/)

## **What is going on inside reactor nr.2?**

### **The “broken” thermometer is indicating temperature reaching almost 250° in reactor2**

Posted by **Mochizuki** on February 10th, 2013 ·

<http://fukushima-diary.com/2013/02/the-broken-thermometer-is-indicating-temperature-reaching-almost-250%E2%84%83-in-reactor2>

Two thermometers of reactor2 (RPV) have been indicating temperature increase since last December. Tepco labelled them as “broken”, but the indicated temperature started increasing again.

Two thermometers are showing the similar trend though they are supposed to be broken, the highest one is almost reaching 250°C.

Tepco is refusing disclosing the diagram of the thermometers for saving “intellectual property of Toshiba”.

February 15 , 2013

### **What is the use of a door?**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1224790\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1224790_5130.html)

-At 10:50 AM on February 15, while carrying goods out of the large carry-in entrance in Unit 6 Reactor Building with its inside door (the door which opens by lifting up) open and its outside door closed, the inside door fell. The door which fell did not fall over. No injury has been reported due to the incident and the incident has not affected the plant condition. The condition of the inside door and the cause of its falling are currently being investigated

### **Miscommunication?**

February 16, 2013

### **TEPCO releases video of vital Fukushima plant equipment, denies quake damage**

<http://mainichi.jp/english/english/newsselect/news/20130216p2a00m0na014000c.html>





TEPCO employees examine the area around an emergency isolation condenser, back, in this still image from video taken Nov. 30, 2012 inside the Fukushima No. 1 nuclear plant's No. 1 reactor building. (Image courtesy of TEPCO)

Tokyo Electric Power Co. (TEPCO) on Feb. 15 released footage from the inside of the Fukushima No. 1 nuclear plant that it insists proves a vital piece of reactor cooling equipment was not damaged by the March 2011 Great East Japan Earthquake.

Suspicion that the emergency isolation condenser in the No. 1 reactor had been damaged by the quake emerged when a plant worker told a Diet disaster investigative committee that water had been observed leaking around the condenser before the ensuing tsunami arrived. TEPCO has maintained that the core meltdowns at the plant were triggered by tsunami damage to backup power and cooling systems and not by the quake itself.

The 28-minute video was shot on Nov. 30 last year and shows four TEPCO employees in protective suits inspecting conditions on the fourth floor, including the ceiling where the leak is said to have occurred.

TEPCO has said the water did not leak from the emergency condenser, but had flowed into an exhaust pipe from the spent fuel pool on the top floor of the reactor building. The exhaust pipe opening is covered by a metal plate, but this had apparently come off.

In February last year, TEPCO refused to allow the Diet committee to do on-site inspections, claiming the inside of the reactor building was too dark to see anything. It has since been proven that there was enough light in the building to perform the inspection.

The footage released Feb. 15 was tracked down only after a former investigative committee member suggested TEPCO had the video in its possession.

"The department that took the video thought the footage had already been released," said Masayuki Ono, acting head of TEPCO's nuclear power and facilities section. "There was miscommunication in the company."

TEPCO has posted the footage on its website at <http://photo.tepco.co.jp/en/index-e.html>

## Faulty or not ?

### Reactor2 temperature jumped up by 120°C within 12 hours

Posted by Mochizuki on February 16th, 2013 ·

The temperature of reactor2 is almost reaching 265°C.

The thermometer attached on the upper part of RPV2 recorded the rapid increase of temperature **from 143.4 to 262.3, when was from 23:00 of 2/15/2013 to 11:00 of 2/16/2013.**

On 2/10/2013, Fukushima Diary reported the temperature of bottom part of RPV was reaching 250°C. **Now it is 284.4.**

According to Tepco, both of the thermometers are supposed to be disordered.

content/uploads/2013/02/%E3%82%B9%E3%82%AF%E3%83%AA%E3%83%BC%E3%83%B3%E3%82%B7%E3%83%A7%E3%83%83%E3%83%88%E3%83%88%E3%83%88%EF%BC%882013-02-16-22.11.29%EF%BC%89-450x125.png>

[http://www.tepco.co.jp/en/nu/fukushima-np/f1/pla/2013/images/csv\\_6h\\_data\\_2u-e.csv](http://www.tepco.co.jp/en/nu/fukushima-np/f1/pla/2013/images/csv_6h_data_2u-e.csv)

## Dry ice for decontamination robot from Toshiba

## Toshiba, gov't show off nuclear decontamination robot

<http://mainichi.jp/english/english/newsselect/news/20130216p2a00m0na016000c.html>



A decontamination robot is seen at a demonstration in Isogo Ward, Yokohama, on Feb. 15. (Mainichi)

YOKOHAMA -- Workers at the Fukushima No. 1 nuclear plant are about to get a technological helping hand in the form of a decontamination robot unveiled here by Toshiba Corp. and the Japanese government on Feb. 15.

Designed to clean the ground level floors, walls and ceilings of the plant's reactor buildings, Toshiba and the Ministry of Economy, Trade and Industry hope the robot will reduce radiation levels enough to allow human workers to enter and move ahead with disassembling the stricken reactors.

Operated using a game console controller and touchscreen, the robot sprays fine dry ice from the end of an arm to remove radioactive material from surfaces. It also sucks up the material to keep it from spreading. The robot has been designed to withstand radiation levels of up to 3 sieverts per hour.

According to Toshiba, sprayed dry ice is also used to remove paint from airplanes and is not a deep cleansing method, able to remove only radioactive material less than a millimeter from the surface.

"We will test its decontamination effectiveness in the future," said a Toshiba representative.

According to the industry ministry, around 2 billion yen in subsidies was set aside in the fiscal 2012 budget for research into robots to help disassemble the Fukushima reactors. The ministry plans to request a further 8.68 billion yen for fiscal 2013.

## **Toshiba develops equipment to clean up radiation using dry ice particles**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201302160051>

Toshiba Corp. has shown off heavy machinery it developed to clean up radioactive materials using dry ice particles.

It sprays dry ice particles by remote control to remove radioactive materials from the floor and walls inside reactor buildings.

The equipment will be tested at the Fukushima No. 2 nuclear power plant from Feb. 18. Plans call for using it at the stricken Fukushima No. 1 nuclear power plant from this summer.

The device comprises two carriages that are operated by controllers with 100 meters of cable attached.

An arm on the carriage sprays dry ice particles to remove radioactive materials and a separate hose vacuums up the materials.

The equipment can operate continuously for 30 minutes.

According to Toshiba officials, development costs came to several tens of millions of yen, half of which was covered by the Ministry of Economy, Trade and Industry in the form of subsidies.

The central government has earmarked 100 billion yen (\$1.1 billion) in the supplementary budget for fiscal 2012 and the initial budget for fiscal 2013 for research expenses associated with the decommissioning of nuclear reactors.

The ministry organized a demonstration of the equipment to the media on Feb. 15.

February 18, 2013

## Radioactive water overflows

### Overflow of radioactive water outside reactor 5 and 6

<http://fukushima-diary.com/2013/02/contaminated-water-overflowed-from-the-tank-of-reactor5-and-6-in-the-end/>

#### Press Release (Feb 17,2013)

#### Status of TEPCO's Nuclear Power Stations after the Tohoku-Chihou-Taiheiyou-Oki Earthquake (Daily Report as of 3:00 PM, February 17)

- At around 7:36 PM on February 16, a cooperative company worker found water overflowing from the water intake tank between the temporary tank storing accumulated water installed outside of Units 5-6 and the desalination system (reverse osmosis membrane). The leaked stopped after stopping the water intake pump on the upstream side of the water intake tank. The amount of leaked water is evaluated to be approx. 19.8m<sup>3</sup> and the leaked water has been absorbed into the ground. We have judged that the leaked water has not flowed to the outside considering that there is no side ditch, etc. in the surrounding area. The cause of the leakage is currently under investigation. The radioactivity density analysis results of the leaked water are as follows.

Cesium 134:  $6.8 \times 10^{-2} \text{Bq/cm}^3$

Cesium 137:  $1.3 \times 10^{-1} \text{Bq/cm}^3$

All  $\gamma$ :  $2.0 \times 10^{-1} \text{Bq/cm}^3$

### TEPCO investigates inside fuel pool of Number 3

<http://photo.tepco.co.jp/en/date/2013/201302-e/130213-02e.html>

<http://www.simplyinfo.org/?p=9728>

## **Analysis: Unit 3 Mast In Pool Inspection**

200 still images from TEPCO's video :

<http://www.flickr.com/photos/simplyinfo/sets/72157632785914272/with/8479956315/>

TEPCO released a new video and handout of the unit 3 mast that fell deeper into the spent fuel pool.

We have processed the video into about 200 still images that can be found here.

The full video of the inspection can be found on our Youtube channel.

TEPCO estimates one end of the mast landed along the east wall with the end resting on a control rod drive rack. The other end appears to be resting tangled in concrete and rebar debris on top of the fuel racks. Portions of the middle of the mast can be seen spanning above the fuel racks by a few inches. What appears to have been the structure that originally held the mast into the fuel crane can be seen partially down the mast.

What is of particular note in the findings from this inspection is that the control rods housed along the east (sea side) wall of the pool. These control rods have considerable damage, with one laying mangled under the mast. The control rods contain hafnium in a steel shell. This damage could have caused them to leak.

This diagram shows the structure of a normal control rod with cracks, an ongoing problem in reactor operation. CNIC has reported in the past about control rod cracking problems at Fukushima Daiichi

## **Cracking in control rods (CNIC)**

### **Problem of damaged control rods spreads**

<http://www.cnic.jp/english/newsletter/nit111/nit111articles/nit111hafnium.html>

Major damage to control rods, including cracks in over 40 places, was first identified in Toshiba control rods at the Fukushima I-6 reactor on January 1st during a periodic inspection. Since then damage has been found at other reactors as well. The affected control rods are hafnium blade type. Hafnium is used as a neutron absorber. The control rods are used to control power output and are partly inserted into the core.

As shown in the diagram below, each thin hafnium blade is enclosed in a steel sheath. Four blades are joined with a tie rod to make a single control rod. The problems relate to the numerous cracks which have appeared in the sheaths and tie rods, and the damage to the sheath that seems to have developed from these cracks. Crack damage has been found in 9 of the 17 hafnium blade type control rods in use at the Fukushima I-6 reactor.

In all, 382 hafnium blade type control rods are in use in Japan's Boiling Water Reactors (BWR). A further 207 are in storage having completed their useful life. As of March 7th, inspections had been completed for 134 control rods still in use. Besides Fukushima I-6, damage and cracking was found in 5 of the same type of control rod at Fukushima I-3. In addition, 157 of those no longer in use had also been checked and 32 anomalies found: 8 at Fukushima I-5, 9 at Kashiwazaki-Kariwa-2, 2 at Kashiwazaki-Kariwa-6, 13 at Hamaoka-3.

### **Driving with broken brakes**

The Nuclear and Industrial Safety Agency (NISA) says that the damage is related to the degree of cumulative irradiation. On February 3rd it directed power companies operating BWRs to fully insert all hafnium blade type control rods for which the cumulative thermal neutron irradiation dose exceeds  $4.0 \times 10^{21}$  neutrons/cm<sup>2</sup>, or is expected to exceed this level during the current operating period. The idea is to insert them into the core before they break. If that were to happen it would no longer be possible to insert them. Continuing to operate the reactors under these circumstances is highly irregular.

In the case of Hamaoka-4, for example, this means that 21 control rods have been fully inserted, reducing the power output by 400 MW to 700 MW (62%). Control rods are a nuclear reactor's brakes. There couldn't be anything more dangerous than operating a reactor with these not fully functional. Both the La Salle 2 power oscillation accident (1983) in the US and the Chernobyl disaster (1986) in the Ukraine occurred at reduced power output. In order to avoid a catastrophe, the power companies should immediately stop the reactors and carry out a thorough check.

### **Stress corrosion cracking caused by neutron irradiation**

The sheaths and tie rods are made of SUS316L stainless steel. It was assumed that hafnium control rods would be employed as neutron absorbers for extended periods of time, so SUS316L was chosen to replace SUS304, because it was believed to be less prone to stress corrosion cracking. However, it is known from irradiation experiments at US experimental reactors and BWRs that stress corrosion cracks appear in SUS316L under cumulative fast neutron irradiation doses of more than  $1.0 \times 10^{21}$  neutrons/cm<sup>2</sup>.

Therefore, it (SUS316L) cannot be said to be very effective. When high burn-up fuels and MOX fuel are used, the situation will become even more serious than when the object is to operate reactors for long periods of time.

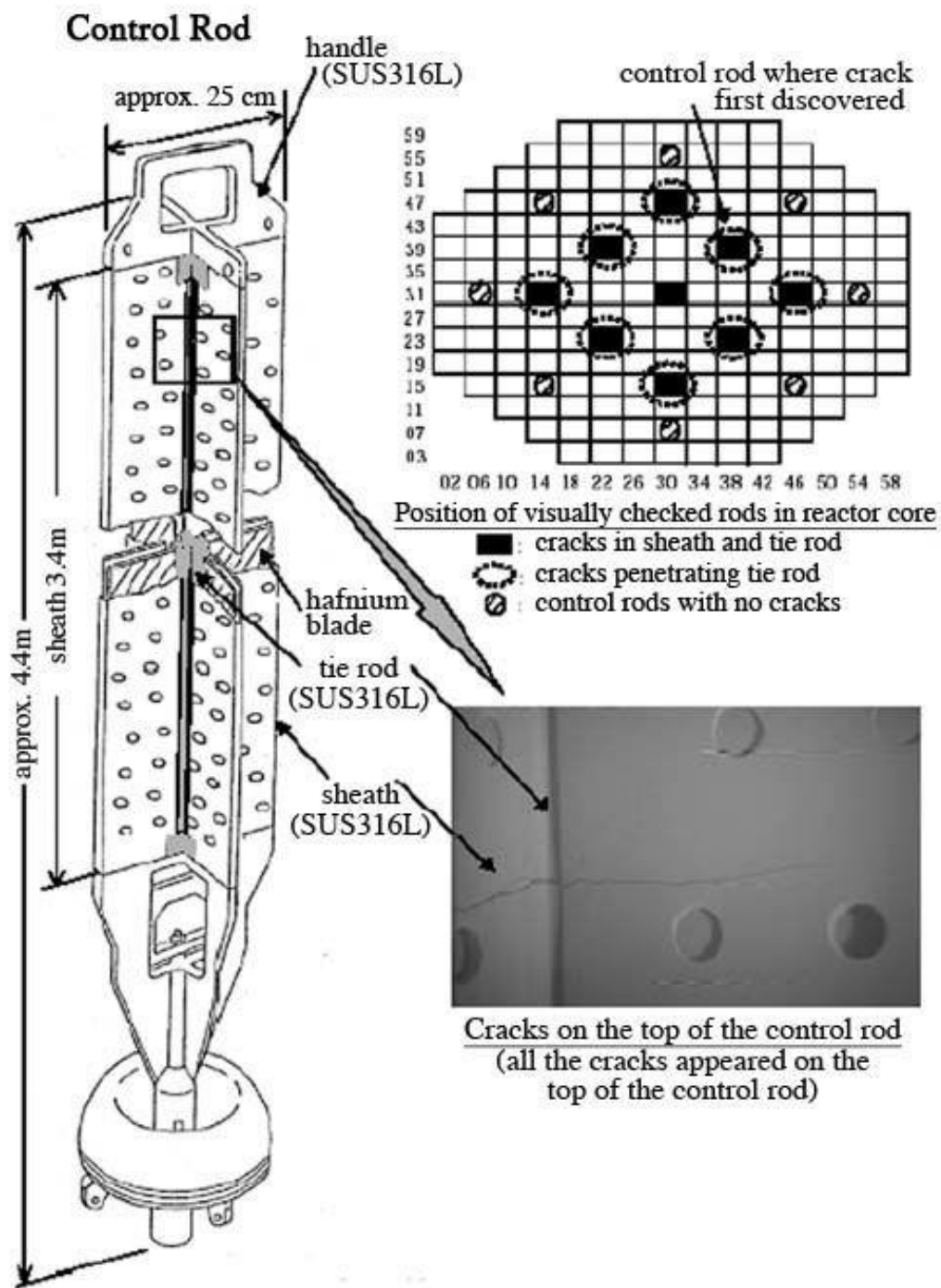
NISA's directive relates to control rods where the cumulative thermal neutron irradiation dose exceeds  $4.0 \times 10^{21}$  neutrons/cm<sup>2</sup>, but cumulative irradiation by fast neutrons generally exceeds this by quite some margin. Also, judging from past accidents, there is a high probability that stress corrosion cracks will appear or be latent at even lower irradiation levels, so the scope of the inspections should be expanded. The same can be said about other types of control rod. Judging just from recent examples, stress corrosion cracks have appeared in hafnium flat tube type, hafnium rod type and hafnium - boron carbide type control rods, so inspections should not be restricted to hafnium blade type rods only.

During the 2002 Tokyo Electric Power Company scandal, attention was focused on cracks in SUS316L. Then in 2003 cracks were found around welds on the handle of the hafnium blade type control rods. It is therefore hard to believe that power companies have not carried out checks for cracks in control rods before. Indeed, the discovery of cracks in used control rods suggests that previous discovery of cracks has been covered up.

Chihiro Kamisawa (CNIC)

### **Damage to hafnium blade type control rod**





Can limonite help to cut radiation?

February 19, 2013

## **Mount Aso limonite helps block radiation from tainted soil: researchers**

<http://mainichi.jp/english/english/newsselect/news/20130219p2a00m0na008000c.html>

A team of researchers has succeeded in cutting radiation levels emitted from contaminated soil by sprinkling iron-rich limonite on it, paving the way for preventing external exposure without removing tainted soil.

The researchers at Tokyo University of Science and other entities announced that they have succeeded in shielding some 65 percent of gamma rays emitted from radioactive cesium in contaminated soil by putting a layer of limonite on it. If put into practice, the method will help prevent external exposure to gamma rays without the hassle of soil removal.

Limonite is mainly collected in areas around Mount Aso in Kumamoto Prefecture. The iron mineral is generated through the microbial reaction of soil deposited in the caldera of Mount Aso. Some 70 percent of limonite's main component consists of iron. The researchers focused on the fact that gamma rays do not penetrate through thick iron plates or lead.

In their experiment, the researchers laid limonite some two centimeters deep on a one-square-meter patch of farmland in Inashiki, Ibaraki Prefecture, which was contaminated with radioactive materials emitted from the Fukushima No. 1 Nuclear Power Plant in the wake of the nuclear disaster. As a result of the experiment, the airborne radiation doses on the soil surface dropped by at least 60 percent.

When experimented with soil samples from the Fukushima Prefecture village of Iitate, the researchers found that iron contained in limonite likely made it hard for gamma rays to penetrate through it after the rays bumped into the iron.

## **Still too "hot" - Keep your distance**

February 21, 2013

## **High radiation bars decommissioning of Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201302210064>

By HISASHI HATTORI/ Senior Staff Writer

[http://www.youtube.com/watch?feature=player\\_embedded&v=AhOFfqKR7go](http://www.youtube.com/watch?feature=player_embedded&v=AhOFfqKR7go)

Preparations for the mammoth task of decommissioning crippled reactors at the Fukushima No. 1 nuclear power plant are being stymied by continued high levels of radiation from the triple meltdowns there two years ago.

Tokyo Electric Power Co., operator of the plant, has had to install more tanks to store radioactive water, which continues to swell by several hundreds of tons daily.

Asahi Shimbun reporters entered the No. 4 reactor building on Feb. 20, accompanied by inspectors from the secretariat of the Nuclear Regulation Authority, to assess the situation.

The reactor was offline for regular inspections when the magnitude-9.0 Great East Japan Earthquake struck on March 11, 2011, generating towering tsunami that swamped the plant.

In the days that followed, a hydrogen explosion tore through the No. 4 reactor building. It raised alarm worldwide that the storage pool for spent nuclear fuel in the building might lose its water through evaporation, resulting in the discharge of voluminous amounts of radioactive substances.

That was narrowly averted.

Most of the debris, such as steel frames mangled in the explosion, have been removed from the roofless top floor of the reactor building, but radiation levels remain high.

"Here, the reading is 200 microsieverts per hour," an inspector said. "But it is 1,000 microsieverts on the north side close to the No. 3 reactor building. Keep your distance."

A shroud has been placed over the spent fuel storage pool on the top floor. The water temperature was about 20 degrees. The water, seen through an opening, was muddy and brown. The fuel inside the pool was not visible.

Workers were installing a shroud for the No. 4 reactor building on the south side of the building. It will be equipped with a crane to remove spent fuel from the storage pool.

The foundation work was already completed, and steel frames were being assembled.

TEPCO intends to mount a determined effort to remove spent fuel from the storage pool in November. Two fuel assemblies were removed on a trial basis in July.

An elevator leading to the top floor was erected on the side of the No. 4 reactor building after the disaster. Blocks of concrete blown off in the explosion are still visible.

Similarly, trucks and cars swept up by the tsunami lay overturned and rusting in coastal areas east of turbine buildings.

From the top floor of the No. 4 reactor building, the No. 3 reactor building resembled a bird's nest made of twisted steel frames.

No workers were visible around the No. 3 reactor building. An unmanned crane was removing debris on the roof.

It is hazardous to human health to work in the reactor building where radiation levels range from 20 to 100 millisieverts per hour.

The No. 1 and No. 2 reactors also went in meltdown. Asahi Shimbun reporters got close to the two reactor buildings by taking routes where radiation levels are relatively low.

Still, the dosimeter reading was 700 microsieverts per hour east of the No. 2 reactor turbine building. The cumulative radiation dose was 0.111 millisievert after the approximately four-hour tour of the Fukushima No. 1 plant.

The figure is roughly one-10th of the annual radiation limit that the International Commission on Radiological Protection sets as a benchmark for public safety in ordinary circumstances.

Atsuhiko Kosaka, chief of the Nuclear Regulation Office responsible for the Fukushima No. 1 plant, says the watchdog body is paying particular attention to minimizing radiation exposure among workers at the site.

"We have yet to identify all hotspots, where radiation levels are locally high," Kosaka said.

Ever-increasing radioactive water has become a key challenge for TEPCO.

Groundwater is flowing into reactor buildings, where it mixes with water used to cool melted fuel inside the No. 1, No. 2 and No. 3 reactors.

The amount of radioactive water stored in tanks and other facilities rose to 230,000 tons this month, up from 10,000 tons in July 2011.

In addition, an estimated 100,000 tons of water have accumulated in the basements of buildings. Currently, there are nearly 500 storage tanks on the plant premises, many as tall as three-story buildings. TEPCO plans to add more by 2015 when it expects to have to store 700,000 tons of radioactive water.

Inside a radioactive water decontamination facility called Sarry, cylindrical cesium adsorption towers were lined up.

Cesium concentrations in radioactive water have recently fallen, but an inspector kept reporters from approaching the towers, saying radiation levels are high.

The Asahi Shimbun was the first media outlet to enter Sarry, which has been operating since August 2011. The name stands for simplified active water retrieve and recovery system.

The start-up of another decontamination system called Alps, scheduled by the end of 2012, has been delayed because the durability of waste containers was called into question.

The multi-nuclide removal system, short for advanced liquid processing system, is capable of removing almost all types of radioactive substances other than cesium.

Preparations for decommissioning have only recently begun. Decommissioning will not be completed for the next 30 to 40 years under a plan drawn up by the government and TEPCO.

**Trial and error is the only way available because the triple meltdowns are unprecedented.**

Prime Minister Shinzo Abe has said he intends to accelerate the process.

The government's nuclear emergency response headquarters set up a council for decommissioning at the Fukushima No. 1 plant on Feb. 8, scrapping a similar unit under the previous Democratic Party of Japan government.

Currently, workers cannot easily approach the three reactor buildings where the meltdowns occurred due to high radiation levels. They have been removing debris, such as concrete blocks, on the plant premises.

Work to remove melted fuel from the three reactors is expected to begin by around 2022. Fuel is believed to be scattered within the pressure vessels, containment vessels or piping systems, but exact locations remain unclear.

In addition, **TEPCO has yet to identify where radioactive water has been leaking from the damaged containment vessels.** The containment vessels must be filled with water before melted fuel is removed. In December, TEPCO sent a remote-controlled robot near the pressure suppression chamber in the No. 2 reactor building to find out where water was leaking. But the mission failed when the robot lost its balance and got stuck.

New technologies must be developed for decommissioning, but manufacturers and general contractors have shown little enthusiasm.

**The companies fear they will not be able to recover their investments because the technologies would have little practical application other than for the Fukushima plant.**

## New robots

See video:

[http://www.youtube.com/watch?v=ZLDHkSzvPwU&feature=player\\_embedded#t=0s](http://www.youtube.com/watch?v=ZLDHkSzvPwU&feature=player_embedded#t=0s)

## **New robots reduce human risk in disaster cleanup**

[http://www.japantimes.co.jp/news/2013/02/21/national/new-robots-reduce-human-risk-in-disaster-cleanup/#.UST\\_NDf1tEs](http://www.japantimes.co.jp/news/2013/02/21/national/new-robots-reduce-human-risk-in-disaster-cleanup/#.UST_NDf1tEs)

by Hiroko Nakata

Staff Writer

The New Energy and Industrial Technology Development Organization on Wednesday unveiled a series of robots and systems to help deal with disasters such as the Fukushima No. 1 nuclear power plant and reduce the danger for workers.

The robots, developed under a one-year project, include a small remote-controlled machine dubbed the Sakura that carries a camera and thermal imager.

Another is the bigger Tsubaki, which can tote measuring instruments weighing up to 50 kg to gather data from contaminated spots, such as inside the damaged reactor buildings at Fukushima.

The robots move about on tracks developed by a startup firm of Chiba Institute of Technology, giving them the ability to turn around in tight spaces and climb up and down steep stairs.

NEDO also unveiled systems allowing the remote-controlled robots to recharge and decontaminate themselves so human workers are not exposed to danger.

Mitsubishi Heavy Co. developed a machine with an 8-meter arm with the dexterity to turn a valve in high places.

Cyberdyne Inc. developed a robotic suit with a metal jacket to protect a worker from radiation, an air cleaner with a filter to aid breathing and a sensor to monitor pulse and temperature.

“What is important is that we use these robots effectively, and are not satisfied with development only,” said Shoji Kukita of NEDO’s tech department.

## **New ALPS system approved by NRA**

February 22, 2013

### **Nuclear regulator conditionally approves new water purifier tests at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130222p2a00m0na003000c.html>

An expert panel of the Nuclear Regulation Authority (NRA) conditionally approved the test run of new water purification equipment for radiation-tainted water at the Fukushima No. 1 Nuclear Power Plant.

The decision, which came Feb. 21, approves the use of the purification system ALPS, a multinuclide removal system. Since the system does not remove tritium, however, NRA did not approve the release of processed water into the ocean, a scheme that plant operator Tokyo Electric Power Co. (TEPCO) is exploring.

Approximately 230,000 cubic meters of radiation-tainted water used to cool melted down reactor cores in the No. 1, 2 and 3 reactors is being stored at the nuclear plant, with the water volume still increasing. The purification system currently in operation only removes cesium, but ALPS removes 62 nuclides, including strontium and plutonium.

The panel concluded that instituting the ALPS system would reduce risks from radiation. It approved a test run of the system on the condition that the storage vessels for radioactive materials that are removed from the water are tested multiple times to ensure they are strong enough that the contents do not leak in case they are dropped in transport. Once TEPCO has fulfilled this criterion, NRA will decide whether to approve the actual test runs.

Because high concentrations of tritium will remain in the water even if the ALPS system is instituted at the plant, NRA ordered that the water be kept within the plant even after processing. TEPCO plans to build

additional water tanks by September 2015 to increase its storage capacity to 700,000 cubic meters, but **the tanks are expected to be filled in 2 1/2 years.**

## Radiation spreads outside Fukushima Daiichi even before venting

### Fukushima radiation spread to residential areas hours before venting

<http://mainichi.jp/english/english/newsselect/news/20130222p2a00m0na009000c.html>

Radioactive material from the damaged Fukushima No. 1 Nuclear Power Plant spread to residential areas hours before workers vented the containment vessel of the plant's No. 1 reactor on March 12, 2011, to release pressure, it has emerged.

In one area, the level of radiation had surged to more than 700 times the normal level, indicating that **many local residents were exposed to high levels of radiation before they evacuated.**

The Fukushima Prefectural Government operated 25 monitoring posts around the nuclear power plant before it was crippled by the March 11, 2011 Great East Japan Earthquake and tsunami. Five monitoring posts were swept away by the tsunami, and 20 couldn't send data because the quake caused power cuts. Accordingly, officials were unable to put the data to use when evacuating residents.

Over the period up until September last year, the prefectural government collected and analyzed data from the 20 monitoring posts that survived the disaster. Results of its analysis were published on the prefectural government's website and the prefecture notified local bodies. However, it was not revealed that radiation had spread before the plant's operator, Tokyo Electric Power Co. (TEPCO), commenced venting operations -- and **neither the Diet nor the government's nuclear accident investigation committees were aware of the fact.**

Workers are believed to have first tried opening a vent at the plant at 10:17 a.m. on March 12, 2011. TEPCO reported success after a fourth venting operation at about 2:30 p.m. the same day.

However, data at four monitoring posts in the Koriyama, Yamada, Kamihatori and Shinzan districts in the Fukushima Prefecture town of Futaba indicated that radiation levels had risen hours before TEPCO starting opening the vents.



Radiation dosages in the four areas before the disaster ranged between 0.04 and 0.05 microsieverts per hour, but as of 5 a.m. the level in the Koriyama district, located about 2.5 kilometers north of the plant, had swelled to 0.48 microsieverts per hour and at 6 a.m. it stood at 2.94 microsieverts per hour. By 9 a.m., roughly one hour before officials started opening the vent, the hourly radiation level had surged to 7.8 microsieverts. In the Yamada district 5.5 kilometers west of the power plant, the radiation level at 10 a.m. had increased to 32.47 microsieverts per hour -- roughly 720 times the normal figure.

The average radiation dosage permitted by the government under normal conditions works out at 0.23 microsieverts per hour. The data obtained from the monitoring posts shows that radiation levels shot up rapidly over a short period of time. Officials believe that the radiation levels were affected by changes in the wind direction.

A final report by the Diet's independent commission to investigate the Fukushima disaster concluded that the core of the No. 1 reactor at the Fukushima plant melted down between the evening of March 11, 2011 and the predawn hours of March 12 due to a total loss of power. Officials believe that the reactor's pressure container and other equipment were damaged, leading to a leak of radioactive material.

The Fukushima Prefectural Government ordered residents within a two-kilometer radius of the plant to evacuate at 8:50 p.m. on March 11. At 9:23 p.m. the central government expanded the scope of the evacuation zone to three kilometers around the plant. The following morning at 5:44 a.m. the central government ordered residents within a 10 kilometer radius to evacuate on the presumption that reactor vents would be opened. However, it was not until 8 a.m. on March 12 that many of the roughly 50,000 residents within the zone started evacuating. It is believed that radiation spread over a wide area after the fourth venting operation, as well as after a hydrogen explosion at 3:36 p.m. **Thirty minutes after the fourth venting operation, the radiation level in the Kamihatori district stood at 1,591 microsieverts.**

Kunikazu Noguchi, an expert on radiological protection at Nihon University, commented that the levels of radiation before venting were not high enough to immediately affect people's health, with the dosage from one hour of exposure being less than that received during a chest X-ray. However, he added, "We have to investigate how the radioactive materials spread and how much radiation residents were exposed to."

Mitsuhiko Tanaka, who served as a member of the National Diet of Japan Fukushima Accident Independent Investigation Committee, expressed surprise at the quick proliferation of radiation. He said it is assumed that radioactive substances leaked from the reactor judging from pressure changed inside the reactor, and it has been confirmed that radiation levels rose on the premises of the nuclear plant. However, he added there were issues that had yet to be solved.

"We haven't yet been able to identify the location within the reactor containment vessel from which radioactive materials leaked," he said. **"There's a mountain of issues that should be examined before we start talking about restarting nuclear reactors."**

The prefectural government did not finish analyzing data from the monitoring posts until after the government and Diet compiled their final reports on the Fukushima disaster, and the data is not reflected in health checks currently performed on Fukushima Prefectural residents.

"If the prefectural government was thinking firstly about the health of its residents, then it would have considered the data vital information that needed to be analyzed quickly," said Reiko Hachisuka, who represented Fukushima Prefecture at the Diet's Fukushima accident investigation committee. "As a prefectural resident, I find the Fukushima Prefectural Government's response shameful."

## **Decommissioning : Appeal to the international community**

### **Global team must dismantle No. 1: IAEA**

<http://www.japantimes.co.jp/news/2013/02/23/national/global-team-must-dismantle-no-1-iaea/#.USiL2Df1tEs>

#### **Cleanup should not just tap into Japan expertise, Amano says**

Kyodo

VIENNA – The International Atomic Energy Agency plans to propose a multinational mission to decommission the Fukushima No. 1 plant's wrecked nuclear reactors, a challenge that will take decades to complete.

"The safe decommissioning (of the reactors) should be undertaken not just by Japan but should draw on the wisdom and the most advanced technologies from around the world," IAEA Director General Yukiya Amano said in an interview Thursday.

The U.N. nuclear watchdog is planning to send an international team of experts to Japan in April to submit the proposal for retiring the reactors.

The move to involve other advanced countries in the decommissioning efforts at the No. 1 plant could lead to the development of new technologies necessary to scrap reactors around the world as more and more reach the end of their service life.

The idea of a multilateral undertaking is also apparently aimed at addressing concern in some quarters of the global community that Japan may monopolize knowhow for reactor decommissioning, an area that

will likely open up lucrative business opportunities at a time when more than 400 reactors worldwide are waiting to be retired.

Next Wednesday, the IAEA will dispatch experts to Fukushima Prefecture for a project being jointly implemented with the prefectural government to promote decontamination of areas affected by fallout from the nuclear disaster in March 2011. These experts are also expected to engage in preliminary consultations with relevant prefectural and other officials ahead of the international team's visit in April.

According to an IAEA official, the proposed multilateral project would be based in an office in the city of Fukushima with a resident staffer.

Amano also suggested the option of creating a task force on decommissioning technology at the IAEA.

"It may be necessary to establish an advisory council, or something similar, concerning decommissioning at the IAEA," he said. "We hope to see the world make the most of the experiences in Fukushima, and the prefecture to capitalize on experiences from around the world."

On the decontamination work, Amano said, "We will make use of experts involved in the Chernobyl nuclear accident and other incidents."

Residents in the affected areas feel "anxieties about whether or not it is all right to return home," he said. "We hope to cooperate in explaining global standards and disseminating information about health issues."

Amano signed a memorandum of understanding concerning project cooperation between the IAEA and the prefecture when a ministerial conference on nuclear safety was held in Koriyama, Fukushima Prefecture, late last year. The agreement covers projects such as cleaning up contaminated land to allow the early return of affected residents, health care and the establishment of a human resources training center to respond to emergency situations.

The IAEA apparently hopes sending an international team of experts to Japan will dispel concerns overseas that Japanese businesses will end up controlling the reactor decommissioning market — large-scale projects loaded with vested interests.

The nuclear watchdog may also be assuming that employing technologies from around the world will help to undertake reactor decommissioning in a sustainable manner.

The Fukushima No. 1 plant, where three reactors experienced catastrophic core meltdowns following the Great East Japan Earthquake and tsunami, will likely need several decades to finish the process of dismantling the entire complex.

The centerpiece of that process is the reactor decommissioning, which will require huge expenditures. Using the best available technology will be essential in ensuring safety and security for residents in nearby areas. Plant operator Tokyo Electric Power Co. and the Ministry of Economy, Trade and Industry have been devising decommissioning plans, but there appears to be a limit to what Japan can do on its own, given its lack of experience when it comes to retiring nuclear reactors.

The IAEA believes that a decommissioning regime can be worked out in terms of technology and costs by seeking support from the U.S. and Russia, both of which have experienced nuclear power plant catastrophes.

Meanwhile, an IAEA source said a major nuclear power state has filed a request with the organization for ensuring fair businesses chances from reactor dismantling.

“There is suspicion in the international community that Japan may be aiming to secure interests in decommissioning work that will be needed in various parts of the world by monopolizing technology attained in (scrapping the) Fukushima” No. 1 plant, a senior government official said in Tokyo.

Amano has long argued that Japan should not undertake reactor decommissioning alone, and the country could find itself being called on to pass on the lessons and experiences of the Fukushima disaster to the world, not just in securing the safety of atomic plants but also in reactor decommissioning.

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**See also TEPCO's report to the IAEA :**

[http://www-pub.iaea.org/iaeameetings/IEM4/30Jan/Suzuki\\_d.pdf](http://www-pub.iaea.org/iaeameetings/IEM4/30Jan/Suzuki_d.pdf)

58 Summary

Situation in Fukushima is assumed to be much more complicated than the case of TMI-2

Tentative plan is to start Defueling from RPV within 10 years.

It is assumed that the Defueling process can take over 20 to 25 years to complete.

Government supported R&D activities are commenced to achieve defueling and Fukushima Daiichi-Cleanup successfully.

Many unexpected situations are expected. Flexible program management will be necessary.

Advices and counsels from the world community would be very much appreciated.

## **International decommissioning for Fuskushima Daiichi**

February 27, 2013

## **IAEA mulls multilateral efforts to retire Fukushima nuclear reactors**

<http://mainichi.jp/english/english/newsselect/news/20130227p2g00m0dm046000c.html>

VIENNA (Kyodo) -- The International Atomic Energy Agency is considering the option of an international undertaking to decommission reactors at the crippled Fukushima Daiichi Nuclear Power Station, a challenge that will need to be tackled in full swing in the years to come.

IAEA Director General Yukiya Amano told Kyodo News on Thursday, "Safe decommissioning (of the accident-hit nuclear reactors) should be undertaken not just by Japan but should draw on wisdom and the most advanced technologies from around the world."

The U.N. nuclear watchdog is planning to send an international team of experts to Japan in April to consult with local authorities about retiring the reactors.

An initiative to involve other advanced countries in the decommissioning efforts could lead to the further development of technology needed for retiring reactors around the world as more and more equipment reaches the end of its service life.

The idea of a multilateral undertaking could also address concern in some quarters in the international community that Japan may monopolize know-how for reactor decommissioning, an area which will likely offer major business opportunities.

Next Wednesday, the IAEA will dispatch experts to Fukushima Prefecture for a project being jointly implemented with the prefectural government to promote decontamination of the areas affected by the nuclear disaster resulting from the major earthquake and tsunami on March 11, 2011.

These IAEA experts are also expected to engage in preliminary consultations with relevant prefectural and other officials ahead of the international team's tour in April.

According to an IAEA official, the proposed multilateral project will be based in an office in Fukushima city with a resident staffer.

Amano also suggested the option of creating a task force on decommissioning technology at the IAEA at a time when the world has more than 400 reactors waiting to be retired. "It may be necessary to establish an advisory council, or something similar, concerning decommissioning at the IAEA," he said.

"We hope to see experiences in Fukushima made the best use of by the world and the experiences of the world by Fukushima," Amano said.

On the decontamination work, Amano said, "We will make use of the experiences of experts involved in the Chernobyl nuclear accident and other incidents."

Residents in the affected areas "have anxiety about whether or not it is all right to return home," he said. "We hope to cooperate in explaining global standards and disseminating information about health issues."

IAEA chief Amano signed a memorandum of understanding concerning project cooperation with the prefecture when the Fukushima ministerial Conference on Nuclear Safety was held in Koriyama, Fukushima Prefecture late last year.

The agreement covers projects such as cleaning up contaminated land to allow the early return of affected residents, health care and the establishment of a human resources training center to respond to emergency situations.

The IAEA action of sending an international team of experts in April to Japan could dispel concern in the international community that Japan will end up controlling the market for reactor decommissioning -- large-scale projects loaded with vested interests.

The nuclear watchdog may also be assuming that using technologies from around the world will help in undertaking reactor decommissioning in a sustainable manner.

Fukushima was an unprecedented disaster where three reactors experienced meltdowns. It will likely need several decades to finish the process of unwinding the nuclear complex.

The centerpiece of that process is the decommissioning of reactors, which will also require huge costs. Using the best available technology will likely be essential in ensuring safety and security for residents in nearby areas.

The plant operator Tokyo Electric Power Co. and the Ministry of Economy, Trade and Industry have been taking the initiative in devising decommissioning plans but there appears to be a limit to what Japan alone can do, given its lack of substantial decommissioning experience.

The IAEA apparently believes that a reasonable decontamination process can be worked out in terms of technology and costs by seeking support from Russia, which has experienced nuclear power plant accidents.

An IAEA source said a major nuclear-power state has filed a request with the organization for ensuring fair businesses chances from reactor decommissioning.

A top Japanese government official, meanwhile, said, "There is suspicion in the international community that Japan may be aiming to secure interests in decommissioning work that will be needed in various parts of the world by monopolizing technology attained in Fukushima."

Amano, the IAEA chief, has long argued that Japan alone should not be undertaking reactor decommissioning.

Japan may be called on to pass on its lessons and experiences from Fukushima to the world not just in securing the safety of nuclear power plants but also in reactor decommissioning.

## Puddle in reactor 2

February 28, 2013

### **[Concern about the soundness of reactor2 building] A puddle found in reactor2, Tepco "It's rainwater."**

Posted by **Mochizuki**

<http://fukushima-diary.com/2013/02/concern-about-the-soundness-of-reactor2-building-a-puddle-found-in-reactor2-tepco-its-rainwater/#.US-XwatOOKo.facebook>

The puddle of contaminated water was found in reactor2. Tepco explains it came down from the second floor of turbine building.

**They concluded it was rainwater but there is no explanation about why they didn't find the puddle of water before.**

-At around 12:12 PM on February 23, a cooperative company worker found a puddle near the center of the Heater Room on the first floor of Unit 2 Turbine Building. The puddle was approx. 5m x 1m x 1mm. It was confirmed that water was dripping from some areas of the ceiling (a drop every 5 seconds) and that there was no leakage from the piping and temporary hose installed near the puddle. The radioactivity

density analysis results of the water sampled from the puddle are as follows. Cesium 134:  $1.3 \times 10^2 \text{Bq/cm}^3$ , cesium 137:  $2.5 \times 10^2 \text{Bq/cm}^3$ . The contamination conditions (radioactivity densities) of the floor surface are as follows: Cesium 134:  $1.2 \times 10^2 \text{Bq/cm}^3$ , cesium 137:  $2.1 \times 10^2 \text{Bq/cm}^3$ . The atmosphere dose rates measured at the site are as follows:  $\gamma + \beta$ : 0.7mSv/h,  $\gamma$ : 0.7mSv/h. Also, a puddle (approx. 15m x 11m x 10mm) was found in the Turbine Exhaust Filter Room on the second floor of Unit 2 Turbine Building, which is located just above the site where a puddle was first found. On February 25, the puddle in the Turbine Exhaust Filter Room on the second floor of Unit 2 Turbine Building was identified to be the water dripping from the ceiling. The radioactivity density analysis results of the water dripping from the ceiling of the Turbine Exhaust Filter Room (obtained on February 26) are as follows. Cesium 134:  $1.1 \times 10^0 \text{Bq/cm}^3$ , cesium 137:  $1.9 \times 10^0 \text{Bq/cm}^3$ . **The water is assumed to be rainwater.** Upon site investigation, it was confirmed that water dripping onto the floor of the Heater Room on the first floor (a drop every 5 seconds) and onto the floor of the Turbine Exhaust Filter Room on the second floor (a drop every 2-3 seconds) had been continuing. The incident is currently being investigated in details.

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130227\\_01-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130227_01-e.pdf)  
[http://www.tepco.co.jp/en/press/corp-com/release/2013/1225013\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1225013_5130.html)

## Many problems unsolved, says NRA

### Nuclear watchdog: No easy task to scrap Fukushima reactors safely

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201302280070>

Japan could be saddled with fragile and hazardous reactors at the Fukushima No. 1 nuclear power plant for years to come, warned an official with the Nuclear Regulation Authority.

Atsuhiko Kosaka said **many challenges remain unresolved and must be dealt with before serious work can begin to scrap the reactors.**

Kosaka heads the agency's Nuclear Regulation Office that is overseeing the early decommissioning efforts under way by plant operator Tokyo Electric Power Co.

Excerpts from an interview with The Asahi Shimbun follow:

Question: What are you paying most attention to regarding work at the site?

Kosaka: One thing is to prevent inspectors and workers from being exposed to radiation unnecessarily, and another is to prevent injuries.

Radiation levels have declined overall on the premises of the plant since the early stage of the disaster, but we are not totally aware of the distribution of radiation levels in areas where no work is under way and where rubble has yet to be cleared.

Lighting has yet to be restored inside buildings, so we have installed temporary lighting for construction work, but in other areas, we need to use flashlights to proceed with our work.

Q: Radiation levels remain high in many areas outside the reactor buildings. For example, they stand at 900 microsieverts per hour near a radioactive water purification plant. Do you have anything to say about that?

A: Radiation hot spots could be lurking anywhere, so it is indispensable to carry dosimeters when you go to areas where little information is available.

Both the situations on the ground and the conditions of radiation are constantly changing. For example, rubble on the top floor of the No. 4 reactor building used to shield radiation from the No. 3 reactor, but the rubble has been cleared and the shield is gone. Radiation levels are higher now.

Q: The decommissioning comes after an unprecedented triple meltdown. Do you have any preventive measures against possible problems?

A: TEPCO's work is like groping in the darkness and has involved an array of problems.

Last winter, for example, frozen pipes and pumps in the cyclic water injection system to cool down the reactors caused a number of water leaks.

Appropriate control methods need to be developed to deal with one situation on the ground to another, and the condition of one piece of equipment to another.

Q: What challenges remain for doing that?

A: There has certainly been some progress on the hardware front, such as relocating high-voltage switchboards to higher ground and preparing against a total loss of power supply.

Further improvement, however, would require strengthened command and control. We are currently in a "whack-a-mole" situation, with ad hoc responses used in every problem that arises.

I want TEPCO to learn lessons from the past two years and try to come up with measures to prevent problems.

(This article is based on an interview by senior staff writer Hisashi Hattori.)

## **New flexible snake-like robot**

March 2, 2013

### **Flexible robot snakes its way where humans cannot go**

<http://ajw.asahi.com/article/0311disaster/recovery/AJ201303020011>

By SHINGO FUKUSHIMA/ Staff Writer

NATORI, Miyagi Prefecture--Developers have unveiled a snake-like robot that they say can worm its way around obstacles and take videos in hard-to-reach places, such as disaster sites piled with rubble.

Known as the "Robo Scope," the device is the work of general contractor Shimizu Corp., Tohoku University and the Kobe-based International Rescue System Institute, a nonprofit organization. The researchers showed the device to reporters here on Feb. 28.



The hose-shaped robot is 7 centimeters in diameter and 10 meters long. Its segments carry a dense brush made of fine nylon hairs. The hairs vibrate, and, acting like the cilia of micro-organisms, they inch the robot forward.

The head of the robot can be adapted to carry various sensors. A video camera would allow it to search for survivors trapped beneath rubble, while a dosimeter would allow operators to explore conditions inside a damaged nuclear plant without risking human life.

March 4, 2013

### **Interview with TEPCO's manager**

[http://www3.nhk.or.jp/nhkworld/english/tv/newsline/path\\_to\\_recovery/interview.html](http://www3.nhk.or.jp/nhkworld/english/tv/newsline/path_to_recovery/interview.html)

#### **Interview:**

##### **Manager of TEPCO, Akira Kawano**

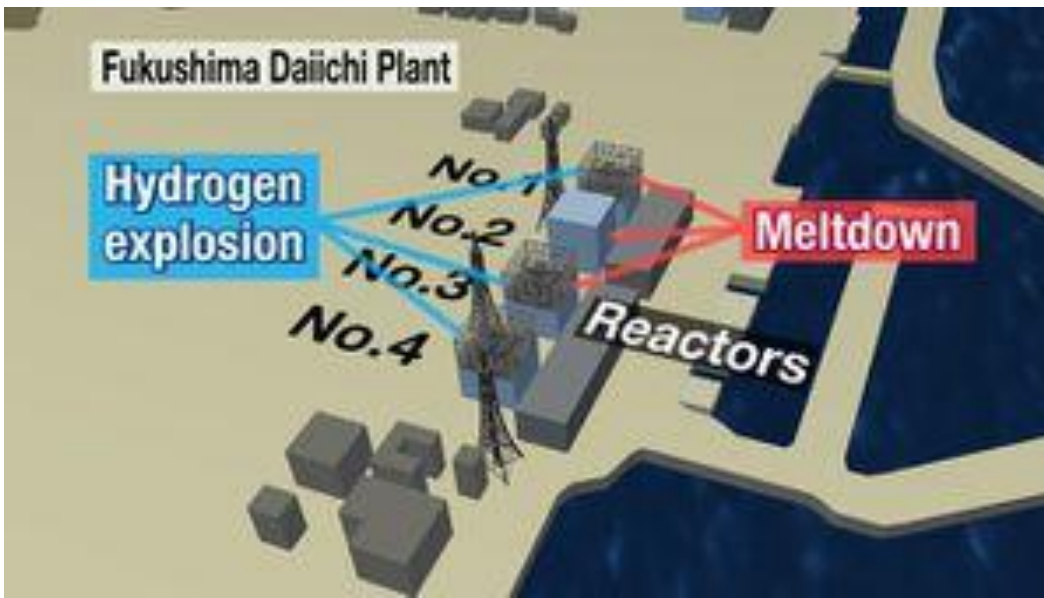
The 2011 earthquake and tsunami triggered a total blackout at the Fukushima Daiichi Nuclear Power Plant which resulted in the loss of cooling water and melt downs in three of the four operating reactors. Hydrogen explosions severely damaged the unit buildings and all four reactors are to be decommissioned.

Two years on, the operator, Tokyo Electric Power Company or TEPCO, say the plant's situation is stable. They say water circulation systems are keeping the nuclear fuel cool and that the plant is no longer releasing significant amounts of radioactive materials.

The government's roadmap says the decommissioning will end within 40 years.

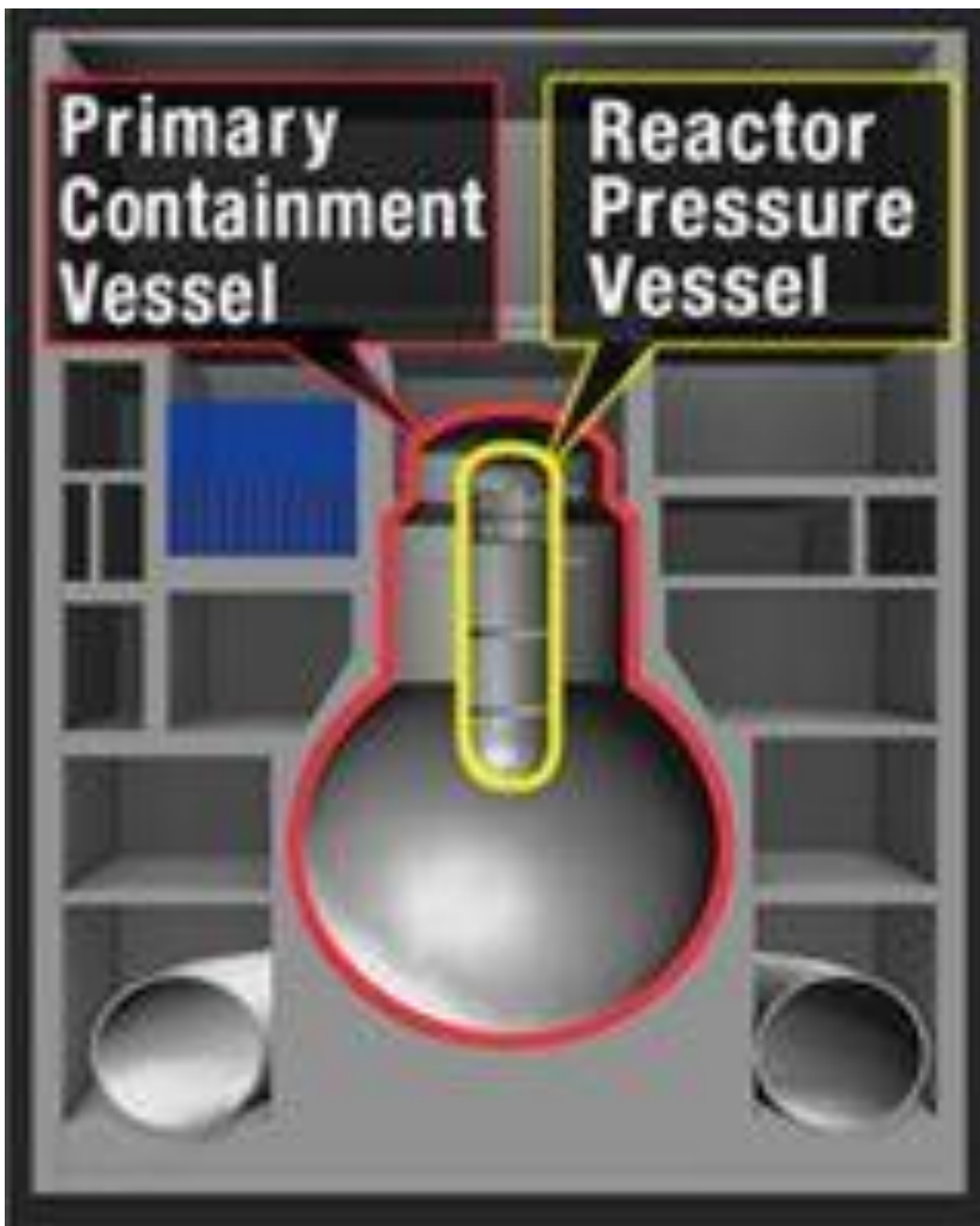
But details of the plan are yet to be decided.

NHK WORLD's Yoichiro Tateiwa spoke with Akira Kawano, general manager of TEPCO responsible for the decommissioning of reactors at Fukushima Daiichi.



MOVIE

Would you describe the current state of the Fukushima Daiichi reactors ?



The core cooling is the most important thing from the nuclear safety aspect. So we are still now injecting a certain amount of water into the core, reactor core, and also we are cooling the spent fuel pool. The temperature of the reactor pressure vessel and also inside the primary containment vessel is very low now, about 15 to 35 degrees centigrade. It's far below 100 degrees centigrade. It's a very stable status.

Also, the additional release of radioactive materials from the buildings, it's also almost nothing. So it's about 0.03 millisieverts per year at the boundary of our site. It's about 80 million times smaller compared to just after the accident.

It's very difficult to understand the inside situation of the primary containment vessel, and also the reactor pressure vessel. But we have already started to investigate their status. We have already inserted CCD camera to see the inside status. And also we inserted measurement tools to measure the temperature

inside, and also the radiation level inside, and it's also very important for us to understand what water level is secured inside the primary containment vessel.

For example in the case of unit 1, it (water level) was 2.8 meters from the bottom of the primary containment vessel, and the temperature is very low. It's around 30-50 degrees centigrade. It means the molten fuel debris are stably cooled down there. But we haven't understood well how those molten fuel debris are distributed and located. We need to know more precisely, so we will continue those efforts for the future retrieval, removal of that debris.

### **What do you know about the molten fuel debris?**

Even we, TEPCO haven't had a really precise information on the debris. In the future, we need to sample the debris, and we need to understand the mechanical characteristics and chemical characteristics of the debris. Otherwise we cannot develop the necessary tool to remove, retrieve the debris.

I hope... we would like to understand something about it within a couple of years. It takes a long time to – it's just difficult to achieve it. It takes time. We need to develop some technology, too. Even for sampling, we need to prepare some container to contain the sample debris. So it takes time.

### **Can we really say the decommissioning process will finish within 40 years ?**

It's very difficult to talk about such a far future. But it really takes time actually. So even just for the removal of the debris, it takes 10 years or more, I think. And you know the half-life of cesium for example is 30 years, so some part of the decommissioning, we need to wait for radiation to be reduced. And then our decommissioning work will be much easier, after the decrease of radiation levels.

We actually have several options for decommissioning the plant, we should wait for a moment, or do something right now, or do something after waiting some time period. That point is the most difficult. And also the point we would like to have some advice on from the international organizations. They have more experience. We actually want to define the kind of end-state of the decommissioning work, after the decommissioning work. But it's really difficult to define the end-state, so we need to have good advice to define it.

We are trying to do decommissioning work as early as possible of course, because we would like people living there to return back to their homeland as early as possible, if it is possible. So we will not stop our efforts to promote decommissioning work as soon as possible. But we need to carefully discuss what the best way is... It's very difficult to say, but it's really a difficult discussion, and we need to do it carefully.

### **What are you planning to do with the spent fuels stored inside the reactor buildings?**

We are focusing to transfer all spent fuels down to the ground, and to transfer to the other, safer storage space that is actually a common fuel storage facility, which is located next to unit 4, as early as possible. In order to achieve it, we have already removed all the rubble, debris at the top part of the unit 4 reactor building last July. And we are now constructing the kind of cover which has a fuel handling machine and also a crane to transfer the spent fuels. So we are planning to start the removal of the spent fuels within this year, regarding unit 4. It's a top priority because there are more than 1,500 fuel bundles there.

Also, some people are concerned about the integrity of the reactor building of unit 4, and the spent fuel

pool. We have already reinforced the structure just under the spent fuel pool. We installed some steel pipe structures, and we poured concrete in that place to have a more seismic margin. It's about a 20 percent margin increase.

And also we are measuring the kind of distance between the top floor level and water level at some points around the spent fuel pool, to verify the building is not tilted. And also we are periodically conducting visual inspections to find out any significant cracks in the concrete. We are also doing some concrete integrity confirmation tests.

We call this the Schmidt Hammer method to verify concrete strength. Such are the things we are doing to verify the integrity of the reactor building of unit 4.

### **So the reactors can withstand a tsunami similar to the one 2 years ago?**

We have already made a seismic analysis assuming the same level of earthquake of March 11th, and we have already proved that our seismic resistance for units 1 through 4 are sufficient, enough against a same level of earthquake. And also assuming a same level tsunami, with a 15-meter level tsunami, we have already installed a temporary seawall in front of the ocean side of our units 1 through 4. And also we prepared electric supply trucks and gas turbines also at a high place, it's about 35 meters high, safe place. And also we deployed fire engines in case we need to inject sea water. So we have prepared as much as we can, so I believe we are mostly prepared.

### **What are you planning to do with the accumulating contaminated water ?**

I would say underground water seeping into the reactor buildings is the biggest challenge for us. We really need to have further deep discussion with the stakeholders, like fishermen, and also the local people, and local communities, even with foreign countries.

We have already started it, some part of it. But we need to continue. It's really impossible to just continuously accumulate that water in the tanks, it's not a reasonable way. So we need to think about the possibility of a discharge, or the other alternative ways, like evaporation or something like that. It's really a difficult discussion, I'm very sorry I cannot answer so clearly.

We are recognizing this is the most difficult and challenging issue for us now. 400 tons of groundwater come daily into plant. And the water becomes highly contaminated in turbine building.

So far, we are managing well regarding the highly contaminated water. We are just accumulating that water in the tanks. But a problem exists in the future. We are continuously increasing the capacity of the tanks, and water is accumulating also in parallel. So the difference is always the same. So we cannot continue it. Of course we are managing well now, but we cannot continue eternally, so we have to think about alternative ways.

### **Is the contaminated water not leaking into the ocean?**

What I can say now is, we investigated possible leakage areas and points, and we didn't find any evidence of further additional leakage from the plant side to the ocean. So I believe it's not happening now. But we need to continuously investigate.

We have been continuously monitoring the radiation level of the sea water at several points, especially inside our port. We are doing also the outside ocean with the cooperation from the government. Especially inside the port, actually some part of the radiation level is a bit higher than the legal limit, because you know we had a very bad experience just after the accident. It was in April, and also in May, we inadvertently discharged contaminated water to the ocean. That is still remaining there, so that's the reason why the radiation level there, in the port, is a bit higher. And we are trying to verify that additional leakage is not happening. We investigated the possible portion of the leakage, like the pump pit, or the trench, or even inside, under the soil, sampling the soil to verify whether the ground water is OK or not. So we did as much as possible to verify that additional leakage is not happening. We didn't find any evidence that further leakage is happening.

And we are also making efforts to reduce cesium levels within the port. And also the reason for the high radiation level is kind of the movement of the soil at the bottom of the ocean. So we have already solidified that soil to avoid unnecessary movement.

The other problem is contaminated fish. We are now trying to trap and catch as many fish as possible within the port. We are also installing a kind of net to avoid them going out to the ocean. Various measures are being taken, especially inside the port.

It's a long way work, but we are gradually trying to improve the situation and the atmosphere under the water.

### **How do you view the importance of sharing information?**

After this accident, it was really difficult for TEPCO to understand precisely our plant's situation. That looked a bit like (we were) hiding something, but we have been actually trying to disclose all the information. And also reflecting (back) now, in case we had some concern that this information could be bad information for the public, we have had some hesitation to disclose it. It's not good. From the viewpoint of risk communication, we actually need to disclose all the information as early as possible. That's much better than information coming out later.

So we learned somehow. It was not only the decision of TEPCO, but influenced by the government and also by media. We really need to improve our capability of risk communication in the future. That's also our challenge...regarding also the decommissioning, end-state of decommissioning work. So we need to share that information. After even preparing the minimum information for the stakeholders, it's also necessary.

We will disclose information every time we have it. So we need to have some time to interpret that information and develop strategy options. Of course we disclose all the information whenever we have it, but for a good discussion we need to prepare some clear options for the stakeholders. And that is much better for us and for them, to have a more fruitful discussion to define the end-state.

## **Plugging holes at Fukushima Daiichi is a must**

March 8, 2013

## **Flooding complicates clean-up at Japanese nuclear plant**

<http://www.reuters.com/article/2013/03/08/us-fukushima-disaster-delays-idUSBRE9270A820130308>

By James Topham and Mari Saito

(Reuters) - Tokyo Electric Power Co is struggling to stop groundwater flooding into damaged reactors at its wrecked Fukushima plant and it may take four years to fix the problem, possibly delaying the removal of melted uranium fuel.

A March 11, 2011, earthquake and tsunami knocked out cooling equipment at the company's Fukushima Daiichi plant north of Tokyo, triggering the worst atomic disaster since Chernobyl in 1986. More than 160,000 people were forced from their homes.

Nearly two years later, hundreds of metric tons of groundwater is seeping into the damaged reactor buildings every day and mixing with water still being poured on the leaking reactors through a jerry-rigged cooling system.

Dealing with the contaminated water has been especially tricky because of equipment failures and high levels of radiation.

Shunichi Suzuki, Tepco's general manager for research and development of Fukushima Daiichi decommissioning, said on Friday stopping the groundwater was crucial.

"Every day we have approximately 400 metric tons of groundwater," Suzuki told Reuters in an interview. Tepco is building a bypass system to try to stop the groundwater flowing from high ground into the buildings.

On Thursday, the Japanese government told the utility to revise by June its roadmap for cleaning up the site, which is expected to take 30 to 40 years. Experts say it could cost at least \$100 billion to close the reactors down.

Plugging leaks in the reactors and removing the water is a necessary before removing melted fuel from the three damaged reactors.

Two years after the disaster, Japan is facing a third year with most nuclear reactors shut because of safety fears the accident raised. The shutdowns have forced Japan to import more fossil fuels for electricity generation pushing it into a current account deficit.

## PLUGGING HOLES

One of the most daunting tasks remains the disposal of water contaminated after it is poured onto the reactors. Radioactive material must be filtered out and stored.

Work to treat and store the contaminated water is behind schedule, partly because of the groundwater flooding in. On Thursday, the company announced another delay in an operation to remove most radioactive material from the water.

Tepco also needs to plug leaks in the reactors made by firms which included General Electric Co, Hitachi Ltd and Toshiba Corp so they can filled with water to reduce radiation exposure and prepare for the removal of fuel.

"We are developing remote technologies to do that, but in case there are too many holes and it is difficult to repair all of them, we have to take a different approach," Suzuki said.

The company may resort to pouring a cement-like material into the reactors' suppression chambers to plug leaks it has not been able to locate, Suzuki said.

"One approach we are considering is putting grout, like cement," he said. "In other words, filling it in. That would block all the holes."

Removing the ground water may take two to four more years, Suzuki said, adding that it wasn't possible to give a firm schedule.

Tepco is building tanks to hold the water and has capacity for 320,000 metric tons of water but wants to increase that to 400,000 metric tons by June.

The utility is considering several measures to dispose of the water, including treating and releasing it into the sea. But Tepco officials said they would not go ahead with that without the consent of authorities.

(Writing by Aaron Sheldrick; Editing by Robert Birsell)



## Hitachi's high-pressure robot

March 9, 2013

### Pressure-washer robot to aid Fukushima decontamination

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303090067>

By KAZUMI TAKO/ Staff Writer

A new robot that delivers an extremely high-pressure jet of water will soon join the decontamination effort at the crippled Fukushima No. 1 nuclear power plant.

Workers need to sluice down the walls and floors of buildings before they can safely work inside, and the robot's arm would allow operators to direct a jet of water up to 2 meters in height, developer Hitachi Ltd. said.

The company said the water is under such high pressure it can remove paint or even the surface of concrete.

The robot, named "Arounder," was shown to the media on March 8.

Operators will control it remotely, using six cameras to monitor its progress. The operators will be located at least 75 meters away.

And with regard to one enduring problem at the plant--vast quantities of radioactive water--Hitachi said the robot will suck back up almost all the water it uses, leaving little on site and making it easier to deal with the contaminated material it collects.

Its tanks will hold enough water to clean up to 5 square meters at a time.

The robot is expected to be deployed at the nuclear plant in the summer

## Progress at Fukushima Daiichi blocked by water

### Water is both the savior and the bane at Fukushima No. 1

<http://www.japantimes.co.jp/news/2013/03/09/national/water-is-both-the-savior-and-the-bane-at-fukushima-no-1/>

by Kazuaki Nagata

Staff Writer

Those who were at the Fukushima No. 1 power plant two years ago probably remember their fears after towering tsunami knocked out the reactor cooling systems, triggering three core meltdowns that threatened to harm the entire nation.

Today the crippled reactors require close monitoring but are in a controllable state — at least compared with the chaos of 2011.

Looking at the bigger picture, however, Tokyo Electric Power Co. isn't making much progress decommissioning reactors 1, 2, 3 and 4 — a task expected to take at least three decades. This is because the very thing that saved the plant is now blocking the way: water.

Water is perpetually needed to keep the melted fuel cool, but the meltdowns burned holes in three of the six reactors, allowing water to leak into the basements of the containment buildings after being tainted with deadly amounts of radioactivity. This was exacerbated by hydrogen explosions, which possibly cracked the containment vessels and ripped the buildings housing the reactors apart.

While pumps are being used to drain and detoxify the water as much as possible, finding safe places to store it remains Tepco's most pressing task.

"The work to decommission the plant is still in the beginning stage. We have to overcome many hurdles, such as taking care of the massive amounts of contaminated water, finding the source of leaks in the containment vessels and recovering the melted fuel rods," said plant manager Takeshi Takahashi, 55, at a Feb. 28 news conference in Fukushima.

"It's going to take a very long time to complete the work, and it's going to be tough, but we're committed to completing it," Takahashi said.

As if the damage above ground isn't enough to worry about, the 9 -magnitude earthquake apparently cracked the walls of the plant, allowing about 400 tons of groundwater to seep into the buildings and mix with the tainted coolant water. Tepco has controlled the coolant volume to ensure the inflow of groundwater is stronger, which will help keep it in the buildings.

About 260,000 tons of tainted water are stored in tanks; Tepco thinks it could probably store up to 700,000 tons if it had time to build more tanks. But as it stands today, there are only enough tanks to store about 60,000 more tons, which means they only have months before the entire site begins to flood.

"The contaminated water is a pressing issue," said Takahashi.

Since the water could very well leave the plant and end up in the water supply and the ocean, Tepco is planning two measures.

One is to make bypasses for the groundwater by digging wells to curb the seepage into the reactor buildings. The diverted groundwater would flow to the sea.

The second measure is a new water processing system called ALPS that can remove 62 kinds of radioactive substances, including strontium, which can cause bone cancer. The existing system mainly removes cesium before recirculating some of the water into the reactors. The rest is stored.

Tepco also will have to find a way to dispose of water processed by ALPS. Since Tepco is trying to limit the amount of coolant to reduce the leak rate, any water purified by ALPS won't be reused as coolant.

And even ALPS cannot remove tritium.

According to Tepco, the level of tritium in the contaminated water is between 1 million and 5 million becquerels per liter, and the legal limit is 60,000. Tritium has a half life of about 12 to 13 years and is about one-thousandth as radioactive as the isotopes cesium-134 and -137.

Drinking 2 liters of water containing 60,000 becquerels of tritium per liter each day for a year will give you a dose of about 0.79 millisievert, the utility said. The legal exposure limit is 1 millisievert per year.

To prevent the tanks from occupying all of the available space on site, Tepco is thinking of dumping the water processed by ALPS into the ocean, despite fierce opposition from fishermen.

Tepco said it will not do it without receiving the consent of related ministries.

Kyoto University professor Akio Koyama, an expert on radioactive waste, said Tepco seems to have no choice but to dump the water because tritium is so hard to remove. If Tepco can dilute the tritium-tainted water to legal levels, it should not be a big problem, Koyama said.

“The water will be further diluted as soon as it is dumped into the ocean. There are various estimates, but I don’t think this will be dangerous,” he said.

Still, it will be hard to convince people in the fishing industry, which was decimated by a similar release in the early stages of the crisis in April 2011.

JF Zengyoren, a national advocacy group for fishermen, visited Tepco on Jan. 25 to protest.

“Fishermen have been suffering from the impacts of the Fukushima crisis and trying to regain consumers’ trust. Dumping tainted water will destroy these efforts,” the organization said.

To end the vicious circle, Tepco must locate the leaks and plug them. But little progress has been made because the radiation levels are still lethal in the reactor buildings and a thorough examination of the machinery will be extremely hard to carry out.

The utility is planning to send robots to find the leaks and other plant makers are developing technologies to plug them.

The only progress Tepco seems to be making is on reactor 4, which was defueled prior to the crisis but had become a storage site for both fresh and spent-fuel rods — including some containing plutonium.

Experts believe the fuel rods in the spent-fuel pool of unit 4 present a critical risk and Tepco is working to remove them as quickly as possible before another major quake topples the remains of the building, which was heavily damaged by the hydrogen explosion.

Tepco claims reactor 4’s building can still withstand a quake rated at upper 6 on the Japanese intensity scale to 7 — the same as the quake that hit two years ago — but experts say it is better to move the fuel to a safer place as soon as possible.

The pool, which sits above the reactor, contains 1,533 spent-fuel rods. Tepco plans to start removing them in November and hopes to be finished by the end of 2014.

## **Fukushima disaster - Chronology**

March 11, 2011

### **Chronology of major events in Fukushima nuclear crisis**

<http://mainichi.jp/english/english/newsselect/news/20130311p2g00m0dm027000c.html>

TOKYO (Kyodo) -- The following is a chronology of events related to the nuclear crisis at Tokyo Electric Power Co.'s six-reactor Fukushima Daiichi nuclear power plant in Fukushima Prefecture, triggered by the earthquake and tsunami on March 11, 2011.

March 11, 2011 -- Magnitude 9.0 earthquake and subsequent tsunami cripple plant, resulting in loss of power at Nos. 1-4 reactor facilities. Government declares nuclear emergency, directing residents in 3-kilometer radius of plant to evacuate.

March 12 -- Prime Minister Naoto Kan inspects plant. Hydrogen explosion occurs at No. 1 reactor building. Government expands evacuation zone to 10-km radius of plant, then to 20-km radius.

March 14 -- Hydrogen explosion occurs at No. 3 reactor building.

March 15 -- Hydrogen explosion occurs at No. 4 reactor building.

March 20 -- Nos. 5-6 reactors achieve cold shutdown.

April 12 -- Government raises nuclear crisis severity level to highest 7 on international scale, on par with 1986 Chernobyl disaster.

April 22 -- Government designates 20-km radius of plant as no-go zone.

June 6 -- The Nuclear and Industrial Safety Agency releases assessment that meltdown occurred at reactor cores of Nos. 1-3 units.

June 27 -- TEPCO starts cooling damaged reactors using water decontaminated through newly installed water treatment system.

Sept. 28 -- Temperatures at bottom of pressure vessels of reactors Nos. 1-3 fall below 100 C.

Dec. 16 -- Government declares state of cold shutdown achieved at plant.

Dec. 21 -- Government and TEPCO announce plan to scrap the plant's Nos. 1-4 reactors in 30 to 40 years.

Feb. 28, 2012 -- Private-sector panel says in report that Kan's response to nuclear crisis created unnecessary confusion.

March 11 -- TEPCO President Toshio Nishizawa issues statement on first anniversary, apologizing again for accident and vowing to continue efforts to keep plant under control.

March 30 -- The government decides to revise its designation of evacuation zones in municipalities near the Fukushima plant.

April 19 -- Nos. 1-4 reactors at the plant are declared defunct, bringing total of Japan's commercial nuclear reactors to 50.

May 5 -- The last of Japan's commercial reactors goes offline.

June 27 -- TEPCO Chairman Tsunehisa Katsumata and President Toshio Nishizawa step down, succeeded by lawyer Kazuhiko Shimokobe and TEPCO Managing Director Naomi Hirose, respectively.

July 1 -- A reactor at Kansai Electric Power Co.'s Oi nuclear power plant in Fukui Prefecture becomes the first in Japan to be reactivated after regular checks since the Fukushima crisis. Another unit at the Oi plant is restarted on July 18.

July 5 -- Diet-appointed panel investigating the Fukushima crisis releases a report saying the disaster was "man-made."

July 18-19 -- TEPCO finishes trial removal of two unused nuclear fuel assemblies from a fuel storage pool at the No. 4 reactor of the Fukushima Daiichi plant.

July 23 -- A government-appointed panel investigating the Fukushima disaster releases final report saying TEPCO mishandled its response to the crisis.

July 31 -- TEPCO receives 1 trillion yen in capital injection from a state-backed bailout fund, falling under effective state control.

Aug. 6 -- TEPCO discloses to the media part of the video recordings of its teleconferences in the first days of the nuclear crisis.

Sept. 19 -- Japan launches new nuclear regulatory body known as the Nuclear Regulation Authority.

Jan. 1, 2013 -- TEPCO sets up its Fukushima headquarters to deal with issues stemming from Japan's worst-ever nuclear accident.

March 11 -- Japan marks second anniversary of the triple disaster -- earthquake, tsunami and nuclear crisis.

March 11, 2013(Mainichi Japan)

## **Fukushima Daiichi : the three phases of dismantling**

### **Fukushima plant decommissioning may last until 2051**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303110084>

In a monumental undertaking the likes of which has never been attempted, it could take up to four decades to complete the decommissioning and dismantling of the four damaged reactors at Tokyo Electric Power Co.'s Fukushima No. 1 nuclear power plant.

The entire process will be composed of three phases, according to the road map toward the decommissioning of the No. 1 to No. 4 reactors at the plant announced in December 2011 by the government and TEPCO. Phase 1 will last until the end of 2013, followed by Phase 2, which is likely to continue until around 2021. The third and final phase should conclude sometime between 2041 and 2051.

#### **PHASE 1:**

In Phase 1, the cooling water circulation loops will be curtailed step by step while cooling of nuclear fuel is continued. A method of establishing a closed and independent cooling system for each reactor building will be devised. Research and development efforts will be started for removing fuel and disposing of radioactive waste.

In addition to the fuel assemblies inside the reactors, totals of 392-1,533 assembly units are left in the spent fuel storage pools of the four reactor buildings. Full-scale operations to remove spent fuel from the No. 4 reactor will start in November 2013, one month earlier than initially scheduled.

#### **PHASE 2:**

In Phase 2, operations to remove fuel assemblies from the spent fuel storage pools of the No. 1 to No. 3 reactors will be launched and completed. The removed fuel assemblies will then be placed in the shared storage pool within the plant, which is relatively less damaged. After nuclear fission and resultant generation of heat have declined to certain levels, the fuel assemblies will be put in dry casks for storage within the compound.

Flooding of the reactors will also be done in Phase 2. Flooding the reactors is important not only for scaling down the cooling water circulation loops but also for the subsequent removal of melted fuel from the reactors. Removal of nuclear fuel must be done in water in order to ensure that radiation is contained and the fuel keeps being cooled. TEPCO tried but failed to flood the reactors immediately after the nuclear disaster broke out on March 11, 2011, following the Great East Japan Earthquake and resulting tsunami. That's probably because the reactor containment vessels had been damaged, resulting in leakage of water.

Repair of the containment vessels will begin around 2016 so that a closed and independent cooling system can be installed in each of the reactor buildings, which are currently connected with each other with pipes and other equipment.

### PHASE 3:

In Phase 3, which will begin around 2021 and last until around 2051, at the latest, the main task will be removal of the melted fuel from the reactors. If the flooding of the reactors to be done in Phase 2 goes as planned, work to remove melted fuel will start around 2021 and be finished for all the reactors around 2031 – 2036. The removed fuel will be stored for a certain period within the plant and then moved to a disposal site.

In the meantime, decontamination and monitoring of radioactive materials will continue in the surrounding sea and within the plant itself. After all the fuel is removed, operations to dismantle the facilities will start. The work will begin with areas, such as the turbine buildings, where levels of radiation are lower. The reactor pressure vessels will be the last to be dismantled. The whole process of dismantling the vessels is expected to require some 15 years.

No decision has yet been made on how the site of the damaged reactor buildings will be used after the facilities are dismantled. Since the land will remain contaminated, the possible options will be quite limited.

## How many nuclear workers will really be available?

March 12, 2013

### Government to review staffing plan at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303120088>

By JUN SATO/ Staff Writer

Japan's government has begun reviewing staffing policies at the Fukushima No. 1 nuclear plant after a survey found that **nearly half of the laborers employed there may be working illegally, dispatched by staffing agencies but disguised as specialist contractors.**

The only legal arrangement is where primary contractors or first-tier subcontractors hire workers directly. But if the government tightens oversight, a labor shortage could result and there could be significant delays in the schedule to decommission the plant's crippled reactors.

Tokyo Electric Power Co., the operator of the Fukushima No. 1 plant, conducted a survey of 4,000 workers from September to October 2012. **Forty-seven percent of respondents said the company that gives them on-the-job orders is not the one that pays their wages.**

The findings suggest that **staffing agencies are providing laborers for work while disguising them as independent contractors. The arrangement is prohibited because it creates uncertainty over which entity is responsible for worker safety.**

In a road map compiled in July 2012, **the government and TEPCO jointly estimated that cleanup, decommissioning and other work at the site would require up to 12,000 workers every year.** A shortage is not projected to arise at least until 2017.

The road map calculated that 23,300 individuals would be available for work over the long term. **As of May, 24,300 people were registered as radiation workers, but 1,000 of them had already been exposed to high amounts of radiation--**a factor that disbars laborers from further nuclear-related work within a certain period.

And in the light of the revelations of suspected illegal hiring practices, the industry ministry plans to review the road map by June because it understands that **the true pool of eligible workers may be much smaller.**

The 23,300 figure has been further called into question by revelations that many workers have in fact been exposed to higher radiation levels than is admitted in their official records.

TEPCO is reluctant to review the road map, saying it is difficult to judge the legality of hiring arrangements based only on the outcome of a survey.

And primary contractors and their immediate subcontractors are certain to oppose moves to end the hiring of agency labor because it would cause their personnel costs to snowball.

If regulations are strengthened significantly, the companies would likely be unable to recruit sufficient workers and decommissioning of the reactors would slow.

**But if authorities make only a half-hearted response, the government-led decommissioning project would continue to be supported by dubious labor practices.**

## Growing international involvement in Fukushima?

March 14, 2013

### Japan urged to send out global SOS over No. 1 plant

by Eric Johnston

Staff Writer

<http://www.japantimes.co.jp/news/2013/03/14/national/japan-urged-to-send-out-global-sos-over-no-1-plant/#.UUGUTjf1tEs>

OSAKA – Two years after the March 11, 2011, earthquake and tsunami, the herculean task of decommissioning the Fukushima No. 1 nuclear plant is the subject of growing international involvement, with the International Atomic Energy Agency looking to step up its role.

But even as Tokyo and the IAEA trumpet increased cooperation, other international experts, and many Japanese who distrust claims by the government and Tokyo Electric Power Co. that progress is being made in containing the triple-meltdown crisis, are calling for a broader range of international experts to be brought on board, including those whose views run counter to the claims of government bureaucrats, engineers and medical professionals.

In general, Japan has received high marks from the U.N.'s nuclear watchdog. At a meeting on nuclear safety in Fukushima in December, IAEA members said Japan had made tangible progress in stabilizing the

Fukushima No. 1 complex and in decreasing the amount of radioactive discharges. The establishment of the independent Nuclear Regulation Authority in September, which had long been called for by pro- and antinuclear experts abroad, was also welcomed.

In late February, the IAEA announced plans for a multinational mission to decommission the Fukushima No. 1 plant's wrecked reactors, a process that will take decades. Japan is also expected to host an IAEA international expert mission on how to dismantle the facility later this year, but the agency has also called on Tokyo to ensure there is international participation in the cleanup.

"The safe decommissioning (of the reactors) should be undertaken not just by Japan, but should draw on the wisdom of the most advanced technologies from around the world," IAEA Director General Yukiya Amano said. "We will make use of experts involved in the Chernobyl nuclear accident and other incidents."

Critics charge that the IAEA can't have the last word on nuclear safety because its mandate is fundamentally contradictory. On the one hand, it's supposed to monitor nuclear safety worldwide, while on the other, it's also supposed to support nuclear power, which means many antinuclear activists in particular, regardless of their expertise, may not get heard.

But the bigger problem, experts say, is that Japan itself is not tapping the advice of a wide body of international expertise outside the IAEA on everything from decommissioning to disposing of nuclear waste and monitoring the health effects of radiation.

As a result, certain questions don't get asked.

"There are some bilateral cooperation activities that are heavily biased by the specific interests of the assisting states. But nothing, absolutely nothing, is visible that would resemble a concerted international effort to solve the unprecedented problems at the Fukushima site," said Mycle Schneider, a Paris-based consultant on energy and nuclear policy who has advised the IAEA and several European governments, and who has called for the broadest possible range of international experts and global assistance to monitor the Fukushima disaster long term.

Cooperation from the U.S. government, industry and nuclear experts on a host of technical and environmental issues related to the Fukushima plant has greatly increased since it experienced three core meltdowns in March 2011. Three U.S. experts, Robert Sindelar from the U.S. Department of Energy; Mark Triplett from Pacific Northwest National Laboratory (PNNL), a government research laboratory; and Sang Don Lee of the National Homeland Security Research Center, traveled to Japan in early February and will stay until the end of this month.



In addition, Tepco officials visited the Savannah River National Laboratory earlier this year to learn about waste management technologies that can be used in the Fukushima cleanup. Japanese-U.S. cooperation in this area is expected to expand further, especially as cleaning up and decommissioning the plant is expected to take decades. Besides the United States, French nuclear company Areva has worked with Japan on dealing with the radioactive water inside the damaged reactor buildings.

But in Schneider's view, such efforts are too narrow. The unprecedented scale of the disaster, he says, means Japan needs to seek all the expert advice it can get, from a wide variety of countries and from those who are not just nuclear engineers but have expertise in several technical fields.

"The most immediate and largest threats are probably still stemming from the spent-fuel pools of the four crippled reactors at Fukushima No. 1. Tepco's affirmation that there is no damage to the fuel assemblies seems to be more of an optimistic guess, rather than a certainty," he said.

Tepco is pumping several cubic meters of water per hour into the damaged reactors to keep them cool. The supply comes mainly from the water that has accumulated in the basements of the units' buildings, and is desalinated and decontaminated before being reinjected into the reactor cores.

"It's meant to be a closed system. But it's obvious that significant quantities of water must have evaporated, or are leaking from the basements to other areas, including into the sea.

"These basements were never constructed to hold radioactive water. And corrosion of the steel reinforcement in concrete walls, especially of the spent-fuel pools, remains another area of concern. Cracks in the concrete could lead to steel corrosion, to significant breaks of the walls and to ever-increasing levels of water leakage," Schneider said.

Tepco has been monitoring some of the sludge. Last month, workers in the reactor 1 building collected water and sediment. Radiation levels on the outside of the container that held the sediment registered 4 millisieverts per hour.

Then there are the concerns over health issues posed by the meltdowns, concerns that often contradict the government's policies. Anand Grover, the U.N. special rapporteur on the right to health, visited Japan in late November, traveling to Fukushima and Miyagi prefectures and meeting with central government and Tepco officials, as well as medical and legal experts, and NGOs.

In a Tokyo news conference at the end of his trip, Grover noted problems in two areas that international critics in and outside Japan, including Schneider, are especially worried about: the way Japan is conducting health surveys and food safety checks.

“(Japan) has undertaken a health management survey. However, it’s limited to the residents of, and visitors to, Fukushima Prefecture at the time of the disaster. They are also limited to thyroid examinations for children, comprehensive health checks, a mental and lifestyle survey, and to a pregnancy survey,” Grover said.

“The scope of the surveys is unfortunately narrow, as they draw on the limited lessons from the Chernobyl accident and ignore epidemiological studies that point to cancer as well as other diseases in low-dosage radiation, even in areas of exposure below 100 millisieverts per year,” he said. “I would urge the government to expand the health survey to all radiation-affected zones.”

The central government also has a long way to go to convince the world, and many Japanese, that the nation’s food is safe. There are calls at home and overseas for long-term independent monitoring and testing of food products. Under one suggestion made by Schneider last year, each product would be tested by a government-certified — but completely independent — laboratory, similar to the Underwriters’ Laboratory that conducts safety testing on technology in the U.S.

From April 2012, the government set some of the world’s strictest limits on radioactive cesium in food, including 10 becquerels per kilogram for drinking water, 50 for milk, 100 for foodstuffs, including dairy products, and 50 for baby food items. One U.S. company, Eden Foods, did its own independent testing in 2011 of Japanese foodstuffs and detected no radiation.

Grover noted that radioactive contamination of food is a long-term issue and commended Japan for reducing the threshold for food safety from 500 to 100 becquerels per kilogram.

“However, individual prefectures have imposed lower threshold levels. Moreover, residents have raised concerns about the enforcement of standards. The government should strengthen food safety in an urgent manner,” he added.

Despite the international calls for Japan to work harder in seeking out all kinds of advice overseas, the international media, antinuclear NGOs, and Japanese individuals and groups pushing for greater global involvement offer numerous reasons for the lack of effort on the part of the government and Tepco to bring in more outside help.

Last autumn, the group Skilled Veterans Corps for Fukushima, which consists of older Japanese nuclear experts who have been pressing Tepco to allow its members to work at the No. 1 complex in order to reduce younger workers' radiation exposure, traveled to the United States.

Their purpose was to update federal government officials, nuclear experts and civil society organizations on the state of the Fukushima reactors, and to call for more international assistance in cleaning up the Fukushima mess.

But the group told its audiences that the main problems in convincing Japan to accept new offers of international assistance started with the large number of multilayered contracts between subcontractors to traditional heavy industries and Tepco, which can't be controlled.

Buck-passing by Tokyo, a fragmented bureaucracy, communities that have been bribed, and an alliance between central and local government leaders and the businesses involved in the cleanup process are also problems, the group added.

## **NHK video on Fukushima**

<http://www3.nhk.or.jp/nhkworld/english/movie/feature201303111406.html>

March 18, 2013

## **[Alert] All power's been down in Fukushima plant for over 3 hours, Tepco investigating the reason**

Posted by Mochizuki

Over 3 hours before this post, Fukushima plant lost power. (19:00 of 3/18/2013)

The coolant system of the spent fuel pools of reactor1, 3 and 4 has been out of operation for over 3 hours already.

Seismic isolation building has lost power too. Tepco is still investigating the reason.

<http://fukushima-diary.com/wp-content/uploads/2013/03/%E3%82%B9%E3%82%AF%E3%83%AA%E3%83%BC%E3%83%B3%E3%82%B7%E3%83%A7%E3%83%83%E3%83%88%EF%BC%882013-03-18-15.23.41%EF%BC%89-450x335.png>

<http://www3.nhk.or.jp/news/html/20130318/j68770110000.html>

## Information from TEPCO

### Status of TEPCO's Nuclear Power Stations after theTohoku-Chihou-Taiheiyou-Ok Earthquake 2013

[http://www.tepco.co.jp/en/nu-news/2013/1225660\\_5484.html](http://www.tepco.co.jp/en/nu-news/2013/1225660_5484.html)

-As for the hole drilled on the ceiling of Unit 6 Reactor Building on March 18, 2011 for the purpose of preventing hydrogen explosion, considering that cold shutdown is being maintained and the plant condition has been stable at Unit 6, work to close the hole has been started on March 8 in order to maintain the air tightness of the building. On March 11, the work has been completed. As a result of air tightness confirmation performed from 1:51 PM to 2:23 PM on March 17, no problem was found.

-At 6:35 AM on March 18, Unit 2 spent fuel pool alternative cooling system was suspended for power supply multiplication work (The pool water temperature when the system was suspended: Approx. 15.0 °C). The pool water temperature increase rate during the cooling suspension is approx. 0.19 °C/h and the amount of pool water temperature increase during suspension is estimated to be approx. 2.3°C. There is no problem with the spent fuel pool water temperature control considering that there is a sufficient margin to the maximum allowed temperature (65°C).

-As a result of putting the desalination system in operation since April 11, 2012 to prevent mid-term corrosion and damage of the structures in Unit 3 spent fuel pool, the chloride concentration of the spent fuel pool was confirmed to have reduced from approx. 1,600ppm (concentration when the desalination system was first put in operation) to approx. 5ppm on March 18, 2013. Thus, desalting at Unit 3 has been completed.

## Blackout

### Fukushima without cooling water for 3 hours after power failure

The Associated Press

TOKYO -- The operator of Japan's tsunami-damaged nuclear plant says a power failure has left three fuel storage pools without fresh cooling water for hours.

Tokyo Electric Power Co. says the blackout Monday night at the Fukushima Dai-ichi plant was brief at its command centre but continued for hours at three of the seven fuel storage pools and a few other facilities. TEPCO says the reactors were unaffected, and it plans to restore power to the pool cooling systems as soon as it determines the cause. It says the nuclear fuel stored in the pools will remain safe for at least four days without fresh cooling water.

The March 11, 2011, earthquake and tsunami destroyed the plant's power and cooling systems, causing three reactor cores to melt and fuel storage pools to overheat. The plant is now using makeshift systems.

Read more:

<http://www.ctvnews.ca/world/fukushima-without-cooling-water-for-3-hours-after-power-failure-1.1200320#ixzz2NuoJHve3>

## Blackout

I have been looking for (official) information in English all afternoon. Although the blackout at Fukushima Daiichi was announced in the Japanese media on Monday, this is the first article in English that I have found in the media I normally rely on for my blog. And it's not Monday any more in Japan.

### **Blackout halts cooling system at Fukushima plant**

[http://www3.nhk.or.jp/daily/english/20130319\\_01.html](http://www3.nhk.or.jp/daily/english/20130319_01.html)

TEPCO officials say a power blackout has suspended a cooling system for used nuclear fuel at the struggling Fukushima Daiichi power plant.

Operator Tokyo Electric Power Company said the blackout took place shortly before 7 PM on Monday.

The affected system is intended to cool 3 pools containing about 2,100 spent rods from the plant's number 1, 3, and 4 reactors.

Officials reported that at 4 PM they registered temperatures in the pools of up to 25 degrees Celsius.

Temperatures are reportedly rising at 0.1 to 0.3 degrees per hour.

The officials said it will take about 4 days for the pools to exceed 65 degrees -- the firm's limit.

They added the blackout has interrupted the cooling system for another pool containing about 6,300 rods. It has also affected part of a system that disposes of contaminated water.

The TEPCO officials clarified the outage has not hindered the injection of coolant into the crippled reactors.

They also said they have spotted no change in radiation levels at monitoring posts around Fukushima Daiichi.

The officials will reportedly begin restoring the cooling system once they discover the cause of the interruption.

## Blackout - New lies from TEPCO

**[Analysis] The sudden blackout revealed the weakness of Fukushima plant, "Reactor4 has 4 days to go"**

Posted by Mochizuki on March 18th, 2013

In the evening of 3/18/2013, Fukushima plant had the power blackout and the coolant system of reactor1, 3 and 4 lost power.

(cf, [Breaking] Power blackout in Fukushima plant, coolant system of the pools in reactor 1,3,4 lost power [URL 1])

Here I would like to explain what the problem is and what was newly revealed.

### **What exactly happened ?**

At 18:57, the plant lost power. Even the seismic isolation building, where is the managing office of the entire plant lost power temporarily. The reason of the blackout is not identified yet.

TEPCO receives the power from Tohoku-epco, but they can't send it to the spent fuel pools.

#### ■ Systems out of power

Kurion -a cesium adsorption system

Coolant system of the spent fuel pool in reactor1, 3, 4

Coolant system of the common spent fuel pool

#### ■ Systems not out of power

Reactor coolant system for reactor1, 2 and 3

Monitoring posts

Gas monitoring systems for reactor1, 2 and 3  
Coolant system of the spent fuel pool in reactor2  
(Source)  
At 5AM in JST, the power is not back on yet.

### **What is the concern ?**

“According to Tepco”, the water temperature of the pool of reactor4 was 25°C at 16:00 of 3/18/2013. It increases at 0.1 ~ 0.3 °C/h, so it takes 4 days to reach 65°C, which is the safety regulation. However, the common pool also lost the power, where has 6377 fuel assemblies. From the research of Fukushima Diary, the temperature increases the second fastest to follow reactor4. [URL 2]  
Tepco didn’t announce how long it takes to reach the safety regulation.

<image: <http://fukushima-diary.com/wp-content/uploads/2013/03/%E3%82%B9%E3%82%AF%E3%83%AA%E3%83%BC%E3%83%B3%E3%82%B7%E3%83%A7%E3%83%83%E3%83%88%EF%BC%882012-12-20-10.50.38%EF%BC%89-450x263.png>>

The spent fuel pools of reactor3 and 4 are still outside of the building. Japanese meteorological agency is giving the warnings of storm to Fukushima.

### **The revealed weakness / lies**

#### ***1. There is still no back-up power for the spent fuel pools***

Tepco stated they reinforced the spent fuel pool of reactor4. Even if another earthquake of the same scale of 311 hit the plant, it can last and they prepare multiple powers to maintain the coolant system.

However, as always, it turned out to be a lie. **They didn’t even need an earthquake to cause a power blackout for reactor4. The power went down for nothing and the reason is not even identified yet.**

Fukushima worker Happy11311 warns if reactor4 has a fire, it would also cause explosion from reactor1 and 3 at least. If Tsunami hits again, it would chop off all the power lines etc..

(cf, Fukushima worker “Most of the workers know it takes over 40 years to decommission Fukushima plant” [URL 3])

Additionally, the Tsunami embankment is still in the temporary state in Fukushima plant. [URL 4]

<image: [http://fukushima-diary.com/wp-content/uploads/2013/03/130228\\_06-1\\_1.jpg](http://fukushima-diary.com/wp-content/uploads/2013/03/130228_06-1_1.jpg)>

#### ***2. Tepco took 3 hours to announce they had power blackout***

Fukushima plant had a power blackout at around 19:00, but they reported it at 22:11.

They state they took time to confirm the situation.

Whether it was on purpose or not, they never update on time. If reactor4 has an emergency, they would take even longer “to confirm the situation”.

Probably we shall not trust them and collect information spontaneously.

## Blackout

March 19, 2013

### **Power trouble leads to suspension of cooling operations at Fukushima plant**

<http://www.japantimes.co.jp/news/2013/03/19/national/power-trouble-leads-to-suspension-of-cooling-operations-at-fukushima-plant/#.UUdyEDf1tEs>

Tokyo Electric Power Co. said Monday a problem with electric power has occurred at its crippled Fukushima Daiichi nuclear power plant, leading to the suspension of the system to cool spent fuel pools of the Nos. 1, 3 and 4 units.

The incident, however, so far has not affected the ongoing water injection to the Nos. 1 to 3 reactors, which suffered core meltdowns in the early days of the March 2011 nuclear crisis, according to the Nuclear Regulation Authority.

No abnormality has been detected in radiation levels in areas surrounding the plant in Fukushima Prefecture.

According to the NRA, Tepco reported to regulators that electricity went out at the plant's accident response center at about 6:57 p.m. Monday.

The power outage at the center was temporary and power to it was soon restored. **But Tepco and the NRA were unable to specify immediately why power to the spent fuel pool cooling systems of the three units remains halted.**

According to Tepco, the temperatures of the water inside the spent fuel pools of the Nos. 1, 3 and 4 units was between 13.7 C and 25 C at 4 p.m. Monday.

Tepco says that it would take four or five days until the water inside the spent fuel tank at the No. 4 reactor building exceeded 65 C, a temperature level that should not be exceeded.

The No. 4 spent fuel pool, located atop a building damaged by a hydrogen explosion, stores a total of 1,533 fuel assemblies.



The electricity trouble has also led to suspended operation of a facility to clean radioactive water accumulating at the plant, as well as a cooling system at another pool located inside a different building at the site which contains 6,377 fuel assemblies.

## Blackout March 19 - Japan Times

### Power still out for fuel-pool cooling system at Fukushima No. 1 plant

AP

<http://www.japantimes.co.jp/news/2013/03/19/national/power-still-out-for-fuel-pool-cooling-system-at-fukushima-no-1-plant/#.UUgYVTf1tEs>

Four fuel storage pools at the crippled Fukushima No. 1 nuclear plant have been without fresh cooling water for more than 15 hours due to a power outage, but Tokyo Electric Power Co. said Tuesday morning it was trying to repair a broken switchboard that might have caused the problem.

Tepco said pool temperatures were well within safe levels at Fukushima No. 1, and the pools would remain safe for at least four days without fresh cooling water.

The utility was preparing a backup system in case the repairs didn't fix the problem, Tepco official Masayuki Ono told reporters.

"If worse comes to worst, we have a backup water injection system," said Ono.

The command center at the plant suffered a brief power outage before 7 p.m. Monday. Electricity was quickly restored to the center but not to equipment pumping water into the fuel pools.

The utility was investigating the cause of the power outage and believes it might be due to problems with the switchboard it is now trying to repair. At the same time, the utility is preparing to connect another switchboard if repairs cannot fix the problem.

The temperature in the four pools had risen slightly, but was well below the utility's target control temperature of 65 degrees, Tepco said.

The spent-fuel pool for reactor 4, which contains spent and new fuel rods, had risen to 30.5 degrees as of 10 a.m. Tuesday from 25 degrees before the power outage. A common pool storing spent fuel for all reactors was at 28.6 degrees, while the reactor 1 pool was at 17.1 degrees and reactor 3 was at 15.9 degrees.

Tepco said the reactors were unaffected and no other abnormalities were found.

The March 11, 2011, earthquake and tsunami destroyed the plant's power and cooling systems, causing three reactor cores to melt down and fuel storage pools to overheat. The plant is now using makeshift systems.

## **No. 1 plant outage fuels worries in Fukushima**

Kyodo

<http://www.japantimes.co.jp/news/2013/03/19/national/no-1-plant-outage-fuels-worries-in-fukushima/#.UUgYozf1tEs>

FUKUSHIMA – Fukushima Prefecture residents expressed anxiety Monday after a power outage left three fuel storage pools without fresh cooling water for hours at the disaster-hit Fukushima No. 1 nuclear power plant.

Masahide Matsumoto, mayor of Katsurao village, which was evacuated after the outbreak of the nuclear crisis in March 2011, said the incident came at a sensitive time, as evacuation zones were set to be reclassified Friday, with some residents granted permission to make day trips to their homes.

“We will be in trouble unless Tokyo Electric Power Co. properly investigates the cause (of the outage) and restores power,” Matsumoto said, citing growing concerns among residents.

A 27-year-old housewife in the city of Fukushima said, “I am very worried because I have a baby. I want the information to be disclosed as quickly as possible because it will be difficult to evacuate promptly if (an emergency occurs) at night.”

The power outage occurred just before 7 p.m. and was made public by the Nuclear Regulation Authority three hours later.

Takashi Haga, a 49-year-old office worker in the city, appeared surprised by the latest incident.

“It revived the memory of the nuclear accident two years ago,” Haga said. “I thought it was under control.”

At the Fukushima prefectural government office, four staff members at a nuclear safety division received information from Tepco and communicated with local municipal officials. The staffers appeared relatively calm, with one of them saying, “We want Tepco to pin down the cause and respond to the situation.”

Makoto Yanagida, a representative of the “Tanpoposha” (No Nukes Plaza Tokyo) antinuclear group said, “It’s just nonsense that a power company is hit by a blackout. We need to be vigilant, though, to see if Tepco is going to make public what really happened.”

## **Power trouble leads to suspension of cooling operations at Fukushima plant**

<http://www.japantimes.co.jp/news/2013/03/19/national/power-trouble-leads-to-suspension-of-cooling-operations-at-fukushima-plant/#.UUgYOTf1tEs>

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No abnormality has been detected in radiation levels in areas surrounding the plant in Fukushima Prefecture.

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The power outage at the center was temporary and power to it was soon restored. But Tepco and the NRA were unable to specify immediately why power to the spent fuel pool cooling systems of the three units remains halted.

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The No. 4 spent fuel pool, located atop a building damaged by a hydrogen explosion, stores a total of 1,533 fuel assemblies.

The electricity trouble has also led to suspended operation of a facility to clean radioactive water accumulating at the plant, as well as a cooling system at another pool located inside a different building at the site which contains 6,377 fuel assemblies.

## **Cooling suspended at Fukushima Daiichi fuel pools**

[http://www3.nhk.or.jp/daily/english/20130319\\_17.html](http://www3.nhk.or.jp/daily/english/20130319_17.html)

Tokyo Electric Power Company says the cooling of spent nuclear fuel pools remains disrupted on Tuesday at the damaged Fukushima Daiichi nuclear power plant.

A momentary power blackout caused a malfunction in the cooling system before 7 PM on Monday. Spent fuel pools of the No. 1, 3 and 4 reactor units and another pool for shared use were affected.

TEPCO officials said they found that 3 high voltage power distribution systems, which receive power from outside the plant, stopped functioning. Two of them were repaired but a problem with the third unit has yet to be identified. As a result the cooling system could not be restored.

The water temperature of each fuel pool remained steady at between 16 and 30 degrees Celsius as of 10 AM on Tuesday.

TEPCO officials say it will take about 4 days for the pool at the No.4 unit -- the hottest one -- to exceed the safety limit of 65 degrees Celsius.

They are planning to replace the damaged electric switchboard or reconnect the cooling system to other switchboards to resume cooling of the pools as soon as possible.

Officials say the utility's in-house rules mandate water injection using fire engines if the fuel pools' cooling system does not work properly for 2 days or more.

## **Fukushima nuclear plant's fuel pool cooling system still suspended**

<http://mainichi.jp/english/english/newsselect/news/20130319p2g00m0dm064000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. remained unable as of Tuesday morning to resume the cooling system for the spent fuel pools of the No. 1, 3 and 4 reactors at the crippled Fukushima Daiichi nuclear power plant, which has been suspended since Monday evening due to a suspected problem with a power switchboard.

The incident has not affected the injection of water into the Nos. 1, 2 and 3 reactors that suffered core meltdowns in the early days of the nuclear crisis at the plant triggered by the March 2011 earthquake and tsunami.

TEPCO spokesman Masayuki Ono said it is placing the "highest priority" on restoring the cooling system of the spent fuel pool located atop the No. 4 reactor building, as the number of fuel assemblies stored in the tank is larger than the heavily damaged Nos. 1, 2 and 3 units.

Ono also said the water inside the pools is still "sufficiently cool," with the temperature of the three pools estimated to be between 15.9 C and 30.5 C as of 10 a.m. Tuesday.

It is expected to take about four days until the temperature of the water inside the No. 4 spent fuel pool reaches 65 C, the upper limit TEPCO has set to secure safety during ordinary times, according to the utility.

Ono said the utility is prepared to inject water into the spent fuel pool at any time necessary if the water in the pool warms up and starts to decrease by evaporation.

TEPCO noticed the trouble after electricity instantaneously went out at the plant's accident response center at 6:57 p.m. Monday.

**The company currently suspects that a problem at one makeshift power switchboard is causing the suspension of the cooling system.**

Economy, Trade and Industry Minister Toshimitsu Motegi told a separate press conference in the morning that he has instructed TEPCO to take every possible measure to address the problem at the plant. At another press conference, Chief Cabinet Secretary Yoshihide Suga said, "We will make utmost efforts to prepare alternative methods to cool the pools in consideration of a worst-case scenario."

## **Fukushima residents irked by outage at crippled atomic plant**

<http://mainichi.jp/english/english/newsselect/news/20130319p2g00m0dm026000c.html>

FUKUSHIMA, Japan (Kyodo) -- Residents of Fukushima Prefecture expressed anxiety about an outage hit the disaster-damaged Fukushima Daiichi nuclear power plant on Monday.

Masahide Matsumoto, mayor of Katsurao village where all of its residents have been forced to evacuate after the March 2011 nuclear disaster, said that the incident came at a sensitive time as evacuation zones are scheduled to be reclassified Friday and some residents are allowed to make day trips to their homes. "We will be in trouble unless Tokyo Electric Power Co. properly investigates the cause (of the outage) and restores power," Matsumoto said, citing concerns for increased worries among villagers.

A 27-year-old housewife in Fukushima City said,

"I am very worried because I have a baby. I want the information to be disclosed as quickly as possible because it will be difficult to evacuate promptly if (an emergency occurs) at night." The incident was made public by the Nuclear Regulation Authority around three hours after it took place just before 7 p.m.

A 49-year-old office employee in the city, Takashi Haga, seemed surprised at the latest incident, saying, "It revived the memory of the nuclear accident two years ago. I thought it was under control."

At the Fukushima prefectural government office, four staff members at a nuclear safety division received information by fax or phone from TEPCO and communicated with officials at local municipalities. The staffers appeared relatively calm, with one of them saying, "We want TEPCO to pin down the cause and respond to the situation."

Makoto Yanagida, a representative of the antinuclear civic group No Nukes Plaza Tokyo known as Tanpoposha in Japanese, said, "It's just nonsense that a power company is hit by a blackout. We need to be vigilant, though, to see if TEPCO is going to make public what really happened."

## **Fukushima nuclear power plant suffers outage, fuel pool cooling stops**

<http://mainichi.jp/english/english/newsselect/news/20130319p2g00m0dm027000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said a power failure occurred at the crippled Fukushima Daiichi Nuclear Power Station just before 7 p.m. Monday, leading to the suspension of systems to cool spent fuel pools of the No. 1, 3 and 4 reactor units.

The incident so far has not affected the ongoing water injection to the Nos. 1 to 3 reactors, which suffered core meltdowns in the early days of the March 2011 nuclear crisis, according to the Nuclear Regulation Authority. No major changes have been observed in radioactivity levels detected by nearby monitoring posts.

As of 1:45 a.m., TEPCO has not been able to work out steps to ensure bringing the system back online. The accident response center at the station also suffered outage but power was restored shortly.

The electricity trouble has also led to suspended operation of equipment for treating contaminated discharge including radioactive materials, as well as a cooling system at another pool located inside a different building which contains 6,377 fuel assemblies.

TEPCO, nor the NRA, has been unable to pin down the cause of the outage, although the power company said it could have stemmed from the power distribution board or cables attached to it.

It took until just past 10 p.m., or around three hours, for TEPCO to make an announcement on the blackout. TEPCO said, "There were too many points to inspect and had trouble confirming with those on the site."

According to the NRA, TEPCO reported to regulators that electricity went out at the plant's accident response center at about 6:57 p.m. Monday.

The temperatures of the water inside the spent fuel pools of the Nos. 1-4 units were between 13.7 C and 25 C at 4 p.m. Monday said.

If no steps are taken to cool down, the temperature of the water inside the spent fuel tank at the No. 4 unit, which has posted the highest temperature, would reach 65 C -- the upper safety margin limit TEPCO has set -- within four to five days, the power company said.

The No. 4 spent fuel pool, located atop a building damaged by a hydrogen explosion, stores a total of 1,533 fuel assemblies.

The cooling system of the fuel pool at the No. 2 unit had been suspended for electrical work since Monday morning but resumed operating at just past 6:30 p.m.

The power station also suffered temporary suspension of the cooling mechanism for spent fuel pools at the Nos. 1-4 units in January last year. In June, cooling of the fuel pool at the No. 4 unit was suspended for around 30 hours and the water temperature in the pool temporarily rose to around 43 C.

## **UPDATE: Cooling units for spent fuel pools remain suspended at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303190020>

Cooling systems remained suspended as of 1 p.m. on March 19 for spent fuel pools and other facilities of the crippled Fukushima No. 1 nuclear power plant, Tokyo Electric Power Co. said.

The shutdown occurred after a power outage around 7 p.m. on March 18 in the main quake-resistant building at the Fukushima plant.

Power was restored, but the cooling systems were still not operating for spent fuel pools in the No. 1, No. 3 and No. 4 reactor buildings, TEPCO said. The cooling system for a common fuel pool, a radioactive water decontamination system and several other facilities have also been suspended.

**TEPCO said March 19 that the outage was likely caused by a defect in a temporary switchboard for the No. 3 and No. 4 reactors.**

The company planned to confirm the cause and restart cooling operations on March 19. It is considering supplying electricity to cooling systems from a different source.

Industry minister Toshimitsu Motegi on March 19 told TEPCO to restore the operations as soon as possible.

The utility said the cooling facilities for nuclear reactors are operating normally, and monitoring posts have shown no changes in radiation levels in the area.

The spent fuel pools in the No. 1, No. 3 and No. 4 reactor buildings together hold 2,491 fuel assemblies. The common pool stores 6,377 fuel assemblies.

**The temperature of water in the No. 4 reactor's pool was the highest at 31.6 degrees as of 1 p.m.,** and it will reach TEPCO's safety standard of 65 degrees in about four days if its cooling system remains suspended.

**TEPCO announced the power outage more than three hours after it occurred.**

"We thought we had better make a report after confirming and summarizing the situation at the facilities," a TEPCO official said. "We are extremely sorry because it took us so long."

During his news conference, Motegi said the announcement should have been made earlier.

At the Fukushima No. 1 plant, cooling systems for spent fuel pools were suspended in the No. 3 reactor building in July 2011, in the No. 2 and No. 3 reactor buildings in January 2012 and in the No. 4 reactor building in June 2012 due to a blackout and other reasons.

### **Crippled Japanese nuclear plant suffers blackout**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303190013>  
THE ASSOCIATED PRESS

A power failure at Japan's tsunami-damaged nuclear plant on March 18 night has left three fuel storage pools without fresh cooling water for hours, the plant's operator said.

Tokyo Electric Power Co. said the power failure at the Fukushima No. 1 nuclear power plant was brief at its command center but continued for hours at three of the seven fuel storage pools and at several other facilities, including one that treats water contaminated with radioactivity.

TEPCO said the reactors were unaffected and no other abnormalities were found. TEPCO spokesman Takeo Iwamoto said the utility plans to restore power to the pool cooling systems as soon as it can determine the cause of the failure.

The utility said the nuclear fuel stored in the pools will remain safe for at least four days without fresh cooling water.

The March 11, 2011, earthquake and tsunami destroyed the plant's power and cooling systems, causing three reactor cores to melt and fuel storage pools to overheat. The plant is now using makeshift systems.

### **Blackout - Cooling restored to SFP nos.1 & 4**

#### **UPDATE: Cooling systems restart for 2 spent fuel pools at Fukushima nuclear plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303190020>

The cooling systems restarted for spent fuel pools in the No. 1 and No. 4 reactor buildings at the crippled Fukushima nuclear plant on March 19, although operations for other facilities remained suspended.

The shutdown of cooling systems occurred after a power outage around 7 p.m. on March 18 in the main quake-resistant building at the Fukushima No. 1 plant, Tokyo Electric Power Co., the plant's operator, said.

Power has been restored, and cooling operations for the spent fuel pool for the No. 1 reactor resumed at 2:20 p.m., the Nuclear Regulation Authority said.

The cooling system for the spent fuel pool in the No. 4 reactor building resumed at 4:13 p.m., TEPCO said.

But by late afternoon on March 19, the cooling systems were still not operating for the spent fuel pool in the No. 3 reactor building and a common fuel pool. A radioactive water decontamination system and several other facilities were also not running.

TEPCO earlier said it planned to confirm the cause of the problem and have all cooling operations restarted on March 19. It is considering supplying electricity to cooling systems from a different source.

The company said the power outage was likely caused by a defect in a temporary switchboard for the No. 3 and No. 4 reactors.

The utility said the cooling facilities for the nuclear reactors were operating normally, and monitoring posts have shown no changes in radiation levels in the area.

The spent fuel pools in the No. 1, No. 3 and No. 4 reactor buildings together hold 2,491 fuel assemblies. The common pool stores 6,377 fuel assemblies.

**The temperature of the water in the No. 4 reactor's pool had climbed to 31.6 degrees at 1 p.m.**

Industry minister Toshimitsu Motegi told TEPCO to restore the operations as soon as possible. He also scolded the company for the delay in disclosing the latest problem at the stricken nuclear plant.

TEPCO announced the power outage more than three hours after it occurred.



“We thought we had better make a report after confirming and summarizing the situation at the facilities,” a TEPCO official said. “We are extremely sorry because it took us so long.”

At the Fukushima No. 1 plant, cooling systems for spent fuel pools were suspended in the No. 3 reactor building in July 2011, in the No. 2 and No. 3 reactor buildings in January 2012 and in the No. 4 reactor building in June 2012 due to a blackout and other reasons.

### **Fukushima urges TEPCO to restore cooling**

[http://www3.nhk.or.jp/daily/english/20130319\\_30.html](http://www3.nhk.or.jp/daily/english/20130319_30.html)

Fukushima Prefecture has asked Tokyo Electric Power Company to restore the cooling system at its Fukushima Daiichi nuclear power plant. The cooling system was suspended after a momentary power outage on Monday evening.

Fukushima Prefecture sought an explanation of the problem from 2 TEPCO officials on Tuesday morning.

An official of Fukushima Prefecture, Shoji Furuichi, said TEPCO had not yet identified the cause of the trouble, fueling concerns among local residents.

He also asked the utility to ensure safety by installing multiple power-generation units at the plant and to step up its monitoring system so similar problems can be detected in their early stages.

He also asked TEPCO to swiftly provide residents with information on any problems that arise at key facilities and explain their estimated impact and risks in an easy-to-understand way. This time, the power outage was made public 3 hours after it took place.

A university student in Fukushima city said the delayed announcement, as well as the outage itself, causes her serious concern, as such delays could seriously affect residents if the situation required them to evacuate.

A company employee in his 60s said he is concerned that the prolonged outage could affect cooling operations at the plant, which is still storing a number of fuel rods.

## Cooling restored at 2 Fukushima reactors

[http://www3.nhk.or.jp/daily/english/20130319\\_27.html](http://www3.nhk.or.jp/daily/english/20130319_27.html)

Tokyo Electric Power Company says it has restored cooling systems for spent fuel pools at 2 of 3 reactors affected by a power failure at the damaged Fukushima Daiichi nuclear power plant.

The momentary power failure just before 7 PM on Monday suspended cooling systems for the No. 1, 3 and 4 reactors as well as a shared pool for spent fuel in the plant's compound.

TEPCO officials later found that 3 power distribution boards had stopped working. The utility repaired two of the boards, but could not fix the third and instead used an emergency power generator to restore the cooling system for the No. 4 reactor's fuel pool.

**As a result, the cooling system for the No. 1 reactor's fuel pool resumed functioning around 2:20 PM on Tuesday, 19 hours after the power failure. The No. 4 reactor cooling system restarted after 4 PM.**

TEPCO plans to restore the cooling systems for the No. 3 reactor by around 8 PM on Tuesday, and for the shared pool by around 8 AM on Wednesday.

The firm continues to investigate what caused the boards to stop functioning. It says they do not appear damaged.

TEPCO says the temperature of the No. 4 pool was 25 degrees one hour before the power failure. The temperature rose to 30.5 degrees Celsius at 10 AM on Tuesday. TEPCO says the level does not affect cooling as it is below the safety threshold of 65 degrees.

The firm says the power failure did not affect water injection to the No. 1, 2 and 3 reactors. They suffered core meltdowns in the early days of the nuclear crisis triggered by the March 11th, 2011 quake and tsunami.

The utility also says no change has been observed in radiation levels at monitoring posts around the plant.

Mar. 19, 2013 - Updated 09:33 UTC (18:33 JST)

## Fukushima plant's spent fuel pool cooling system partially restored

<http://mainichi.jp/english/english/newsselect/news/20130319p2g00m0dm064000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Tuesday it has partially restored the cooling system for the spent fuel pools of the No. 1, 3 and 4 reactors at the crippled Fukushima Daiichi nuclear power plant, which has been suspended since Monday evening due to a suspected problem with a power switchboard.

The incident has not affected the injection of water into the Nos. 1, 2 and 3 reactors that suffered core meltdowns in the early days of the nuclear crisis at the plant triggered by the March 2011 earthquake and tsunami.

As for the spent fuel pool located atop the damaged No. 4 reactor building, one of the two lines forming the cooling system was restored at around 1:20 p.m. Tuesday. The other line is expected to resume operation at around 8 p.m., the utility said.

The cooling system for the No. 1 spent fuel pool was also put back online at 2:20 p.m.

During a press conference in the morning, TEPCO spokesman Masayuki Ono said it is placing the "highest priority" on restoring the cooling system of the No. 4 spent fuel pool, as the number of fuel assemblies stored in the tank is larger than those left in the pools of the Nos. 1, 2 and 3 units.

Ono also said the water inside the pools is still "sufficiently cool," with the temperature of the pools at the No. 1, 3 and 4 reactors estimated to be between 15.9 C and 30.5 C as of 10 a.m. The upper limit TEPCO has set to secure safety during ordinary times is 65 C.

Ono said the utility is prepared to inject water into the spent fuel pool at any time necessary if the water in the pool warms up and starts to decrease by evaporation.

TEPCO noticed the trouble after electricity instantaneously went out at the plant's accident response center at 6:57 p.m. Monday.

The company suspects a problem at one makeshift power switchboard is causing the suspension of the cooling system.

Economy, Trade and Industry Minister Toshimitsu Motegi said at a press conference he has instructed TEPCO to take every possible measure to address the problem at the plant.

At another press conference, Chief Cabinet Secretary Yoshihide Suga said, "We will make utmost efforts to prepare alternative methods to cool the pools in consideration of a worst-case scenario."

## Blackout - The New York Times

### Blackout Halts Cooling System at Fukushima Plant

By MARTIN FACKLER

Published: March 19, 2013

[http://www.nytimes.com/2013/03/20/world/asia/blackout-halts-cooling-system-at-fukushima-plant.html?\\_r=0](http://www.nytimes.com/2013/03/20/world/asia/blackout-halts-cooling-system-at-fukushima-plant.html?_r=0)

TOKYO — A partial power failure at the stricken Fukushima Daiichi nuclear plant in Japan has stopped the flow of cooling water to four fuel storage pools, but temperatures still remain well within safe levels, the plant's operator said Tuesday.

The operator, Tokyo Electric Power Company, said its engineers were trying to repair a faulty switchboard that it blamed for the outage that began on Monday night. The failure also briefly cut off electrical power to the command center at the plant, which suffered a triple meltdown two years ago after a huge earthquake and tsunami destroyed reactor cooling systems.

The company, known as Tepco, said the current loss of cooling water was manageable because temperatures would remain at safe levels for at least four days, and the plant also has backup systems.

Still, the problems underscore the continuing vulnerability of the plant, which is beginning a complex cleanup of the three damaged reactors that is expected to take decades. Some experts have warned that the current cooling systems, some of which were hastily built by engineers frantically struggling to regain control of the overheating reactors, could be knocked out by another large earthquake.

Much of the ongoing concern has focused on the pools near the reactors that are used to store spent fuel rods. These contain far more radioactive material and have less shielding from the outside than the reactors, raising the specter of another massive release of contaminated particles.

The radioactive plume from the original accident in March 2011 forced the evacuation of some 160,000 residents in Fukushima, a region in northeastern Japan. Many of those evacuees still live in temporary shelters and may never be able to return home.

On Tuesday, Tepco said it was investigating the cause of the current blackout, which it believes it has traced to the switchboard and attached cables. The company said it was readying a replacement switchboard in case it cannot fix the original one.

In a statement, the operator said the temperatures in the pool near the No. 4 reactor had risen the highest since losing power, to 25.9 degrees Celsius, or 78.6 degrees Fahrenheit, still well below the safety threshold of 65 degrees Celsius. The company said it estimated that temperatures would remain at safe levels for another 109 hours, or four and a half days, if no new cooling water were added.

It said temperatures at the other three affected pools were lower.

The No. 4 pool has been a source of concern before, largely because the building in which it is housed was almost totally destroyed during the original accident by a hydrogen blast caused by melting atomic fuel. The explosion left the pool exposed to the outside air. Tepco has been building a new, more protected pool to which it plans to move the spent fuel rods.

## Cooling restored in all SFP but what about water decontamination system?

March 20, 2013

### Cooling restored at all Fukushima fuel pools



[http://www3.nhk.or.jp/daily/english/20130320\\_05.html](http://www3.nhk.or.jp/daily/english/20130320_05.html)

Tokyo Electric Power Company says it has restored all 4 cooling systems for the spent fuel pools at the Fukushima Daiichi nuclear plant. They had stopped working on Monday afternoon, raising concerns about a rise in the cooling water's temperature.

A power failure suspended the cooling systems for the spent fuel pools of the No. 1, 3 and 4 reactors as well as a shared pool in the plant's compound.

TEPCO repaired the cooling systems step by step.

The utility says it finished repairing the one for a shared pool early Wednesday morning. The shared pool contains the largest number of spent fuel rods that need to be cooled down constantly.

TEPCO officials said 3 power distribution boards had stopped working, leading to the halt of the cooling systems. The boards were using electricity from outside the plant.

The firm continues to investigate what caused the boards to stop functioning.

TEPCO says the temperature of the No. 4 pool was the highest among the 4 pools, and was 25 degrees Celsius one hour before the power failure on Monday.[and 31, 6° at 1 pm Tuesday]

The temperature rose above 30 degrees Celsius at 4:30 PM on Tuesday. TEPCO said this level will not affect cooling, as it is below the safety threshold of 65 degrees.

The firm says the power failure did not affect the water injection to the No. 1, 2 and 3 reactors. The reactors suffered core meltdowns in the early days of the nuclear crisis triggered by the March 2011 quake and tsunami.

The utility also says no change has been observed in radiation levels at monitoring posts around the plant.

## **Official announcements by TEPCO**

### **Power Supply Facilities Failure at Fukushima Daiichi Nuclear Power Station (Follow-up Report 6)**

[http://www.tepco.co.jp/en/announcements/2013/1225705\\_5502.html](http://www.tepco.co.jp/en/announcements/2013/1225705_5502.html)

At around 6:57 PM on March 18, there was an incident where the power supply facilities in the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station momentarily stopped. The updates on the incident are provided below.

At 0:12 AM today, the common pool cooling purification system was restarted.

When the system was restarted, the temperature of the common pool was 31.8 Celsius and there were enough margins to the operational limit of 65 Celsius.

All of the systems we explained on yesterday's press conference have been restarted.

## **Power Supply Facilities Failure at Fukushima Daiichi Nuclear Power Station (Follow-up Report 5)**

[http://www.tepco.co.jp/en/announcements/2013/1225703\\_5502.html](http://www.tepco.co.jp/en/announcements/2013/1225703_5502.html)

At around 6:57 PM on March 18, there was an incident where the power supply facilities in the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station momentarily stopped. The updates on the incident are provided below.

We announced that the Unit 3 spent fuel pool alternative cooling system was restarted in the previous announcement and stated “We are checking the temperature of the pool when we restarted the system.”

When the system was restarted, the temperature of the spent fuel pool was 17 Celsius and there were enough margins to the operational limit of 65 Celsius.

## **Power Supply Facilities Failure at Fukushima Daiichi Nuclear Power Station (Follow-up Report 4)**

At around 6:57 PM on March 18, there was an incident where the power supply facilities in the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station momentarily stopped. The updates on the incident are provided below.

[ Unit 4 spent fuel pool alternative cooling system ]

The primary system of Unit 4 spent fuel pool alternative cooling system was started at 1:20 PM, and the secondary system was restarted at 4:13 PM today using a diesel generator.

Since the secondary system had received power from the regular M/C in the Process Building, it was stopped at 6:48 PM today, and it was restarted using the power from the regular M/C in the Process Building.

When the system was restarted, the temperature of the spent fuel pool was 31 Celsius and there were enough margins to the operational limit of 65 Celsius.

[ Unit 3 spent fuel pool alternative cooling system ]

The Unit 3 spent fuel pool alternative cooling system was restarted at 10:43 PM for the primary and secondary system. Now we are checking the temperature of the pool when we restarted the system.

[ Common pool cooling purification system ]

It is supposed to restart the common pool cooling purification system by 8:00 PM on March 20. However, we are working on it to start the system before the planned time. Soon after we restart the system, we will inform you about it.

### **Power Supply Facilities Failure at Fukushima Daiichi Nuclear Power Station (Follow-up Report 3)**

At around 6:57 PM on March 18, there was an incident where the power supply facilities in the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station momentarily stopped. The updates on the incident are provided below.

-The primary and secondary systems of Unit 1 spent fuel pool alternative cooling system were started at 2:20 PM and cooling has been restarted.

-Unit 3 spent fuel pool alternative cooling system is planned to be restarted at 8:00 PM today.

-The primary system of Unit 4 spent fuel pool alternative cooling system was started at 1:20 PM. The secondary system is planned to be restarted at 8:00 PM today.

-Common pool cooling purification system is planned to be restarted at 8:00 AM tomorrow.

Other affected facilities are currently being recovered. The current water temperatures of the suspended spent fuel pools have no impact on the spent fuel pool water temperature control.

### **Power Supply Facilities Failure at Fukushima Daiichi Nuclear Power Station (Follow-up Report 2)**

At around 6:57 PM on March 18, there was an incident where the power supply facilities in the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station momentarily stopped. The updates on the incident are provided below.

The cesium absorption apparatus (Kurion) of the water treatment facility which was suspended due to the incident was started at 12:01 PM today, and the steady flow rate was achieved at 12:17 PM. No problem has been found with its operation.

The power supply facilities for which soundness was confirmed have been recovered as follows. Units 1 and 4 spent fuel pool alternative cooling systems are currently being recovered.

- The regular M/C in the Process Building has received power from the backup M/C in the Process Building at 9:03 AM today.

- The common M/C4A has received power from the regular M/C in the Process Building at 10:01 AM today.

The current water temperatures of the suspended spent fuel pools have no impact on the spent fuel pool water temperature control.



## Power Supply Facilities Failure at Fukushima Daiichi Nuclear Power Station (Follow-up Report)

At around 6:57 PM on March 18, there was an incident where the power supply facilities in the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station momentarily stopped.

Upon investigation, the following facilities were confirmed to be suspended.

- Common pool cooling purification system
- Nitrogen supply equipment (Nitrogen separator B)\*

\*After confirming the soundness of the power supply, the equipment was started at 3:00 AM on March 19 and nitrogen supply was started at 3:10 AM. Nitrogen injection had continued while the equipment was suspended as the other nitrogen supply equipment (nitrogen separator A) was in operation.

No problem has been found with the following facilities.

- Units 1-3 nitrogen injection systems
- Nitrogen supply equipment (Nitrogen separator A)

Since it takes a certain amount of time for the spent fuel pool/common pool water temperatures to increase, the temperatures will not immediately reach the maximum allowed temperature (65°C). The amounts of time to reach the maximum allowed temperature (65°C) are as follows.

	Temperature increase rate	Pool water temperature
Unit 1	0.076°C/h (Mar. 18)	16.0°C(4:00 PM on Mar. 18)
Unit 3	0.146°C/h (Mar. 18)	13.7°C(4:00 PM on Mar. 18)
Unit 4	0.368°C/h (Mar. 18)	25.0°C(4:00 PM on Mar. 18)
Common pool	0.226°C/h (Mar. 18))	25.2°C((4:00 PM on Mar. 18)

**"We don't believe the Fukushima disaster is under control"**

## Power, cooling restored at Fukushima nuclear plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303200018>

THE ASSOCIATED PRESS

Cooling systems were restored for four fuel storage pools at Japan's tsunami-damaged nuclear plant, more than a day after a power outage halted the supply of fresh cooling water and raised concerns about the safety of the facility, which still relies on makeshift equipment.

Tokyo Electric Power Co. said the cooling system at the last pool at the Fukushima No. 1 nuclear plant was repaired early on March 20. It said pool temperatures were well within safe levels and the reactors were unaffected.

TEPCO spokesman Yoshikazu Nagai said workers were still trying to determine the cause of the cooling failure, which began when a brief power blackout hit the plant on the evening of March 19.

About 50 workers in hazmat suits and full-face masks were mobilized to fix the cabling to three switchboards that were suspected of involvement in the problem. TEPCO also prepared a backup system in case the repairs didn't fix the issue and "worse comes to worst," company spokesman Masayuki Ono said earlier March 19.

A massive earthquake and tsunami on March 11, 2011, caused extensive damage to the plant. Massive radiation leaks at that time contaminated air, water and soil around the plant, causing some 160,000 residents to evacuate.

The latest power outage was a test for TEPCO to show if it has learned anything from the disaster. TEPCO, which has faced repeated cover-up scandals, was slammed by local media on March 19 for waiting hours to disclose the blackout.

Ono acknowledged the plant was vulnerable.

**"The Fukushima plant still runs on makeshift equipment, and we are trying to switch to something more permanent and dependable, which is more desirable," he said. "Considering the equipment situation, we may be pushing a little too hard."**

Ono said the utility did not immediately try to switch to a backup cooling system because doing so without finding and fixing the cause could lead to a repeat of the problem.

There is a backup cooling system but no backup outside power source. TEPCO has backup cooling systems with separate power sources for reactor cooling, but **fuel storage pools only have emergency diesel generators as a backup**. TEPCO said it will consider installing backup outside power for the pools.

The No. 3 and No. 4 reactors share a makeshift switchboard that sits on the back of a truck, but an upgrade to a permanent, safer location is being planned later this month. Reactor cooling water pumps also sit on the back of a truck, with hoses traveling several kilometers to reach the reactors.

“We have a ton of problems that still need to be taken care of to overcome the challenges that we have never experienced before,” Ono said. But he denied the power outage would affect the plant's long-term cleanup plans.

Regulators have raised concerns about the makeshift equipment and urged the plant to switch to a more permanent arrangement. The operator still has to remove melted, highly radioactive fuel from the reactors before fully decommissioning the plant, which officials say could take 40 years.

Chief government spokesman Yoshihide Suga sought to allay concerns.

“We have put in place measures that leave no room for worry,” Suga told a regular briefing.

The command center at the plant suffered a brief power outage before 7 p.m. March 18. Electricity was quickly restored there but not to equipment pumping water into the fuel pools.

The temperature in the four pools had risen slightly, but was well below the utility's target control temperature of 65 degrees, TEPCO said.

“We don't believe the Fukushima disaster is under control,” said Yuko Endo, chief of nearby Kawauchi village, part of which remains restricted because of radiation contamination, keeping hundreds of residents away from their homes. Officials are struggling to make the area livable again, but people cannot return home unless they feel confident about the plant's stability, he said.

## **TEPCO restores Fukushima plant's spent fuel pool cooling system**

<http://mainichi.jp/english/english/newsselect/news/20130320p2g00m0dm001000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Tuesday it has resumed cooling the spent fuel pools of the Nos. 1, 3 and 4 reactors at the crippled Fukushima Daiichi nuclear power plant, a day after the key system was suspended due to a suspected problem with a power switchboard.

The incident did not affect the injection of water into the Nos. 1, 2 and 3 reactors that suffered core meltdowns, but indicated that the situation remains vulnerable more than two years after the plant was ravaged by the quake-triggered tsunami on March 11, 2011.

TEPCO spokesman Masayuki Ono told a press conference that the utility has yet to nail down the cause of the incident as it has devoted its energy to restoration efforts.

Electricity went out at a total of nine facilities, including an installation to remove radioactive substances from water used to cool reactors and a cooling system for a common pool located inside another building at the site.

Ono admitted that it was the first time such a large number of facilities, including important devices, had suffered an electricity failure simultaneously since the plant was brought under control in December 2011.

TEPCO initially noticed the problem after electricity instantaneously went out at the plant's accident response center at 6:57 p.m. Monday.

TEPCO had placed the highest priority on restoring the cooling system of the No. 4 spent fuel pool, as the number of fuel assemblies stored in the tank is higher than those left in the pools of the Nos. 1, 2 and 3 units. It succeeded in resuming the system by 4:13 p.m. Tuesday.

The cooling system for the Nos. 1 and 3 spent fuel pools was also put back online on Tuesday.

The temperature of the No. 4 spent fuel pool stood at 30 C at 4:30 p.m., compared with 25 C at 4 p.m. a day earlier. TEPCO has set an upper limit of 65 C to secure safety during normal operations.

TEPCO said the cooling system of the common pool was restored shortly after midnight Tuesday, meaning the operation of all nine facilities has recovered. The pool stores a total of 6,377 fuel assemblies.

The company suspects a problem at a makeshift power switchboard caused the suspension of the cooling system. The equipment in question is the only remaining makeshift power switchboard at the plant, installed after the nuclear crisis, according to Ono.

Economy, Trade and Industry Minister Toshimitsu Motegi said at a press conference that he has instructed TEPCO to take every possible measure to address the problem at the plant.

Chief Cabinet Secretary Yoshihide Suga also said there is "no need to worry," but a Fukushima prefectural government official told TEPCO the same day that **the incident has created "significant anxiety" among local people.**

Given that it took TEPCO about three hours before announcing that the cooling system had been suspended, the company said it will seek to convey information more quickly on issues that could stir public concern.

## **Cooling systems restored at Fukushima reactors: Tepco**

AFP-JIJI, Kyodo

<http://www.japantimes.co.jp/news/2013/03/20/national/cooling-systems-restored-at-fukushima-reactors-tepco/#.UUIqjff1tEs>

Technicians have restored power to all cooling systems at the reactors of the Fukushima No. 1 nuclear plant, operator Tepco said Wednesday after a blackout sparked a new crisis.

Equipment in pools used to cool used fuel became fully operational 12 minutes after midnight, some 30 hours after the blackout, Tokyo Electric Power Co. said.

Used nuclear fuel becomes dangerous if its temperature is allowed to rise uncontrollably to the point where a self-sustaining critical reaction begins, causing a meltdown.

The incident did not affect the injection of water into the reactors 1, 2 and 3 that suffered core meltdowns, but indicated that the situation remains vulnerable more than two years after the plant was ravaged by the quake-triggered tsunami on March 11, 2011.

The latest crisis began Monday night with a brief power outage at a building on the plant's site that serves as the central command for work to contain the nuclear accident and to dismantle the reactors.

The initial glitch cut electricity to the cooling pools at three of four heavily damaged reactors as well as a common pool at 7 p.m. on Monday, according to Tepco.

By Tuesday evening engineers had managed to restart cooling systems in the three affected reactor pools, the utility said.

A separate cooling system for the common pool was restarted just after midnight Wednesday, ending the latest problem, the company said.

"At 0:12 a.m. today (Wednesday), the common pool cooling purification system was restarted," Tepco said in a statement. "All of the systems have been restarted."

Tepco has stressed that the glitch was fixed before any lasting damage was caused, saying the temperatures of all the fuel pools remained well below the safety limit of 65 degrees.

Company officials say there has been no major change to the level of radioactivity at nearby monitoring spots.

Monday's outage knocked out power at a total of nine facilities, including an installation to remove radioactive substances from water used to cool reactors and a cooling system for a common pool located inside another building at the site.

Ono admitted that it was the first time such a large number of facilities, including important devices, had suffered an electricity failure simultaneously since the plant was brought under control in December 2011.

Tepco has yet to identify the cause of the blackout, but suspects a problem with a switchboard.

The firm says the incident did not affect the injection of cooling water into reactors whose cores melted down soon after the start of the 2011 nuclear crisis.

The meltdown of three of Fukushima's six reactors occurred after an earthquake and huge tsunami on March 11, 2011, which shut off the power supply and cooling system.

Tepco drew flak for playing down the scale of the disaster in the first few months. It has since admitted it had been aware of the potential dangers of a big tsunami but did nothing for fear of the reputational and financial cost.

The latest incident rekindled public concern about whether the politically connected utility is being fully transparent.

Tepco informed the government's regulatory agency about the blackout shortly after it started, but waited three hours before issuing a public press release.

## **No. 1 fuel pool power to be restored: Tepco**

*Repairs of makeshift switchboards to rectify woes; tardy reporting hit*

by Reiji Yoshida

Staff Writer

<http://www.japantimes.co.jp/news/2013/03/20/national/no-1-fuel-pool-power-to-be-restored-tepco/#.UUlqUzf1tEs>

Critical cooling systems for four pools containing thousands of nuclear fuel assemblies at the Fukushima No. 1 power plant shut down due to a loss of power overnight Monday, highlighting the vulnerability of the ad hoc equipment set up after the meltdowns two years ago.

Tokyo Electric Power Co. said repairs to fully recover the cooling functions of the fuel pools at reactors 1, 3 and 4 were completed on Tuesday night. Meanwhile, the utility said another huge common fuel pool would be fully functional by 8 a.m. Wednesday.

Tepco was still trying to pinpoint the cause of the power loss Tuesday afternoon, raising concern about the soundness of the facilities at the badly damaged nuclear plant, where decommissioning work will take decades.

Tepco emphasized that it would take at least three more days for the water in the spent fuel pool in the damaged reactor 4 building, potentially the most dangerous one, to reach the threshold control temperature of 65 degrees, giving the operator ample time to restore power before the coolant water started to boil and evaporate.

The utility speculated that a makeshift switchboard set up after the meltdowns of reactors 1-3 probably malfunctioned Monday evening, causing two more switchboards and other equipment to automatically shut down.

It is thought that this led to the power loss to the cooling systems for the fuel pools in the reactor 1, 3 and 4 buildings as well as the large common pool, which contains 6,377 nuclear fuel assemblies, Tepco said.

The injection of coolant water into the damaged cores of reactors 1, 2 and 3 was not disrupted, Tepco said.

“We are still trying to identify the cause (of the power loss). We need to investigate further,” said Tepco executive Masayuki Ono, who served as a spokesman at the news briefing Tuesday morning.

Tepco announced the loss of cooling functions shortly after 10 p.m. Monday, about three hours after the power went out, drawing criticism from the media.

Tepco said the information was withheld because it took several hours to figure out which equipment was affected by the power disruption.

Chief Cabinet Secretary Yoshihide Suga, meanwhile, sought to ease concern by assuring the public that the plant has backup equipment on hand for worst-case scenarios.

“We are preparing (backup safety) measures so that you don’t need to worry,” Suga told a news conference Tuesday morning.

According to Tepco, fire engines are deployed at the Fukushima plant, and other water pumps are available as well to inject water into any of the pools in the event the cooling equipment goes down for an extended period.

Radiation monitoring posts in and around the Fukushima plant showed no abnormal readings, according to both Tepco and the government.

But the current problem pulls back the curtain on the unreliability of the cooling systems at the Fukushima plant.

Containing 1,533 fuel assemblies, the reactor 4 pool is the hottest of the four. Its water temperature was estimated at 30.5 degrees at 10 a.m. Tuesday, and would rise 0.368 degree per hour while the cooling system is out, Tepco said.

At 100 degrees, the water would boil and evaporate. If all the water was lost, the fuel assemblies would melt down and the pool collapse, releasing vast amounts of radioactive material into the environment.

Tepco now plans to transfer all the fuel assemblies from the reactor 4 pool to the sturdier common pool by the end of this year.

But the cooling system for the common pool was also shut down by the recent power loss.

It is expected to take more than three decades to decommission the three troubled reactors at the Fukushima complex, which has six reactors. It has not been decided what will happen with the rest of the crippled plant. Tepco will have to keep the cooling systems running throughout the long process to prevent further meltdowns of the still-hot reactor cores.

Ono said that for now at least Tepco believes the makeshift switchboard either lost current or surged, tripping other switchboards and equipment connected to the network, and cutting power to the cooling systems.

## **A mouse in the panel board...**

**The blackout was caused by a mouse in the panel board, the board has been left on the truck since 3/18/2011**

Posted by Mochizuki on March 20th, 2013



According to Tepco, the power blackout of Fukushima plant was caused by a **mouse** that came in the terminals to have caused a short circuit.

**The panel board was provisionally installed on the bed of a truck on 3/18/2011. Knowing the risk, Tepco has been leaving it there.**

The panel board was for reactor 3 and 4. **There are 6 more provisional panel boards for these reactors.** The terminal and the wall were burnt and the mouse was dead underneath.

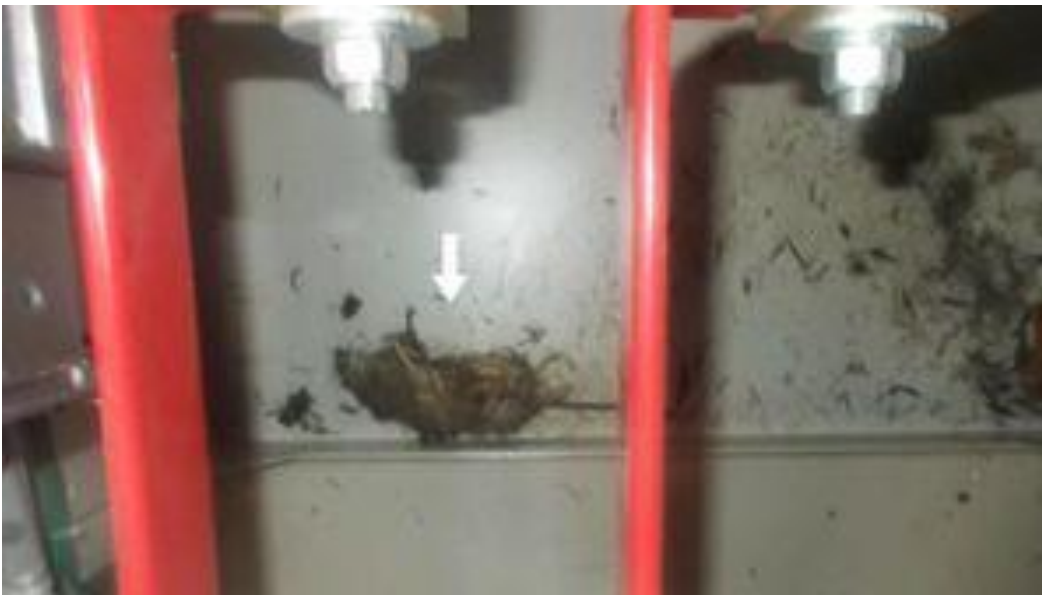
See images on <http://fukushima-diary.com>

<http://photo.tepco.co.jp/date/2013/201303-j/130320-01j.html>

<http://www.fnn-news.com/news/headlines/articles/CONN00242543.html>

<http://www.tokyo-np.co.jp/s/article/2013032090071113.html>

## It was a rat!



at-zap: A dead rat lies near a switchboard Wednesday at the Fukushima No. 1 nuclear plant. Tokyo Electric Power Co. suspects the rodent caused the Monday short-circuit that disabled the cooling systems for the fuel pools of the plant's stricken reactors. | TOKYO ELECTRIC POWER CO./KYODO

National

## **Tepco smells a rat in Fukushima No. 1 fuel pool cooling glitch**

Kyodo

<http://www.japantimes.co.jp/news/2013/03/21/national/tepco-smells-rat-in-fukushima-no-1-fuel-pool-cooling-glitch/#.UUoegDf1tEs>

A rat apparently gnawed on a switchboard or its wiring, causing the 30-hour power cutoff for the spent-fuel pool cooling systems at the triple-meltdown-hit Fukushima No. 1 nuclear plant that led to renewed fallout fears, Tokyo Electric Power Co. indicated Wednesday.

Tepco said it found the burnt carcass of what appeared to be a rat near the makeshift switchboard as well as burn marks on the equipment, although it has yet to determine the exact cause of the power outage.

The switchboard runs the cooling systems of the spent-fuel pools of reactors 3 and 4 as well as a common pool located inside another building at the site that contains 6,377 nuclear fuel assemblies.

Tepco said it had not taken any steps to prevent wildlife, such as rodents, from getting at the switchboard and said it is continuing to investigate other factors that may have caused the power outage, which was apparently resolved minutes after midnight Tuesday.

The makeshift switchboard was located on the back of a truck that had been parked outside since May 2011. Tepco was planning to stop using the equipment and switch to a new permanent switchboard by the end of this month.

The cooling system for reactor 1 has a separate electrical system from the makeshift power switchboard, but at the time of the power outage it was connected to the makeshift switchboard due to ongoing multiple tasks and was affected, the utility said.

Tepco restarted all nine power outage-hit facilities, including an installation to remove radioactive substances from water used to cool the crippled reactors, by midnight Tuesday after electricity went out a day earlier.

On Wednesday, the water temperature stood at 31.8 degrees in the common pool that stores the 6,377 fuel assemblies, 31 degrees in the reactor 4 spent-fuel pool and 17 degrees in both the reactors 1 and 3 fuel pools.

Those temperatures are between 1 and 6.3 degrees higher than the levels before the power outage.

Tepco spokesman Masayuki Ono said, "It will take several days for the temperatures to get back to normal."

The latest trouble occurred more than two years after the plant was ravaged by the tsunami from the March 11, 2011, Great East Japan Earthquake, as well as possibly by the temblor itself. Reactors 1-3 suffered core meltdowns after the disaster struck, as well as hydrogen explosions, which destroyed the building housing reactor 4 and left its spent-fuel pool exposed.

## **Switchboard found burnt at Fukushima plant**

[http://www3.nhk.or.jp/daily/english/20130320\\_28.html](http://www3.nhk.or.jp/daily/english/20130320_28.html)

Tokyo Electric Power Company says it has found burn marks on one of the power distribution boards that stopped working and brought to a halt cooling systems for spent-fuel pools at the damaged Fukushima Daiichi nuclear plant.

A small animal that appeared to be a rat was also found dead near the board. The company suspects the animal touched the terminal of the board and caused a short circuit.

The cooling systems were restored after midnight on Wednesday after a suspension of about 29 hours.

TEPCO started investigating the cause of the trouble on Wednesday morning and closely checked the 3 boards.

Shortly after noon, workers found burn marks on an electric terminal of one of the boards and a nearby wall. The board was installed on a truck after the nuclear accident.

The workers also found the body of a small animal about 15 centimeters long nearby.

The company suspects the animal touched the terminal and triggered a short circuit, leading to a major problem after other power-supply facilities detected abnormalities and came to a halt.

The latest interruption to the cooling system was the longest since the nuclear meltdown following the March 2011 quake and tsunami.

A brief power failure caused 9 systems to fail, including the cooling systems for the spent fuel pools of the No. 1, 3 and 4 reactors, and a shared pool in the plant's compound, on Monday evening.

Mar. 20, 2013 - Updated 14:57 UTC (23:57 JST)

## **Latest announcements by TEPCO**

### **Power Supply Facilities Failure at Fukushima Daiichi Nuclear Power Station (Follow-up Report 8)**

[http://www.tepco.co.jp/en/announcements/2013/1225705\\_5502.html](http://www.tepco.co.jp/en/announcements/2013/1225705_5502.html)

At around 6:57 PM on March 18, there was an incident where the power supply facilities in the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station momentarily stopped. The updates on the incident are provided below.

As previously announced, at 12:36 PM on March 20, a TEPCO employee found soot at terminals and on a wall in the power panel of the Units 3/4 temporary M/C (A) during the investigation of the power supply facilities failure in Fukushima Daiichi NPS. After that, Futaba Fire Station conducted a site investigation and concluded that it was not fire at 1:57 PM.

We will conduct further investigations for this power supply facilities failure, and will announce soon after we find new information.

## **Power Supply Facilities Failure at Fukushima Daiichi Nuclear Power Station (Follow-up Report 7)**

At around 6:57 PM on March 18, there was an incident where the power supply facilities in the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station momentarily stopped. The updates on the incident are provided below.

At 12:36 PM on March 20, a TEPCO employee found soot at terminals and on a wall in the power panel of the Units 3/4 temporary M/C (A) during the investigation of the power supply facilities failure in Fukushima Daiichi NPS.

Then, we informed the fact to Futaba Fire Station at 12:45 PM.

We will conduct further investigations for this power supply facilities failure, and will announce soon after we find new information.

## **New wire-attached anti-tsunami wall**

March 21, 2013

### **Tsunami seawall to stop debris**

[http://www3.nhk.or.jp/daily/english/20130321\\_09.html](http://www3.nhk.or.jp/daily/english/20130321_09.html)

A seawall designed to prevent fishing boats and other large debris from being washed onshore by tsunami has been built in Kochi Prefecture, southwestern Japan.

The seawall was set up at Nomi port in Susaki city, where about 500 fishing boats are moored.

It's 115 meters long and about 2.2 meters high, and topped by 1.5-meter-high poles.

Officials say **2 sets of wires installed between the poles can hold back debris weighing up to about 5 tons.**

Some fishing ports in Hokkaido were able to keep out debris thanks to wires, when quake-triggered tsunami struck Japan's northeastern coast 2 years ago.

But Susaki city says its wire-attached seawall is probably the first in Japan.

## **The rat (more about)**

### **Rat suspected of causing power problem at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130321p2g00m0dm023000c.html>

### **TEPCO: Rat likely caused Fukushima power failure**

[http://www3.nhk.or.jp/daily/english/20130321\\_04.html](http://www3.nhk.or.jp/daily/english/20130321_04.html)

Tokyo Electric Power Company says a small animal may have caused a power failure at the Fukushima Daiichi nuclear power plant.

A utility spokesperson says the firm's engineers found the burnt body of what looked like a rat near a switchboard installed outside the building.

He said the engineers suspect the animal touched the switchboard which caused a short circuit, resulting in the blackout on Monday.

He also said many parts of the plant lost power as there was no emergency electrical circuit system due to a temporary integration of 2 power lines as a result of construction work.

The power failure led to operations being suspended at 9 facilities in the Fukushima plant. The affected units include the pools of the No. 1, 3 and 4 reactors and another pool to cool down spent fuel rods.

Workers managed to get the cooling system functioning again early Wednesday, some 29 hours after the blackout started.

This is the first power failure at the Fukushima plant to stop the cooling systems for several hours since the March 2011 accident.

TEPCO engineers are investigating the cause of the short circuit.

They are planning on moving the outdoor switchboards inside. They are also thinking of setting up an auxiliary power unit for the cooling pools.

## The rat (still more about)

### Fukushima blackout investigators examine dead rat

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303210068>

see video:

[http://www.youtube.com/watch?feature=player\\_embedded&v=EGkuCfNvrGA](http://www.youtube.com/watch?feature=player_embedded&v=EGkuCfNvrGA)

A dead rat was found lying near equipment that likely short-circuited this week and plunged critical cooling systems at the Fukushima No. 1 nuclear plant into crisis again.

Officials of Tokyo Electric Power Co., the plant operator, said on March 20 they found the remains of a rodent inside the housing of a scorched switchboard.

They now believe that is where the blackout began, possibly when the rat climbed across live terminals and shorted them together.

Power was lost to a cooling system that keeps the water of fuel rod storage pools from heating up.

The outage lasted a little over a day. All cooling equipment was back up early on March 20.

Company officials subsequently began an investigation. Shortly after noon that day, they discovered charring on a temporary switchboard delivered to the site aboard a truck after the March 2011 accident and which has been in use there ever since. It is the only temporary switchboard now in use at the plant. Inside the unit's housing, workers found the remains of a small animal, likely a rat, about 15 centimeters from nose to tail, lying near the charred terminal. Officials plan to examine the matter further.

Such a power loss should ordinarily have affected only one electrical network that supplies power to cooling equipment for spent fuel pools at reactors No. 3 and No. 4 and a common pool for spent fuel.

But in this instance, a blackout occurred in a second network, too, which led to the failure of power in equipment that keeps spent fuel cool in the storage pool at the No. 1 reactor.

**Ordinarily, the two electrical networks are independent from one another. However, the two were temporarily connected together when maintenance work took place to strengthen the site's systems against the impact of another tsunami. That may be why a blackout in one triggered another simultaneously.**

TEPCO officials said the cooling equipment for the nuclear fuel storage pools in the No. 1, No. 3 and No. 4 reactors as well as that for the common storage pool were all functioning normally.

(This article was written by Naoya Kon and Yu Kotsubo.)

## Radioactive water at Fukushima Daiichi - Latest report from TEPCO

### Radioactive Materials at Fukushima Daiichi Nuclear Power Station (91st Release)

[http://www.tepco.co.jp/en/press/corp-com/release/betu13\\_e/images/130321e0101.pdf](http://www.tepco.co.jp/en/press/corp-com/release/betu13_e/images/130321e0101.pdf)

## US & Japan want cooperation on decommissioning Fukushima

March 25, 2013

### US And Japan To Cooperate On Fukushima-Daiichi Decommissioning

<http://www.nucnet.org/all-the-news/2013/03/25/us-and-japan-to-cooperate-on-fukushima-daiichi-decommissioning>

The US has offered to help decommission the four damaged reactors at Fukushima-Daiichi and the US Nuclear Regulatory Commission (NRC) will “work closely” with Japan's Nuclear Regulation Authority (NRA) to carry out joint research on safety and security, a Japanese nuclear industry group has said.

Takuya Hattori, president of the Japan Atomic Industrial Forum (JAIF), told NucNet that the NRC and NRA are planning to hold meetings twice a year to exchange information.

He said such meetings would provide a forum to exchange technical information and carry out joint research to secure the safety of nuclear plants.

The two countries will also be able to discuss a wide range of potential areas in which to cooperate. Working groups could be set up for high priority issues, he said.

Mr Hattori also said he believes “a major international initiative” is needed on the decommissioning of nuclear reactors, including units that were damaged following the earthquake and tsunami at Fukushima-Daiichi in March 2011.

He said the ageing of hundreds of nuclear facilities worldwide demands attention that should not just be limited to the country where the facilities are based.

Mr Hattori said only an international initiative could succeed in completing the planning for, and safe and cost-effective implementation of decommissioning.

Units 1 to 4 at the six-unit Fukushima-Daiichi plant will be permanently decommissioned, a task that

could take up to 50 years.

Plant operator Tokyo Electric Power Company's decommissioning roadmap for the units is in three phases with the final phase taking up to 40 years. **However, this phase might not begin for another 10 years, allowing time for the removal of spent fuel and other debris.**

Mr Hattori said it could take up to 10 years to remove spent fuel from the plant's spent fuel pools.

Mr Hattori said public confidence in nuclear power among Japanese people is still to be restored two years after the Fukushima-Daiichi accident. He said restoring this confidence was "the most difficult task" for the industry.

But he did not rule out the construction of new nuclear plants in Japan and said he was confident nuclear still had a role to play in meeting the energy needs of Japan and the rest of the world.

"Yes, the public do not want us to depend so much on nuclear energy, but I think they still understand the necessity for nuclear power," he said.

Mr Hattori said "lack of preparation and imagination" was one of the causes of the disaster, adding, "never again must we be so complacent." He said plant managers and nuclear safety experts in Japan showed they could not imagine scenarios that have a very low probability such as the combination of earthquake and tsunami that gave rise to the accident at Fukushima-Daiichi.

"The accident was not the result of nuclear technology itself, but the inevitable result of management systems that had built-in institutional defects," he said.

Asked whether or not the stress tests being carried out in Japan based on similar tests in Europe would solve any potential safety issues with Japan's nuclear plants, he said "in safety, nothing is enough".

He said: "If some countries or someone thinks 'we have passed the stress-test, we are safe', that is a problem. That is the starting point in the loss of the safety culture."

Mr Hattori said management systems need to be improved and those involved in nuclear safety need to have "a questioning attitude".

"We need to know how to be prepared for a severe situation and how to manage any severe situation. We need to improve communication between the nuclear site and the support centres. We need to improve information for the general public.

Asked about the cost of improvements to nuclear plants following the Fukushima-Daiichi accident, Mr Hattori said you could not put a cost on safety.

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## Wanted : Rat-proof switchboards in nuclear plants!

March 26, 2013

### TEPCO concludes rat caused last week's Fukushima blackout

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303260044>

Tokyo Electric Power Co. concluded March 25 that a charred rat found electrocuted beneath a temporary switchboard was behind a recent extended blackout at the utility's crippled Fukushima No. 1 nuclear power plant.

The blackout, which affected critical cooling systems at the nuclear plant's spent fuel storage pools, began on March 18 and lasted 29 hours.

The temporary switchboard arrived at the plant on the back of a truck shortly after the March 2011 nuclear disaster and has been in use there ever since.

Following the blackout, TEPCO investigators found a terminal with scorch marks inside the switchboard's housing and a dead rat, clearly electrocuted, lying on the floor nearby.

Analysis of the operation records of the cooling systems and other equipment led them to conclude that a short-circuit caused by the rat climbing across live terminals caused the blackout, TEPCO officials said.

The investigators spotted no anomalies in the other switchboards.

Investigators believe the rat entered through an opening in the housing. To prevent a recurrence, workers have disconnected key devices from the temporary switchboard, which remains outdoors, and **reconnected them to rat-proof, indoor switchboards**, the utility said.

### Rat found as cause of power problem at Fukushima plant

<http://mainichi.jp/english/english/newsselect/news/20130326p2g00m0dm035000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Monday it has concluded that a rat caused a power supply problem that disabled cooling systems for spent nuclear fuel pools at its crippled Fukushima Daiichi nuclear plant last week.

The animal apparently touched a switchboard and triggered a short circuit that led to the power outage from the evening of March 18, the company said. The 25-centimeter-long rat was found dead in the switchboard.

A TEPCO official said the company will take stronger measures to prevent small animals from entering the switchboard.

It took about 29 hours for the cooling systems to be recovered completely.

### **How the meltdown of No 3 could have been avoided on March 13, 2011**

<http://www3.nhk.or.jp/nhkworld/english/movie/feature201303292000.html>

On Air (March 29, 2013): The missed opportunity. It could have been worse without TEPCO...

March 29, 2013

### **Analysis] J gov can take over Tepco for the decommissioning work of Fukushima with a major legal reform**

<http://fukushima-diary.com/2013/03/analysis-j-gov-can-take-over-tepco-for-the-decommissioning-work-of-fukushima-with-a-major-legal-reform/>

Posted by **Mochizuki**

More and more people are starting to question if Tepco can really handle the decommissioning work of Fukushima.

About 10 days before this post, they lost power in Fukushima plant, which stopped the coolant system of the pools of reactor 1, 3, and 4.

Tepco concluded it was caused by "a small animal -rat", but the panel board was left on the bed of the truck since 3/18/2011 for two years. Fukushima workers comment power stoppage frequently happens though it doesn't become huge news like this time. It's even suspicious if the power stoppage was really caused by the rat.

(cf, Fukushima worker “Power outage frequently happens in Fukushima plant” [URL])

They are also struggling with the contaminated water. They are planning to discharge it to the sea little by little. There’s actually no way of stopping the ground water flowing into the plant.

(cf, [Analysis] There is no way of stopping ground water flowing into the plant [URL])

What surprises us is the poor mathematical sense of Tepco.

The temporary panel board was left on the truck for 2 years.

It was obvious that Tepco was going to run out of the capacity to stock the contaminated water. It could have been exactly simulated by the simplest maths from the very beginning.

The next problem that Tepco is going to have to face is the supply of nuclear workers.

Again, it is obvious that Tepco will have the serious shortage of skilled workers.

What would they do ?

For this question of the independent journalist, Tepco still can’t show a realistic solution.

Unfortunately, it is clear that Tepco cannot handle the the decommission process.

However, the more we criticize them, the more we will be troubled actually.

In the press conference, Tepco is sounding more and more like they are giving it up to handle it all by themselves. No wonder, they are not the decommissioning expert, they are just a power seller.

In the press conference of 3/8/2013, Tepco’s spokesman commented it’s not the issue of only Tepco, now it’s the issue of the government and the whole industry to keep the stable supply of Fukushima workers.

(cf, Tepco “Tepco can’t maintain the stable supply of Fukushima workers, needs help of the gov and industry” [URL])

Actually whatever Tepco tries to do, such as installing a new system, they need the permission of the government and it takes time.

Legally and financially, the decommissioning work will be initiated by Japanese government sooner or later.

Historically, Japan has been developing the nuclear power as its national policy. Tepco was used by the government. Fukushima Diary assumes Tepco was nationalized in order to stop them from suing the government.

Once the decommissioning work is also nationalized, Japanese government is anticipated to reform the law largely. To make it more efficient, the government is likely to deregulate the safety limit of contaminated water to be discharged to the sea, and the dose limit of plant workers. Also, national conscription is anticipated for the stable supply of Fukushima workers.

The safety limit of food would be deregulated and media coverage would be more restricted.

This is the truth that Tepco is incapable of handling the situation, but it's also the truth that it would be even worse after Tepco is discharged.

## **Overview of the Multi-nuclide Removal Equipment (ALPS) at Fukushima Daiichi Nuclear Power Station**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130329\\_01-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130329_01-e.pdf)

March 30, 2013

[TEPCO will only test one of the three devices]

### **TEPCO to test new water decontamination device**

[http://www3.nhk.or.jp/daily/english/20130330\\_02.html](http://www3.nhk.or.jp/daily/english/20130330_02.html)

The operator of the crippled Fukushima Daiichi nuclear plant will begin testing a new device to decontaminate radioactive wastewater massing at the facility.

Tokyo Electric Power Company will test-run the device from Saturday. The device can filter 62 radioactive substances that older models could not remove.

Company officials say they will initially use just one of 3 such devices as they need to take a cautious approach to handling the high-level radioactive water.

TEPCO plans to test the device for about 4 months. The company has yet to indicate when it will test the remaining 2 devices and put them into full-scale operation.

TEPCO was expected to start the trial last September. But it was forced to suspend the plan after a storage vessel for the device was found to be unsafe.

The Nuclear Regulation Authority gave the go-ahead to the utility last week, after TEPCO submitted extra safety measures.

Radioactive water at Fukushima Daiichi is accumulating at a rate of about 400 tons every day. The device is considered crucial to securing safety at the site and preventing pollution to the environment.

## **Overview of the Multi-nuclide Removal Equipment (ALPS) at Fukushima Daiichi Nuclear Power Station**

Photos & videos from TEPCO

<http://photo.tepco.co.jp/en/date/2013/201303-e/130329-03e.html>

### **Hot test started for the multi-nuclide removal equipment (ALPS)**

At 9:56 AM today (March 30, 2013), hot test using waste liquid treated by the water treatment facility was started for the multi-nuclide removal equipment (ALPS). Though the multi-nuclide removal equipment is comprised of three systems (A, B and C), the hot test will be performed on system (A) first to confirm the treatment status.

## **TEPCO to test one of the ALPS systems**

March 31, 2013

Tokyo Electric Power Co. said Saturday it has begun a trial run of a new system able to remove about 60 types of radioactive substances from cooling water used in the Fukushima No. 1 plant's wrecked reactors.

### **Tepco testing new water decontamination system at Fukushima No. 1 plant**

<http://www.japantimes.co.jp/news/2013/03/31/national/tepco-testing-new-water-decontamination-system-at-fukushima-no-1-plant/#.UVc9NTf1tEs>

Kyodo

Full-fledged operation of the advanced liquid processing system (ALPS) will start in about four months after its performance is verified. Tepco said it plans to process 250 tons of irradiated water a day using the

new multinuclide removal system, which has the capacity to dispose of up to 500 tons when fully operational.

ALPS has been installed to clean the contaminated water flowing through a 4-km loop and used to cool the crippled reactors. Unlike the existing system that can only remove radioactive cesium, ALPS can extract almost all radioactive substances except for tritium.

The new system is necessary to ensure the safe storage of processed water, according to Tepco.

Although the utility initially planned to start a test run by the end of December, its introduction was delayed after containers used to store processed wastewater were found to lack robustness. As Tepco has enhanced the containers' durability, the Nuclear Regulation Agency approved the start of the trial run.

After the March 11, 2011, tsunami inundated the Fukushima No. 1 nuclear plant, causing three catastrophic meltdowns, Tepco created a system in which water used to cool reactors 1 to 3 passes through the current system that removes radioactive cesium. The processed water is then stored in tanks.

## Getting ready for US shale gas

April 1, 2013

### Traders gear up for U.S. shale gas

JJI

<http://www.japantimes.co.jp/news/2013/04/01/business/traders-gear-up-for-u-s-shale-gas/#.UVlkPzdsFEs>

Japan's top trading firms are stepping up preparations to import shale gas from the United States, a move expected to ease skyrocketing procurement costs for liquefied natural gas driven by Tokyo's verbal bludgeoning of the yen.

Lower LNG costs will help curb electricity rates that have soared since the loss of atomic power caused by the Fukushima disaster sent demand for fossil fuels soaring. Only two of Japan's 50 reactors are running.

The trading firms are expected to start importing shale gas from the U.S. as early as 2017 if Washington approves exports to Japan in the first half of the year.

Sumitomo Corp. in 2009 became the first Japanese trading house to acquire shale gas interests in the U.S., starting with a development project in Texas.

Mitsui & Co. and Marubeni Corp. have since followed suit, while Itochu Corp. has acquired a major U.S. gas firm that owns several gas wells jointly with an investment fund.

Mitsui and Mitsubishi Corp. have separately teamed up with a U.S. firm to sell some 4 million tons each per year of U.S.-made LNG outside the country, starting in 2017. They also agreed to supply 200,000 tons each annually to Tokyo Electric Power Co. for about 20 years.

Sumitomo plans to import about 2.3 million tons of LNG per year starting in 2017, jointly with Tokyo Gas Co. Mitsubishi plans to start importing shale gas from Canada in 2019 through a local partnership partly owned by the company.

In 2012, Japan's LNG imports surged 11.2 percent from the previous year to 87.31 million tons. But the value of the imports surged 25.4 percent to a whopping ¥6.004 trillion.

Import prices for LNG produced in areas including the Middle East are linked to crude oil prices and recently stand between \$15 and \$16 per million British thermal units. U.S. benchmark Henry Hub natural gas prices are much lower at between \$3 and \$5 per million Btu. The price gap is expected to make procurement costs for U.S. LNG 20 to 30 percent lower than in other areas, including the Middle East.

But a market source said, "LNG prices in the United States are likely to rise to around \$6 per million Btu."

Sumitomo President Kuniharu Nakamura said LNG procurement costs may go lower once the U.S. approves exports to Japan. "But it is difficult to predict a long-term outlook," he said.

## Offshore wind energy

April 4, 2013

### Project tests viability of offshore floating wind turbines

Kyodo

[http://www.japantimes.co.jp/life/2013/04/04/environment/project-tests-viability-of-offshore-floating-wind-turbines/#.UV\\_H4jdsFEs](http://www.japantimes.co.jp/life/2013/04/04/environment/project-tests-viability-of-offshore-floating-wind-turbines/#.UV_H4jdsFEs)

A rare type of floating offshore wind turbine is being tested about 1 km off Kabashima, a 9-sq.-km island with some 110 households in Nagasaki Prefecture.

The wind turbine, with a 22-meter propeller arc diameter, generates 100 kwh and has been in operation since August as part of an Environment Ministry test project to develop a low-cost floating wind power plant.

Most wind turbines worldwide extend from pylons buried in the seabed, with just a smattering of the type that float. In the floating type, the pillar is anchored to the bottom and its lower hollow core is filled with seawater to keep it upright, so the pillar is self-righting like a “daruma” doll.

The upper part of the pillar that supports the wind turbine is made of steel while the lower part is made of concrete, allowing for drastically lower costs compared with those made entirely of steel.

Compared with wind power plants on land, strong and stable winds at sea allow plants built offshore to more effectively generate electricity.

The Environment Ministry plans to set up a wind turbine with an 80-meter-diameter propeller arc for experimental use this summer. This plant would be able to generate 2,000 kwh, or enough electricity for about 800 households.

The generated electricity will be sent via undersea cables to households on Kabajima, as well as to nearby islands via cables operated by Kyushu Electric Power Co.

Wind turbines rooted into the seabed, the most common type, are better usually constructed at depths of up to 50 meters. But Japan — despite being an island nation — is lacking in shallow beaches, making the typical setup difficult.

If the Environment Ministry’s test project succeeds, it could be used nationwide, possibly even prompting the creation of a new global market.

Commissioned by the Ministry of Economy, Trade and Industry, research is under way for a similar project off the coast of Fukushima Prefecture, with construction for three types of offshore floating wind turbines set to begin this summer.

## **Rats again!**

April 5, 2013

### **Power restored to Japan nuke plant cooling system**

<http://mainichi.jp/english/english/newsselect/news/20130405p2g00m0dm061000c.html>

TOKYO (AP) -- Power was restored Friday to a cooling system at a tsunami-damaged nuclear plant in Japan that failed for the second time in a month after an outage caused by construction work to keep out rats suspected of setting off the earlier blackout.



Power for the cooling system for a storage pool for fuel was restored after a two-hour break at reactor No. 3, and there was no immediate danger from the breakdown, according to Tokyo Electric Power Co., the utility that operates Fukushima Dai-ichi in northeastern Japan.

Work to put up nets to keep out rats and other animals at Fukushima Dai-ichi plant in northeastern Japan inadvertently caused the power outage, TEPCO spokesman Akitsuka Kobayashi said. Details were not clear, and the outage was still under investigation.

A dead rat found near a switchboard was suspected of the power outage last month that led to a cooling system not working for two days at the plant.

Nuclear Regulation Authority spokesman Takahiro Sakuma said an alarm went off in the afternoon about the latest problem at reactor No. 3.

The cooling system can be turned off for two weeks before temperatures approach dangerous levels at the spent fuel storage pools. But if the water runs dry, the fuel rods, even spent ones, will spew enormous levels of radiation.

The plant went into multiple meltdowns after the March 2011 tsunami damaged backup generators and all cooling systems failed, including those for the reactors.

The plant is being decommissioned, but continues to have glitches.

Fears are growing about the safety of nuclear plants, and people have periodically staged streets protests that are rare in Japan.

Only two of the nation's 50 working power plants are up, and the government is running beefed up safety checks on the plants, including scrutinizing quake faults right below or near the plants.

Shinzo Abe, who became prime minister about three months ago, has expressed a desire to restart nuclear plants.

Japan lacks natural resources and relied on nuclear energy for about a third of its electricity needs prior to March 2011. Energy imports have soared over the last two years, putting a strain on the economy.

## **Fukushima reactor cooling system fails again**

[http://www3.nhk.or.jp/nhkworld/english/news/20130405\\_26.html](http://www3.nhk.or.jp/nhkworld/english/news/20130405_26.html)

Tokyo Electric Power Company says the cooling system for a fuel pool at the Fukushima Daiichi nuclear power plant has failed again.

TEPCO says an alarm went off at around 2:30 PM on Friday, indicating that the system at the Number Three reactor had power trouble. Officials confirmed the failure.

The pool contains 514 units of spent fuel rods and 52 units of unused rods.

The utility says the pool's temperature was around 15 degrees Celsius at 2 PM, and that it would take about 2 weeks to reach 65 degrees, the in-house safety threshold.

Radiation levels near the plant have not changed.

Officials of the Nuclear Regulation Authority and Tokyo Electric are conducting on-site inspections.

A power failure occurred at the fuel pools of the reactor and 2 others at the plant last month.

## **Fukushima nuclear plant's cooling system goes offline for 3 hours**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304050069>

THE ASAHI SHIMBUN AND WIRE REPORTS

The cooling system for a fuel storage pool for one of the reactors at the crippled Fukushima No. 1 nuclear power plant in Japan temporarily failed on April 5 for the second time in a month.

Nuclear Regulation Authority spokesman Takahiro Sakuma said an alarm went off in the afternoon about the problem at reactor No. 3 around 2:30 p.m. Nearly three hours later at 5:20 p.m., electrical power had been restored.

No sign of radiation leakage has been detected outside the reactor's building.

The plant went into multiple meltdowns after the March 2011 tsunami damaged backup generators and all cooling systems failed, including those for the reactors. The plant is being decommissioned, but continues to have glitches.

Last month, a power outage led to a cooling system not working for two days, and TEPCO later said it had found a dead rat near a switchboard and suspected that was the cause for the power going out at nine facilities at Fukushima No. 1.

Fears are growing about the safety of nuclear plants, and people have periodically staged streets protests that are rare in Japan.

Only two of the nation's 50 working power plants are up, and the government is running beefed up safety checks on the plants, including scrutinizing quake faults right below or near the plants.

Shinzo Abe, who became prime minister about three months ago, has expressed a desire to restart nuclear plants.

Japan lacks natural resources and relied on nuclear energy for about a third of its electricity needs prior to March 2011. Energy imports have soared over the last two years, putting a strain on the economy.

### **Fukushima reactor cooling system restarted**

[http://www3.nhk.or.jp/nhkworld/english/news/20130405\\_29.html](http://www3.nhk.or.jp/nhkworld/english/news/20130405_29.html)

Tokyo Electric Power Company says it has restarted a fuel pool cooling system at the Fukushima Daiichi nuclear power plant after several hours of suspension.

TEPCO says an alarm went off at around 2:30 PM on Friday, signaling electric trouble at the plant's Number 3 reactor fuel pool. Officials confirmed the failure.

The pool contains 514 units of spent fuel rods and 52 units of unused rods.

The utility says the pool's temperature was 15 degrees Celsius at 2 PM and that it would take about 2 weeks to reach the in-house safety threshold of 65 degrees.

The utility says radiation levels at monitoring posts near the plant did not change during the suspension.

Tokyo Electric says the alarm went off while workers were installing wire nets around an outdoor power distribution board to keep small animals away.

The utility says the nets may have accidentally touched the board.

TEPCO decided to install the net after a small animal, possibly a rat, touched a switchboard outside a building and caused a power failure at 3 reactors last month.

The trouble halted cooling systems at the reactors for up to 29 hours.

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## Make space

### TEPCO makes room to store spent nuclear fuel from damaged Fukushima reactor building

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304050062>

Workers at Tokyo Electric Power Co. removed spent nuclear fuel housed in a common storage pool at the Fukushima power plant and moved it to a temporary storage depot on the plant site, TEPCO said April 4.

It was the first time for spent fuel in the common storage pool to be relocated since the onset of the nuclear disaster set off by the Great East Japan Earthquake two years ago.

TEPCO said the spent fuel was moved to make room for more spent fuel assemblies during decommissioning work. The emptied space will receive fuel assemblies from the No. 1 through No. 4 reactors.

TEPCO said most of the fuel in the common storage pool had been moved there from spent fuel storage pools provided in the individual nuclear reactor buildings before the triple meltdowns at the Fukushima No. 1 nuclear power plant in March 2011.

For the April 4 removal operation, the spent fuel was packed into a receptacle that can hold 37 spent nuclear fuel assemblies, called a dry cask, and placed into a temporary reinforced-concrete cask depot built on the east part of an athletic field on the plant site, the utility said, adding that fuel removal from the common storage pool will continue.

TEPCO said the fuel assemblies in the common storage pool generate relatively small amounts of heat.

TEPCO said it plans to start removing nuclear fuel from the spent fuel storage pool of the No. 4 reactor building into the common storage pool as early as November.

## New radioactive leak

### **Tepco has emergency press conference about new highly radioactive leak at Fukushima Daiichi**

<http://enenews.com/tepco-to-hold-emergency-press-conference-about-new-leak-of-highly-radioactive-substance/emailpopup/>

Kyodo News, April 6, 2013: Tokyo Electric Power Co. said Friday that contaminated water may have leaked into soil from an underground reservoir tank at the Fukushima Daiichi Nuclear Power Station. A radioactive substance has been detected in water accumulated between soil around the tank and the outer layer of a waterproof sheet covering the tank. The tank is covered by three layers of waterproof sheets. According to TEPCO and the Nuclear Regulation Authority, around 6,000 becquerels of radiation per cubic centimeter was logged in the water on Friday. [...]

Fukushima Diary (*h/t Anonymous tip*): By this January, 96% of contaminated water storage facility was full. They made 4 holes underground and has been using them for the emergency water storage facility. On 4/5/2013, Tepco announced they found the highly contaminated water leaking into the ground. [...] Tepco is going to hold an emergency press conference at 1:30AM of 4/6/2013 (JST). [...] See Tepco's announcement here

*See also:* Japan Engineer: Fukushima contaminated water to go in giant pit -- "It can easily be discharged underground" (VIDEO)

### **Press Release (Apr 05,2013)Suspension of Unit 3 spent fuel pool alternative cooling system at Fukushima Daiichi Nuclear Power Station**

At around 2:27 PM on April 5, an alarm indicating a power board failure related to power supply went off and Unit 3 spent fuel pool alternative cooling system was confirmed to be suspended. As a result of investigating the condition of the alternative cooling system at the site, no abnormality such as leakage was found.

The cause of the incident is assumed to be a ground fault which may have occurred during the implementation of countermeasure against small animals (installation of entry prevention net) on the power board of concern. The incident will be investigated in details.

Since no problem was found as a result of insulation resistance test performed on the power supply facilities affected by the incident from 3:50 PM to 4:00 PM, the cooling system was restarted at 5:20 PM.

No problem has been found with the system operation after restart.

\*The water temperature of Unit 3 spent fuel pool as of 2:00 PM today (April 5) was 15.1°C and the amount of time to reach the maximum allowed limit stipulated by the technical specification (65°C) is estimated to be approx. 2 weeks.

## **TEPCO - Pres releases on water leak**

### **Press Release (Apr 06, 2013) Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.5)**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1226125\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1226125_5130.html)

This is follow-up information regarding the water leak from the underground reservoir No. 2 in Fukushima Daiichi NPS.

Since 5:43 am on April 6, we have been transferring the water from the underground reservoir No. 2 to the underground reservoir No. 1 utilizing the three temporarily pumps in addition to the pump which started first.

To add one more temporarily pump, we temporarily stopped the three temporarily pumps at 12:07 pm. The pump which started first is still under operation.

### **Press Release (Apr 06, 2013) Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.4)**

This is follow-up information regarding the water leak from the underground reservoir No. 2 in Fukushima Daiichi NPS.

At 5:43 am on April 6, we started transferring the water from the underground reservoir No. 2 to the underground reservoir No. 1. In addition, we started operation of the additional three temporarily pumps at 9:38 am.

At 9:41 am, we conducted an on-site survey and confirmed that there is no abnormality such as leakage on the transferring line.

### **Press Release (Apr 06, 2013) Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.3)**

This is follow-up information regarding the water leak from the underground reservoir No. 2 in Fukushima Daiichi NPS.

At 5:43 am on April 6, we started transferring the water from the underground reservoir No. 2 to the underground reservoir No. 1. In addition, we will install three temporally pumps and will start operation soon after these are ready.

### **Press Release (Apr 06, 2013) Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.2)**

This is follow-up information regarding the water leak from the underground reservoir No. 2 in Fukushima Daiichi NPS.

At 5:43 am on April 6, we started transferring the water from the underground reservoir No. 2 to the underground reservoir No. 1.

At 5:43, we conducted an on-site survey and confirmed that there is no abnormality such as leakage on the transferring line.

We assume that amount of the leaked water is approx. 120 m<sup>3</sup>, the whole  $\gamma$  radioactive concentration is approx.  $1.5 \times 10^0$  (Bq/cm<sup>3</sup>), the whole  $\beta$  radioactive concentration is approx.  $5.9 \times 10^3$  (Bq/cm<sup>3</sup>), the whole amount of  $\gamma$  radioactivity is approx.  $1.8 \times 10^8$  (Bq) and the whole amount of  $\beta$  radioactivity is approx.  $7.1 \times 10^{11}$  (Bq). We are conducting further investigations on this matter.

We judged that this incident can be applied mutatis mutandis pursuant to Paragraph 10 of Article 19 (17) of Regulations Concerning the Installment, Operation, etc. of Reactors that stipulates "when radioactive material leakage found in controlled area due to accident or other contingency situations" at 5:10 am on April 6, even though it is occurred outside of the controlled area.

Therefore, this report has been issued in accordance with the Article 168 of Safety Standard for Nuclear Facilities of Fukushima Daiichi Nuclear Power Station (Reports).

### **Press Release (Apr 06, 2013) Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station (Follow-up Information)**

This is follow-up information regarding the water leak from the underground reservoir No. 2 in Fukushima Daiichi NPS.

We are planning to transfer the water in the underground reservoir No.2 to the underground reservoir No.1 soon after it is ready.

Approximately 13,000 m<sup>3</sup> (operational limit) of water is accumulated in the underground reservoir No.2 (Capacity: approximately 14,000 m<sup>3</sup>) and approximately 11,500 m<sup>3</sup> (operational limit) of the water will be transferred to the underground reservoir No.1 (Capacity: approximately 13,000 m<sup>3</sup>).

We assume that there is no leakage to the ocean since there is no drainage ditch near the reservoir.

## **Press Release (Apr 05,2013)Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station**

On April 3, order of 10<sup>1</sup> (Bq/cm<sup>3</sup>) of radioactive concentration was detected as a result of a water quality analysis of the water between the outermost sheet (bentonite sheet) of three layered sheets and the ground in the underground reservoir No.2.

Therefore, we conducted a water quality analysis of the water between the outermost sheet (bentonite sheet) and the inner sheet (two layered water shielding sheet) today (April 5) and detected approximately 10<sup>6</sup> (Bq/cm<sup>3</sup>) of radioactive concentration.

We will conduct additional water quality analysis tomorrow (April 6).

Now we are investigating this incident.

## **Methane hydrate not such a good idea**

### **‘Flammable ice’: a bad choice**

by Peter Wynn Kirby

Special To The Japan Times

<http://www.japantimes.co.jp/opinion/2013/04/05/commentary/flammable-ice-a-bad-choice/#.UV5yezdsFEs>

OXFORD, ENGLAND – Ironically the Japanese ship that a few weeks ago achieved the historic feat of drilling down, extracting and burning “flammable ice” (aka methane hydrate, available in huge quantities underseas globally but notoriously difficult to utilize) was christened Chikyu, the Japanese word for Earth.

Perhaps instead they should rechristen the ship using the handy Japanese term for “man-made disaster” (*jinsai*) — a word that has certainly gotten a lot of use around irradiated Fukushima these past two years. Or simply have another few Japanese characters painted on the hull to make *chikyu ondanka*, or “global warming.”



Methane hydrate is only the most recent unconventional energy source to find itself in the news, alongside the shale-gas fracking boom in the United States, for example.

Putting economic and ecological considerations aside for a moment, the main benefit of these comparatively untapped energy troves is that they move fossil fuel production away from democracy-challenged states like Russia, Nigeria and much of the Middle East — places where the phrase “rule of law” remains a men’s club punch line and where petrodollars fuel a wide range of dysfunctional governance behavior.

Still, it’s not as if we enlightened First World nations can pat ourselves on the back just yet. Despite the boomtown exuberance that fracking and some other unconventional extraction methods currently inspire, even the least objectionable of such fossil fuels still give off powerful climate gases.

Carbon dioxide is perhaps the least of our worries here, as emissions of methane are more than 70 times worse over a 20-year period. It’s not called “methane hydrate” for nothing.

Large-scale extraction and exploitation of flammable ice would almost certainly lead to problematic **leakage of the potent greenhouse gas methane** at a time when we need it least.

The repercussions of these energy developments unfortunately go far beyond the greenhouse effect. The polarized and vituperative fracas over climate change in recent years — more street fight than reasoned scientific and political dialogue — has largely restricted the terms of global debate to the simple question of whether the planet is warming and, by extension, whether scientists and politicians and others are “deniers” or “warmists.”

In the process, the majority of participants and bystanders in this brawl have overlooked or ignored a crucial point: Extracting and burning hydrocarbons has long been toxic and dangerous, exacting a heavy toll on human populations and the environment generally.

The body count is surprisingly high. According to the World Health Organization, urban air pollution alone causes about 1.3 million premature deaths globally each year. Then there are the grave health complications that afflict many more among the living, such as serious respiratory disorders and additional stress on those suffering heart disease.

Much of this man-made adversity and misfortune is the miasmatic legacy of fossil fuel consumption, though you’d hardly know it from the very limited public awareness of this pollutant state of affairs.

Regardless of the planet's warming timeline, gradually shifting toward greater reliance on forms of renewable energy production is clearly the smart move anyway, now that societies have the means to exploit energy more sustainably and cheaply.

Methane hydrate is hardly a benign windfall energy source, despite the largely positive media attention the Japanese extraction achievement attracted last month. Methane gas from the tricky Macondo well — combined with poor management and execution — caused the disastrous explosion that kicked off BP's Deepwater Horizon oil spill in the Gulf of Mexico in 2010. Methane hydrate crystals then clogged up the containment dome, vastly complicating the emergency response. Roughly 16 Exxon Valdez's worth of spilled oil later, we need to proceed responsibly with methane hydrate extraction.

Estimated reserves of flammable ice are colossal, likely to far exceed those of all the planet's other hydrocarbons combined, and the prospect of exploiting even a fraction of this amount gives pause.

Obviously, this is not just a Japanese problem: By exploiting deepwater methane hydrate last month, albeit at a small scale, Japan simply got there first technologically. Widespread extraction of flammable ice by a range of states and multinational corporations is likely to be just a matter of time.

Nevertheless, this successful seaborne operation by the Yokosuka-based Japan Agency for Marine-Earth Science and Technology has brought us to an awkwardly symbolic juncture at a delicate time. For **such looming unconventional fossil fuel exploitation, as with fracking in America, threatens to take important momentum away from sensible renewable energy development that would have far less negative environmental and health impacts.**

Naturally part of this wry symbolism radiates from Japan's disaster-torn recent history. Just two years after the catastrophic triple-meltdowns at the Fukushima No. 1 nuclear power plant, and with Japan's troubled nuclear sector hanging in political limbo, the "Green Archipelago" is burdened with pressing energy issues.

After 3/11, Japan quickly became the world's biggest importer of expensive liquefied natural gas to fill the huge power gap as reactor after reactor went into cold shutdown. From a narrow economic perspective, exploiting domestic offshore reserves of methane hydrate might just be too tempting for Japan's leaders to resist.

Yet, with popular Japanese anti-nuclear sentiment still very high, a robust strategic decision to push aggressively for comprehensive development of renewable energy production now could help Japan

squeeze as much potential as possible from sustainable sources while positioning its corporations to capitalize on export of new or refined eco-technologies to other nations. Japan should seize this opportunity to set a carbon-conscious example for the industrialized world that exploits renewables while promoting as much as possible the nation's economic and environmental self-interest.

How many rooftop solar installations would Japan need to take an aging, poorly maintained nuclear power plant permanently offline?

How much wind development would compensate for decommissioning each nuclear reactor sitting on an active seismic fault?

What level of investment in renewable energy sources generally would leave Japanese corporations poised to capitalize on changing attitudes to wind and solar development globally?

Can 2011's radical energy conservation measures (*setsuden*) or Japan's successful "Top Runner" appliance efficiency standards provide lessons for building a less energy-rapacious society?

These are the sorts of important energy questions that a range of nations should confront, but post-tsunami Japan is perhaps particularly well suited to hosting a bold nationwide debate on these issues — crucially counterbalancing the sly and slowly building susurrus of pro-nuclear propaganda and misinformation that seeks to bring most or all of Japan's reactors back online. Fukushima demonstrated the horrific externalities of having a large and poorly managed nuclear sector in a seismically active country.

**Wouldn't Japan prefer to stand as a beacon of eco-technology rather than continuing to represent an irradiated nuclear dystopia?**

Isn't smart renewable energy development the wise choice instead of risking another Fukushima that cash-strapped Japan can ill afford?

In other words, Japan would be best served by focusing on expanding renewables aggressively now rather than allowing itself to shipwreck on the Scylla of reckless nuclear power or the Charybdis of largely untested methane sources that come with a monstrous carbon footprint. That goes for the rest of us as well.

The good ship Chikyu is more off course than it seems. Burning flammable ice would do few favors for a warming planet.

Peter Wynn Kirby ([www.geog.ox.ac.uk/staff/pkirby.html](http://www.geog.ox.ac.uk/staff/pkirby.html)) is a research fellow in Oxford University's School of Geography and the Environment. He has written in The Japan Times about Japan's eerie and problematic stockpiles of plutonium and whale meat ([info.japantimes.co.jp/text/eo20120620a3.html](http://info.japantimes.co.jp/text/eo20120620a3.html)) His most recent book is "Troubled Natures: Waste, Environment, Japan" (2011).

## "A reminder of precarious state" of Fukushima Daiichi

April 6, 2013

### Reactor 3 cooling pool stops for three hours

AFP-JJI, Kyodo

[http://www.japantimes.co.jp/news/2013/04/06/national/reactor-3-cooling-pool-stops-for-three-hours/#.UV7\\_KTdsFEs](http://www.japantimes.co.jp/news/2013/04/06/national/reactor-3-cooling-pool-stops-for-three-hours/#.UV7_KTdsFEs)

The system keeping spent fuel cool in the pool for reactor 3 at the Fukushima No. 1 power plant stopped Friday and was restarted three hours later, Tokyo Electric Power Co. said.

In the latest glitch at the crippled facility, an alarm sounded at 2:27 p.m. and technicians soon confirmed that the cooling system was not working, a Tepco spokesman said.

"We have no information at hand about the cause," the spokesman said.

Although the breakdown was not thought to be immediately dangerous, it served as a reminder of the precarious state of the atomic plant more than two years after it was crippled by the giant tsunami of March 2011.

Last month, a power outage at the plant stopped cooling systems for four pools storing spent nuclear fuel after a rat interfered with the electrical flow.

As of 2 p.m. Friday, the temperature inside the reactor 3 pool was 15.1 degrees, indicating the spent fuel was stable and was not posing an immediate danger to the environment, Tepco said.

## **Radioactive water leak (follow-up)**

### **TEPCO removing radioactive water**

[http://www3.nhk.or.jp/nhkworld/english/news/20130406\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20130406_13.html)

Tokyo Electric Power Company has begun transferring radioactive water from a leaking storage tank at its Fukushima Daiichi nuclear plant.

The company says radioactive strontium and other substances were detected on the ground around a storage tank from Wednesday to Friday.

TEPCO estimates that 120 tons leaked so far based on the change in the level of water in the tank.

The work began on Saturday morning.

Workers are using 4 pumps to transfer radioactive water in the tank to an adjacent tank.

The utility says the leaked water has not flowed into the ocean because there is no ditch around the tank, and the sea is some 800 meters away.

TEPCO says it will take at least 5 days to finish the transfer of water.

### **Fukushima reservoir tank may have leaked contaminated water**

<http://mainichi.jp/english/english/newsselect/news/20130406p2g00m0dm003000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Friday that up to 120 tons of contaminated water may have leaked into soil from one of the seven underground reservoir tanks at the crippled Fukushima Daiichi nuclear power plant.

Around 13,000 cubic meters of contaminated water remain in the tank, with TEPCO having begun transferring it to other tanks nearby with four pumps on Saturday morning, the utility said.

It will take roughly five days to complete the transfer, TEPCO added.

Radioactive substances have been detected in water accumulated around the tank, which measures some 60 meters long, 53 meters wide and 6 meters deep and is covered by three layers of waterproof sheets.

According to TEPCO and the Nuclear Regulation Authority, around 6,000 becquerels of radiation per cubic centimeter were logged Friday in water between the sheets. Trace amounts of radioactive substances were also detected in water between the outermost sheet and the soil.

The tank stores water used to cool down atomic reactors at the crippled plant after radioactive cesium is removed, but other radioactive substances are thought to remain.

The tank is around 800 meters from the ocean and TEPCO believes the contaminated water is unlikely to flow into the sea.

## Radioactive water leak (follow-up 2)

### 120 tons of contaminated water leaks at Fukushima nuclear plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304060038>

By SHUNSUKE KIMURA/ Staff Writer

About 120 tons of contaminated water has leaked from an underground storage tank at the Fukushima No. 1 nuclear plant and may have mixed with underground water, Tokyo Electric Power Co. said April 6. TEPCO estimated that the water contained about 710 billion becquerels of radioactivity and leaked through the joints of protective sheets of the storage tank.

The water had passed through a filtration system before leaking, and its radioactivity level was about half that of water that has yet to be filtered, according to TEPCO.

TEPCO acknowledged that the contaminated water likely soaked the soil surrounding the tank and may have reached underground water.

But "the contaminated water has not seeped into the sea," TEPCO spokesman Masayuki Ono said at a news conference before dawn on April 6. Ono noted that the storage tank is located 800 meters from the Pacific Ocean.

About 13,000 tons of contaminated cooling water was put into the tank from Feb. 1 to March 2, filling it to capacity.

Workers began to transfer contaminated water from the leaky underground storage tank to a different tank early on April 6. It takes about an hour to transfer about 100 tons of water, meaning five days or more are required to complete the task.

The water had initially been used to cool melted nuclear fuel after the onset of the Fukushima nuclear disaster in March 2011, and was subsequently put into the storage tank.

TEPCO has been removing cesium from the water with filtration equipment. However, water that goes through the filtration process and is stored in the underground storage tank is still highly contaminated because it contains other radioactive materials, such as strontium. The radioactivity level of the water is about **290,000 becquerels per cubic centimeter**.

TEPCO became aware of the leak after measuring the height of the water in the tank on April 4 and 5.

The underground storage tank is 60 meters long, 53 meters wide and 6 meters deep. It is lined with three layers of protective sheets--two made of polyethylene and the outermost layer of clay--to prevent leakage. TEPCO had been checking for possible leaks by measuring radioactivity levels of water from a hole dug near the tank. Until last month, however, the radioactivity level of the water had been so low that it was impossible to detect any leakage.

But on April 3, 20 becquerels of radioactivity per cubic centimeter was detected, followed by 35 becquerels the next day.

At 3 p.m. on April 5, workers took water from an area between the clay layer and a polyethylene layer. At 10 p.m. they found that the radioactivity level of the water was about 6,000 becquerels.

TEPCO suspects that joints in the sheets of the polyethylene layer had ruptured and the water then managed to leak through the 6.4-millimeter-thick clay layer.

## Radioactive water leak (TEPCO)

### **Press Release (Apr 06, 2013)Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.6)**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1226137\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1226137_5130.html)

This is follow-up information and data correction regarding the water leak from the underground reservoir No. 2 in Fukushima Daiichi NPS.

To add one more temporary pump (approx. 30 m<sup>3</sup>/h), we temporarily stopped the three temporary pumps at 12:07 pm. At 12:52 pm, we started operating the additional temporary pump after we had confirmed the condition of the temporary transferring line.

At 12:55 pm, we conducted an on-site survey and confirmed that there is no abnormality such as leakage on the transferring line.

At 12:57 pm, we started operating the three temporary pump, and we conducted an on-site survey at 12:58 pm and confirmed that there was no abnormality such as leakage on the transferring line.

We would like to correct the flow rates of the tree temporary pumps here.

(Wrong) The flow rates of the tree temporary pumps: Approx. 20.8 m<sup>3</sup>/h

(Correct) The flow rates of the tree temporary pumps: Approx. 30.3 m<sup>3</sup>/h, 60 m<sup>3</sup>/h, and 48 m<sup>3</sup>/h

We are analyzing the number of days necessary to transfer the water.

## TEPCO - Press releases on the leak

## **Press Release (Apr 06, 2013) Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.9)**

This is follow-up information regarding the water leak from the underground reservoir No. 2 in Fukushima Daiichi NPS.

To switch the pump to the reservoir No.6, we stopped the pump at 3:33 pm. At 4:10 pm, we restarted the pump and transferring the water in the reservoir No.2 to No.6.

At 4:30 pm, we conducted an on-site survey and confirmed that there is no abnormality such as leakage on the transferring line

## **Press Release (Apr 06, 2013) Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.8)**

This is follow-up information regarding the water leak from the underground reservoir No. 2 in Fukushima Daiichi NPS.

We have been transferring the water from the reservoir No. 1 to No.2 using the pump and the four temporary pumps. To switch the pump to the reservoir No.6, we stopped the pump at 3:33 pm. We continue transferring the water using the temporary pumps to the reservoir No.1.

We conducted an on-site survey and confirmed that there is no abnormality such as leakage on the transferring line.

We will start transferring the water to the reservoir No.6 soon after it is ready.

## **Press Release (Apr 06,2013)Water Leak from the Underground Reservoir No.2 in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.7)**

This is follow-up information regarding the water leak from the underground reservoir No. 2 in Fukushima Daiichi NPS.

We are transferring the water from the reservoir No. 1 to No.2 using the pump and the four temporary pumps. To switch the pump to the reservoir No.6, we will stop the pump temporarily. We continue transferring the water using the temporary pumps to the reservoir No.1.

We are planning to continue transferring the water in the reservoir No.2 to No.1 using the four temporary pumps (Flow rate: Approx. 30 m<sup>3</sup>/h\*2, 48 m<sup>3</sup>/h, 60 m<sup>3</sup>/h). It may take 2.5 days to transfer approx. 10,000 m<sup>3</sup> of the water.

We are planning to transfer the water in the reservoir No.2 to No.6 using the pump (Flow rate: Approx. 40 m<sup>3</sup>/h). It may take 3.1 days to transfer approx. 3,000 m<sup>3</sup> of the water.

It may take 3.1 days to transfer the water since the transfers will be operated in parallel.



## Radioactive water leak (3)



Where did it go?: Workers examine an underground tank Saturday that leaked 120 tons of highly radioactive water at the Fukushima No. 1 nuclear plant in the town of Okuma. | KYODO

## Fukushima tank springs major leak

### *120 tons of radioactive water escape from underground facility*

Kyodo

<http://www.japantimes.co.jp/news/2013/04/07/national/fukushima-tank-springs-major-leak/#.UWB100psFEs>

Around 120 tons of contaminated water with an estimated 710 billion becquerels of radioactivity has probably leaked into the ground under the Fukushima No. 1 power plant, Tokyo Electric Power Co. revealed Saturday.

“It is the largest amount of radioactive substances that has been leaked” since the crippled facility’s cold shutdown was declared in December 2011, Tepco official Masayuki Ono said.

The utility, which announced the leak overnight, said Saturday morning that the water escaped from one of seven underground reservoir tanks at the No. 1 plant and that the remainder — an enormous 13,000 tons — is being pumped to other tanks nearby.

Although the process is likely to be completed early this week, Tepco warned that up to 47 tons of the highly irradiated water may additionally leak out before the task is completed. As the tank will out of commission for some time while the incident is investigated, Tepco is also looking to secure a new storage facility for the radioactive water.

The tank in question held processed water that had been used to cool down the plant's stricken reactors. Able to hold about 14,000 tons of water, the tank, which Tepco began using to store contaminated water in February, almost reached full capacity last month.

The utility believes the radioactive water may have leaked out through a joint in the tank's seepage control sheets.

Although much of the cesium had been removed, the water was still tainted with other dangerous radioactive substances. According to the utility, around 710 billion becquerels of radioactive materials are estimated to have seeped out of the tank, which measures around 60 meters long, 53 meters wide and 6 meters deep and is covered by three layers of waterproof sheeting.

Water found around the tank also turned out to be radioactive, the utility said.

Between the waterproofing sheets, it was measured at around 6,000 becquerels per cubic centimeter Friday, according to Tepco and the Nuclear Regulation Authority. Trace amounts of radioactive material were also detected in water between the outermost sheet and the soil.

The tank is around 800 meters from the Pacific but Tepco said it believes the irradiated water is unlikely to make its way to the sea.

## Radioactive leak (4)

### Removal of radioactive water continues

[http://www3.nhk.or.jp/nhkworld/english/news/20130406\\_21.html](http://www3.nhk.or.jp/nhkworld/english/news/20130406_21.html)

Tokyo Electric Power Company is working to transfer radioactive water from a leaking storage tank at its damaged Fukushima Daiichi nuclear plant.

Radioactive water stored in a large underground tank was found to be leaking between Wednesday and Friday.

The utility estimates that 120 tons have leaked so far.

This is the same amount that leaked from storage tank plumbing in March of last year. The leakage is likely to continue, making it the largest leak since the government announced that the reactors had been brought to a state of cold shutdown in December of 2011.

Workers using 4 pumps started to transfer the water to an adjacent tank on Saturday morning.

To shorten the time for the operation, they later began to transfer the water to another tank south of the one that is leaking. Five pumps are being used to transfer 200 tons per hour. TEPCO says it will take more than 3 days to complete the work.

TEPCO estimates that 710 billion becquerels of radioactive strontium, or about 3 times more than the annual allowable limit at the complex, has leaked.

The utility says the contaminated water has not flowed into the ocean, but the leakage is expected to continue until the transfer is completed.

TEPCO is planning to monitor the state of leakage and its impact on the environment by measuring levels of radioactive materials in the soil around the tank

## **Another leak at Fukushima Daiichi - Five more to go?**

April 7, 2013

### **TEPCO reports leak from another water storage tank**

[http://www3.nhk.or.jp/nhkworld/english/news/20130407\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20130407_13.html)

Tokyo Electric Power Company says it has found a small leakage of contaminated water from a storage facility at its Fukushima Daiichi nuclear power plant. This follows a recent massive leak from another underground tank.

The company examined a contaminated water storage tank adjacent to the underground tank that had leaked 120 tons of radioactive water. The 2 tanks have the same structure.

TEPCO says a small amount of radioactive strontium was detected just outside a triple-layer of waterproof sheets underneath the storage tank, leading to discovery of the leak.

The tank contains more than 10,000 tons of contaminated water.

But the utility says it is a minor leak as it hasn't observed any change in the tank's water level and the concentration of radioactive substances is low.

It says it will continue to monitor the storage facility, but it sees no need to transfer the water to a different tank.

TEPCO is now transferring 13,000 tons of contaminated water from the tank where the massive leak occurred to 2 other tanks nearby.

The utility says it will take 2 more days until Tuesday to finish the work.

TEPCO officials apologized for causing concern and explained that no water from either leak has reached the ocean.

### **Contaminated water likely leaked from second Fukushima tank**

<http://mainichi.jp/english/english/newsselect/news/20130407p2g00m0dm004000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Sunday it is highly likely that radioactive water has leaked from another underground storage tank at the crippled Fukushima Daiichi power plant, in addition to a leak reported Friday.

TEPCO said the amount of water involved would be extremely small, however.

The utility said late Friday night that up to 120 tons of contaminated water may have leaked into soil from one of the seven storage tanks at the complex, devastated by a series of explosions in the days after the March 2011 earthquake and tsunami.

The tank involved in the latest suspected leak is located close to the tank where the initial leak was reported, according to TEPCO.

The seven tanks, which are of the same design and covered by three layers of waterproof sheeting, store water used to cool the plant's nuclear reactors after radioactive cesium has been removed.

The utility examined water that accumulated around the tank Saturday and detected highly concentrated radioactive substances, but as the water level of the tank has not lowered significantly, TEPCO has determined the leak is minor.

## Summary from the Yomiuri

### **120 tons of N-water leaked at Fukushima**

<http://the-japan-news.com/news/article/0000113437>

Tokyo Electric Power Co. announced Saturday that about 120 tons of water contaminated with radioactive substances leaked from an underground storage facility at its Fukushima No. 1 nuclear power plant.

TEPCO announced the leak late Friday, but said measures to address the problem had not been taken for two days because the cause had not been identified. It assumed the water was still leaking.

The power company estimated that the leaked water contains a total of 710 billion becquerels of radioactive substances. The leak is the largest ever at the plant.

Since Saturday morning, about 13,000 tons of polluted water in the questionable storage facility was being transferred into a neighboring underground storage unit.

The storage facility, which is 60 meters long, 53 meters wide and six meters deep, is pool-like in structure, with a three-layer waterproof sheet and a concrete cover.

Water leaked from nuclear reactors is run through filters and other devices to remove radioactive elements, then stored in facilities for low-level contaminated water.

TEPCO started using the storage facility Feb. 1. As of Friday, 13,000 tons of polluted water was stored there, close to the 14,000-ton limit.

Water samples taken by TEPCO from soil around the facility on Wednesday showed 35 becquerels per cubic centimeter of radioactive substances, indicating an abnormal situation.

However, TEPCO officials did not announce the finding immediately, as no other unusual changes in water quality data, such as chloride concentration, were seen.

On Friday, two days after the problem was noticed, water with 6,000 becquerels per cubic centimeter of radioactive substances sat between the first and second layers of the waterproof sheet, alerting TEPCO officials that a leak had occurred.

As the sheet's layers were joined when the facility was constructed, TEPCO assumed that the sheet may have been damaged, or that a mistake had been made during construction.

An average of about 400 tons a day of groundwater seeped into buildings housing nuclear reactors and turbines, increasing the quantity of polluted water.

The latest incident will reduce the plant's storage capacity for polluted water from about 53,000 tons to 40,000 tons, making it necessary for TEPCO to review measures for handling polluted water, including increasing the number of storage tanks.

TEPCO said it expected the transfer of water would take at least five days to complete.

"As the height of the water storage facility is relatively low, we think it's unlikely that the polluted water mixed into underground water and reached the sea 800 meters away," said Masayuki Ono, acting chief of TEPCO's nuclear facilities department, at a press conference Saturday.

## **TEPCO anticipated the situation...What about long term?**

### **TEPCO likely to expedite setup of tank**

The Yomiuri Shimbun

<http://the-japan-news.com/news/article/0000113545>

Tokyo Electric Power Co. is likely to accelerate the construction of a new tank to store radioactive water at its Fukushima No. 1 nuclear power plant, as the existing tanks are expected to be filled by July.

The company has to urgently review control measures for radioactive liquid at the plant, as up to 120 tons of contaminated water seems to have leaked into the soil below a storage tank.

About 400 tons of groundwater flow into the reactor buildings each day, continually amplifying the amount of contaminated water that must be managed.

Consequently, TEPCO has been rapidly setting up new tanks and reservoirs on-site to store the increasing volume of water.

As one of the underground reservoir tanks is now not in service due to the leak, the company will have to accelerate its plan to construct a new tank, a senior official at TEPCO said.

At the power plant, TEPCO processes highly contaminated water leaking from nuclear reactors through a device to remove radioactive cesium.

After the cesium is removed, part of the leaked water is used to cool nuclear reactors at the plant.

TEPCO stores excess water in tanks and reservoirs as it cannot release the water into the sea because of the suspected presence of other radioactive substances.

According to TEPCO, the existing tanks, which have a capacity of 325,300 tons, currently hold 271,800 tons of water.

However, the remaining capacity was reduced to 14,000 tons due to the recent leak. This is equivalent to approximately one month's worth of groundwater flowing into the reactor buildings.

"If groundwater continues to enter the buildings at this pace, the existing tanks are expected to reach capacity in about three months," the TEPCO official said.

The company started transferring the contaminated water in the problematic tank to **an adjacent reservoir** early Saturday.

Masayuki Ono, senior TEPCO official in charge of securing suitable locations for nuclear power plants, said at a press conference in Tokyo on Saturday morning that the company has no concrete plans for the tank after it is repaired.

**Each time the plant nears its storage capacity, the company has to build more tanks and reservoirs.**

**Through deforestation of some areas around the plant, it has secured a place to set up new tanks. The latest tank TEPCO is building will have a capacity of 400,000 tons. The construction work is scheduled for completion in October,** a TEPCO official said.

"The current conditions for storing contaminated water are very severe. **We need to devise a long-term plan for treating contaminated water,**" Ono said. "We'd like to set up a new tank quickly to avoid a situation in which there's nowhere to store contaminated water."

## Summary from the Asahi (A"sea of contaminated water")

### TEPCO floundering in dealing with sea of contaminated water

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304070026>

The recent leaking of radioactive water from a storage tank at the Fukushima No. 1 nuclear plant--and the suspected leak from a second tank--illustrate the plant operator's challenge in safely disposing of increasing amounts of contaminated water, with no effective solution in sight.

Tokyo Electric Power Co. said April 7 that it suspects a new smaller leak separate from the one that it confirmed the day before of about 120 tons of contaminated water from an underground storage tank at the nuclear complex. In a news conference, the utility said that it detected a small amount of radioactive materials outside the second tank, which is adjacent to the first leaking one.

In a news conference early on the day before, Masayuki Ono, a TEPCO spokesman, explained how the leak occurred in the first tank.

"Sheets made of polyethylene have lost the ability of retaining water and a small amount (of contaminated water) has leaked outside," Ono said.

On April 3, the utility detected radioactive materials in underground water surrounding the storage tank. But the company waited two days before reporting it to the government.

"We believed a detailed investigation (of the situation) was needed (before reporting it to authorities)," Ono said, explaining the delay.

The amount of leaked water was estimated at 120 tons. Although TEPCO denied that all of it leaked outside, the leak was the largest since the government declared in December 2011, nine months after the crisis unfolded at the nuclear complex, that the disaster was under control.

The underground storage tank--60 meters long, 53 meters wide and 6 meters deep--is lined with an outer 6.4 millimeter-thick layer of clay, and topped by two layers of polyethylene sheets, each 1.5 millimeters thick.

Ono said the exact cause of the leak has yet to be determined, and that a detailed investigation will follow after all of the contaminated water at the leaking tank was removed.

“There is the possibility that joints in the water-shielding sheets have been damaged,” he said. “The sheets turned out not to have the ability they were designed for.”

TEPCO began transferring contaminated water from the leaky tank to two nearby underground tanks with similar seepage control methods in place. Seven underground storage tanks have been built, and so far, five of these tanks have been used to hold contaminated water.

Asked about the potential of new leaks occurring in the other tanks, Ono said, “The possibility that leaks may occur again is not zero, but (transferring contaminated water to the nearby tanks) is the best possible step we can take.”

The transfer is expected to be completed early this week, by when up to an additional 47 tons of polluted water is projected to have leaked.

On April 6, TEPCO detected a tiny amount of radioactive substance in groundwater around the two storage tanks adjacent to the leaky tank.

The utility will monitor radiation levels in the coming weeks.

On April 7, in the second suspected leak, the utility said water found between the sheets in another underground tank measured 2,200 becquerels of radioactivity per cubic centimeter. The water level in the tank had not dropped, so the amount of leakage is considered small, TEPCO said.

The utility is injecting about 370 tons of water a day to cool the melted nuclear fuel at the crippled plant's No. 1-3 reactors.

TEPCO has been removing radioactive cesium from the contaminated water that was used to cool the reactors.

Some of this contaminated water was recycled as cooling water. The remainder is stored in the tanks before it is treated to reduce radiation levels.



The overall volume of contaminated water on the nuclear complex is rising steadily, partly because 400 tons of groundwater a day is flowing into the reactor buildings.

TEPCO plans to pump out the groundwater, but the company said it is impossible to prevent the entire influx.

Even if the project to pump out groundwater goes as envisaged, the plant would be still left with 200-300 tons of groundwater flowing in daily.

The company has built tanks to hold increasing amounts of contaminated water in the forest area on the premises.

But the storage capacity of these facilities is nearing their limits, TEPCO said. The tanks have a capacity of storing 325,000 tons, and 80 percent of those tanks were already filled.

As of April 2, the amount of contaminated water at the plant is estimated at 370,000 tons, including the figure for highly radioactive water remaining in the basements of the reactor buildings.

TEPCO plans to expand the capacity of storing polluted water to 450,000 tons by autumn. In addition, it is considering building tanks to hold an additional 250,000 tons of contaminated water.

Still, the tanks will be filled within several years. The tank that was found to be leaking is also no longer usable, depriving the plant of 14,000 tons of capacity.

Acknowledging the loss, TEPCO said in its April 6 news conference it has to rework its long-term plan for dealing with contaminated water.

The utility began a trial run of Alps, a new apparatus to treat contaminated water, in late March. If Alps goes into full operation, the system is supposed to significantly reduce radiation levels, as it is capable of removing most radioactive materials, including strontium. Contaminated water contains strontium after cesium is removed.

Still, TEPCO will have to find a final destination for the contaminated water after treating it. One option, discharging treated water into the sea, is strongly opposed by local fishermen.

(This article was written by Shunsuke Kimura and Jin Nishikawa.)

## How bad is this second leak?

April 7, 2013

### **TEPCO dealing with water leaks at Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20130408\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20130408_02.html)

The operator of the crippled Fukushima Daiichi nuclear power plant is being forced to review the way it manages contaminated water. This follows the discovery of a second leak in its water storage system.

Tokyo Electric Power Company on Sunday said it has found a small leakage -- up to 3 liters -- from an underground storage facility. The tank currently contains about 10,000 tons of radioactive water.

This follows an earlier massive leak of about 120 tons of radioactive water from another underground tank that is to the west of the tank where the second leakage occurred.

The power company is in the process of transferring to 2 different tanks 13,000 tons of radioactive water from the tank that first leaked about 120 tons of contaminated water.

The firm now plans to transfer about 2,000 tons of radioactive water from the tank where the second leakage was found. Utility officials say the leakage may be coming from upper part of the tank.

TEPCO also said it will closely monitor the situation by taking water samples twice a day from 24 locations.

The latest discovery was another blow to TEPCO. The company continues to struggle with growing amounts of contaminated water as underground water is flowing into the troubled nuclear power plant. The power company finds itself in a difficult position as the leakages are from tanks that are supposed to store massive amounts of radioactive water.

### **Tepco finds second pit leaking in Fukushima**

*Seepage minor but casts doubt on radioactive storage strategy*

JJI

<http://www.japantimes.co.jp/news/2013/04/08/national/tepcu-finds-second-pit-leaking-in-fukushima/#.UWGWW0psFEs>

A second underground storage pool is leaking radioactive water at the disaster-stricken Fukushima No. 1 power plant, operator Tokyo Electric Power Co. said Sunday.

The first pool, No. 2, was found to have leaked 120 tons of highly radioactive water on Friday. The size of the leak at the second pool, No. 3, was confirmed at 3 liters late Sunday. The leaks are likely to force Tepco to review its storage strategy for the toxic water, which has become its biggest enemy.

Since the leak is small, there are no plans to drain pool No. 3 into another storage area as is being done with pool No. 2, Tepco said.

The pools are part of a group of seven vast clay-lined storage pits at the plant measuring 60 meters long, 53 meters wide and 6 meters deep. Since each is covered in three layers of protective waterproof lining, how the water escaped will remain a mystery until the faulty pits are drained and examined.

Tepco said Saturday it detected just 0.11 becquerel of radioactive substances emitting beta particles, such as strontium, per cubic centimeter of groundwater found outside the external lining of pit No. 3 the same day. The radiation level was about double that detected Wednesday.

At that time, the utility said the water leaked by pit No. 2 may have seeped into the soil surrounding No. 3, where the second case of leakage was found. But after detecting substances exhibiting 2,200 becquerels of radioactivity in water found between the second and third layers of lining at No. 3 on Sunday, the utility concluded that this pit was leaking as well. The reasons behind the radiation discrepancies were not explained.

The water level inside pool No. 3, however, hasn't fallen, indicating the leak isn't that large, Tepco said.

**Tepco is transferring the remaining water in No. 2 to two other pits, but the water escaping from No. 3 is raising questions about the integrity of all of the pools and the subsequent risk to the environment.**

Aside from the pools, the power plant has been building makeshift tanks to store the tainted seawater, which is perpetually needed to cool the damaged reactors' melted fuel rods. But capacity is running out quickly.

Masayuki Ono, a senior Tepco official, said at a news conference Sunday that it is difficult for the plant to store all of the radioactive water in the temporary tanks.

On Saturday, Tepco said that around 120 tons of contaminated water with an estimated 710 billion becquerels of radioactivity probably leaked into the ground under the Fukushima No. 1 power plant. No explanation was given about where it might have ended up.

“It is the largest amount of radioactive substances that has been leaked” since the crippled facility’s cold shutdown was declared in December 2011, Tepco official Masayuki Ono said.

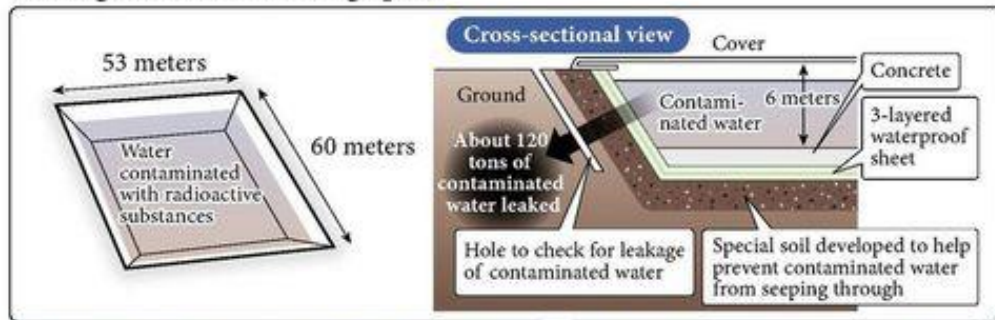
The utility said the remainder of the water in pool No. 2 — an enormous 13,000 tons — is being pumped into other tanks nearby — a process expected to take days.

## Radiation estimates to be surpassed

### Fukushima storage problems escalate

<http://the-japan-news.com/news/article/0000114832>

Underground water storage pool



The Yomiuri Shimbun

Yomiuri Shimbun file photo Water contaminated with radioactive substances was found to have leaked from an underground storage pool at the Fukushima No. 1 nuclear power plant.

A second discovery of leakage at an underground storage pool at Tokyo Electric Power Co.'s crippled Fukushima No. 1 nuclear power plant shows the challenges in storing an increasing amount of water contaminated with radioactive substances.

TEPCO announced Saturday night that radioactive substances had been detected in the soil around an underground storage pool for contaminated water at the Fukushima plant.

On Sunday, the utility confirmed the contamination of the soil was caused by radioactive water leaking from the pool. This discovery came after about 120 tons of water contaminated with radioactive substances was found to have leaked from a neighboring storage pool earlier last week, which TEPCO announced Friday.

Since all seven of such underground storage pools at the plant were built with the same structure, TEPCO has decided to move the contaminated water from these pools to tanks on the ground as a stopgap measure.

Observers have warned that storing radioactive water will become even more difficult in the summer given the typical increase in rainfall.

### **Radiation to surpass estimates**

Of the seven underground storage pools at the plant, three contained contaminated water. After the leak was confirmed Friday at one pool, TEPCO quickly studied the other two, and discovered the contaminated soil on Saturday.

The soil was found around a structure measuring 56 meters long, 45 meters wide and six meters deep. The pool could hold 11,000 tons of water and was nearly at capacity when the discovery was made.

At the plant, water is filtered to reduce and remove radioactive elements after being used to cool down melted nuclear fuel in the reactors. This water is then transferred to the storage pools.

The contaminated soil contained 0.11 becquerel per cubic centimeter of radioactive substances, less than one-hundredth of the amount found in the water leaked at the first pool.

Meanwhile, work to move the contaminated water from the first pool where the leak was found to other storage tanks is expected to take three days.

In addition to the 120 tons already leaked, 21 to 47 tons of contaminated water are estimated to leak from the facility before the work is completed.

**Taking into account the second leak found at the other pool Sunday, the total amount of accumulated radioactive substances leaked is certain to surpass the initial estimate of 710 billion becquerels.**

The combined effect of both leaks is now considered the largest leakage of contaminated water after the reactors were shut down in December 2011.

It seems TEPCO did not plan for the possible leakage of contaminated water from the underground storage pools since most of the past leakages were found at the joints of water pipes.

The underground storage pools were designed to store as much contaminated water as possible by making effective use of land around the plant, where construction of tanks is difficult on the ground.

### **Seams in sheets likely damaged**

The structure of the underground storage pools is similar to that of those used for storing industrial waste.

Three layers of waterproof sheets made from polyethylene or another synthetic resin line the pool to prevent contaminated water from leaking into surrounding soil. Since a single layer consists of several attached waterproof sheets, TEPCO suspects the water might have leaked through tears in the seams.

However, the company has yet to determine what might have caused such damage.

Before starting to use the pools in February, TEPCO tested the sheets to confirm they were watertight. The firm continued to check the sheets once a week to ensure no water had leaked. It did not find any issues in its last inspection March 27.

Therefore, TEPCO was surprised to find radioactive substances in water sampled outside the pool on Wednesday.

"A small hole might have been made in a seam of the waterproof sheets, which isn't strong," said a senior official of the company.

"Some space could have been created between the sheets depending on water temperatures," said Atsunao Marui, a chief researcher at the National Institute of Advanced Industrial Science and Technology. An expert on underground structures, he added, "A sharp object could also have damaged the sheets."

Since the water in the leaking pool discovered Wednesday is being moved to another pool with the same structure and the cause of the leakage is still unknown, another leak could occur.

At the plant, 276,000 tons of contaminated water is already stored in tanks and the underground pools. The plant's remaining storage capacity is only 53,000 tons. If all the underground storage pools are rendered unusable even temporarily, the plant's available storage capacity would drop to 24,000 tons.

## **Discharge of contaminated fish?**

April 8, 2013

### **Disconnection of the Silt Fences at Fukushima Daiichi NPS**

[http://srv05.admin.over-blog.com/index.php?module=admin&action=blog:index&ref\\_site=1&nlc\\_=251365406408](http://srv05.admin.over-blog.com/index.php?module=admin&action=blog:index&ref_site=1&nlc_=251365406408)

At around 10:10 today, April 8, a corporate company worker found disconnection of the silt fence at the Unit 5/6 intake canal, and the silt fence at the shallow draft quay which was tied up **to prevent fish from moving out.**

Since the wave height is currently too high for strong wind to work around the area, we will repair the silt fence after the weather has quiet down.

We will conduct additional sampling in front of the Unit 6 intake canal today.

There are no significant changes with the monitoring post data.

See also:

### **Silt fence within Fukushima nuclear plant port disconnected, highly contaminated fish discharged**

<http://fukushima-diary.com/2013/04/silt-fence-within-fukushima-nuclear-plant-port-disconnected-highly-contaminated-fish-discharged/>

## **Leak: The problem lies with the structure itself**

### **Defect could affect all radioactive water storage tanks at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304080089>

By SHUNSUKE KIMURA/ Staff Writer

Tokyo Electric Power Co. suspects two leaks of radioactive water at the Fukushima No. 1 nuclear plant were caused by shoddy workmanship to install devices to detect such spillage.

The latest problem at the stricken plant suggests that the defect could cause leaks at the five other underground water storage tanks because they all have the same structure.

TEPCO, operator of the plant, said April 7 that radioactive water leaked from the No. 3 storage tank. It earlier confirmed that at least 120 tons of contaminated water leaked from the adjacent No. 2 storage tank.

The utility has yet to confirm how the leaks occurred, but it said it suspects a breach where water-shielding sheets had been connected or damage to the sheets.

It noted that when a leak detector is installed, an opening is made in the sheets. If the sealing is inadequate, the opening could widen when the sheets come under the weight of the water.

Storing contaminated water has become a serious challenge for TEPCO at the Fukushima No. 1 nuclear plant as it continues to cool the melted fuel and spent fuel rods in preparation for decommissioning the reactors.



TEPCO has set up facilities that can together store 325,000 tons of contaminated water at the plant, including 58,000 tons at the seven underground tanks.

The storage facilities already hold more than 270,000 tons, but the amount of radioactive water is increasing by 400 tons daily.

“It is extremely difficult (not to use the underground tanks),” Masayuki Ono, acting general manager of TEPCO’s Nuclear Power and Plant Siting Division, said April 7. “We have been able to hold (the radioactive water) only by continuing to build tanks.”

Shunichi Tanaka, chairman of the Nuclear Regulation Authority, ordered TEPCO on April 7 to monitor the leaked water and prevent it from flowing out of the premises.

The Fukushima prefectural government asked the utility to review its radioactive water storage plan, including shifting water from the underground tanks to those above ground.

TEPCO has been moving radioactive water from the No. 2 tank, which stores 13,000 tons, to the No. 1 and No. 6 tanks since April 6. The work is expected to be completed as early as April 11.

But the company is only draining some of the water from the No. 3 tank, which holds 11,000 tons, and is monitoring its conditions.

“We are giving priority to the No. 2 tank, whose conditions are worse,” a TEPCO official said. “We are not leaving the No. 3 tank unattended.”

The No. 3 tank is 56 meters long, 45 meters wide and 6 meters deep. It stores water used to cool melted fuel inside nuclear reactors that is then treated by a cesium adsorption system.

The water contained about 290,000 becquerels of radioactivity per cubic centimeter, roughly half the level of the untreated water that has accumulated in the reactor buildings.

TEPCO detected a small amount of radioactive materials outside the No. 3 tank on April 6. It examined water contained between water-shielding sheets and found 2,200 becquerels of radioactivity per cubic centimeter.

The company also said April 7 it believes that radioactive water began leaking from the No. 2 tank around March 20.

The company has been monitoring water levels and radioactivity concentrations outside the tank. But only after the leak was detected did TEPCO find that water levels had started falling around March 20.

There were also signs of changes in radioactivity concentrations on March 20, but the company did not notice them until April 3.

The tanks are lined with three layers of water-shielding sheets: two sheets of polyethylene and the outer sheet of clay.

TEPCO says the leaked water will not spread extensively because cement has been mixed into soil around the tanks. But contamination could affect the entire area if leaked water mixes with groundwater.

Groundwater has been flowing into the reactor buildings, creating 400 tons of radioactive water daily.

TEPCO planned to pump up groundwater and release it into the sea before it enters the reactor buildings. That plan would be meaningless if the groundwater is already contaminated.

## Get on with it!

### Nuclear regulator instructs TEPCO over water leaks

[http://www3.nhk.or.jp/nhkworld/english/news/20130408\\_24.html](http://www3.nhk.or.jp/nhkworld/english/news/20130408_24.html)

Japan's nuclear regulator has instructed the operator of the troubled Fukushima Daiichi nuclear plant to swiftly find the cause of radioactive water leaks from underground storage tanks there.

The move comes after the Tokyo Electric Power Company reported a massive leak of more than 120 tons of contaminated water from an underground storage tank last week. There was another report on Sunday of a small leak of up to 3 liters from different tank.

Toyoshi Fuketa, a member of the Nuclear Regulation Authority, summoned to his office Zengo Aizawa, a vice president of TEPCO on Monday.

Fuketa urged Aizawa to identify the cause of the leaks and their environmental impact, and to review TEPCO's storage system of tainted water.

Fuketa stressed the authority is taking the leaks seriously.

He said the existing tanks have to be used to store the contaminated water for the time being because of the current tank shortage. He urged the TEPCO executive to come up with a more secure plan to store radioactive water.

He also said he will consider expanding the authority's inspection staff at the Fukushima plant after the plant suffered a series of problems, including last month's power failure at the fuel pools.

## **TEPCO ordered to address radioactive water leaks at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130408p2g00m0dm082000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. faced increasing pressure from government entities Monday to address recent radioactive water leakages and power outages at its accident-stricken Fukushima Daiichi nuclear power plant.

"If these kinds of incidents continue to occur, the very process toward decommissioning the (crippled) reactors could be affected," Economy, Trade and Industry Minister Toshimitsu Motegi told TEPCO President Naomi Hirose in their meeting, while adding that the public is "greatly" concerned about the situation at the plant in northeastern Japan.

Motegi also ordered TEPCO to take measures so that radioactive water found to be leaking from the plant's underground storage tanks will not end up flowing into the adjacent Pacific Ocean.

The Nuclear Regulation Authority summoned TEPCO Executive Vice President Zengo Aizawa the same day to confirm the situation over the water leakage.

NRA Commissioner Toyoshi Fuketa said at a press conference after meeting with Aizawa that he is taking the incident "seriously" in the sense contaminated water has been released into the environment but denied the situation will immediately pose a huge risk.

"It will take quite a long time...until the contamination spreads outside the site. So we have a certain amount of time to take measures to contain the contamination," he said.

TEPCO has used the underground tanks to store part of the massive amount of radioactive water that is created as a result of continuing water injection to the Nos. 1 to 3 reactors, which have suffered meltdowns due to the March 2011 accident.

Cesium is removed before the water is transferred to the tanks, but other radioactive substances remain. It is the first time leaks have been confirmed at such tanks.

In addition to the water problem, a power outage, believed to have been triggered by a rat that touched a switchboard, disabled cooling systems for the spent fuel pools of the Nos. 1, 3 and 4 units in March.

Apparently taking into account a spate of problems the plant has experienced even more than two years after the nuclear crisis occurred, Kiyoshi Kurokawa, the head of a now-defunct accident investigation panel, said the situation is "clearly yet to be settled."

Kurokawa made the remarks during a meeting of a special committee newly set up in parliament to oversee the government's handling of nuclear power issues and carry out related investigations.

The Diet-appointed investigation panel said in its report released last July that TEPCO and regulators failed to take proper safety steps amid cozy ties, calling it "clearly a man-made disaster."

## **IAEA will observe decommissioning process**

### **IAEA to examine Fukushima decommissioning process**

[http://www3.nhk.or.jp/nhkworld/english/news/20130409\\_04.html](http://www3.nhk.or.jp/nhkworld/english/news/20130409_04.html)

Experts from the International Atomic Energy Agency say they will inspect the decommissioning process at the Fukushima Daiichi nuclear plant for the first time later this month.

IAEA officials will visit the plant from April 17th to 19th.

They will speak to officials from the plant's operator, Tokyo Electric Power Company. They will also meet with officials from the Natural Resources and Energy Agency.

They are expected to suggest ways of dealing with leaks of contaminated water from underground tanks at the plant.

The inspectors are expected to review the entire decommissioning process. They will also check measures to protect workers from exposure to radiation.

IAEA officials visited the plant in May 2011 to examine the extent of the disaster. But this will be their first time to observe the decommissioning process.

TEPCO officials say it will take up to 40 years to complete the decommissioning.

## We're doing what we can

### **TEPCO head briefs government on leakage accident**

[http://www3.nhk.or.jp/nhkworld/english/news/20130408\\_27.html](http://www3.nhk.or.jp/nhkworld/english/news/20130408_27.html)

The head of Tokyo Electric Power Company says the utility will remove by Wednesday radiation-contaminated water from storage tanks at the crippled Fukushima Daiichi nuclear plant.

TEPCO President Naomi Hirose made the pledge on Monday when he briefed Trade and Industry Minister Toshimitsu Motegi about the recent accidents at the plant.

More than 120 tons of contaminated water leaked from an underground storage tank last week. A minor leakage was also found at another tank on Sunday.

Hirose told Motegi that the work to transfer the remaining contaminated water to other storage tanks in the compound will be completed in 3 days time.

He promised that TEPCO would strengthen its monitoring of the tanks.

Motegi told Hirose the utility must prevent the contaminated water from entering the nearby Pacific Ocean.

TEPCO says **it has set up an emergency taskforce** led by its president to deal with a spate of accidents at the Fukushima plant. The cooling system for spent fuel pools failed due to a power blackout last month and earlier this month

## Now that's reassuring...

see for instance page 2 of the

### **Report submitted to the Minister of Economy, Trade and Industry regarding the establishment of the "Emergency Response Headquarters for Reliability Improvement at Fukushima Daiichi Nuclear Power Station" April 8, 2013**

<http://www.tepco.co.jp/en/announcements/2013/images/130408a.pdf>  
Emergency Measures for Contaminated Water Treatment

Measures to be implemented

In response to the leakage from the underground reservoir which occurred on April 5, the following emergency measures will be implemented for the time being.

Safely transfer the water in the underground reservoir No.2 to an unused underground reservoir while performing water level measurement and sampling to monitor the condition. After all the water is removed (planned on April 10), the leakage location will be investigated.

Reduce the water level of the underground reservoir No.3 from 95% to less than 80% (by safely transferring the water to an unused underground reservoir) while performing water level measurement and sampling to monitor the condition. The leakage location will be investigated similarly to the underground reservoir No.2.

If we assume that we immediately stop using the underground reservoirs at this point in time, the tank capacity would be insufficient for storing the water currently stored in the underground reservoirs. The water will continue to be stored in the underground reservoirs for the time being while maintaining the water level at approx. 80% (max.) or less which is the location of the leakage detection hole on the upper part of the reservoir (which is assumed to be the leakage location).

Tank installation plan (including those of a capacity of approx. 120,000 tons planned to be installed in the first half of FY2013) will be implemented ahead of schedule.

Areas for future tank installation to further increase the tank capacity will be considered.

Steadily perform hot testing of the multi-nuclide removal equipment (ALPS) for the purpose of risk mitigation through the purification of contaminated water.

## And now...at reservoir no.1

April 9, 2013

### **Press Release (Apr 09,2013)Water Leak from the Underground Reservoirs in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.22)**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1226232\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1226232_5130.html)

This is follow-up information regarding the water leak from the underground reservoirs at Fukushima Daiichi NPS.

The chloride concentration analysis results of the samples collected in the leakage detection hole (at 2 locations) of the underground reservoir No.1 this afternoon (April 9) are as follows.

- Water in the leakage detection hole of the underground reservoir No.1 (in the northeast side)

Sampling performed at 1:40 PM on April 9

Chloride concentration: 1100ppm

(Reference) Result of sampling performed at 8:35 AM on April 9

Chloride concentration: 910ppm

- Water in the leakage detection hole of the underground reservoir No.1 (in the southwest side)

Sampling performed at 1:20 PM on April 9

Chloride concentration: 9ppm

(Reference) Result of sampling performed at 8:30 AM on April 9

Chloride concentration: 8ppm

The water level, etc. of the underground reservoir of concern will continue to be monitored intensively.

## Underground tanks no good, says Motegi.[But are the others safe?]

April 10, 2013

### **Underground tanks should not be used at Fukushima plant: Motegi**

<http://mainichi.jp/english/english/newsselect/news/20130410p2g00m0dm065000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. should eventually stop using underground tanks to store radioactive water accumulating at the crippled Fukushima Daiichi nuclear power plant, Economy, Trade and Industry Minister Toshimitsu Motegi said Wednesday.

The remarks were made as three of the seven underground tanks have been found to be leaking polluted water, leading TEPCO to consider transferring some of the liquid to more reliable tanks.

The utility known as TEPCO has said that it cannot opt to empty all the underground cisterns currently in use because there is not enough alternative storage capacity on the site now. TEPCO plans to install tanks with 15,000 tons of capacity by mid-April.

Motegi told a parliamentary committee that the contaminated water will be "swiftly" moved to tanks located above ground and "after that, underground cisterns should not be used."

The situation regarding radioactive water leaks has been worsening since TEPCO first announced it earlier this month, with the number of underground cisterns found with problems increasing.

There is speculation there may have been some flaws in the construction process of the containers, all seven which were built by Maeda Corp.

TEPCO also said Wednesday that it confirmed a small amount of radioactive substances outside the water-containment sheets laid between the No. 1 tank, the latest container found with leaks, and the soil.

To enhance oversight at the plant, which has also recently seen the suspension of its cooling system for spent fuel pools, the Nuclear Regulation Authority said it has decided to increase the number of inspectors at the plant from eight to nine.

At the Fukushima plant, a massive amount of radioactive water is accumulating as a result of continuing water injections into the Nos. 1 to 3 reactors, which experienced meltdowns during the March 2011 nuclear crisis.

Water once used to cool the damaged reactors is recycled as coolant after radioactive cesium and other substances in a water-processing facility have been removed. But the total amount of contaminated water is increasing because the existing water flow allows an influx of about 400 tons of groundwater a day.

NRA Chairman Shunichi Tanaka said during a meeting of regulatory commissioners Wednesday that TEPCO needs to remake its long-term plan on the handling of radioactive water

"What is most important is to take measures so that the situation outside the plant's premises will not be affected," Tanaka said.

**Motegi halts use of underground Fukushima pools** Industry Minister Toshimitsu Motegi says he plans to have the operator of the troubled Fukushima Daiichi nuclear power plant halt the use of underground pools that have leaked large amounts of contaminated water. He says contaminated water in the leaked pools will be quickly transferred to steel tanks above ground.

Motegi was speaking at a Lower House committee session on Wednesday. He expressed regret over Tokyo Electric Power Company's slow response to the problem.

The minister said he will instruct TEPCO to accelerate the construction of additional above-ground storage tanks and complete them by the end of May. The new tanks are to accommodate contaminated water from the underground pools.

## TEPCO press releases (April 11, 2013)

April 11, 2013

### **Press Release (Apr 11, 2013) Water Leak from the Underground Reservoirs in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.38)**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1226347\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1226347_5130.html)

This is follow-up information regarding the water leak from the underground reservoirs at Fukushima Daiichi NPS.

Following the work progress updates such as the measures to prevent the expansion of contaminated water leakage from the underground reservoirs to the leakage detection holes announced yesterday (April 10), the following works have been performed today.

[Measures to prevent the expansion of contaminated water leakage from the underground reservoirs to the leakage detection holes]

- Underground reservoir No.1

The temporary pump was started in the morning to pump up the leaked water in the detection holes (northeast/southwest) and return it to the underground reservoir.

- Underground reservoir No.2

As the installation of a temporary pump was completed, the pump was started to pump up the leaked water in the detection holes (northeast/southwest) and return it to the underground reservoir.

- Underground reservoir No.3



The temporary pump is planned to be installed tomorrow. The work to return the leaked water in the detection hole (northeast/southwest) to the underground reservoir will be implemented tomorrow or on later date according to the progress of water transfer from the underground reservoir No.3 to No.6.

As for the underground reservoirs No.1 and No.2, the temporary pumps will be started in the morning and the afternoon tomorrow (once each) or on later date when the sampling of leaked water is performed to return the leaked water in the leakage detection holes (northeast/southwest) to the underground reservoirs.

[Visual inspection of the leakage detection hole (northeast) penetration of the underground reservoir No.2]

Continued from yesterday, the removal work of the impermeable sheet (rainwater protection sheet installed on the upper surface of the reservoir) covering the penetration and the gravels was carried out for visual inspection of the leakage detection hole (northeast) of the underground reservoir No.2. Once the removal of the impermeable sheet installed near the penetration is completed tomorrow, the visual inspection of the penetration will be performed. The results are to be announced.

[Boring investigation to confirm the contamination condition, etc. in the surrounding area of the underground reservoirs]

In order to confirm the contamination condition in the surrounding area of the underground reservoirs and the contamination expansion to the sea side, drilling work to install new observation holes (Holes used to sample water contained in the soil. New observation holes will be installed at 22 locations including 8 in the sea side) was carried out. The drilling work will be continued tomorrow. Water sampling from the observation holes and analysis will be started on April 15 (earliest). The analysis results are to be announced.

### **Press Release (Apr 11, 2013) Water Leak from the Underground Reservoirs in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.37)**

This is follow-up information regarding the water leak from the underground reservoirs at Fukushima Daiichi NPS.

Regarding the leakage from the connection part (flange) of the transfer pump outlet pipe which occurred during water transfer from the underground reservoir No.3 to No.6, the pipe flange will be disassembled in order to investigate the cause of the leakage.

Also, we will start removing the soil covering the upper part of the underground reservoir (embankment) where the leaked water has been absorbed.

### **Press Release (Apr 11, 2013) Water Leak from the Underground Reservoirs in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.36)**

This is follow-up information regarding the water leak from the underground reservoirs at Fukushima Daiichi NPS.

Regarding the leakage which occurred during water transfer from the underground reservoir No.3 to No.6, the area affected by the water leaked from the connection part of the transfer pump outlet pipe is 2m x 3m on the soil covering the upper part of the reservoir (embankment) near the reservoir No.3 tank man hole. Since the leaked water has been absorbed into the covering soil, there is no possibility of the leaked water flowing out of the site boundary. The amount of leakage is estimated to be approx. 22L (calculation value).

Though the incident has occurred in the controlled area, the condition has been judged to be subject to the application of Article 19-17, Item 10 of the Rule for the Installation, Operation, etc. of Commercial Nuclear Power Reactors (Rule for Commercial Nuclear Power Reactors) ("in the case that leakage of radioactive materials, etc. occurs in the controlled area due to a reactor facility failure or other unexpected incidents") at 2:43 PM on April 11. This incident is reported in accordance with Article 168 of the Technical specification for nuclear reactor facility at Fukushima Daiichi Nuclear Power Station (Report).

< Reference: Underground reservoir No.3 >

Water quality analysis result:  $2.9 \times 10^5$  Bq/cm<sup>3</sup>

Leakage amount: Approx. 22L

Value stipulated by law:  $3.7 \times 10^6$  Bq

< Announcement on an emergency press conference >

An emergency press conference will be held at 6:00 PM on April 11 in the meeting room on the third floor of our Head Office. We will explain about the current statuses of the underground reservoirs at Fukushima Daiichi Nuclear Power Station.

At the Corporate Communications Department in Fukushima, the information will be provided at the regular press conference at 6:00 PM on the same day.

Head Office

Date and time: April 11, 2013 from 6:00 PM

Place: Meeting room on the third floor of the Head Office (Reception starts at 5:30 PM)

Fukushima

Date and time: April 11, 2013 from 6:00 PM

Place: Press conference room of the Fukushima prefectural press club on the second floor of the Fukushima Prefectural Government Office Building

## **Press Release (Apr 11, 2013) Water Leak from the Underground Reservoirs in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.35)**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1226332\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1226332_5130.html)

This is follow-up information regarding the water leak from the underground reservoirs at Fukushima Daiichi NPS.

Though the water transfer from the underground reservoir No.3 to No.6 was started at 2:00 PM on April 11, the transfer pump was suspended at 2:03 PM on the same day as leakage from the connection part (flange) of the transfer pump outlet pipe was found.

The leakage has stopped after the transfer pump was suspended. The leaked water has been absorbed

into the soil.

The leakage is currently being investigated in details.

## **Contaminated water to be moved to more "reliable" tanks...by June**

### **TEPCO to stop using underground tanks at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304110054>

Tokyo Electric Power Co. has decided to stop using all the underground tanks to store radioactive water at its crippled Fukushima No. 1 nuclear power plant.

TEPCO President Naomi Hirose told a news conference at the company's Fukushima Revitalization Headquarters in Naraha, Fukushima Prefecture, on April 10 that all of the water in those tanks will be transferred to surface tanks.

"We are deeply sorry for seriously troubling the public and the people of Fukushima (Prefecture)," he said in opening the news conference.

Four of the tanks currently hold 23,600 tons of radioactive water. According to Hirose and other officials, TEPCO will move 7,100 tons of the water to existing surface storage tanks, including one of the plant's filtered water tanks, between next week and early May.

The utility will also build 38 new steel tanks, with a combined capacity of 19,000 tons, and move the remaining 16,500 tons of radioactive water into them between the second half of May and early June.

The company previously only planned to transfer just over 7,000 tons of the water to existing surface tanks.

"I believe the new tanks will allow us a certain leeway in our operations," Hirose said. "We will commit ourselves fully to the task."

Hirose dismissed speculation that radioactive water could be released into the sea.

"That will absolutely never happen," the president said. "There is no change in our policy to use all available means to manage (the water)."

Hirose admitted TEPCO has yet to establish the cause of the water leaks from three of the underground storage tanks and indicated they will likely never be used in the future.

### **TEPCO to remove all radioactive water from troubled tanks by June**

<http://mainichi.jp/english/english/newsselect/news/20130411p2g00m0dm031000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant on Wednesday unveiled a plan to transfer all the highly radioactive water stored in underground tanks to more reliable containers by the end of June to address the risks of further leaks.

Three of the seven underground tanks have been found to be leaking, and operator Tokyo Electric Power Co. has decided to empty not only those three but another tank as well. The tanks are used to store water for cooling reactors which experienced meltdowns during the 2011 nuclear crisis at the plant. A total of 23,600 tons of liquid will be pumped out by June.

Two of the tanks are not in use, and TEPCO said it will also eventually remove about 3,000 tons of water held in the remaining tank, which is much less contaminated because that water has not been used to cool the crippled reactors.

TEPCO said it came up with the plan because the utility found it can secure enough alternative storage capacity at the site, such as by using existing containers that have room for the water and by installing new tanks.

Economy, Trade and Industry Minister Toshimitsu Motegi told a parliamentary committee earlier in the day that TEPCO should eventually stop using the underground tanks after swiftly removing the contaminated water.

The situation regarding the radioactive water leaks has been worsening since TEPCO earlier this month disclosed the damage, with the number of underground cisterns with problems increasing.

There is speculation there may have been some flaws in the construction process of the containers, all seven of which were built by Maeda Corp.

TEPCO also said it confirmed a small amount of radioactive substances outside the water-containment sheets laid between the No. 1 tank, the latest container found with leaks, and the soil.

At the Fukushima plant, a massive amount of radioactive water is accumulating as a result of continuing water injections into the Nos. 1 to 3 reactors, which experienced meltdowns.

Water once used to cool the damaged reactors is recycled as coolant after radioactive cesium has been removed in a water-processing facility. But the total amount of contaminated water is increasing because the existing water flow allows an influx of about 400 tons of groundwater a day.

To reduce the risk of keeping a massive amount of polluted water at the plant's premises, TEPCO plans to install a new water treatment system capable of reducing various radioactive substances in addition to cesium to an undetectable level.

TEPCO started a trial run of the system in late March, but it will take at least about four months before shifting to full operation, officials said.

To enhance oversight at the plant, which has also recently seen the suspension of its cooling system for spent fuel pools, the Nuclear Regulation Authority said it has decided to increase the number of inspectors at the plant from eight to nine.

NRA Chairman Shunichi Tanaka said during a meeting of regulatory commissioners Wednesday that TEPCO needs to remake its long-term plan for handling radioactive water.

"What is most important is to take measures so that the situation outside the plant's premises will not be affected," Tanaka said.

## **Radioactive water leak from pipe confirmed at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130411p2g00m0dm076000c.html>

TOKYO (Kyodo) -- Another radioactive leak was detected at the crippled Fukushima Daiichi nuclear power plant on Thursday while workers were pumping out contaminated water from one of the troubled underground tanks, Tokyo Electric Power Co. said.

Around 22 liters of radioactive water has leaked from a junction of the piping for transferring liquid, not from the tanks themselves. The water seeped into the soil covering the upper part of the tank, but has not spread outside the site, TEPCO said.

The incident occurred only a day after the utility announced a plan to remove all the highly radioactive water stored in the underground tanks to more reliable containers by the end of June to address the risk of further leaks from the tanks.

TEPCO spokesman Masayuki Ono told a press conference that it will not take long to solve the piping problem and the overall plan to transfer more than 20,000 tons of water is unlikely to be significantly affected.

The leak in the piping was detected only minutes after workers started transferring the content of the No. 3 tank to the No. 6 tank on Thursday afternoon. It was the first time that the equipment in question was used, Ono said.

**Up to 6.4 billion becquerels of radioactive substances are estimated to have seeped into the ground, but TEPCO plans to remove the soil in the area.**

TEPCO has seven underground tanks and some of them store part of the huge amount of radioactive water resulting from continuing water injections into the Nos. 1 to 3 reactors, which experienced meltdowns during the 2011 nuclear crisis.

The water in the underground tanks has passed through a water-processing facility for the removal of cesium, but it is still contaminated with other radioactive substances.

Three of the tanks have already been found to be leaking and TEPCO plans to eventually stop using the cisterns.

To determine the cause of the leaks, TEPCO has started work to visually check the condition of the No. 2 tank, which was the first found to be leaking radioactive water.

## **More radioactive water seeps into the ground**

April 12, 2013

### **Another leak found at Fukushima plant during water transfer**

The Asahi Shimbun

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304120067>



Tokyo Electric Power Co. on April 11 confirmed another leak at its crippled Fukushima No. 1 nuclear power plant, this time from a pipe being used to transfer contaminated water between underground storage tanks.

TEPCO earlier this month confirmed radioactive water had leaked from its No. 1, No. 2 and No. 3 storage tanks.

According to TEPCO officials, the most recent leakage was found at the part connecting the No. 3 tank's transfer pump with the outlet pipe. The officials said about 22 liters of contaminated water leaked during eight minutes when workers tried to transfer radioactive water from the No. 3 tank to the No. 6 tank around 2 p.m. on April 11. The water leaked into soil around the No. 3 tank.



TEPCO has suspended the water transfer, but plans to resume the operation as early as April 12 after fixing the pipe connection.

In response to the string of water leakages, the nuclear industry watchdog and the energy agency have decided to enhance their cooperation to support and monitor TEPCO.

Katsuhiko Ikeda, secretary-general of the Nuclear Regulation Authority, met with Ichiro Takahara, director-general for the Agency for Natural Resources and Energy, on April 11. It was their first meeting since the Nuclear Regulation Authority was formed in September last year.

During the meeting, they agreed to regularly hold director-general-level meetings to discuss decommissioning of the plant's reactors. They intend to use those meetings to enable the NRA secretariat to advise TEPCO in earlier stages, when the plant operator draws up work plans.

They have also decided that officials of the energy agency should participate in the NRA's expert panel meetings held to monitor and consider the safety of TEPCO's decommissioning operations. (This article was written by Shunsuke Kimura and Jin Nishikawa.)

## **More radioactive water leaks during Tepco transfer effort at Fukushima No. 1**

Jiji

<http://www.japantimes.co.jp/news/2013/04/12/national/more-radioactive-water-leaks-during-tepco-transfer-effort-at-fukushima-no-1/#.UWesBkpsFEs>

There were further leaks of radioactive water during work to transfer water from a leaking sunken reservoir at Tokyo Electric Power Co.'s Fukushima No. 1 power station, Tepco said Thursday.

About 22 liters of radioactive water apparently leaked from a joint between a pipe and a pump used to send water from the problematic reservoir No. 3 to another reservoir, it said.

The incident happened just after the utility announced Wednesday a plan to move all radioactive water currently stored in the sunken reservoirs to above-ground tanks once they are available. The latest leak may affect the plan, which was drawn up to stop the contamination of the environment by the leaked water.

Work to transfer water from reservoir No. 3 started at 2 p.m. but was halted due to the leak from the pipe-to-pump fitting three minutes later. The water seeped into soil near the reservoir, according to Tepco officials.

Reservoir No. 3 holds some 10,400 tons of water containing strontium and other radioactive materials, releasing 290,000 becquerels of radiation per cubic centimeter.

**After discovering a leak Sunday, Tepco decided to transfer some 2,000 tons of water to reservoir No. 6 for temporary storage.**

On Thursday, no water was transferred to or from reservoirs No. 1 and 2, which have also suffered leaks, Tepco said.

## We don't know what caused it

April 13, 2013

### TEPCO yet to nail down cause of radioactive leaks at Fukushima plant

<http://mainichi.jp/english/english/newsselect/news/20130413p2g00m0dm053000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima No. 1 Nuclear Power Plant said Friday it has failed to find out why radioactive water leaked from underground tanks during visual checks of an area suspected to have been the cause of the incidents.

Workers removed part of the soil covering one of the troubled tanks and checked an area where a leak detection pipe, installed close to the tank, pierces through a water-containment sheet. But they could not find any irregularities there, plant operator Tokyo Electric Power Co. said.

"We have no choice but to think that the leakage occurred at another place in the case of the No. 2 tank," TEPCO spokesman Masayuki Ono said at a press conference, while noting that junctions of water-containment sheets located around the tank could be seen as other suspicious areas.

But he added that even if there are holes in the water-containment sheets, they are unlikely to be large because the amount of water accumulating inside the pipe has been small.

To contain contamination caused by the leaks, TEPCO is collecting the polluted water that has flowed into the pipe and returning it to the tank again.

Workers cannot go inside the 6-meter-deep tank to directly find out the cause partly because it is contaminated with radioactive substances, according to Ono.

TEPCO has seven underground tanks and some of them store part of the huge amounts of radioactive water resulting from continuing water injections into the Nos. 1 to 3 reactors, which experienced meltdowns in the 2011 nuclear crisis.

The water in the underground tanks has passed through a water-processing facility for the removal of cesium, but it is still contaminated with other radioactive substances. Three such tanks have been found to be leaky.

TEPCO plans to remove all the heavily contaminated water currently stored inside the underground tanks to other reliable containers installed above the ground.

According to TEPCO, radioactive substances were not observed in groundwater at the plant's three locations about 300 and 500 meters away from the troubled tanks toward the direction of the Pacific Ocean.

## IAEA worried

### IAEA sends experts to damaged Fukushima plant

[http://www3.nhk.or.jp/nhkworld/english/news/20130414\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20130414_01.html)

A team of experts from the International Atomic Energy Agency is on its way to Japan to review the decommissioning of the Fukushima Daiichi nuclear plant.

Team leader Juan Carlos Lentijo left Vienna, Austria, for Tokyo on Saturday. Lentijo is director of the Agency's division of nuclear fuel cycle and waste technology.

He will be joined by 12 experts, including several specialized in reactor decommissioning.

They are scheduled to visit the Fukushima plant from Wednesday through Friday. The team will assess decommissioning work at reactors 1, 2 and 3, which suffered core meltdowns.

Before departure, Lentijo said the team will look closely at how plant operator, Tokyo Electric Power Company, is dealing with leaks of contaminated water from underground tanks.

He said he wants to confirm that TEPCO staff and organizations are working effectively to address the problem.

## No clue

April 14, 2013

## **Tepco clueless on leaking cisterns**

Kyodo

<http://www.japantimes.co.jp/news/2013/04/14/national/tepcocluelessonleakingcisterns/#.UWmhZUpsFEs>

The operator of the Fukushima No. 1 power plant said that visual checks of the crippled complex's leaking cisterns have failed to turn up any clues as to how radioactive water is escaping.

Although workers removed some of the soil covering one of the troubled sunken reservoirs and checked an area where a leak detection pipe passes through one of the three water-containment sheets, no irregularities were found, Tokyo Electric Power Co. reported Friday.

**“We have no choice but to think that the leakage occurred at another place in the case of the No. 2 (cistern),”** Tepco spokesman Masayuki Ono said at a news conference.

Some of the junctions between the water-containment sheets might also be suspect, but even if holes exist in these areas they are unlikely to be large based on the amount of water that has accumulated in the detection pipe, according to Ono.

The tainted water in the pipe has been returned to the No. 2 cistern, he said.

## **More days needed to transfer contaminated water**

### **Transfer of radioactive water to be delayed at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130414p2g00m0dm004000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Sunday it has postponed the planned transfer of radioactive water from a leaking underground tank at the crippled Fukushima Daiichi nuclear power plant because it needs more time to install a water pipe.

The operator of the crisis-hit plant in northeastern Japan had planned to start moving contaminated water in the No. 2 tank to a tank above ground.

Company officials now say **it will take several more days to put in place and inspect a pipe to be used to transfer the water.**

The firm known as TEPCO has seven underground tanks, some of which are storing radioactive water used in the ongoing operation to cool the Nos. 1 to 3 reactors, which went into meltdown in the 2011 nuclear crisis.

## Beginning of transfer

April 15, 2013

### TEPCO begins preparing to transfer contaminated water at stricken Fukushima plant



The Fukushima No. 1 Nuclear Power Plant, where preparations are underway to move contaminated water to aboveground storage tanks, is pictured in this photo taken from a Mainichi helicopter on April 15. (Mainichi)

Tokyo Electric Power Co. on April 15 began preparing to move radioactively contaminated water from underground reservoirs at the crippled Fukushima No. 1 Nuclear Power Plant to storage tanks on the ground.

The move follows the recent discovery of leaks from three of the reservoirs, whose cause remains to be confirmed. It is expected to take until June to transfer all of the contaminated water, leaving the plant at risk of further leaks over the next two months.

TEPCO has seven reservoir tanks, each with the same design, at the plant. So far leaks have been confirmed at the No. 1-3 tanks, which as of April 12 held 6,000, 1,100 and 8,400 cubic meters of contaminated water, respectively. The No. 4 and No. 6 reservoir tanks respectively hold 3,000 and 8,100 cubic meters of water, while the No. 5 and No. 7 reservoir tanks are not in use.

The utility plans to prioritize the transfer of contaminated water from the No. 1 and 2 reservoir tanks, where relatively large leaks were detected, hoping to complete the work by around the Golden Week holiday period in May. On April 15, the company set up temporary piping and pumps and began preparing to pump water from the No. 2 reservoir tank to a storage tank on the ground about 200 meters away. It plans to move 1,400 cubic meters of tainted water from the No. 1 reservoir tank to a storage tank on the ground, and another 4,600 cubic meters to a filtrate tank. The company expects to complete transfers of contaminated water from the No. 3, 4 and 6 reservoir tanks by around June.

At first TEPCO said that if it didn't use the underground reservoirs, then it would find itself short of space to store radioactively contaminated water, and that it planned to continue using the seven underground reservoir tanks. However, as the threat of further leaks loomed, the Fukushima Prefectural Government and other parties have asked the company to move the water to storage tanks above ground.

## **IAEA reviewing cleanup at damaged Fukushima nuke plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304150116>

THE ASSOCIATED PRESS

The U.N.'s nuclear watchdog agency on April 15 began reviewing the decommissioning process at Japan's crippled nuclear plant, where new problems are triggering growing safety concerns about a cleanup expected to take decades.

The experts will assess and analyze melted reactors, radiation levels and waste management at the Fukushima No. 1 nuclear power plant to make its decommissioning process safer and more stable, team leader Juan Carlos Lentijo told reporters.

The cleanup is "a very difficult challenge," he said, and "it is very important to conduct the decommissioning process in a very safe way."

The mission by the 12-member team is the International Atomic Energy Agency's first review of the plant's decommissioning process.

Japan's nuclear watchdog said there have been at least eight accidents or problems at the plant since mid-March, ranging from extensive power outages and leaks of contaminated water.

The problems are raising concerns about whether the plant, crippled by the March 2011 tsunami, can stay intact through a decommissioning process that could take 40 years. The problems have also prompted officials to compile risk-reduction measures and revise decommissioning plans.

Among the most pressing issue is leakage of tons of highly radioactive water from three of seven underground storage pools into the soil. Plant operator Tokyo Electric Power Co. and regulatory officials said none of it was believed to have reached ocean.

The contaminated water storage has been a headache from right after the accident, but officials finally acknowledged last week that the lack of space has become a "crisis." TEPCO has promised to speed up building more reliable steel tanks and eventually empty the underground tanks, but the leak will continue until then. Runoff from the three reactors melted in the aftermath of the March 2011 earthquake and tsunami and a steady inflow of groundwater seeping into the basement of their damaged buildings produce about 400 tons of contaminated water daily at the plant.

The IAEA team will inspect the plant and hold more talks with TEPCO and government officials during its review. It will compile an assessment and advise the Japanese government in a report next week, and a follow-up evaluation is expected within several months.

## **IAEA at Fukushima**

April 16, 2013

## **IAEA starts review at Fukushima**

Kyodo

<http://www.japantimes.co.jp/news/2013/04/16/national/iaea-starts-review-at-fukushima/#.UWwZV0psFEs>

A team of nuclear experts formed by the International Atomic Energy Agency on Monday started its activities in Japan to review the country's ongoing efforts to scrap the crippled reactors at the Fukushima No. 1 nuclear power plant.

It is the first IAEA mission to Japan focusing on decommissioning. The 12-member team will also look into the recent radioactive water leaks and electricity supply disruptions at the plant — mishaps occurring more than two years after the devastating nuclear crisis started.

Team leader Juan Carlos Lentijo, director of the IAEA Division of Nuclear Fuel Cycle and Waste Technology, said the recent troubles are among the topics to be discussed during the one-week mission.

“After this week of discussions, I hope that we will have enough information to give our assessment and to give our feedback to the government of Japan on the two issues,” he said prior to the start of the team's activities.

The experts will also assess the general strategy for the decommissioning of the plant's four crippled reactors, a process the government and Tokyo Electric Power Co. expect to take at least 40 years.

During their stay, the experts will visit the Fukushima complex and release a preliminary report on April 22, according to government officials.

The review will be made in two steps, with the second step slated for several months later, Lentijo said.

Tepco has said it has kept the stricken reactors stable by injecting water continuously. But as a result, massive amounts of radioactive water continue to accumulate at the site and managing the polluted liquid remains a challenge.

Most recently, Tepco found a series of leaks of contaminated water from sunken reservoirs.



Before revelation of the water leaks, a power outage, believed to have been triggered by a rat that touched a makeshift switchboard, disabled the cooling system for the spent-fuel pools of reactors 1, 3 and 4. It took 29 hours to restore the system.

See also:

### **IAEA starts review on Japan's efforts to scrap Fukushima reactors**

<http://mainichi.jp/english/english/newsselect/news/20130415p2g00m0dm062000c.html>

## **Moving to higher grounds**

### **Radioactive water set to be shifted to aboveground tanks soon: TEPCO**

<http://mainichi.jp/english/english/newsselect/news/20130416p2a00m0na014000c.html>

Tokyo Electric Power Co. (TEPCO) has announced that the **transfer of radiation-tainted water in underground reservoirs to aboveground tanks at the Fukushima No. 1 Nuclear Power Plant is to start on April 16 at the earliest -- a couple of days behind the initial schedule.**

The measures come following a string of leakages of radioactive water from the No. 1 through No. 3 cisterns out of seven underground reservoirs at the crippled nuclear plant. The No. 4 and No. 6 cisterns -- whose structures are the same as those of the leaking reservoirs -- also contain tainted water.

The transfer of tainted water -- which had originally been scheduled to start on April 14 -- will begin as soon as the method's safety is confirmed during final checks on April 16.

TEPCO explained on April 15 that the planned water transfer was delayed due to a leakage of contaminated water from pipes during work to transfer water from the No. 3 cistern to the No. 6 cistern underground on April 11, which required "unexpected inspections."

"Even though the start (of the water transfer) was delayed, it won't affect the planned completion of the transfer (in June)," said TEPCO spokesman Masayuki Ono.

Regarding the reason why a power outage took place on April 5 during work to set up metal wire to ward off small animals from a power supply system for the spent nuclear fuel pool of the No. 3 reactor, which suspended the cooling system for about three hours, TEPCO explained that a piece of wire sticking out

from the metal wire touched the terminal of a switchboard, shorting out and charring both the wire and the terminal.

"The fact that power had not been turned off before the work is partly to blame. We will strive to prevent a recurrence," TEPCO said.

The metal wire was set up following another earlier power outage in March believed to have been triggered by a rat that touched a switchboard, disabling cooling systems for spent fuel pools at the nuclear complex.

### **TEPCO moves irradiated water to ground tanks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130416\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20130416_33.html)

The operator of the crippled Fukushima Daiichi nuclear power plant has begun moving contaminated water from leaking underground storage pools to tanks above ground.

Tokyo Electric Power Company, or TEPCO, plans to move most of the contaminated water to tanks above ground after a series of leaks were found in some of the 7 underground storage pools.

On Tuesday, TEPCO began transferring about 20 tons of water per hour from the No. 2 pool to a tank more than 400 meters to the southeast. The No. 2 pool is the first of those where leaks were found.

More than 23,000 tons of contaminated water is scheduled to be transferred by early June.

Priority will be on the No. 1 and 2 pools, as they are thought to be leaking the most.

TEPCO says because the pipes being used to move the water will cover a long distance it will step up monitoring activities to ensure no water escapes.

The underground pools will continue to leak during the operation. The firm plans to pump the contaminated water that leaks back into the pools, to minimize effects on the environment.

TEPCO plans to quickly install more tanks, as contaminated water at the plant is continuing to increase by about 400 tons per day. This will not fundamentally solve the problem and the firm will explore other ways to try to deal with this situation.

## Not so cool

### **Tepco plans to transfer contaminated water to suppression pool of reactor 5 and 6 in emergency**

Posted by Mochizuki

As to the major leakage of highly contaminated water, Tepco is planning to transfer 23,600 tones of water to the tanks.

However, **those tanks don't exist yet**. Because they have to build the tanks, the water leakage won't be fixed until June.

(cf, Major leakage can't be fixed until early June [URL])

On 4/15/2013, Tepco announced they would transfer water to the suppression pools of reactor5 and 6 in case of emergency.

Suppression chamber is one of the major coolant systems of the reactor.

The reservoirs stock concentrated radioactive salt water. It would seriously damage the suppression chambers as well.

**The suppression chambers must have had coolant water inside. It is not announced where the water was moved.**

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130415\\_07-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130415_07-e.pdf)

## IAEA in Fukushima

April 18, 2013

### **IAEA inspects Japan's crippled nuclear plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304180015>

THE ASSOCIATED PRESS

A U.N. nuclear watchdog team has begun inspecting Japan's crippled nuclear plant, which has been plagued with radioactive water leaks and other glitches more than two years it was struck by a tsunami. The International Atomic Energy Agency team is primarily reviewing the decommissioning of the Fukushima No. 1 plant, which was ravaged in the March 2011 disaster. The team will also investigate recent blackouts and leaks that have raised doubts whether the plant can survive the decades-long cleanup process.

Tokyo Electric Power Co. President Naomi Hirose said he hoped to gather expertise from around the world to resolve the problems hampering the cleanup at the plant.

Japanese government is launching a panel specifically on the contaminated water, a mixture of cooling water runoff from melted reactors and underground water.

## Off again

April 22, 2013

### **Fukushima nuclear cooling system offline for 3rd time in 5 weeks**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304220119>

REUTERS

Tokyo Electric Power Co. halted the cooling system for a spent fuel pool at its Fukushima No. 1 nuclear plant on April 22.

It was the third time a cooling system has been offline there in the past five weeks, underlining the challenges the utility faces in trying to shut down the facility.

TEPCO said in a statement that it halted the system for the No.2 unit's spent fuel pool for inspection after it found dead rats near a transformer.

The inspection was expected to take 3 to 4 hours from 11:36 a.m.

TEPCO estimated that temperatures in the pool would rise less than one degree during the inspection from around 14 degrees Celsius before it halted the system, it said.

Two years after an earthquake and tsunami crippled the plant, TEPCO faces a raft of hurdles, including groundwater flooding into damaged reactors, as it works to decommission the complex. The clean-up effort is expected to take decades.

Last month, a 29-hour power supply halt affecting nine facilities, including four spent fuel pool cooling systems, was caused by a rat touching exposed wires in a temporary switchboard, triggering a circuit breaker.

In early April, the No.3 unit's spent fuel pool cooling system stopped, after workers appeared to have had inadvertently caused a power outage when they were trying to install a net to keep small animals from crawling into the reactor building.

## Japan may need longer than 40 years, says AIEA

### IAEA: Japan nuke cleanup may take more than 40 years

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304220121>

THE ASSOCIATED PRESS

A U.N. nuclear watchdog team says Japan may need longer than the planned 40 years to decommission its tsunami-crippled nuclear plant and is urging its operator to improve plant stability.

The head of the International Atomic Energy Agency team, Juan Carlos Lentijo, said on April 22 that damage at the Fukushima No. 1 nuclear power plant is so complex that it is "impossible" to predict how long the cleanup may last.

He suggested it would take longer than the 40 years Japan has projected.

The plant runs on makeshift equipment and frequently suffers glitches.

Lentijo urged the plant operator to promptly replace temporary equipment with a more reliable, permanent system.

The 12-member mission plans to release a report next month.

The plant was badly damaged by an earthquake and tsunami in March 2011.

### Fuel-rod cooling halted by rats at crippled Japan nuclear plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304220119>

REUTERS

Japan's crippled Fukushima No. 1 nuclear power plant halted cooling of a spent fuel pool at the site on April 22 to remove two dead rats, the third time cooling equipment has gone offline in five weeks because of rodents.

Plant operator Tokyo Electric Power Co. (TEPCO) said it halted cooling of the No. 2 unit pool, which stores spent uranium fuel rods at the Fukushima site, for a few hours to remove the rats and install a net to stop further such intrusions.

Last month, TEPCO lost power to cool fuel rods for 29 hours, an outage it later blamed on a rat that had shorted a temporary switchboard.

Two weeks later, workers attempting to install a net tripped the system again.

A tsunami crashed into the plant in March 2011, causing fuel-rod meltdowns at three reactors and triggering the evacuation of 160,000 people in the world's worst nuclear disaster since Chernobyl in 1986.

The incident on April 22 follows a string of mishaps including four leaks of contaminated water from underground storage pits.

The problems at the plant, 240 km (150 miles) north of Tokyo, attracted a rebuke from the government and the nuclear regulator, reviving public debate over whether TEPCO was up to the task of a decommissioning project expected to last decades.

The International Atomic Energy Agency (IAEA) said it believed TEPCO could handle the job, but said the contaminated water was its "biggest challenge."

Juan Carlos Lentijo, an IAEA team leader, said decommissioning would be an enormous task.

"It will be near impossible to ensure the time for decommissioning such a complex facility in less than 30, 40 years as it is currently established in the roadmap," he said after a week-long IAEA tour of the site.

TEPCO has been waging a constant battle to filter and store groundwater that continues to flood the basements of the reactor buildings at a rate of 400 tons a day.

The IAEA said that TEPCO had achieved the stable cooling of the reactors and spent fuel pools, but cautioned that it needed to improve systems to treat the toxic water and find reliable ways to monitor and store it on site.

More than 80 percent of available storage capacity has been filled, forcing TEPCO to scramble to build new tanks.

## The rat saga continues

April 23, 2013

### **Fukushima nuke plant forced to stop cooling system for fuel pools due to dead rats**

<http://mainichi.jp/english/english/newsselect/news/20130423p2a00m0na021000c.html>

The operator of the crippled Fukushima No. 1 nuclear plant said on April 22 it had to temporarily stop a cooling system for a spent fuel pool after finding two dead rats inside a transformer.

According to Tokyo Electric Power Co. (TEPCO), workers patrolling at the site found the dead rats at around 10:15 a.m. on April 22 inside the makeshift transformer which was built after the plant disaster in March 2011. TEPCO had to temporarily stop the cooling system for the No. 2 reactor's spent fuel pool for a cleanup. The cooling system restarted before 4 p.m. on the same day after the company covered a hole that rats apparently entered through.

Just last month the Fukushima No. 1 plant experienced a blackout caused by rats that disabled cooling systems for about 30 hours.

"Fortunately, we didn't have a blackout this time," Toshihiko Fukuda, general manager at TEPCO's Nuclear Quality and Safety Management body, told a news conference. "We'll continue our inspection around the plant to eliminate any problems," he said.

In addition, TEPCO said it finished transporting radioactive water from the No. 2 underground tank, which was found to be leaking earlier this month, to another cistern above ground before noon on April 22. The amount of water that was transported was 1,070 cubic meters. The company plans to start moving radioactive water from the No. 1 water tank as well.

## IAEA getting worried?

### IAEA tells Tepco to improve critical systems at Fukushima No. 1

AFP-JIJI

<http://www.japantimes.co.jp/news/2013/04/23/national/iaea-tells-tepco-to-improve-critical-systems-at-fukushima-no-1/#.UXaPWsoR2vM>

The International Atomic Energy Agency on Monday called on Tokyo Electric Power Co., operator of the crippled Fukushima nuclear power plant, to improve "essential systems" as it struggles to deal with leaks and power cuts.

"Tepco should continue its efforts to improve the reliability of essential systems, to assess the structural integrity of site facilities and to enhance protection against external hazards," the U.N. nuclear watchdog said in a statement.

The comments came after an IAEA mission met with officials from the government and Tepco last week in Tokyo, ahead of their on-site inspection at the plant.

The statement was released just hours after Tepco said it had temporarily switched off a reactor cooling system following the discovery of a pair of dead rats near to critical equipment.

The measure was taken to allow workers to safely remove the bodies and to check whether the animals had done any damage to delicate electrical systems, a Tepco spokesman said.

## Installation of multiplex power distribution systems

April 25, 2013

### TEPCO shuts down cooling system for spent nuclear fuel pool at Fukushima plant

<http://mainichi.jp/english/english/newsselect/news/20130425p2a00m0na011000c.html>

Tokyo Electric Power Co. (TEPCO) said it temporarily shut down the cooling system for a spent nuclear fuel pool of the No. 3 reactor at the Fukushima No. 1 Nuclear Power Plant at 9:39 a.m. on April 25 **to install a multiplex power distribution system there.**

TEPCO, the operator of the crippled Fukushima nuclear power station, said the cooling system was expected to remain shut for about 33 hours. While the cooling system is offline, the temperature of the water in the spent nuclear fuel pool is likely to rise about five degrees Celsius. But TEPCO said, "There is no problem. The water temperature was low enough at 16 degrees when it was shut down." **The utility also said it would shut down the cooling system for the spent nuclear fuel pool at the No. 4 reactor for about nine hours on April 26 in order to conduct similar installation work.**

In March this year, a power outage, triggered by a rat that touched a switchboard and caused a short circuit, disabled cooling systems for the spent fuel pools of the No. 1, 3 and 4 reactors. It took nearly 30 hours for the cooling systems to be fully recovered. The Nuclear Regulation Authority instructed TEPCO to take preventative measures promptly, including installing multiplex power distribution systems, among other measures.

## Proposals to sort out problem of contamination from radioactive water

### Steps to halt increase of radioactive water at Fukushima plant studied

<http://mainichi.jp/english/english/newsselect/news/20130427p2g00m0dm007000c.html>

TOKYO (Kyodo) -- A government-appointed panel of experts on Friday started studying ways to prevent more radioactive water from accumulating at the Fukushima Daiichi nuclear power plant, **including a plan to embed walls around the damaged reactor buildings to stop groundwater from entering.**



About 400 tons of groundwater seep into the plant every day, flowing into the lengthy and complicated water circulation loop that keeps the plant's damaged reactors cool. In the process, the groundwater becomes contaminated.

Plant operator Tokyo Electric Power Co. has so far dealt with the situation by increasing the number of water storage tanks at the site. It has also built a dozen wells to pump out part of the groundwater that enters the reactor buildings as it flows from the mountainside to the ocean-side.

But the panel, also joined by officials of the government and TEPCO, hopes to find a more fundamental solution because the utility could eventually run out of water storage capacity.

Some proposals were presented during the meeting of the panel members Friday, such as **building an underground wall around reactor buildings by using a clay-like material.**

TEPCO once considered building a wall on the mountain side of the reactor building after the plant was crippled by a huge earthquake and tsunami in March 2011, but it abandoned the idea because of the risk that contaminated water accumulating inside the reactor buildings could flow onto the soil outside.

The problem of keeping massive amounts of radioactive water at the plant has recently drawn renewed attention after TEPCO found some underground water storage pools containing contaminated water had leaked and had to find a secure storage space.

## **NHK video: Contaminated Water Struggle Watch**

<http://www3.nhk.or.jp/nhkworld/newsline/201304262000.html>

3 approaches by TEPCO engineers:

- build more containers: add 400.000 tons of capacity but this will be only short-term (maximum 3 years respite)
- try to decontaminate the water contained in the tanks
- curb the approach of water: divert any groundwater seeping in and redirect it towards the ocean but only 1/4 of this water could be diverted.

## **The New York Times on contaminated water**

April 29, 2013

## Flow of Tainted Water Is Latest Crisis at Japan Nuclear Plant

<http://www.nytimes.com/interactive/2013/04/30/world/asia/struggling-to-contain-radioactive-wastewater.html?ref=asia>





By *MARTIN FACKLER*

TOKYO — Two years after a triple meltdown that grew into the world’s second worst nuclear disaster, the Fukushima Daiichi nuclear power plant is faced with a new crisis: a flood of highly radioactive wastewater that workers are struggling to contain.

Groundwater is pouring into the plant’s ravaged reactor buildings at a rate of almost 75 gallons a minute. It becomes highly contaminated there, before being pumped out to keep from swamping a critical cooling system. A small army of workers has struggled to contain the continuous flow of radioactive wastewater, relying on hulking gray and silver storage tanks sprawling over 42 acres of parking lots and lawns. The tanks hold the equivalent of 112 Olympic-size pools.

But even they are not enough to handle the tons of strontium-laced water at the plant — a reflection of the scale of the 2011 disaster and, in critics’ view, ad hoc decision making by the company that runs the plant and the regulators who oversee it. In a sign of the sheer size of the problem, the operator of the plant, Tokyo Electric Power Company, or Tepco, plans to chop down a small forest on its southern edge to make room for hundreds more tanks, a task that became more urgent when underground pits built to handle the overflow sprang leaks in recent weeks.

“The water keeps increasing every minute, no matter whether we eat, sleep or work,” said Masayuki Ono, a general manager with Tepco who acts as a company spokesman. “It feels like we are constantly being chased, but we are doing our best to stay a step in front.”

While the company has managed to stay ahead, the constant threat of running out of storage space has turned into what Tepco itself called an emergency, with the sheer volume of water raising fears of future leaks at the seaside plant that could reach the Pacific Ocean.

That quandary along with an embarrassing string of mishaps — including a 29-hour power failure affecting another, less vital cooling system — have underscored an alarming reality: two years after the meltdowns, the plant remains vulnerable to the same sort of large earthquake and tsunami that set the original calamity in motion.

There is no question that the Fukushima plant is less dangerous than it was during the desperate first months after the accident, mostly through the determined efforts of workers who have stabilized the melted reactor cores, which are cooler and less dangerous than they once were.

But many experts warn that safety systems and fixes at the plant remain makeshift and prone to accidents.

The jury-rigged cooling loop that pours water over the damaged reactor cores is a mazelike collection of pumps, filters and pipes that snake two and a half miles along the ground through the plant. And a pool for storing used nuclear fuel remains perched on the fifth floor of a damaged reactor building as Tepco struggles to move the rods to a safer location.

The situation is worrisome enough that Shunichi Tanaka, a longtime nuclear power proponent who is the chairman of the newly created watchdog Nuclear Regulation Authority, told reporters after the announcement of the leaking pits that “there is concern that we cannot prevent another accident.”

A growing number of government officials and advisers now say that by entrusting the cleanup to the company that ran the plant before the meltdowns, Japanese leaders paved the way for a return to the insider-dominated status quo that prevailed before the disaster.

Even many scientists who acknowledge the complexity of cleaning up the worst nuclear disaster since Chernobyl fear that the water crisis is just the latest sign that Tepco is lurching from one problem to the next without a coherent strategy.

“Tepco is clearly just hanging on day by day, with no time to think about tomorrow, much less next year,” said Tadashi Inoue, an expert in nuclear power who served on a committee that drew up the road map for cleaning up the plant.

But the concerns extend well beyond Tepco. While doing a more rigorous job of policing Japan’s nuclear industry than regulators before the accident, the Nuclear Regulation Authority has a team of just nine inspectors to oversee the more than 3,000 workers at Fukushima.

And a separate committee created by the government to oversee the cleanup is loaded with industry insiders, including from the Ministry of Trade, in charge of promoting nuclear energy, and nuclear reactor manufacturers like Toshiba and Hitachi. The story of how the Fukushima plant ended up swamped with water, critics say, is a cautionary tale about the continued dangers of leaving decisions about nuclear safety to industry insiders.

When Tepco and the government devised the current plans for decommissioning the plant in late 2011, groundwater had already been identified as a problem — the plant lies in the path of water flowing from nearby mountains to the sea. But decision makers placed too low a priority on the problem, critics say, assuming the water could be stored until it could be cleaned and disposed of.

According to some who helped the government plan the cleanup, outside experts might have predicted the water problem, but Tepco and the government swatted away entreaties to bring in such experts or companies with more cleanup expertise, preferring to keep control of the plant within the collusive nuclear industry.

Tepco also rejected a proposal to build a concrete wall running more than 60 feet into the ground to block water from reaching the reactors and turbine buildings, and the Trade Ministry did not force the issue, according to experts and regulators who helped draw up the decommissioning plan.

Instead, Tepco made interim adjustments, including hastily building the plastic- and clay-lined underground water storage pits that eventually developed leaks.

It was only after the discovery of those leaks that the regulation agency was added as a full-fledged member to the government’s cleanup oversight committee.

But the biggest problem, critics say, was that Tepco and other members of the oversight committee appeared to assume all along that they would eventually be able to dump the contaminated water into the ocean once a powerful new filtering system was put in place that could remove 62 types of radioactive particles, including strontium.

The dumping plans have now been thwarted by what some experts say was a predictable problem: a public outcry over tritium, a relatively weak radioactive isotope that cannot be removed from the water.

Tritium, which can be harmful only if ingested, is regularly released into the environment by normally functioning nuclear plants, but even Tepco acknowledges that the water at Fukushima contains about 100 times the amount of tritium released in an average year by a healthy plant.

“We were so focused on the fuel rods and melted reactor cores that we underestimated the water problem,” said Tatsujiro Suzuki, vice chairman of the Japan Atomic Energy Commission, a government body that helped draw up Tepco’s original cleanup plan. “Someone from outside the industry might have foreseen the water problem.”

Tepco rejects the criticism that it has mishandled the growing groundwater problem, saying that the only way to safely stop the inflow is by plugging the cracks in the damaged reactor buildings. It contends that no company in the world has the ability to do that because it would require entering the highly radioactive buildings and working in dangerously toxic water several feet deep.

“We operate the plant, so we know it better than anyone else,” said Mr. Ono, the Tepco spokesman. He then teared up, adding, “Fixing this mess that we made is the only way we can regain the faith of society.”

For the moment, that goal seems distant. The public outcry over the plans to dump tritium-tainted water into the sea — driven in part by the company’s failure to inform the public in 2011 when it dumped radioactive water into the Pacific — was so loud that Prime Minister Shinzo Abe personally intervened last month to say that there would be “no unsafe release.”

Meanwhile, the amount of water stored at the plant just keeps growing.

“How could Tepco not realize that it had to get public approval before dumping this into the sea?” said Muneo Morokuzu, an expert on public policy at the University of Tokyo who has called for creating a specialized new company just to run the cleanup. “This all just goes to show that Tepco is in way over its head.”

Makiko Inoue contributed reporting from Tokyo, and Matthew L. Wald from Washington.

## Crucial issues still unanswered after 2 years

May 1, 2013

### Questions in Fukushima crisis

[http://www3.nhk.or.jp/nhkworld/english/news/20130501\\_36.html](http://www3.nhk.or.jp/nhkworld/english/news/20130501_36.html)

There are 3 major points that the Authority wants to investigate about the cause of the crisis at the Fukushima nuclear power plant.

The first question is whether the earthquake impacted the plant, and if so, how.

TEPCO and the government-appointed panel of experts maintain that the plant's radiation containment system withstood the quake and remained intact until the tsunami reached the plant.

But the Diet panel says there still is no evidence available to prove that the quake didn't cause any damage to major equipment. No detailed inspections have been conducted inside the contaminated reactor buildings.

The second question is how the fuel rods melted down and damaged the reactors, and where and how the melted fuel is now in the reactors.

The third question is from where radioactive substances leaked into the atmosphere.

It is estimated that they leaked through sections connecting the containment vessels and the pipe networks that had been damaged by high temperatures and pressure. But it remains to be proved exactly which sections were damaged to allow the leak.

All experts agree that they need to identify possible weaknesses and shortcomings in the reactors and containment vessels that helped cause the crisis.

**With those vital questions still unanswered for the past 2 years, it remains difficult to be certain of the safety of nuclear power generation.**

## Radiation-proof vehicles for police

May 2, 2013

## **Japan police introduce radiation-proof vehicles**

[http://www3.nhk.or.jp/nhkworld/english/news/20130502\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20130502_13.html)

Japan's National Police Agency has deployed radiation-proof vehicles at headquarters in Tokyo and Fukushima to better prepare for nuclear-related trouble.

The agency says the vehicles have lead on their bodies and windows, are air-pressurized, and can monitor atmospheric radiation levels. Each is 10.5 meters long, weighs 21 tons, and costs more than 1.5 million dollars.

The vehicles are to be mobilized in the event of terror attacks on nuclear facilities or nuclear accidents.

Since the 2001 September 11th attacks in the United States, Japan has been deploying police units at 22 of the country's nuclear facilities.

The police stepped up their alert for possible attacks on nuclear facilities after the Fukushima Daiichi plant accident showed the widespread affect of nuclear contamination on people's lives.

The agency says one of the vehicles will be used at the Fukushima plant, while one in Tokyo will be on standby for use in emergencies across Japan.

## **Earthquake or tsunami ? And other unanswered questions**

### **Nuclear watchdog to answer unresolved questions about Fukushima disaster**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201305020057>

By JIN NISHIKAWA/ Staff Writer

Japan's nuclear watchdog said it will seek to address unanswered questions about the Fukushima nuclear disaster in a report to be submitted to the Vienna-based International Atomic Energy Agency by year-end.

The Nuclear Regulation Authority reached the decision May 1 at an inaugural meeting of its investigative panel.

The Japanese government, the Diet and other parties set up their own individual investigation commissions in the aftermath of the reactor meltdowns at the Fukushima No. 1 nuclear power plant triggered by the March 11, 2011, Great East Japan Earthquake and tsunami.



Although they released their respective reports by July 2012, many aspects of the disaster remain unclear.

**The NRA plans to focus its inquiry on those issues that the panels failed to agree upon.**

During the May 1 meeting, the NRA presented a list of unresolved issues from the reports. Studies were started immediately on two of them: If the "isolation condensers," or key cooling equipment for the No. 1 reactor, were damaged, and what caused the hydrogen explosion in the No. 4 reactor building.

Whether the No. 1 reactor's isolation condensers were damaged has been a focus of investigations because of the implications with regard to the adequacy of anti-seismic measures implemented by the government and Tokyo Electric Power Co., the plant operator. While the Diet's Fukushima Nuclear Accident Independent Investigation Commission said the earthquake--not the tsunami--may have damaged the condensers, the government's Investigation Committee on the Accident at the Fukushima Nuclear Power Stations said such a scenario is unlikely.

In February 2012, a TEPCO official dissuaded members of the Diet investigation panel from conducting an on-site survey in the No. 1 reactor building by misinforming them that it was "pitch-dark" inside and unfit for inspections. After it emerged in February that the inside was not "pitch-dark" at the time, NRA Chairman Shunichi Tanaka said he would push for an inspection of the No. 1 reactor.

The NRA panel plans to conduct studies and compile reports successively on an issue-by-issue basis, according to NRA officials. As the IAEA is expected to release its own investigation report on the Fukushima nuclear crisis by the end of 2014, the NRA said it hopes the international nuclear watchdog can draw on the NRA's investigation results.

### **Nuclear watchdog to study impact of 2011 quake on Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130502p2g00m0dm012000c.html>

TOKYO (Kyodo) -- The Nuclear Regulation Authority decided Wednesday to investigate more thoroughly whether key safety equipment for one of the nuclear reactors at the Fukushima Daiichi power plant sustained damage before the complex was hit by a tsunami in March 2011.

The decision was reached by a panel tasked by the NRA to further study the cause of the Fukushima Daiichi nuclear power plant disaster and how it evolved, given differences among accident investigation commissions that looked into the disaster.

A government-appointed commission expressed skepticism in its report that the magnitude 9.0 earthquake on March 11, 2011, by itself caused catastrophic damage to key facilities of the Nos. 1 to 3 reactors that suffered meltdowns.

But another commission appointed by parliament suggested that the quake may have damaged piping for an emergency cooling system, called an isolation condenser, at the No. 1 unit.

The report said several workers on the fourth floor of the No. 1 reactor building at the time of the earthquake witnessed a water leak on the same floor, which houses two large tanks for the isolation condenser and the piping for the equipment.

The now-defunct commission also denied the possibility that water sloshed out of the spent fuel pool on the fifth floor, but no on-site inspection has taken place.

Access to buildings housing the three reactors remains limited due to high radiation levels.

During the meeting of the NRA-appointed panel, members called for the testimonies of the workers to be reconfirmed and for the damage to the piping to be checked through a pressure test.

## Nice plan

May 5, 2013

### **Contaminated water transfer to end early in June**

[http://www3.nhk.or.jp/nhkworld/english/news/20130505\\_08.html](http://www3.nhk.or.jp/nhkworld/english/news/20130505_08.html)

Tokyo Electric Power Company, or TEPCO, plans to complete the transfer of radioactive water from leaking underground storage pools to tanks above ground at the Fukushima Daiichi nuclear plant early in June.

A series of leaks of highly contaminated water have been found since April 5th in some of the underground storage pools.

TEPCO decided to stop using the underground storage pools and move all of the 23,000 tons of water to tanks.

About 7,000 tons of contaminated water from the No. 1 and 2 pools has already been transferred without trouble.

The utility company plans to install more tanks which can accommodate about 19,000 tons of water to complete the transfer.

The underground pools continue to leak during the operation. The utility pumps the leaked water back to the pools to minimize the environmental impact.

It continues to monitor underground water at 30 wells around and on the sea side of the plant.

No contamination of ground water has been detected yet but TEPCO plans to set up new monitoring wells in locations closer to the underground pools to gather more information about underground conditions.

## Nitrogen injection

May 7, 2013

### **Tepco to restart nitrogen gas injection into reactor1**

<http://fukushima-diary.com/2013/05/tepco-to-restart-nitrogen-gas-injection-into-reactor1/>

Posted by **Mochizuki**

According to Tepco, they are going to restart the nitrogen gas injection into the suppression chamber of reactor1 on 5/8/2013.

6~7m<sup>3</sup>/h will be injected in order to “push out the retained hydrogen gas” and also “look into the effect of radiolysis of water within suppression chamber”, which implies Tepco admits hydrogen gas is being produced from the radiolysis of water.

If the hydrogen gas density goes over 2%, there is a possibility of further hydrogen explosion.

They injected nitrogen gas only one month ago. There is a possibility that hydrogen gas is being constantly produced in reactor1.

[http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts\\_130507\\_07-j.pdf](http://www.tepco.co.jp/nu/fukushima-np/handouts/2013/images/handouts_130507_07-j.pdf)

## "We would like to release that water into the ocean"

May 8, 2013

### TEPCO to dump groundwater to ease crisis at Fukushima nuclear plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201305080062>

After a series of blunders, miscalculations and unresolved problems, Tokyo Electric Power Co. adopted a new strategy to avoid a total collapse of its system for handling radioactive water at its crippled nuclear plant.

TEPCO is running out of storage space for water used in the nonstop process of cooling the melted and spent fuel at the Fukushima No. 1 nuclear plant. Exacerbating the storage problem is the groundwater that keeps flowing into the plant's buildings.

The company has dug 12 wells to the west of the reactor buildings, where it plans to pump up groundwater before it can enter the facilities and become contaminated.

**"We would like to release that water into the ocean if we can gain the understanding of the relevant officials,"**Toshihiko Fukuda, who heads TEPCO's Nuclear Quality and Safety Management Department, said at a May 7 news conference.

TEPCO officials will explain the plan at a meeting scheduled for May 13 of representatives of fisheries cooperatives in Fukushima Prefecture. If approval is obtained, the utility plans to start dumping the pumped-up water into the ocean the following day.

"We would like to cooperate in settling the situation by giving our approval once safety has been confirmed," Tetsu Nozaki, chairman of the federation of prefectural fisheries cooperatives, said.

**It would be the second time for water at the plant site to be released into the ocean.**

Fisheries cooperatives in Fukushima Prefecture were forced to refrain from sending out their boats after highly radioactive water was dumped into the ocean in the immediate aftermath of the March 2011 nuclear accident.

Dealing with the radioactive water has long been an uphill battle for TEPCO in its overall plan to decommission the crippled reactors, a process expected to take decades to complete.

The situation deteriorated on April 5, when radioactive water was found leaking from underground storage tanks at the plant.

Water used to cool the fuel in the No. 1 to No. 4 reactors that were damaged during the accident has accumulated in the basements of the reactor buildings. Under TEPCO's recycling system at the plant, this water has been pumped out, treated, and used again to cool the fuel.

However, about 400 tons of groundwater flow into the reactor buildings on a daily basis and mixes with the radioactive water.

According to calculations, 300 tons of groundwater would still flow into the reactor buildings every day even after TEPCO starts pumping up the water through the wells.

A general contractor on April 26 proposed building a wall to block the inflow of the groundwater. However, a similar proposal was dropped immediately after the nuclear accident over fears the water-shielding wall would cause contaminated water in the buildings to flow into groundwater at lower levels. Currently, surface tanks at the Fukushima No. 1 plant hold about 280,000 tons of radioactive water. An additional 100,000 tons are believed to be flooding the basements of the No. 1 to No. 4 reactor buildings as well as the turbine buildings.

After the leaks were discovered in the underground storage tanks, TEPCO transferred about 8,000 tons of radioactive water from the faulty tanks to surface tanks by May 6. The remaining 16,000 tons or so will remain in the underground tanks until new surface tanks are completed in late May, according to TEPCO's plan.

An estimated 120 tons of radioactive water leaked into the ground from the faulty underground tanks. Officials of TEPCO and the Japan Atomic Energy Agency say the contaminated water could mix with groundwater and reach the ocean in 10 years at the earliest.

TEPCO officials have yet to determine the cause of the leaks. One factor may have been the fact that they did not follow Environment Ministry guidelines for industrial waste.

The underground storage tanks were protected by a double layer of polyethylene waterproof sheets and a 6.4-millimeter-thick sheet of bentonite, a clay-like substance.

**The ministry's standards for controlled disposal sites for industrial waste call for at least 50 centimeters of bentonite to surround the waterproof sheets.**

**TEPCO officials apparently felt that a double layer of polyethylene waterproof sheets would be sufficient.**

"It would be theoretically possible to prevent leaks for several decades to about a century if a layer of packed bentonite measuring at least 50 centimeters had been laid out outside of the sheets," said Hideo Komine, a civil engineering professor at Ibaraki University. "The company should consider rebuilding the underground tanks."

Handling radioactive water was often an afterthought for TEPCO officials. Soon after the accident, the main priority was cooling the reactors, so water was pumped in from every available source, including the ocean and nearby dams.

When the utility was criticized for dumping highly radioactive water into the ocean from the basements of the reactor buildings, officials decided a new approach was needed.

They stored the water at nearby buildings and started building surface tanks.

In June 2011, the utility began recycling some of the radioactive water to cool the reactors, after installing about 4 kilometers of piping.

TEPCO officials apparently never considered 400 tons of groundwater would flow into the reactor buildings on a daily basis.

## Can't be helped, says TEPCO

### Radiation level at Fukushima plant boundary could exceed limit: TEPCO

<http://mainichi.jp/english/english/newsselect/news/20130508p2g00m0dm044000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear complex said Tuesday that the radiation level around the plant's boundary is expected to exceed a self-imposed limit due to steps taken to address recently discovered leaks in underground radioactive water storage tanks.

Tokyo Electric Power Co. set a target to keep the site-boundary dose below 1 millisievert per year, but **it now expects the dose at one point in the southern area to rise to up to 7.8 millisieverts**, company officials said.

TEPCO unveiled the estimate as it decided to transfer around 23,000 tons of polluted water stored inside leaky underground tanks to more reliable containers above ground. About a third of the liquid has already been pumped out from the troubled cisterns.

According to the estimate, the increase in radiation level will be highest at the plant boundary close to a location where part of the contaminated water will be transferred.

TEPCO will try to keep the radiation level lower by first using tanks that are further from the plant's boundary and by operating a new water treatment facility that can remove various radioactive substances.

At the Fukushima plant in northeastern Japan, a massive amount of radioactive water is accumulating as a result of continuing water injections to the three reactors that suffered meltdowns in the early stage of the nuclear crisis, triggered by the March 2011 earthquake and tsunami.

## **Radiation level of groundwater the same as that of surrounding rivers...**

### **TEPCO eyes dumping groundwater from Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130508p2g00m0dm098000c.html>

FUKUSHIMA, Japan (Kyodo) -- Tokyo Electric Power Co. plans to discharge some groundwater that has flowed into the premises of the crippled Fukushima Daiichi nuclear power plant, after finding that its radiation level is the same as in the rivers in surrounding areas, sources close to the matter said Wednesday.

At the Fukushima plant groundwater flows into reactor buildings and gets mixed with highly radioactive water that is accumulating inside. But TEPCO has created a dozen wells to pump out the groundwater before it seeps into the buildings and becomes contaminated.

As a trial, TEPCO has pumped out about 200 tons of groundwater using the wells. **Its density of radioactive substances was "the same as rivers in surrounding areas,"** according to company officials.

TEPCO hopes to hold a meeting with local fishermen next Monday to seek approval of its planned release of the groundwater, they said.

The Fukushima plant has been plagued with highly radioactive water accumulating inside reactor buildings and adjacent reactor turbine buildings as a result of the continuing injection of water to cool the Nos. 1 to 3 reactors that have suffered meltdowns.

Water once used to cool the damaged reactors is currently recycled as coolant. But the total amount of contaminated water is increasing because of an influx of about 400 tons of groundwater every day.

When the planned system for discharging groundwater before it seeps into the complex buildings begins fully operating, TEPCO expects the total amount of groundwater inflow to be reduced to about 300 tons a day.

See also:

## **TEPCO to dump groundwater to ease crisis at Fukushima nuclear plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201305080062>

May 10, 2013

## **Smoke without a fire**

## **Press Release (May 10, 2013) Smoke from Near the North Side of Unit 6 at Fukushima Daiichi Nuclear Power Station**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1227201\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1227201_5130.html)

At around 9:25 AM today (May 10), a cooperative company worker found smoke coming out from near the mobile temporary toilet installed in the north side (outside) of Unit 6 at Fukushima Daiichi Nuclear Power Station.

The incident was reported to the fire department at 9:35 AM. (Since we judged that the incident was not a fire, site investigation was not done by the fire department.)

Upon site investigation, black smoke was found to be coming out from the exhaust stack of the engine generator installed in the mobile temporary toilet as the power supply for ventilation. The smoke was confirmed to have stopped coming out after suspending the generator.

As a result of site investigation, the smoke was identified to be the gas exhausted from the engine generator turning black due to oil loss via the piston ring of the engine generator. Thus, we have judged that this incident was not a fire.

## **Four years to replace makeshift cover of No.1**

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### **Cover on Fukushima reactor building to be demolished**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201305100075>

By JIN NISHIKAWA/ Staff Writer

Tokyo Electric Power Co. will demolish and replace the makeshift canopy covering a badly damaged reactor building at its Fukushima No. 1 nuclear power plant in order to remove rubble and radioactive material.



TEPCO, which announced the plan on May 9, said it will take about four years to complete a new cover for the No. 1 reactor building before removing fuel rods from the reactor's pool.

Although the amount of radioactive substances released from the reactor into the air will increase between the time the current cover is removed and the new one is installed, TEPCO said that it will not likely have a significant impact on the exposure assessment.

TEPCO will start demolishing the current cover this winter and then remove concrete and other rubble on the top floor of the building. After that, a crane and other equipment for fuel removal will be installed and a new cover put in place over the building.

The roof and walls of the No. 1 reactor building were destroyed in a hydrogen explosion that occurred on March 12, 2011, the day after the Great East Japan Earthquake and tsunami. The protective cover, made of polyester fiber panels, is 47 meters long, 42 meters wide and 54 meters high. It was built over the reactor building in October 2011.

### **TEPCO to take off cover of No. 1 reactor building for fuel removal**

<http://mainichi.jp/english/english/newsselect/news/20130510p2g00m0dm002000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Thursday it plans to temporarily take off a cover placed around the damaged No. 1 reactor building to prepare for the removal of fuel in the spent fuel pool.

Tokyo Electric Power Co. installed the cover in October 2011 to prevent the further release of radioactive substances into the air, given that a hydrogen explosion destroyed the roof and walls of the building housing the stricken No. 1 reactor.

A TEPCO official said that dismantling the cover -- work which will start in the fall -- is expected to lead to a "slight rise" in the radiation level but the impact will be "little."

After removing the cover, workers will clean the upper floor of the building where debris is scattered, and place a crane and other equipment necessary to take out fuel from the pool.

A cover will be reinstalled after the work finishes. The whole process is expected to take about four years, according to TEPCO.

TEPCO will continue to measure the radiation level of the upper floor while there is no outer cover.

The Nos. 1, 3 and 4 reactor buildings were badly damaged by hydrogen explosions that occurred in the early stage of the nuclear crisis, triggered by a huge earthquake and tsunami on March 11, 2011. The Nos. 1 to 3 reactors suffered core meltdowns.

Under a road map toward the decommissioning of the four reactors, TEPCO plans to start taking out fuel assemblies from the spent fuel pool at the No. 4 reactor building later this year and move on to the removal of fuel at the spent fuel tanks of other units.

## Dumping or not dumping?

May 13, 2013

### **TEPCO seeks approval over dumping groundwater from Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130513p2g00m0dm077000c.html>

FUKUSHIMA, Japan (Kyodo) -- Tokyo Electric Power Co. on Monday met with fishermen in Fukushima to seek approval for a plan to discharge groundwater it has pumped from the premises of the crippled Fukushima Daiichi nuclear power plant.

After the meeting, Tetsu Nozaki, the head of the Fukushima Prefectural Federation of Fisheries Co-operative Associations, said the federation has not given a green light to the plan and will make a decision after listening to the opinions of its members.

Because groundwater seeps into the plant's reactor buildings and gets mixed with highly radioactive water that is accumulating inside, TEPCO has created a system to direct part of the groundwater into the Pacific Ocean before it flows into the buildings. The water will be dumped after radioactive content is confirmed to be sufficiently low.

About 200 tons of groundwater has already been pumped out under a trial operation and has been stored in tanks. Its density of radioactive substances was "the same as rivers in surrounding areas," according to company officials.

TEPCO needs to continue to inject water into the three reactors that have suffered meltdowns in the wake of the nuclear crisis, triggered by a huge earthquake and tsunami on March 11, 2011.

But the water injection currently leads to an increase of the overall contaminated water at the plant because about 400 tons of groundwater flows into reactor buildings and adjacent reactor turbines buildings every day.

When the planned system fully starts operating, TEPCO expects the total amount of groundwater inflow to be reduced to about 300 tons a day.

## **Fishermen say no to TEPCO**

## **Fisheries officials uneasy at TEPCO plan to release groundwater**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201305130103>

IWAKI, Fukushima Prefecture--Local fisheries officials on May 13 withheld their consent to Tokyo Electric Power Co.'s plan to release into the sea groundwater that is now flowing into its stricken nuclear power plant.

TEPCO is stuck with a steadily rising volume of highly contaminated water used to cool melted fuel at its crippled reactors. In addition, hundreds of tons of groundwater are flowing daily into the reactor and turbine buildings.

The problem is hindering the utility's preparation for the decommissioning process.

TEPCO intends to start releasing groundwater into the sea if fisheries officials here agree.

Clearly anticipating they could clinch an agreement, TEPCO officials met May 13 with representatives of the Fukushima Prefectural Federation of Fisheries Co-operative Associations, the prefectural government and the Fisheries Agency here to discuss the plan. But they made no headway.

The utility envisages pumping groundwater from the site before it reaches the basement of the reactor and turbine buildings, as well as other facilities, and mixes with the highly contaminated water used for cooling.

Some 400 tons of groundwater flows into the complex daily.

During the meeting, TEPCO officials explained the plan to pump groundwater and release it after confirming its safety.

They said the concentration of radioactive materials in groundwater pumped through wells that TEPCO dug are lower than the figures detected in nearby rivers.

Tetsu Nozaki, who heads the federation, said the group will hold off on making a decision, reversing his earlier position.

"As for giving our consent, this is something that must go back to the drawing board," he said. "TEPCO and the central government need to provide us with a full explanation."

Nozaki had earlier signaled that consent would be given.

One fisheries official called for more time to decide on the matter, saying, "Some members do not understand the difference between groundwater and contaminated water."

Another voiced opposition, saying, "I cannot see clearly how the central government will get involved in this."

The utility plans to dig 12 wells on its premises to pump groundwater. The idea is that it will be stored in tanks temporarily and released into sea after TEPCO confirms its safety.

The overall amount of contaminated water at the plant now stands at 380,000 tons. It is stored at tanks and other facilities on the premises.

The figure is expected to reach 700,000 tons in 2015.

Even if TEPCO releases groundwater into the sea, it does not mean that the entire inflow of groundwater into the buildings will stop.

The utility estimated that pumping will reduce the total inflow by about 100 tons a day.

However, a TEPCO official acknowledged that the figure could vary once actual pumping work begins. (This article was written by Shunsuke Kimura and Takemichi Nishibori.)

### **Fukushima fisheries associations turned down Tepco's discharging ground water**

<http://fukushima-diary.com/2013/05/fukushima-fisheries-associations-turned-down-tepcos-discharging-ground-water/>

On 4/26/2013, Fukushima Diary reported "Tepco is about to discharge pumped ground water to sea, "They won't remove 21,000 Bq/m<sup>3</sup> of Tritium" [URL]"

According to Tepco, they are ready to discharge pumped ground water to the sea.

Currently 400 tones of ground water flows to the plant everyday. To control this water, Tepco made 12 wells to pump up the water before flowing to the plant.

Tepco is now ready to discharge the water pumped from 4 of 12 wells. They state they only need the "approvals" of the stakeholders.

The water is not purified before discharge. They only analyze the nuclides.

On 5/13/2013, Fukushima Prefectural Federation of Fisheries Co-operative Associations **decided not to approve the request of Tepco to discharge the ground water**. The associations stated some of the members don't distinguish ground water and contaminated retained water. Tepco commented they will continue to convince the associations.

## Japan & renewables

### Renewable energy policy

<http://www.japantimes.co.jp/opinion/2013/05/13/editorials/renewable-energy-policy/#.UZCB70psFEs>

The ongoing crisis at the Fukushima No. 1 nuclear power plant is yet another reminder that one of the few potentially positive effects of the Tohoku disaster was a shakeup and rethink of Japan's energy policy. Electricity supply shortages in the wake of the 2011 disaster pushed the country to re-evaluate its energy use and to search for alternatives to nuclear energy.

The momentum may have fallen off slightly during the past year, but a new report from Australia's Climate Commission indicates positive moves by China and the United States, the two largest emitters of carbon pollutants.

Because the report positions Japan, the fifth-largest emitter, as a potential leader in a range of energy policies, it strikes a positive note. But Japan still has a lot of work to do to establish a viable national energy policy.

Japanese initiatives on energy efficiency, emissions trading schemes and renewable energy sources should be given greater encouragement by the government.

The Australian report compiled data, studies and analysis from climate scientists, policy experts and business leaders. The report showed that all major economies were taking action on energy policies but that China and the U.S. were leading.

Japan should pay attention to the findings and work harder to help lead global energy policies through innovation at home and cooperation abroad.

One area where Japan has become a global leader, according to findings by the International Energy Agency (IEA), an autonomous organization of which Japan was a founding member, is in **energy efficiency**. Efficiency means much more than just better vending machines that consume less electricity, though.

Over the past year, according to the Ministry of Economy, Trade and Industry, Japan has expanded its energy efficiency in housing and building, as well as with machinery and equipment.

The target for Japan is to cut electricity demand by at least 10 percent by 2030. That target is a moderate one that could be exceeded if the government supports and enacts its policies more thoroughly. The IEA

has stated that energy efficiency could reduce almost 65 percent of global greenhouse emissions, which contribute the worst effects of climate change.

Japan has also taken tentative steps to set up an emissions trading scheme, but only in Tokyo and Saitama. That puts Japan rather far behind the 35 countries with developed national emissions trading schemes.

While the market-based approach of controlling pollution by providing economic incentives may not be perfect, the trading schemes have been effective in capping pollutants by setting a clear economic cost on all emissions, so that they are not ignored but factored into the total cost of all production.

Many small and medium-sized enterprises in Japan may complain that the system of carbon calculation amounts to no more than an added tax on fossil fuel, but the financial pressure will lead businesses toward renewable energy sources.

Developing a stronger carbon pricing system, and enforcing it, will put Japan in line with other developed economies. China is set to begin emissions trading in selected cities and provinces this year, and the U.S. has already established nine subnational schemes, most notably in California. Japan should not fall behind. Perhaps Japan's greatest energy challenge, as it is in the rest of the world, is to develop renewable energy sources. Japan's government could learn from China, which has become the world leader in renewable energy.

From 2011 to 2012, China increased its wind power capacity by 36 percent and its solar power capacity by 75 percent. According to the Climate Commission report, China invested \$65.1 billion in clean energy, a figure unmatched by any other nation.

Japan has a significant role to play not only in making clean energy a reality at home but also in helping to export the technology abroad.

Already, the Japan-China Economic Association, a private-sector bilateral economic promotion body based in Tokyo, has set up a cooperative network to help reduce pollution in China.

Joint Japanese-Indian corporate ventures have contributed to high-efficiency, low-emission technologies. If Japan can continue to develop its clean-energy industry, such cooperative ventures and their economic benefits are sure to increase.

The U.S., too, has gained traction in renewable energy policy. After his re-election, President Barack Obama made a commitment to clean energy in his State of the Union Address in February. Despite opposition, the U.S. nearly doubled its renewable energy capacity between 2008 and 2012. Working together on clean energy is an important cooperative undertaking that would continue to benefit both Japan and the U.S.

**Without policy support by the government, though, renewable energy is not likely to happen.** The Australian report shows evidence that in countries with declining support, progress on finding solutions to energy problems slowed or even stopped. Globally emissions continue to rise but at a slower pace. That may be a cause for optimism, but it is not a sign of having reached a solution.

Climate change will continue to pose serious risks for every country. Controlling emissions, improving efficiency and developing renewable energy sources are the best insurance policies against those risks. The coming decade is crucial, not just for Japan, but for the world.

## Fishermen unconvinced

## **TEPCO, fishermen divided over groundwater release**

[http://www3.nhk.or.jp/nhkworld/english/news/20130513\\_28.html](http://www3.nhk.or.jp/nhkworld/english/news/20130513_28.html)

The operator of the damaged Fukushima Daiichi nuclear power plant has failed to persuade local fishermen on a plan to release groundwater into the sea before it seeps into the reactor buildings.

Tokyo Electric Power Company, or TEPCO, on Monday briefed the fishermen on its plan to dig 12 wells in the plant compound. Groundwater would be pumped from the wells and out to the sea nearby.

TEPCO says contaminated water from the crippled reactors has increased 400 tons per day and that to reduce this, it needs to lessen the amount of groundwater seeping into the reactor buildings.

The utility says the plan will cut the daily volume of contaminated water by 100 tons. It also says groundwater radiation levels are now as low as those in nearby rivers.

But the fishermen say some of their colleagues are worried because they can't know the difference between groundwater and contaminated water.

TEPCO says it will revisit the plan next month or a later time.

## **Waiting for Gov't to explain**

May 14, 2013

### **Govt. to explain TEPCO groundwater release plan**

[http://www3.nhk.or.jp/nhkworld/english/news/20130514\\_15.html](http://www3.nhk.or.jp/nhkworld/english/news/20130514_15.html)

Japan's industry minister is seeking understanding from fishermen for a plan by the operator of the Fukushima Daiichi nuclear plant to release groundwater into the ocean.

Toshimitsu Motegi told reporters on Tuesday that it is extremely important to prevent the groundwater from seeping into crippled reactor buildings.

He said securing local consent is a precondition for releasing the water, and that the government intends

to offer a full explanation to win understanding.

Plant operator Tokyo Electric Power Company failed to persuade local fisherman on Monday.

TEPCO plans to dig 12 wells in the plant compound to pump out groundwater before it gets into the contaminated reactor buildings.

The utility says the volume of contaminated water accumulating from the reactors has increased by 400 tons per day.

## Fierce anger and distrust from the rank and file

### Fukushima fishermen's distrust leads to rejection of TEPCO groundwater plan

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201305140090>

Tokyo Electric Power Co. officials underestimated Fukushima fishermen's **anger and distrust** toward the company whose failures continue to threaten their livelihoods.

After meeting fisheries leaders several times since last summer, utility officials believed they had won approval from a prefectural fisheries federation for a plan to reduce the amount of contaminated water at the stricken Fukushima No. 1 nuclear plant.

However, the fishermen themselves lashed out against TEPCO at a meeting in Iwaki, Fukushima Prefecture, on May 13.

**"An explanation from TEPCO alone will not be enough to win the confidence of union members,"** a participant at the meeting said.

TEPCO officials emphasized the safety of its plan to pump up groundwater at the plant and release it into the ocean before it can flow into the basements of reactor and turbine buildings and mix with highly radioactive water accumulated there.

**Some leaders of the Fukushima Prefectural Federation of Fisheries Co-operative Associations had agreed with TEPCO's plan.**



**However, opposition from rank-and-file members was so great that the federation ended up rejecting TEPCO plan.** Some members said that any water from the plant dumped into the sea would spread fears about the safety of their catches.

Officials of the Fukushima prefectural government and the central government's Fisheries Agency also attended the meeting.

Fishermen in the Tohoku region, especially Fukushima Prefecture, have been trying to regain a sense of normalcy in their operations since the Great East Japan Earthquake and tsunami on March 11, 2011, led to the triple meltdown at the plant.

Weeks after the accident, the utility announced that highly radioactive water had leaked from the reactor buildings into the sea, contaminating the sea bed and fish. The company also released several thousand tons of contaminated water into the ocean in the early stages of the crisis.

Fukushima Prefecture has been fighting an uphill battle to convince the public that its products are safe from radiation contamination.

However, **every report about water leaking or being released from the nuclear plant fuels fears of radiation and raises alarm among the local fishermen.**

In the northern part of Fukushima Prefecture, where the contamination of seafood has been lower than in other areas, the Soma-Futaba fishermen's union is preparing for full-fledged operations.

Since last June, the union has been distributing its catch based on trial operations. The types of marine products union members now catch have expanded to 16, and distribution has branched out to more markets.

The Iwaki fishermen's union is also preparing to resume operations on a trial basis.

But the Soma-Futaba union considered suspending its trial operations after radioactive water stored in underground tanks at the nuclear plant was found to have leaked into the ground in April. Distributors called the Soma-Futaba union to ask if its marine products were safe for sale.

“If something happens at the plant, it will directly hit the image of local products,” said an official with a local marine food processor.

One senior union member who attended the May 13 meeting said the leaks reported in April “heightened anxiety among fishermen and their distrust of TEPCO.”

The leaks have also compounded the difficulties in storing water used to cool the melted and spent fuel at the plant. The lack of storage space is hindering the company’s overall plan to decommission the reactors.

Of the estimated 380,000 tons of contaminated water on the complex, 290,000 tons are stored in tanks and other facilities.

About 400 tons of groundwater flows in daily through cracks in the reactor and turbine buildings apparently caused by the March 11 earthquake. TEPCO plans to reduce the flow to 300 tons by diverting the water to the sea.

Describing the May 13 meeting as “extremely important,” TEPCO officials sought to win consent by showing the results of a study by the company and a third party on the quality of the groundwater.

Radioactive levels of groundwater at the plant were 0.02 to 0.18 becquerel per liter, compared with 1 to 2 becquerels per liter detected in rivers near the plant, TEPCO said.

Although the federation opposes the release of contaminated water, it was initially inclined to accept the utility’s plan for the groundwater.

“(The federation) would be better off letting it happen because **TEPCO will have no choice but to release contaminated water into the sea if its system to handle radioactive water falls apart,**” a federation official said.

**The utility had assumed the federation would cooperate with the plan and was prepared to start releasing the groundwater into the sea the day after the meeting.**

However, one union leader said before the meeting that most members at his union were opposed to the plan.

Tetsu Nozaki, who heads the federation, acknowledged after the meeting that a consensus was reached at the federation's top level, but not among individual members.

**“Even if it is groundwater, damage to the public perception of fishing will be unavoidable and could hurt our trial operations,”** a member said.

One union leader noted that there was confusion among fishermen about the water to be released under TEPCO's plan.

“Many of our members got a wrong idea that contaminated water would be dumped into the sea after being treated,” the leader said at the meeting. “If that is the case, then it will be impossible for consumers to understand (the difference between groundwater and treated water).”

Although surprised at the outcome of the meeting, TEPCO officials acknowledged that past talks with federation officials alone have proved insufficient to win the backing of local fishermen.

“We should start all over,” a TEPCO official said.

Federation officials are trying to reduce distrust of TEPCO by holding briefings where the utility and the central government can explain the water-release plan to individual fishermen. The presence of government officials is expected to emphasize that TEPCO's plan is safe and in line with the central government's policy.

Tsunemasa Niitsuma, managing executive officer with TEPCO, said after the May 13 meeting that the company has yet to gain the full trust of Fukushima fishermen.

“It is important for us to proceed to the next step after gaining their firm understanding,” he said.

The utility intends to complete the briefing rounds for union members in about a month.

The federation comprises six unions, with a total of 1,499 members.

## **Some margin of error**

May 17, 2013

## **TEPCO: Less water than initially thought leaked from nuke plant tanks**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201305170053>

A significantly smaller amount of radioactive water than originally believed leaked from underground storage tanks on the grounds of the Fukushima No. 1 nuclear power plant, according to new estimates by Tokyo Electric Power Co.

**TEPCO said May 16 an estimated 300 liters of radioactive water escaped from the No. 2 storage tank, down from the 120,000 liters the utility initially estimated on April 6.** The water leaks were first spotted at the No. 2 tank on April 5, followed by similar leaks found at the No. 3 tank on April 7, and the No. 1 tank on April 9.

On May 16, the utility also estimated **the combined amount of radioactive water leaks from the No. 1 and No. 3 storage tanks at 90 liters maximum, which is 390 liters total leakage when the three tanks are combined.**

TEPCO officials added that only an estimated maximum of 30 liters escaped into the soil, with the bulk of the radioactive leaks remaining within a three-layered sheet structure of the storage tanks. They attributed the overestimation for the No. 2 tank to **errors in the readings of a water level gauge**, which were used to evaluate the amount of leakage.

The new estimates were derived from radioactive substance concentrations in the leaked water and other data, TEPCO officials said.

## **Leak in Fukushima plant tank far smaller than earlier estimated**

<http://mainichi.jp/english/english/newsselect/news/20130517p2g00m0dm005000c.html>

FUKUSHIMA, Japan (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear complex said Thursday that around 20 liters of radioactive water escaped from the first of three underground water tanks found to have leaked at the plant, much smaller than the earlier estimate of 120 tons.

Tokyo Electric Power Co. also said most of the 20 liters of water is believed to have remained within leak-detecting equipment located close to the No. 2 tank and did not seep into the soil.

TEPCO President Naomi Hirose told a press conference in Fukushima Prefecture that regardless of the volume, it was still "a fact" that leaks occurred at the plant, vowing to get to the bottom of the incidents.

The utility came up with the revised figure for the leaked water as it has been studying in detail a series of leaks confirmed in April from three of the plant's seven underground tanks. The incidents led the utility to decide to pump out all the contaminated water stored in the cisterns.

The handling of the radioactive water remains a challenge for TEPCO because the amount increases everyday as a result of continuing injections into the three reactors that suffered meltdowns during last year's nuclear crisis.

The underground cisterns were constructed to store part of the water but ended up being useless.

TEPCO has not yet determined exactly where the leak in the No. 2 tank occurred.

It also said the volume of polluted water that seeped into the soil from the Nos. 1 and 3 tanks was smaller than that from the No. 2 tank.

## **Reactor1 temperature rised after nitrogen gas injection**

Posted by **Mochizuki**

<http://fukushima-diary.com/2013/05/reactor1-temperature-rised-after-nitrogen-gas-injection/>

Since 5/14/2013, Fukushima Diary has been reporting the unusual increase of temperature in reactor1. (cf, Reactor1 reaching 49°C, increased by 3°C within 24 hours [URL])

On 5/17/2013, Tepco reported the temperature increased just after they injected nitrogen gas into PCV. (cf, Tepco to restart nitrogen gas injection into reactor1 [URL 2])

However last year, reactor1 temperature decreased when they injected nitrogen gas, which is the opposite reaction from now.

According to the minutes of mid/long term Fukushima measures meeting held on 10/22/2012, Tepco is aware of this strange connection between nitrogen gas injection and the temperature but doesn't know how it affects.

(cf, Tepco reported they don't know why nitrogen injection decreases the temperature of reactor1 [URL 3])

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130517\\_07-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130517_07-e.pdf)

## **Magnitude 6.0 quake hits North-East Japan**

May 19, 2013

## **Magnitude 6 quake rocks Tohoku region; no tsunami warning issued**

<http://www.japantimes.co.jp/news/2013/05/19/national/magnitude-6-quake-tohoku-region-no-tsunami-warning-issued>

Kyodo

An earthquake with a preliminary magnitude of 6.0 jolted the Tohoku region and surrounding areas Saturday afternoon, the Meteorological Agency said. No tsunami warning was issued.

On the Japanese seismic scale to 7, the 2:48 p.m. quake, which originated off Fukushima Prefecture at a depth of about 46 km, registered upper 5 in Ishinomaki, Miyagi Prefecture, and 4 in several parts of Miyagi as well as Fukushima, according to the agency.

Ishinomaki was one of the areas hard hit by the March 11, 2011, megaquake and tsunami.

So far no injuries have been reported, Miyagi police and firefighters said.

The agency believes the latest earthquake was an aftershock of the 2011 temblor.

"Aftershock activities have become less frequent but we urge the public to be careful, since there are also unusually strong aftershocks like this one (today)," an agency official said.

The quake caused no abnormalities at the Fukushima No. 1 and No. 2 nuclear power plants or the Onagawa plant in Miyagi Prefecture, according to the utilities that operate them.

Sendai airport briefly suspended flights to check the runways, while train services on the Tohoku Shinkansen Line were partially stopped for about six minutes, carriers said.

May 18, 2013

## **M6.0 quake jolts northeastern Japan, no tsunami warning issued**

<http://mainichi.jp/english/english/newsselect/news/20130518p2g00m0dm101000c.html>

TOKYO (Kyodo) -- An earthquake with a preliminary magnitude of 6.0 jolted northeastern Japan and surrounding areas Saturday afternoon, the Japan Meteorological Agency said. No tsunami warning was issued.

The 2:48 p.m. quake, which originated off Fukushima Prefecture at a depth of about 46 kilometers, registered an intensity of upper 5 on the Japanese seismic scale of 7 in parts of Miyagi Prefecture and 4 in other areas of Miyagi as well as Fukushima, according to the agency.

No abnormalities were caused by the quake at the Fukushima Daiichi and Fukushima Daini nuclear power plants in Fukushima Prefecture and the Onagawa plant in Miyagi Prefecture, according to the utilities that operate them.

Sendai airport briefly suspended flights to check the runways, while train services on the Tohoku Shinkansen Line were partially stopped for about six minutes, their operators said.

## Another overflow (1)

### **M5.9 caused further overflow of contaminated water, Tepco “The tank was full since yesterday”**

<http://fukushima-diary.com/2013/05/m5-9-caused-further-overflow-of-contaminated-water-tepco-the-tank-was-full-since-yesterday/>

At 14:48 5/18/2013, M5.9 hit Fukushima offshore.

(cf, M5.9 hit Fukushima offshore at 14:48 5/18/2013 (JST) [URL])

According to Tepco, this quake caused another overflow of contaminated water.

On 5/17/2013, Tepco had 27.5 m3 of contaminated water overflow from the tank of reactor5&6.

(cf, 27.5 m3 of contaminated water overflowed from tank of reactor5&6, “Forgot to switch the tanks” [URL])

Around 16:10 5/18/2013, Tepco employee found contaminated water overflowing from this tank again.

It’s assumed to be because the tank has been full since 5/17/2013. Tepco states it was only 4L to have overflowed, radiation level is lower than the detectable level.

Tepco is planning to decrease the water level of the tank.

[http://www.tepco.co.jp/cc/press/2013/1227452\\_5117.html](http://www.tepco.co.jp/cc/press/2013/1227452_5117.html)

[http://www.tepco.co.jp/cc/press/2013/1227456\\_5117.html](http://www.tepco.co.jp/cc/press/2013/1227456_5117.html)

## Another overflow (2)

Info from TEPCO :

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[http://www.tepco.co.jp/en/nu-news/2013/1227436\\_5484.html](http://www.tepco.co.jp/en/nu-news/2013/1227436_5484.html)

On May 16, sampling was performed in the drain holes of the underground reservoirs No.1-7 (14 locations), the leakage detection holes of the underground reservoirs No.1-4 and 6 (sample could not be collected at 2 out of 10 locations) and the observation holes of the underground reservoirs (22 locations). As a result, no significant change was found with the results compared to the previous analysis results (May 15). Though the all  $\beta$  density in the leakage detection hole (northeast) of the underground reservoir No.1 had slightly increased (to  $2.1 \times 10^3 \text{Bq/cm}^3$ ) on May 15, the density has decreased to  $9.2 \times 10^2 \text{Bq/cm}^3$  on May 16 which is equivalent to the concentration on May 14 ( $7.2 \times 10^2 \text{Bq/cm}^3$ ).

- At around 8:55 AM on May 17, a TEPCO employee preparing for yard watering found water overflowing from the upper part of Units 5-6 RO treated water tank. The leakage stopped after closing the valve at 9:00 AM on the same day. As a result of site inspection, the leakage area was found to be about 3m x about 20m. The leakage amount is estimated to be  $27.5 \text{m}^3$  based on the water levels of the D7 tank up to May 16 and the transfer amount of treated water. The water leaked from D7 tank is usually scattered within the power station site and the  $\gamma$  density and all  $\beta$  density of the water were below the detection limits (based on the sampling results obtained on May 16) (Cesium 137 detection limit:  $1.5 \times 10^{-3} \text{Bq/cm}^3$ , All  $\beta$  detection limit:  $2.3 \times 10^{-2} \text{Bq/cm}^3$ ). As a result of sampling performed on May 17 to ensure safety, the  $\gamma$  density and all  $\beta$  density of the water were below the detection limits (Cesium 137 detection limit:  $1.5 \times 10^{-3} \text{Bq/cm}^3$ , All  $\beta$  detection limit:  $2.4 \times 10^{-2} \text{Bq/cm}^3$ ). The leaked treated water has been absorbed into the ground. We consider that the leaked water will not flow into the sea because there are no side ditches near the location of the leakage, and because the source of the leakage is more than 100 m away from the sea. The treated water leakage was caused by overflow from the D7 tank, which is attributed to a failure to perform an operation to switch tanks from the D7 tank to the D8 tank, among eight treated water tanks (D1-D8) in total, while this operation was to be performed on May 16.

## IAEA "expert advice

May 19, 2013

### IAEA inspector backs pumping Fukushima groundwater into sea

<http://mainichi.jp/english/english/newsselect/news/20130519p2g00m0dm064000c.html>



VIENNA (Kyodo) -- A possible solution to the increasing amount of contaminated water inside the crisis-hit Fukushima Daiichi nuclear power plant could be to pump groundwater into the sea before it gets into the reactor buildings, as planned by the plant operator, the head of international inspectors has said.

"It will be very nice if they really get to bypass the main building through these systems -- through this direct pumping of the water to the sea or whatever it is. Because it is clean water," Juan Carlos Lentijo, head of a 13-member team of the International Atomic Energy Agency that inspected the plant last month, told Kyodo News in a recent interview.

Tokyo Electric Power Co. has created a system to direct part of the groundwater into the sea before it flows and seeps into the reactor buildings and mixes with highly radioactive water accumulating inside, increasing the amount by 400 tons a day, but has yet to win approval from local fishermen to discharge the water.

Lentijo, who is an expert on nuclear fuel cycles and waste technology, called the ongoing accumulation of water the biggest remaining problem at the site, given that it is possible a relatively stable condition at the reactors and spent fuel pools could be achieved.

He also said **decontamination of the accumulated water is a key factor for the future development and stability of the site.**

If such water is removed, "maybe they can go to the building and try to see what the problems are and try to repair these problems," he said.

As the Japanese government and TEPCO review their roadmap for decommissioning four reactors there, Lentijo called for a decision soon on the plant's "end-state," terming it a "very strategic decision" that will have a significant impact on the process as options range from the site's complete cleanup to its use for long-term storage or disposal of some radioactive materials.

Asked about the necessary time to clean up the plant, he called a 30- to 40-year period "realistic from the current knowledge," which results mainly from decommissioning efforts at previous incidents, while noting that **the situation in Fukushima is unique.**

But there still is "potentiality for future developments that could enhance the situation," he said, referring to a recently imposed research program which he said could help in speeding up the process by developing new efficient tools, instruments or methods for enhanced decommissioning.

His view will be included in a final report the team will deliver to the Japanese government on May 22, he added.

### **Press Release (May 18,2013)Oil Leakage from Unmanned Heavy Equipment Used for Debris Removal in Unit 3 Reactor Building at Fukushima Daiichi Nuclear Power Station (Follow-up Information)**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1227506\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1227506_5130.html)

This is follow-up information regarding oil leakage from the unmanned heavy equipment, which occurred today (May 18).

The leakage of oil used for the control of the unmanned heavy equipment was inspected using a monitoring camera, and we have estimated the leakage area to be approx. 5m x 4m, and the leakage amount to be 20L.

As to the leakage source, it is currently considered that the leakage was caused by coming off of a control hose at the front end of a hydraulic cutter of the unmanned heavy equipment. We will find details later.

The unmanned heavy equipment has been placed on the gantry installed near the upper part of Unit 3 Reactor Building. Thus, the oil has been spreading on the gantry, which is sufficiently far from the spent fuel pool. Therefore, the oil does not affect the spent fuel pool.

How to treat the leaked oil is under consideration.

## **Clean-up on radioactive floor**

May 20, 2013

### **Tepco had subcontract workers manually wipe out the leaking oil by rag beside reactor3**

<http://fukushima-diary.com/2013/05/tepco-had-subcontract-workers-manually-wipe-out-the-leaking-oil-by-rag-beside-reactor3/>

On 5/18/2013, Fukushima Diary reported “Remote-control heavy equipment leaked flammable oil on debris removal of reactor3, Tepco “Far enough from SFP” [URL]”

According to Tepco, they had **subcontract workers (Not Tepco workers) wipe out the leaking oil on the assembly base directly.**

Due to the high level of radiation, human workers can't get on the operation floor of reactor3. This is why they are removing the debris by using the remote-control heavy equipment.

Former Fukushima worker, Happy11311 commented on Twitter like this.

(cf, Debris removal of reactor3 sacrifices human worker to watch being significantly exposed [URL])  
As I tweeted below, the debris removal of the operation floor of reactor3 is really difficult. Because the operation floor of reactor3 is extremely radioactive, human workers can't work unlike on reactor4. Removing task is operated by remote controlling, but camera can't cover the sight adequately sometimes.

The assembly base, where the heavy equipment leaked oil is located beside the extremely radioactive reactor3.

**The subcontract workers wiped it out by oil adsorption mat and rag. The exposure dose is not reported.**

## Diluting tritium not the only problem for TEPCO

May 21, 2013

### Fukushima No. 1 can't keep its head above tainted water

<http://www.japantimes.co.jp/news/2013/05/21/reference/fukushima-no-1-cant-keep-its-head-above-tainted-water/#.UZsvTkpsFEs>

by Reiji Yoshida  
Staff Writer

More than two years into the triple-meltdown crisis at the Fukushima No. 1 power plant, workers continue to wage a desperate battle to keep the stricken reactors cool while trying to contain the 400 tons of radioactive water produced by the process each day.

Tokyo Electric Power Co. must decommission the three reactors, but the water is thwarting the effort. The decommissioning, if it ever starts, will take decades.

Here are some questions and answers on the encroaching problem and its implications for public health and the environment:

### **Why is radioactive water accumulating and how much is there?**

As of May 7, Tepco had routed 290,000 tons of radioactive water into some 940 huge tanks at the complex, but 94,500 tons remain inside the basement floors of the reactor buildings and other facilities.

Tepco must perpetually pour water over the melted cores of reactors 1, 2, and 3 via makeshift systems to prevent the fuel from melting and burning again.

But the cores' containment vessels were damaged by the meltdowns, allowing the highly radioactive coolant water to leak and flow into the basements. The dangerous radiation levels have prevented workers from getting close enough to fully assess the damage, let alone start the decommissioning process.

Compounding the problem is some 400 tons of groundwater that is also entering the basements of the tsunami- and explosion-damaged buildings, mixing with the leaking coolant water.

Tepco has been operating a water-recycling system to drain the basements that is supposed to extract cesium before recirculating the water back to the reactors. But the added inflow of the groundwater is exacerbating the threat.

In response, all Tepco has been able to do is build more storage tanks.

### **What problems will the water eventually pose?**

Tepco says there is a limit to how many tanks the complex can accommodate before the site runs out of storage space.

Tepco said it can boost storage capacity from 430,000 tons from this year to 700,000 tons by mid-2015 by clearing a forest and other space in the compound. The move is expected to buy them about three years' time.

Tepco is proposing some of the water be dumped into the sea after processing it to remove most, but not all, radioactive isotopes. Local fishermen strongly oppose the plan as it will taint the image of their produce.

Previous discharges into the Pacific have effectively contaminated the sea. Failure to store it means it will probably flood the whole compound and end up in the ocean anyway.

Neither Tepco nor government experts have come up with any other viable solutions.

### **Will the processed water pose health or environmental risks?**

According to Tepco, the processed water could theoretically be safe, but fishermen and consumers disagree.

Tepco has been using an advanced liquid processing system made by Toshiba Corp. to decontaminate the coolant water.

ALPS can bring the density of 62 main radioactive substances below detectable levels, including strontium and plutonium.

Tritium is the exception, however. **Tepco says the tritium level in the contaminated water is between 1 million and 5 million becquerels per liter. The legal limit is 60,000.**

Tepco thus wants to dilute the water to bring the tritium density below the legal limit by dumping it into the sea. It has promised not to dump any without gaining the nod of local fishermen first.

**Tritium, a common hazard at nuclear plants, can increase the risk of cancer if ingested and has a half life of 12.3 years. It is about 1,000th as radioactive as cesium-134 and -137.**

### **Are there other concerns over water-related facilities?**

Tepco revealed on April 5 that radioactive water stored in makeshift cisterns with coamings and surface covers were leaking into the soil.

This forced the utility to stop using the reservoirs, which were basically lined trenches with lids, and pump some 24,000 tons of tainted water out of them and into aboveground tanks.

The transfer is expected to be finished later this month.

Experts also are worried about the integrity of the 940 aboveground tanks built as of April 1, since 280 of them are considered “temporary” because they can only be used for up to five years. These are made of steel plates bolted together with waterproof packing to seal the seams, unlike welded steel tanks that offer a longer-term solution.

Tepco will need to start repairing or replacing the temporary tanks in spring 2016.

### **Tepco has dug 12 wells to intercept groundwater before it seeps into the reactor building basements. Will this work?**

Yes, but only to a certain extent.

The wells were dug on the mountainside above the damaged buildings. Tepco plans to pump up as much groundwater as possible to keep it from entering the basements as it heads to the sea.

But Tepco estimates the wells can only pump up 100 of the 400 tons leaking into the buildings every day.

Tepco was going to release the well water into the sea because its radioactivity is much lower than the safety standards for drinking water set by the World Health Organization.

It suspended the plan on May 13 after the local fisheries association vetoed the idea, fearing any further discharge would only worsen the already marred image of local seafood.

The Weekly FYI appears Tuesdays. Readers are encouraged to send ideas, questions and opinions to [hodobu@japantimes.co.jp](mailto:hodobu@japantimes.co.jp)

## Energy alternative

May 22, 2013

### **Energy companies to build thermal power plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20130522\\_29.html](http://www3.nhk.or.jp/nhkworld/english/news/20130522_29.html)

Two of Japan's biggest energy companies are cooperating to build a thermal power plant.

Officials at Tokyo Electric Power Company and Chubu Electric Power Company are in the final stages of negotiating the deal. They reportedly plan to sell the electricity outside their respective service areas.

This is a rare move for Japanese power companies, which are strictly regulated.

The 600-thousand-kilowatt coal-fired generator would be built in TEPCO's thermal power compound north of Tokyo.

Under the deal, TEPCO would sell about 70 percent of the electricity to businesses in the Tokyo metropolitan area. Chubu Electric would sell the remainder.

## Flap gate to prevent floods

### **Flood-prevention system eliminates need for electricity, human operators**

<http://ajw.asahi.com/article/economy/technology/AJ201305210056>

By DAISUKE SUDO/ Staff Writer

OSAKA--Engineers say they have created a flood-prevention system that runs on the forces of nature, eliminating the risk to human operators and problems caused by power outages.

The "flap gate," jointly developed by Kyoto University and machinery maker Hitachi Zosen Corp., can be used in sea walls to block tsunami and tidal waves or at building entrances to prevent inundation from torrential rain.

Hitachi Zosen showed the system to reporters at its headquarters in Osaka's Suminoe Ward on May 20.

The flap gate is essentially a gate affixed to the seabed or ground at the opening of a sea wall or the entrance to a building. In normal times, the board at the base of the gate lies flat.

If a surge in water reaches the sea wall or building, the flap gate's board automatically rises. Once the board is fully erected, the water pressure and buoyancy keep it in place to block the water.

The board is made of a special resin that is buoyant but strong enough to hold moving cars.

Currently, flap gates can work in spaces with a width of up to 10 meters and a height of 5 meters.

Hajime Mase, a professor of engineering at Kyoto University who specializes in disaster-prevention measures in coastal areas, said the big selling point of the flap gate was safety.

"The new system will not put humans in danger," he said.

Opening sections of sea walls are usually closed by humans via remote control.

After the Great East Japan Earthquake and tsunami on March 11, 2011, it became impossible to close sea walls by remote control due to a power outage. Many volunteer firefighters tried to close them manually, but they drowned in the towering waves.

Hitachi Zosen aims to achieve sales of 3 billion yen (about \$30 million) a year from the flap gates.

## **New remote-controlled robot**

### **Robot for nuclear decommissioning**

[http://www3.nhk.or.jp/nhkworld/english/news/20130522\\_40.html](http://www3.nhk.or.jp/nhkworld/english/news/20130522_40.html)

The government and Tokyo Electric Power Company say they plan to build a facility to develop a robot to help decommission the reactors at the Fukushima Daiichi nuclear plant.

Radiation levels in the plant are too high for workers to remove melted nuclear fuel rods.

**The government and TEPCO say they will develop a robot that can be operated remotely. They plan to**



build the facility in a town in Fukushima Prefecture, about 20 kilometers from the crippled plant.

The facility will include a life-size model of the containment vessel.

Workers will be trained to operate the robot at the facility.

The government and TEPCO hope to begin operating within 2 years.

May 23, 2013

## Not enough workers - Not enough qualified workers

### Stricken Fukushima nuke plant struggles to keep staff

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201305230104>

THE ASSOCIATED PRESS

Keeping the meltdown-stricken Fukushima nuclear plant in northeastern Japan in stable condition requires a cast of thousands. Increasingly the plant's operator is struggling to find enough workers, a trend that many expect to worsen and hamper progress in the decades-long effort to safely decommission it.

Tokyo Electric Power Co., the utility that runs the Fukushima No. 1 plant that melted down in March 2011 after being hit by a tsunami, is finding that it can barely meet the headcount of workers required to keep the three broken reactors cool while fighting power outages and leaks of tons of radiated water, said current and former nuclear plant workers and others familiar with the situation at Fukushima.

Construction jobs are already plentiful in the area due to rebuilding of tsunami ravaged towns and cities. Other public works spending planned by the government, under the "Abenomics" stimulus programs of Prime Minister Shinzo Abe, is likely to make well-paying construction jobs more abundant. And less risky, better paid decontamination projects in the region irradiated by the Fukushima meltdown are another draw.

Some Fukushima veterans are quitting as their cumulative radiation exposure approaches levels risky to health, said two long-time Fukushima nuclear workers who spoke to The Associated Press.

They requested anonymity because their speaking to the media is a breach of their employers' policy and they say being publicly identified will get them fired.

TEPCO spokesman Ryo Shimizu denied any shortage of workers, and said the decommissioning is progressing fine.

"We have been able to acquire workers, and there is no shortage. We plan to add workers as needed," he said.

The discrepancy may stem from the system of contracting prevalent in Japan's nuclear industry. Plant operators farm out the running of their facilities to contractors, who in turn find the workers, and also rely on lower-level contractors to do some of their work, resulting in as many as **five layers of contractors**. Utilities such as TEPCO know the final headcount--3,000 people now at the Fukushima plant--but not the difficulties in meeting it.

TEPCO does not release a pay scale at the Fukushima plant or give numbers of workers forced to leave because of radiation exposure. It does not keep close tabs on contracting arrangements for its workers.

A December 2012 survey of workers that the company released found 48 percent were from companies not signed as contractors with the utility and the workers were falsely registered under companies that weren't employing them.

It is not clear if any laws were broken, but the government and TEPCO issued warnings to contractors to correct the situation.

Hiroyuki Watanabe, a city assemblyman for Iwaki in Fukushima, who talks often to workers at the Fukushima No. 1 plant, believes the labor shortage is only likely to worsen.

"They are scrounging around, barely able to clear the numbers," he said. "Why would anyone want to work at a nuclear plant, of all places, when other work is available?"

According to Watanabe, a nuclear worker generally earns about 10,000 yen (\$100) a day. In contrast, decontamination work outside the plant, generally involving less exposure to radiation, is paid for by the environment ministry, and with bonuses for working a job officially categorized as dangerous, totals about 16,000 yen a day, he said.

Experts, including even the most optimistic government officials, say decommissioning the Fukushima plant will take nearly a half-century. TEPCO acknowledges that the exact path to decommissioning remains unclear because an assessment of the state of the melted reactor cores has not yet been carried out.

Since being brought under control following the disaster, the plant has suffered one setback after another.

A dead rat caused a power blackout, including temporarily shutting down reactor-cooling systems, and leaks required tons of water to be piped into hundreds of tanks and underground storage areas. The process of permanently shutting down the plant hasn't gotten started yet and the work up to now has been one makeshift measure after another to keep the reactors from deteriorating.

Thousands of spent nuclear fuel rods that are outside the reactors also have to be removed and safely stored. Taking them out is complex because the explosions at the plant have destroyed parts of the structure used to move the rods under normal conditions. The process of taking out the rods, one by one, hasn't even begun yet. The spent rods have been used as fuel for the reactors but remain highly radioactive.

One worker at the plant, who has gained a big following on Twitter because of his updates about the state of the plant since the meltdowns, said veteran workers are quitting or forced to cut back on working in highly radiated areas of the plant as their cumulative exposure rises.

"I feel a sense of responsibility to stick with this job," he told AP. "But so many people have quit. Their families wanted them to quit. Or they were worried about their children. Or their parents told him to go find another job."

Known as "Happy-san" to his 71,500 Twitter followers, he has worked in the nuclear industry for 20 years, about half of that at Fukushima. He has worked at bigger contractors before, but is now at a mid-level contractor with about 20 employees, and has an executive level position.

"If things continue the way they are going, I fear decommissioning in 40 years is impossible. If nuclear plants are built abroad, then Japanese engineers and workers will go abroad. If plants in Japan are

restarted, engineers and workers will go to those plants,” he said in a tweet. Most of Japan's nuclear plants were shut for inspections after the Fukushima disaster.

His cumulative radiation exposure is at more than 300 millisieverts. Medical experts say a rise in cancer and other illnesses is statistically detected at exposure of more than 100 millisieverts, but health damage varies by individuals.

He was exposed to 60 millisieverts of radiation the first year after the disaster and gets a health checkup every six months.

Nuclear workers generally are limited to 100 millisieverts exposure over five years, and 50 millisieverts a year, except for the first year after the disaster when the threshold was raised to an emergency 100 millisieverts.

The workers handle the day-to-day work of lugging around hoses, checking valves and temperatures, fixing leaks, moving away debris and working on the construction for the equipment to remove the spent fuel rods.

Other jobs are already so plentiful that securing enough workers for even the more lucrative work decontaminating the towns around the plant is impossible, according to Fukushima Labor Bureau data.

During the first quarter of this year, only 321 jobs got filled from 2,124 openings in decontamination, which involves scraping soil, gathering foliage and scrubbing walls to bring down radiation levels.

“There are lots of jobs because of the reconstruction here,” said bureau official Kosei Kanno.

A former worker at the Fukushima plant, who switched to a decontamination job in December, said he became fed up with the pay, treatment and radiation risks at the plant. He has 10 years of experience as a nuclear worker, and grew up in Fukushima.

He warned it would be harder to find experienced people like him, raising the risk of accidents caused by human error.

He accused TEPCO of being more preoccupied with cost cuts than with worker safety or fair treatment. The utility went bankrupt after the disaster and was nationalized by a government bailout. Even if TEPCO somehow obtains workers in quantity in coming months, their quality would deteriorate, he said.

"We're headed toward a real crisis," said Ryuichi Kino, a free-lance writer and photographer who has authored books about the nuclear disaster and has reported on TEPCO intensively since March 2011.

Under the worst scenario, experienced workers capable of supervising the work will be gone as they reach their radiation-exposure limits, said Kino.

He believes an independent company separate from TEPCO needs to be set up to deal with the decommissioning, to make sure safety is not being compromised and taxpayer money is spent wisely.

Watanabe, the assemblyman, said the bigger nuclear contractors may go out of business because they are being under-bid by lower-tier companies with less experienced, cheaper workers. That is likely to worsen the worker shortages at the skilled level, he said.

Happy-san has the same fear. Some of the recent workers, rounded up by the lesser contractors, appear uneducated and can't read well, he said.

Although life at the plant has calmed compared to right after the disaster, Happy-san still remembers the huge blast that went off when one of the reactors exploded, and rubble was showering from the sky for what felt like an eternity.

"We had opened the Pandora's box. After all the evil comes out, then hope might be sitting there, at the bottom of the box, and someday we can be happy, even though that may not come during my lifetime," he said.

## **Even AIEA admits to "high degree of uncertainty"**

### **IAEA Outlines 'Challenges And Uncertainty' For Fukushima Decommissioning**

<http://www.nucnet.org/all-the-news/2013/05/23/iaea-outlines-challenges-and-uncertainty-for-fukushima-decommissioning>

Relatively stable cooling of fuel and fuel debris in the reactors and spent fuel pools has been established at Fukushima-Daiichi, but there are still “several challenges” to be met before “a sustainable situation” is achieved at the plant, the International Atomic Energy Agency has said.

In a report released yesterday, the IAEA said the continuing accumulation of contaminated water at the site is influencing the stability of the situation and must be resolved in the near term before other recovery and decommissioning steps can begin.

The report also warned that “a high degree” of uncertainty is influencing some of the key aspects which form the basis for progress at the nuclear site.

The most important is the “unknown detailed radiological and physical situation” inside the reactor pressure vessels and the integrity of the units’ primary containment vessels.

The status and the location of the fuel debris, the extent of the structural damage and the loss of integrity of the structures and components, as well as the magnitude of the contamination are not well known, the report said.

The condition and the location of the fuel debris have to be determined in order to plan for its removal and to develop adequate technologies. The removal of the debris is a prerequisite for decommissioning.

For ensuring the long term stability of the fuel and fuel debris cooling, efforts must continue to improve the reliability of essential systems, to assess the structural integrity of the site facilities and to improve protection against external hazards, the report said.

Considering the magnitude of the accident consequences, achievement of an “end state” for Fukushima-Daiichi will present a challenging task for several decades, the report concluded.

In the report, the IAEA said whether all the radiation-contaminated material at the plant will be removed, some structures including waste facilities will be left, or the site will be used for power generation in the future is of “crucial” importance to waste management strategy.

The decommissioning will require deployment of “very large human and financial resources” and will involve generation and management of huge amounts of waste, including retrieval of the waste from the existing temporary waste storage sites and its proper disposal.

The report said adequate waste disposal facilities or long-term storage sites with adequate capacity will have to be made available in time to support a programme of such magnitude.

The report acknowledges Japanese accomplishment and provides advice on a range of issues, including overall strategy and planning, stakeholder involvement, and the management of reactor fuel.

The report follows an invitation by Japan for the IAEA to carry out an independent peer review of

decommissioning plans for Fukushima-Daiichi units 1 to 4.

The review has been organised in two steps, with the first part carried out in Japan from 15 to 22 April 2013.

The decommissioning roadmap was released in December 2011 by the Ministry of Economy, Trade and Industry (METI).

It calls for the four Fukushima-Daiichi units to be decommissioned in three phases with the final phase taking up to 40 years. However, this phase might not begin for another 10 years, allowing time for the removal of spent fuel and other debris.

Phase one will last two years and involve starting the removal of spent fuel from the spent fuel pools.

Units 1, 2 and 3 at the six-unit plant were in commercial operation at the time of the March 2011 accident and all suffered reactor core and fuel damage.

Unit 4 was offline and was not loaded with fuel, but the reactor building was severely damaged by a hydrogen explosion.

The IAEA report is online:

[www.iaea.org/newscenter/focus/fukushima/missionreport230513.pdf](http://www.iaea.org/newscenter/focus/fukushima/missionreport230513.pdf)

**Related reports in the NucNet database (available to subscribers):**

- Japan Releases Roadmap For Fukushima-Daiichi Decommissioning (News in Brief No.251, 21 December 2011)

## Checking ocean off Fukushima

May 24, 2013

### **Nuclear Watch NHK : Studying waters off Fukushima**

<http://www3.nhk.or.jp/nhkworld/newsline/201305242019.html>

international team wants to check how much groundwater from the Fukushima site gets into the ocean (contaminating it)

## Leaking underground reservoirs and alternate transfer

May 28, 2013

### **Press Release (May 28,2013)Water Leak from the Underground Reservoirs in Fukushima Daiichi Nuclear Power Station (Follow-up Information No.179)**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1227833\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1227833_5130.html)

This is follow-up information regarding the water leak from the underground reservoirs at Fukushima Daiichi NPS.

An alternating transfer between the underground reservoir No.3 and the underground reservoir No.6 to G6 tank will be conducted since they are sharing the same transfer line.

The water transfer from the underground reservoir No.3 to G6 area tank was started at 10:25 AM on May 25 and **temporarily suspended** at 9:05 AM today (May 28).

The transfer line will be switched from the underground reservoir No.3 to the underground reservoir No.6 and the water transfer from the underground reservoir No.6 to G6 area tank was started at 9:54 AM today.

[http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts\\_130528\\_02-e.pdf](http://www.tepco.co.jp/en/nu/fukushima-np/handouts/2013/images/handouts_130528_02-e.pdf)

## Freeze Fukushima Daiichi

May 29, 2013

### **"Frozen wall" considered for nuclear plant water**

[http://www3.nhk.or.jp/nhkworld/english/news/20130530\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20130530_02.html)

The operator of the disabled Fukushima Daiichi nuclear power plant is still struggling to control the flow of groundwater into the reactor buildings 2 years after the accident.

A government panel is now proposing that a "frozen wall" be built around the buildings to prevent



groundwater from seeping into the site.

The panel has been discussing measures against the groundwater since April when leaks were found in underground storage pools for contaminated water.

One measure being considered is to pump up the groundwater before it reaches the reactor site and release it into the ocean.

But the panel members say it would be difficult to contain 400 tons of groundwater per day. Fishermen also oppose the plan.

Another plan would be to bury coolant pipes and freeze the ground around the reactor buildings in order to make "frozen walls".

The panel members say the new plan comes with some technical difficulties. The operator would need to make sure that the groundwater level does not drop too much or else the contaminated water inside the site could seep out.

The panel will finalize the plan at a meeting on Thursday. It will call on the government and Tokyo Electric Power Company to urgently consider the plan.

May 29, 2013 - Updated 21:01 UTC

## Earthquake or tsunami?

### **New probe into Fukushima accident launched**

[http://www3.nhk.or.jp/nhkworld/english/news/20130530\\_08.html](http://www3.nhk.or.jp/nhkworld/english/news/20130530_08.html)

Japan's nuclear regulators are launching a new probe into the causes of the Fukushima Daiichi nuclear accident 2 years after it occurred.

The government, Diet and an independent panel have already compiled accident reports. Plant operator Tokyo Electric Power Co. has also finished its own probe. But experts say many questions have been left unanswered.

5 officials from the Nuclear Regulation Authority will enter the plant's No. 1 reactor building to try to clear up one of the key questions.

**The authority wants to know if the March 11 earthquake damaged the reactor's cooling system before the arrival of a massive tsunami.**

The Diet's investigation panel suggested that the quake had first damaged the system.

The officials will check the 4th floor of the building, where utility workers witnessed water leaking near a reactor cooling system immediately after the earthquake hit.

TEPCO says the leaked water originated from a fuel pool that leaked into the building's air-conditioning system so the officials also plan to check the system.

High radiation will limit the visit to just over 10 minutes.

The Authority will discuss the findings at its next meeting in June. The findings will be used to determine safety strategies at nuclear plants.

May 31, 2013

## Grout this water out!

### **Tepco considers to fill Torus room with grout to stop ground water flowing in**

<http://fukushima-diary.com/2013/05/tepcu-considers-to-fill-torus-room-with-grout-to-stop-ground-water-flowing-in/>

On 5/30/2013, Fukushima Diary reported "Tepco to consider freezing ground for 1400m to stop ground water flowing into the plant [URL]"

Additionally, the committee of experts suggested Tepco **to fill the torus room with grout.**

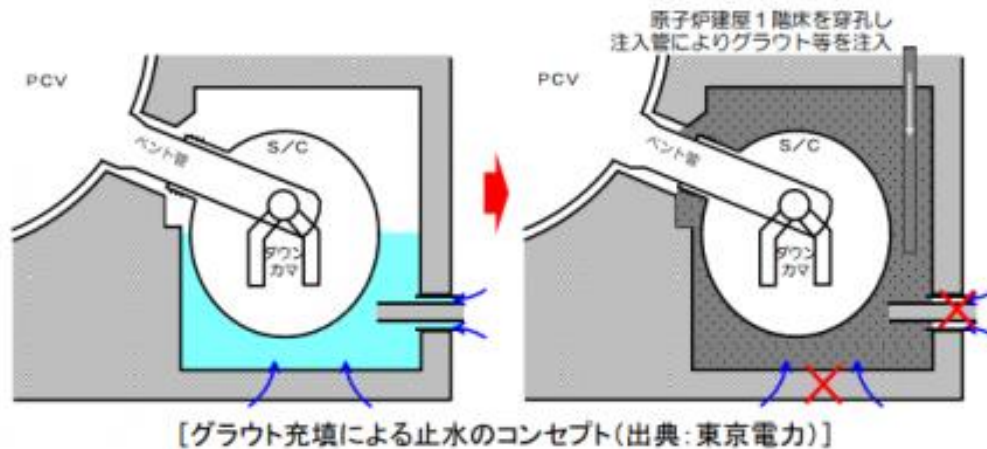
They state it stops ground water flowing into the plant.

Tepco plans to conduct the feasibility study **with United States Department of Energy** this year.

However, they need to evaluate if it doesn't affect installation of the PCV circulating coolant system and the entire decommissioning plan.

They assume it takes 1.5 years to make planning, and 2 years to inject the grout material. **(3.5 years in total)**

The committee points out the benefit of using grout is it doesn't directly touch the molten fuel. However, **it hasn't been confirmed that the fractured molten fuel is not really in the torus rooms.**



## Frozen soil wall to block radioactive water

### Gov't orders TEPCO take measure to halt radioactive water increase

<http://mainichi.jp/english/english/newsselect/news/20130531p2g00m0dm035000c.html>

TOKYO (Kyodo) -- The government told Tokyo Electric Power Co. on Thursday to take action to prevent radioactive water from further increasing at its Fukushima Daiichi complex by building shielding walls in the ground by freezing the soil around the crippled reactor buildings.

The frozen soil, to be created by circulating coolant underground, is intended to block massive amounts of groundwater from seeping into the reactor buildings, where it gets contaminated by radioactive substances. The government expects the system to be in use from the first half of fiscal 2015.

According to a report compiled by a government panel on Thursday, there are no previous examples of walls to intercept water, created from frozen soil, being used for longer than a few years, making the project at the Fukushima plant "an unprecedented challenge in the world."

Economy, Trade and Industry Minister Toshimitsu Motegi told TEPCO President Naomi Hirose that the project is "very challenging" but drastic measures should be taken to address "one of most serious problems" in the process of decommissioning the plant's four units, which is expected to continue up to 40 years or so.

About 400 tons of groundwater seep into the reactor buildings every day, flowing into the lengthy and complicated water circulation loop that keeps the plant's damaged reactors cool. This means that the total volume of toxic water is increasing by the same amount daily.

TEPCO once considered building walls to intercept water after the plant was crippled by a huge earthquake and tsunami in March 2011, but it abandoned the idea due to fears that change in water pressure could lead contaminated water accumulating inside the reactor buildings to flow onto the soil outside.

The risks will remain even after the creation of walls with frozen soil, a method originally proposed by a contractor Kajima Corp., so TEPCO would have to control the level of water inside the reactor buildings such as by installing pumps.

To create frozen soil, pipes to run coolant will be inserted around the reactor buildings. The wall is expected to be 1.4 kilometers long and could be 30 meters deep in some areas, the industry ministry officials said.

According to one of the officials, the costs for creating the system will not become clear until details are worked out, but tens of billions of yen may be needed.

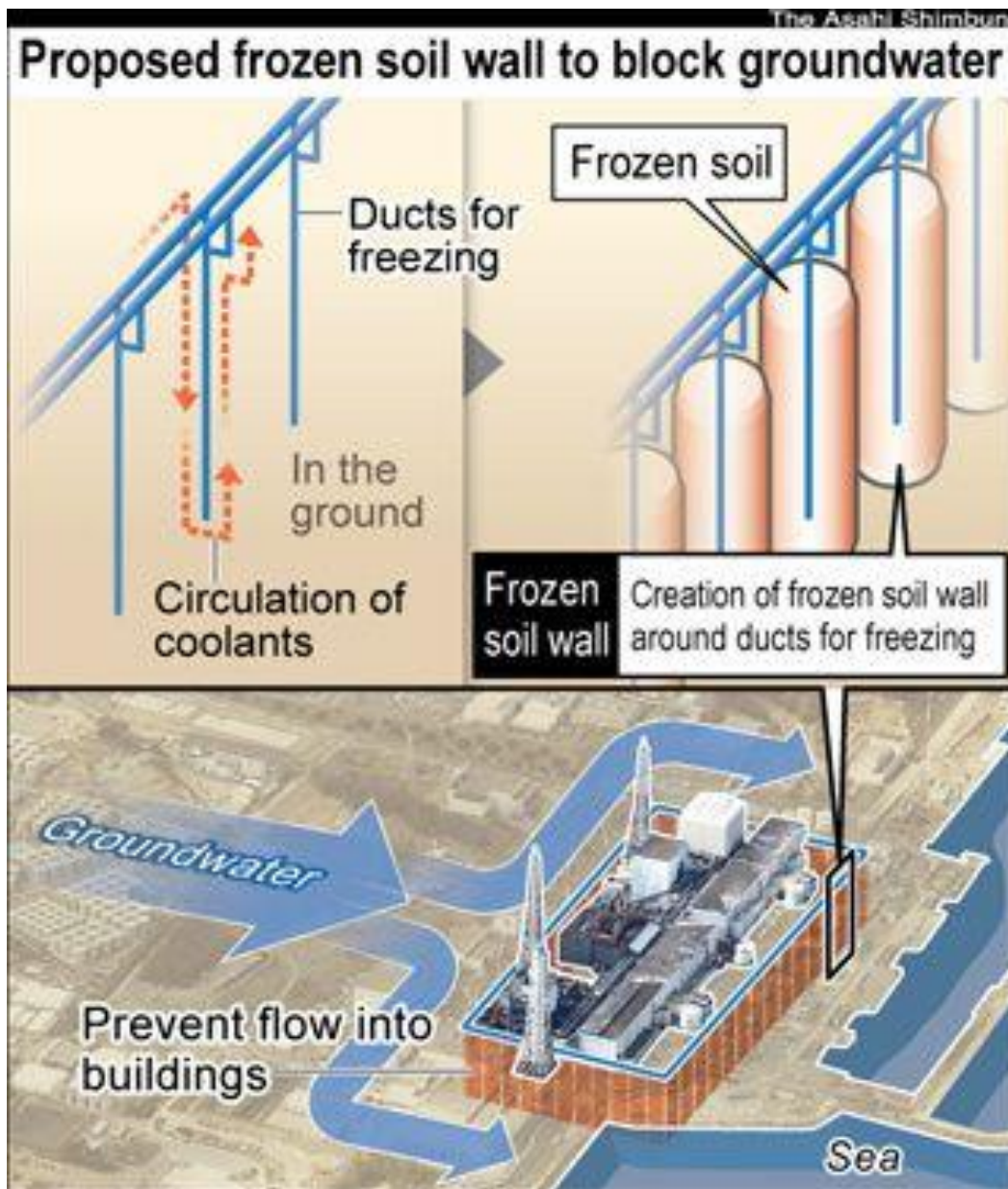
Motegi said the government will financially support the project's feasibility study by allocating part of the funds earmarked for research and development related to reactor decommissioning in the fiscal 2013 budget.

The problem of keeping massive amounts of radioactive water at the plant has drawn renewed attention after TEPCO recently found some underground water storage pools had leaked contaminated water and had to find a secure storage space.

The government also requested TEPCO to build tanks to secure a total of 800,000 tons of water storage capacity by the end of fiscal 2016, compared from the current 330,000 tons.

# TEPCO told to freeze soil around reactor buildings to block groundwater

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201305310067>



The Asahi Shimbun

Tokyo Electric Power Co. will implement a "difficult" proposal to use walls of frozen soil to reduce the amount of groundwater flowing into reactor buildings at its crippled Fukushima No. 1 nuclear power plant.

A government committee working on measures to deal with water contaminated with radioactive materials submitted the proposal to industry minister Toshimitsu Motegi on May 30. Motegi then instructed TEPCO President Naomi Hirose to carry it out.

"From a technical viewpoint, it will be difficult to do so," a TEPCO official said, "but we will implement the proposal along with other measures."

According to the industry ministry's Agency for Natural Resources and Energy, the proposal to create frozen soil walls to block the flow of groundwater into the reactor buildings was made by Kajima Corp., a leading construction company.

The proposal will also be incorporated into the government's "middle- and long-term road map" to decommission reactors at the plant.

According to the proposal, ducts will be inserted into the ground around reactor buildings at intervals of 1 meter to a depth of up to about 30 meters. Then, coolants of about minus 50 degrees will be circulated in those ducts to freeze the soil. The frozen soil will then serve as a wall against groundwater.

The wall will be able to block more groundwater than other walls that are made of clays or crushed stones and can be constructed more quickly.

However, the cost of creating the system is expected to reach **several tens of billions of yen, and maintenance of the system will also entail considerable outlays**. There are no instances of the system being used for extended periods.

The government, TEPCO and construction companies will set up a joint working group in June at the earliest to design the system, with the goal of putting it into practical use in the first half of fiscal 2015.

Contaminated water at the plant is being produced and accumulated in reactor buildings when water is used to cool melted nuclear fuel. Now, groundwater flowing into those buildings through cracks made by earthquakes and other impacts is increasing the amount of contaminated water by 400 tons every day.

**The government estimates that the frozen soil walls will reduce the amount of groundwater flowing into the reactor buildings to 100 tons a day.**

TEPCO is also considering a "groundwater bypass" plan in which it digs wells around reactor buildings, pumps up groundwater before it flows into the buildings, confirms its safety and then dumps it in the sea.

However, local fishermen are opposed to the plan on grounds it may fan groundless rumors that fish caught in local waters are contaminated with radioactive materials. TEPCO and the government are now trying to dispel that fear by offering detailed explanations to the fishermen.

(This article was written by Shunsuke Kimura and Keisuke Katori.)

## Of the importance of math

### TEPCO's failure at math may have increased radiation release at Fukushima plan

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306050089>

By TOSHIHIRO OKUYAMA/ Senior Staff Writer

Workers miscalculated pressure levels inside a reactor during the early stages of the Fukushima nuclear crisis, leading to a reduction in cooling water and a possible increase in the volume of radioactive materials released.

Tokyo Electric Power Co. estimated the pressure inside the No. 2 reactor containment vessel at 400 kilopascals on March 16, 2011, five days after the Fukushima No. 1 nuclear plant was crippled by the Great East Japan Earthquake and tsunami.

The actual pressure was 40 kilopascals, far below the 101 kilopascals of the surrounding atmosphere, suggesting that a large amount of radioactive materials escaped from the reactor.

TEPCO later discovered the mistake but did not announce it. Instead, the correct pressure figures were included in a deluge of information released by the utility.

TEPCO concluded that pressure was rising on the afternoon of March 16 and halved the amount of water being injected into the No. 2 reactor on the morning of March 17.

Tadayuki Yokomura, chief of the company's Kashiwazaki-Kariwa nuclear plant in Niigata Prefecture, warned TEPCO officials against lowering the water level later that morning.

"I think the airtightness (of the containment vessel) has not been maintained," Yokomura said, according to a video footage of a TEPCO teleconference.

However, TEPCO further reduced the amount of water by midday, apparently fearing that flooding the reactor could lead to a rise in pressure that might cause an explosion.

TEPCO increased the amount of water in the late afternoon of March 17 because some officials suspected that much of the injected water was leaking out.

TEPCO noticed the mistake in the pressure level when it reconfirmed data more than a month later. The company said it cannot say whether the mistake affected the situation.

"Radiation levels were unchanged before and after the amount of water injected was changed," an official said.



The No. 2 reactor was considered the most dangerous at the Fukushima No. 1 nuclear plant early in the crisis. Cooling functions were lost on March 14, and the reactor melted down following the No. 1 and No. 3 reactors.

The difficulty in venting fueled concerns that mounting pressure could rupture the containment vessel and release lethal levels of radioactive materials.

Early on March 15, TEPCO temporarily evacuated all but the minimum required 70 or so workers from the plant compound.

Officials were closely monitoring pressure levels inside the containment vessel as an indicator of whether radioactive materials were contained within the reactor.

At TEPCO's news conference on the afternoon of March 16, reporters asked about the possibility that the containment vessel had already lost airtightness due to structural damage, and that the pressure inside had fallen to the level of the atmosphere.

Late on the night of March 16, a TEPCO official told reporters that the pressure was rising.

The company presented data that showed the pressure had increased from 220-240 kilopascals earlier in the day to 400 kilopascals or more between 7 a.m. and 2 p.m.

However, the actual figure was 40 kilopascals from early morning through noon.

According to TEPCO, workers thought the reading of a pressure gauge at the central control room was either 40 or 400 kilopascals past noon. However, they were unable to reconfirm the reading for fear of being exposed to high radiation levels.

Instead, workers calculated the pressure based on data from a system that suspends reactor operations if it detects an abnormal pressure rise. But they used a wrong conversion formula and erroneously concluded that it was 400 kilopascals.

TEPCO noticed the mistake in late April at the earliest. The company included corrected pressure figures when it distributed a large volume of electronic data--including figures for other reactors--at a news conference on May 16, 2011.

TEPCO officials did not clearly explain that the March 16 pressure data for the No. 2 reactor had been corrected.

The corrections went largely unnoticed. And the panels set up by the government, the Diet and TEPCO to investigate the nuclear accident failed to address the issue.

The Asahi Shimbun independently analyzed the data for the No. 2 reactor and has asked TEPCO to provide an explanation since April 2012.

"Workers applied a wrong conversion formula while they were preoccupied with dealing with the accident," a TEPCO public relations official said.

The official also indicated that there was no problem with the way the corrected figures were disclosed.

"We compiled and provided as much information as possible while giving priority to recovery operations at the plant," the official said.

## **New photos of inside No.1**

June 5, 2013



## **NRA releases images of debris inside Fukushima reactor building**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306050085>

By JIN NISHIKAWA/ Staff Writer

The Nuclear Regulation Authority released some of the images on June 4 of damaged equipment that was used to cool a reactor at the Fukushima No. 1 nuclear power plant.

The nuclear watchdog inspected the plant on May 30-31 to examine the isolation condensers in the No. 1 reactor building after the Diet investigatory panel said the condensers could have been damaged by the Great East Japan Earthquake on March 11, 2011, before the tsunami struck.

The NRA plans to scrutinize the images and start discussions this month to determine if the equipment was damaged by the 9.0-magnitude temblor.

The images show a large amount of debris scattered on the floor, and that some heat insulating materials wrapping the condensers had peeled away, apparently as a result of the March 12, 2011, hydrogen explosion at the No. 1 reactor building, operated by Tokyo Electric Power Co.

The isolation condensers cool steam from the reactor's pressure vessel, condense it into water and return the cooling water into the reactor. Installed solely in the No. 1 reactor building, the condensers were designed to function even without a power source in an emergency.

During the May inspection, the investigators were able to remain on the fourth floor of the building--where the condensers were installed--for only 15 minutes due to high levels of radiation, which were measured at 20-30 millisieverts per hour.

Whether the condensers were damaged before the tsunami has been at the center of debate because of the implications with regard to the adequacy of anti-quake preparedness at the Fukushima power plant and other nuclear facilities.

Experts believe that the condensers failed, contributing to a meltdown at the No. 1 reactor taking place earlier than expected. The melting of fuel rods in the reactor began several hours after the quake and tsunami.

The Diet's Fukushima Nuclear Accident Independent Investigation Commission pointed out the possibility in its report last year that the condensers were damaged by the quake before the subsequent tsunami struck the facility.

Engineers working near the condensers at the time of the quake and tsunami told the panel that they saw water leaking before the tsunami inundated the plant.

But the government's Investigation Committee on the Accident at the Fukushima Nuclear Power Stations concluded that there were no signs indicating damage stemming from the quake.

The NRA's recent inquiry came after a TEPCO official dissuaded members of the Diet panel in February 2012 from conducting an on-site survey by misinforming them that it was "pitch dark" inside the facility and unfit for inspections.

## **New photos of Reactor 4**

On the site of Masaichi Shiozaki

<http://www.tepco.co.jp/nu/fukushima-np/past-progress/images/130523.pdf>

This is a report of 180 photographs regarding the fourth reactor that TEPCO submitted to Nuclear Regulatory Authority on May 23, 2013.

shooting date: Oct 5th and Nov 8th of 2011.

## Overground tank built to replace underground leaking pools leaking too

### TEPCO reports another leak at Fukushima

[http://www3.nhk.or.jp/nhkworld/english/news/20130605\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20130605_25.html)

The operator of the Fukushima Daiichi nuclear plant has reported another leak of radioactive water, this time **from a steel storage tank above ground.**

Tokyo Electric Power Company officials say a worker found the leak shortly after noon on Wednesday.

The tank is one of those built at the plant since May **to store contaminated water transferred from storage pools underground.**

**The utility built the tanks after finding a series of leaks in April in the underground pools.**

TEPCO officials say the contaminated water was seeping from a joint in the tank, at a rate of **one drop every 3 to 4 seconds.**

They report that bolts at the joint were tightened. They stopped water transfer and are investigating the cause.

The officials say no changes were detected in radioactivity levels at monitoring points near the plant.

The tank is about 400 meters from the sea. TEPCO officials say there is no risk of contaminated water reaching the sea.

## Radiation monitoring helicopter

## Chiba University invents unmanned helicopter to monitor radiation levels

<http://mainichi.jp/english/english/newsselect/news/20130605p2a00m0na010000c.html>

The unmanned helicopter takes off on a demonstration flight at Chiba University. (Mainichi)



CHIBA -- A team of engineers has invented a small unmanned helicopter that can be used for monitoring radiation levels around the crippled Fukushima No.1 nuclear power plant. The aircraft has been drawing attention for its ability to cruise without the use of remote control.

Kenzo Nonami, a professor at Chiba University, and his lab team produced the 1.5-meter-long helicopter that can carry up to 10 kilograms of equipment. It has enough power to rise to a latitude of 100 meters using GPS to identify its flight location. Since it can fly using an autopilot system, the helicopter could be used for tasks that are too dangerous for humans, including monitoring radiation levels and for dispersing agrichemicals.

In December the owner of a machine manufacturer from the village of Iitate, Fukushima Prefecture, asked Nonami, who is known for his development of small unmanned helicopters, to invent a device for observing radiation levels around mountain regions near the nuclear plant where radiation levels are too high for humans to investigate.

The team tested the helicopter in Fukushima at the end of May. The creators aim to improve the machine to be able to carry up to 20 kilograms. At present the helicopter battery only lasts for 15 minutes, so the team is working on a system in which the batteries automatically switches over to a backup.

"We'll continue improving the machine for speedy research at sites where people can't get close," Nonami said.

## **Photos of no.1 reactor**

### **Nuke regulators inspect damaged Fukushima reactor building to analyze disaster**

<http://mainichi.jp/english/english/newsselect/news/20130605p2a00m0na018000c.html>



NRA officials inspect the fourth floor of the damaged No. 1 reactor building at the Fukushima No. 1 Nuclear Power Plant on May 31. (Photo courtesy of the NRA)

The Nuclear Regulation Authority (NRA) has inspected the badly-damaged reactor building of the No. 1 reactor at the Fukushima No. 1 Nuclear Power Plant for the first time as part of its efforts to analyze the possible causes of the nuclear disaster.

The NRA released photographs of the interior of the fourth floor of the No. 1 reactor building on June 4. The Diet's task force investigating the accident at the Fukushima nuclear complex had abandoned its efforts to inspect the fourth floor of the reactor building after receiving a false explanation by the Tokyo Electric Power Co. (TEPCO), the operator of the Fukushima nuclear station, that "It is in complete darkness." Therefore, it is the first time that a nuclear regulatory body has inspected the damaged facility for the purpose of analyzing the accident.

The photographs released by the NRA include those of the emergency cooling system called the "isolation condenser (IC)" whose piping the Diet's investigative panel suggested could have been damaged by the March 11, 2011 Great East Japan Earthquake as well as those of the spots in the building from which workers said water was gushing out immediately after the earthquake.

The NRA is due to analyze the photographs and video footage. It then plans to present its views on possible causes of the nuclear disaster, including its opinion pointing to the possibility that the emergency cooling system was actually damaged by the earthquake, at a meeting of experts tasked with analyzing the causes of the disaster to be held as early as by the end of June.

June 5, 2013

### **Photos released of Fukushima reactor probe**

[http://www3.nhk.or.jp/nhkworld/english/news/20130605\\_15.html](http://www3.nhk.or.jp/nhkworld/english/news/20130605_15.html)

Japan's nuclear regulators have released photographs of their first on-site investigation of the 2011 accident at the Fukushima Daiichi nuclear power plant.

The new investigation by the Nuclear Regulation Authority is focused on whether the March 11 earthquake damaged the plant's No. 1 reactor's cooling system before the arrival of a massive tsunami.

The authority released 4 photographs shot on the 4th floor of the No.1 reactor building. They were shot by 5 officials from the authority's secretariat last Friday.

The photos show the cooling system's red water tank and air-conditioning system in which parts were displaced and damaged.

Utility workers say they saw water leaking on the 4th floor near the tank immediately after the earthquake hit. The plant's operator, Tokyo Electric Power Company, says the water came from a fuel pool on the floor above and leaked into the air-conditioning system.

Nuclear regulators only stayed on the 4th floor of the reactor building for about 15 minutes due to high radiation levels.

The officials' highest reading for exposure was 4.8 millisieverts which is about 5 times Japan's maximum permissible dose per year for the general public.

The regulators say they shot hundreds of photographs and 40 minutes of video.

### **The New York Times on tank leak**

## Leak Found in Steel Tank for Water at Fukushima

By MARTIN FACKLER

[http://www.nytimes.com/2013/06/06/world/asia/tepcosayswateratfukushimaiscontaminated.html?\\_r=1&](http://www.nytimes.com/2013/06/06/world/asia/tepcosayswateratfukushimaiscontaminated.html?_r=1&)

TOKYO — The operator of the stricken Fukushima nuclear plant said Wednesday that it had found a leak in one of the hundreds of steel tanks used to store radioactive water at the plant, raising renewed questions about the company's ability to handle the plant's cleanup.

The discovery comes a day after the operator, the Tokyo Electric Power Company, or Tepco, admitted that it had found cesium particles in groundwater flowing into the Fukushima Daiichi plant, reversing its earlier assertion that the water was uncontaminated.

The company stressed that the size of the tank leak was small — the equivalent of about a quart had dripped out so far, it said — and that the level of radioactivity in groundwater was within safe levels. However, the problems are the latest in a string of mistakes and mishaps that have added to mounting criticism of the government's decision to leave the tricky cleanup in the hands of Tepco, the company that many say allowed the triple meltdown two years ago to happen in the first place.

Recently, Tepco has struggled to deal with tens of millions of gallons of contaminated, toxic water at the plant, which must be stored in the large steel tanks that now occupy virtually every available bit of space there. The amount of radioactive water has continued to grow as groundwater has flowed at a rate of 100,000 gallons per day into the basements of the damaged reactor buildings. This contaminated water must be drawn off every day to prevent it from overwhelming makeshift systems that cool the melted reactors.

The company has installed a new filtering system that it says removes every type of radioactive particle but one, tritium. Still, that leaves it no choice but to keep storing the water rather than dumping it.

Wednesday's leak underscored the risks of doing so at the plant, where a larger spill might potentially reach the nearby Pacific Ocean. The leaking tank had just been installed to store toxic water from an underground storage pond that needed to be emptied after it, too, sprang a leak.

Faced with growing public alarm over the water crisis, the government last week ordered Tepco to stop the influx of groundwater by freezing soil around the reactor buildings, a novel plan that calls for creating a wall of underground ice. The company has also planned to reduce the influx by pumping some of the groundwater into the sea before it reaches the buildings and becomes contaminated.

However, the pumping plan needs the approval of residents and commercial fishermen in areas outside the evacuation zone immediately around the plant, who have been slowly regaining their livelihoods since the meltdowns spewed radiation over northeastern Japan. The company had been offering them reassurances that the water to be dumped contained no radioactive particles that could further contaminate the ocean.

Those plans could now be jeopardized by Tuesday's admission that the groundwater in fact does contain cesium, a byproduct of the meltdowns. The company, which conceded that it had erred in previous tests, said it had found up to 0.39 becquerels of radioactive cesium 137 per liter of water, an amount that is far below Japan's safety level for drinking water of 10 becquerels per liter.



Still, it may be enough to scuttle or at least put on hold the company's plan to pump groundwater into the sea. Just last week, the company sought to persuade local fishing cooperatives by telling them that levels of cesium in the groundwater were so low that they could not be detected. Those reassurances were met with intense skepticism by fishermen who, even before Tuesday's admissions, said they no longer trusted any assertions made by Tepco.

## **Gordon Edwards & Helen Caldicott on contaminated water**

### **Experts Explain Effects of Radioactive Water at Fukushima**

<http://akiomatsumura.com/2013/06/experts-explain-effects-of-radioactive-water-at-fukushima.html>

#### Introduction

*by Akio Matsumura*

Contaminated water is posing a new problem at the Fukushima site. Tepco must continue to cool the irradiated fuel rods, but has not devised a permanent and sustainable disposal process for the highly radioactive contaminated water that results. While they have a process that can remove much of the radiation from the water, some elements like tritium – a carcinogen – cannot be removed and is concentrating at magnitudes much higher than is legal. Tepco wants to spill the water into the Pacific Ocean in order to dilute the tritium levels to legal amounts, but fishermen skeptical of the power company oppose the move. Meanwhile, Tepco is storing the contaminated water in tanks. Unsurprisingly, those tanks are leaking (NYT). They admit they will eventually run out of space for the storage tanks.

Management of the contaminated cooling water has come to be the most demanding and dangerous issue that Tepco has faced since 2011.





## **Background**

According to the Japan Times (*excerpted*):

As of May 7, Tepco had routed 290,000 tons of radioactive water into some 940 huge tanks at the complex, but 94,500 tons remain inside the basement floors of the reactor buildings and other facilities. Tepco must perpetually pour water over the melted cores of reactors 1, 2, and 3 via makeshift systems to prevent the fuel from melting and burning again.

But the cores' containment vessels were damaged by the meltdowns, allowing the highly radioactive coolant water to leak and flow into the basements. The dangerous radiation levels have prevented workers from getting close enough to fully assess the damage, let alone start the decommissioning process.

Compounding the problem is some 400 tons of groundwater that is also entering the basements of the tsunami- and explosion-damaged buildings, mixing with the leaking coolant water.

Tepco has been operating a water-recycling system to drain the basements that is supposed to extract cesium before recirculating the water back to the reactors. But the added inflow of the groundwater is exacerbating the threat.

In response, all Tepco has been able to do is build more storage tanks.

## **What problems will the water eventually pose?**

Tepco says there is a limit to how many tanks the complex can accommodate before the site runs out of storage space.

Tepco said it can boost storage capacity from 430,000 tons from this year to 700,000 tons by mid-2015 by clearing a forest and other space in the compound. The move is expected to buy them about three years' time.

## **How Water Becomes Radioactively Contaminated**

*by Gordon Edwards, Ph.D.*

(1) When nuclear fuel is used in a nuclear reactor or an atomic bomb, the atoms in the fuel are “split” (or “fissioned”) to produce energy. The fission process is triggered by subatomic particles called neutrons. In a nuclear reactor, when the neutrons are stopped, the fission process also stops. This is called “shutting down the reactor.”

(2) But during the nuclear fission process, hundreds of new varieties of radioactive atoms are created that did not exist before. These unwanted radioactive byproducts accumulate in the irradiated nuclear fuel — and they are, collectively, millions of times more radioactive than the original nuclear fuel.

(3) These newly created radioactive materials are classified as fission products, activation products, and transuranic elements. **Fission products** — like iodine-131, cesium-137 and strontium-90 — are the broken pieces of atoms that have been split. **Activation products** — like hydrogen-3 (“tritium”), carbon-14 and cobalt-60 — are the result of non-radioactive atoms being transformed into radioactive atoms after absorbing one or more stray neutrons. **Transuranic elements** — like plutonium, neptunium, curium and americium — are created by transmutation after a massive uranium atom absorbs one or more neutrons to become an even more massive atom (hence “transuranic,” meaning “beyond uranium”).

(4) Because of these intensely radioactive byproducts, irradiated nuclear fuel continues to generate heat for years after the fission process has stopped. This heat (“decay heat”) is caused by the ongoing atomic disintegration of the nuclear waste materials. No one knows how to slow down or shut off the radioactive disintegration of these atoms, so the decay heat is literally unstoppable. But decay heat does gradually diminish over time, becoming much less intense after about 10 years.

(5) However, in the early years following a reactor shutdown, unless decay heat is continually removed as quickly as it is being produced, the temperature of the irradiated fuel can rise to dangerous levels — and radioactive gases, vapors and particles will be given off into the atmosphere at an unacceptable rate.

(6) The most common way to remove decay heat from irradiated fuel is to continually pour water on it. Tepco is doing this at the rate of about 400 tons a day. That water becomes contaminated with fission products, activation products and transuranic elements. Since these waste materials are radiotoxic and harmful to all living things, the water cannot be released to the environment as long as it is contaminated.

(7) Besides the 400 tons of water used daily by Tepco to cool the melted cores of the three crippled reactors, another 400 tons of ground water is pouring into the damaged reactor buildings every day. This water is also becoming radioactively contaminated, so it too must be stored pending decontamination.

(8) Tepco is using an “Advanced Liquid Processing System” (ALPS) that is able to remove 62 different varieties of radioactive materials from the contaminated water — but the process is slow, removal is seldom 100 percent effective, and some varieties of radioactive materials are not removed at all.

(9) Tritium, for example, cannot be removed. Tritium is radioactive hydrogen, and when tritium atoms combine with oxygen atoms we get radioactive water molecules. No filtration system can remove the tritium from the water, because you can’t filter water from water. Released into the environment, tritium enters freely into all living things.

(10) Nuclear power is the ultimate example of the throwaway society. The irradiated fuel has to be sequestered from the environment of living things forever. The high-quality materials used to construct the core area of a nuclear reactor can never be recycled or reused but must be perpetually stored as radioactive waste. Malfunctioning reactors cannot be completely shut off because the decay heat continues long after shutdown. And efforts to cool a badly crippled reactor that has melted down result in enormous volumes of radioactively contaminated water that must be stored or dumped into the environment. No wonder some have called nuclear power “the unforgiving technology.”

### **Nine Medical Implications of Tritium-contaminated Water**

*by Helen Caldicott, M.D.*

(1) There is no way to separate tritium from contaminated water. Tritium, a soft beta emitter, is a potent carcinogen which remains radioactive for over 100 years. It concentrates in aquatic organisms including algae, seaweed, crustaceans and fish. Because it is tasteless, odorless and invisible, it will inevitably be ingested in food, including seafood, over many decades. It combines in the DNA molecule – the gene – where it can induce mutations that later lead to cancer. It causes brain tumors, birth deformities, and cancers of many organs. The situation is dire because there is no way to contain this radioactive water permanently and it will inevitably leak into the Pacific Ocean for over 50 years or longer along with many other very dangerous isotopes including cesium 137 which lasts for 300 years and causes very malignant muscle cancers – rhabdomyosarcomas, strontium 90 which also is radioactive for 300 years and causes bone cancers and leukemia, amongst many other radioactive elements.

(2) All cancers can be induced by radiation, and because much of the land in Fukushima and beyond is contaminated, the food – tea, beef, milk, green vegetables, rice, etc. – will remain radioactive for several hundred years.

(3) “Cleanup” is a misnomer, radioactively contaminated soil, timber, leaves, and water cannot be decontaminated, just possibly moved to another site there to contaminate it.

(4) Incineration of radioactive waste spreads the cancer-inducing agents to other areas including non-contaminated areas of Japan.

(5) Cancers have a long incubation period – 2 to 80 years after people eat or breath radioactively contaminated food or air.

(6) The IAEA says that decommissioning of these reactors will take 50 to 60 years and some people predict that this mess will never be cleaned up and removed.

(7) Where will Japan put this highly radioactive melted fuel, fuel rods and the like? There is absolutely no safe place to store this deadly material (that must be isolated from the exosphere for one million years according to the US EPA) on an island that is riven by earthquakes.

(8) As these radioactive elements continually seep into the water and the ocean and are emitted into the air the incidence of congenital deformities, cancer and genetic defects will inevitably increase over time and into future generations.

(9) Children are 10 to 20 times more sensitive to the carcinogenic effects of radiation than adults (little girls are twice as sensitive as boys) and fetuses are thousands of times more sensitive – one X ray to the pregnant abdomen doubles the incidence of leukemia in the child.

## "Small" leak from steel tank - follow-up

June 6, 2013

### TEPCO reports another radioactive water leak from storage tank

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306060083>

Tokyo Electric Power Co. has disclosed yet another case of radioactive water leaking from an aboveground steel storage tank at the stricken Fukushima No. 1 nuclear power plant. It said a worker spotted water leaking at a rate of one drip per 3-4 seconds shortly after midday on June 5.

The contents were quickly moved to a nearby empty tank, one of dozens that are being used for contaminated water transferred from underground reservoirs. The immediate concern was whether there was a structural failure in the tank and that similar incidents could occur.

The worker patrolling the area detected the leak from a joint about 4 meters from the bottom on the side wall of a 10-meter-high tank around 12:15 p.m.

The worker tried to stop the leak by tightening bolts that hold the tank together. When that failed, water was transferred to an empty tank nearby until the water level was lower than the joint.

The leak stopped after about 4 hours. The spillage amounted to less than 1 liter, which TEPCO said would have minimal impact on the environment.

The above-ground storage tank can hold 500 tons of water.

The discovery of leaks of contaminated water from underground storage tanks in April prompted TEPCO to move quickly to build new aboveground storage tanks. Thirty-eight cylindrical tanks, made of steel plates joined together by bolts, were newly installed in May.

This process allows the tanks to be built more quickly than when welding is involved. There have been three similar leaks involving the same type of steel tanks in the past, a TEPCO official said.

**The plant complex has 63 such tanks**, the official said.

Contaminated water was found to be leaking from an aboveground water storage tank at the Fukushima No. 1 nuclear power plant on June 5. Tokyo Electric Power Co. said a joint marked with a white cloth is where the water was leaking from. (Provided by Tokyo Electric Power Co.)

### Small leak found at water storage tank at Fukushima Daiichi plant

<http://mainichi.jp/english/english/newsselect/news/20130606p2g00m0dm038000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Wednesday that it found radioactive water dripping from one of the newly installed steel tanks that is being used in place of the leaky underground water storage cisterns.

The amount of leaked water is estimated to be around 1 liter. A Tokyo Electric Power Co. official told a press conference that there is no need to worry about the impact on the external environment and the company is studying the cause.

The tank was installed on the south side of the plant in May so TEPCO could transfer part of the over 20,000 tons of contaminated water held in underground cisterns, which were found to have leaks in April.

According to TEPCO, workers found radioactive water leaking from the surface of the steel tank at a rate of one drip per several seconds at 12:15 p.m. Wednesday.

The tank is built of steel plates held together by bolts and the dripping was observed at the junctions of the plates.

Tightening the bolts failed to stop the leak so **TEPCO removed some of the contents inside the troubled container so the height of the water was lower than the point where the leak occurred.**

TEPCO spokesman Masayuki Ono said the latest incident will not cause the company to drastically change its handling of radioactive water that is accumulating at the site as a result of it being injected into the three crippled reactors to keep them cool.

Ono also said **there were three similar leaks involving the same type of steel tanks in 2012.**

## **Keidanren at Fukushima Daiichi**

### **Keidanren chief visits Fukushima nuclear plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20130606\\_37.html](http://www3.nhk.or.jp/nhkworld/english/news/20130606_37.html)

The head of Japan's top business federation has pledged technological support for the decommissioning of the damaged Fukushima Daiichi nuclear power plant.

Keidanren chairman Hiromasa Yonekura visited the plant run by Tokyo Electric Power Company on Thursday. It was **his first visit since the March, 2011 nuclear accident.**

Yonekura talked to workers engaged in the decommissioning process at the quake-proof building.

He then toured the plant by bus, taking in damaged facilities and storage tanks for radioactive wastewater.

Officials told him the wastewater accumulates at a rate of about 400 tons every day.

Yonekura told reporters a safe decommissioning of the reactors is essential for rebuilding Fukushima Prefecture.

He said Japanese businesses will contribute technological resources to aid the process.

## **Fishermen: We don't want your radioactive water**

June 8, 2013

### **Don't dump radioactive groundwater into sea, Fukushima fishermen tell Tepco**

JJI

<http://www.japantimes.co.jp/news/2013/06/08/national/dont-dump-radioactive-groundwater-into-sea-fukushima-fishermen-tell-tepco/#.UbMiqNhBpg4>

SOMA, FUKUSHIMA PREF. – Fukushima Prefecture fishermen voiced opposition Friday to Tokyo Electric Power Co.'s plan to release groundwater from the firm's stricken nuclear power plant into the sea.

Some voiced concern about harmful rumors that such dumping may trigger, while others said they could not trust Tepco.

Their views were expressed at a meeting between the Soma Futaba fisheries cooperative and representatives of Tepco and the Agency for Natural Resources and Energy.

The utility promised to check the groundwater before it is released to ensure it is not radioactive, but the fishermen remained distrustful

"We need more explanations," co-op head Fusayuki Nanbu told reporters after the meeting, complaining that Tepco failed to acknowledge the fishermen's sentiment.

The meeting was Tepco's second briefing to fishermen regarding its plan to release the groundwater. The prefectural association of fisheries cooperatives will meet June 24 to form a unified response.

Tepco hopes to release groundwater into the sea from under the Fukushima No. 1 nuclear plant before it flows into the basements of buildings housing reactors that suffered meltdowns at the power station, the site of Japan's worst nuclear power catastrophe. The step is expected to limit the volume of water that is contaminated with radioactive materials.

Previous releases of radioactive water led to widespread contamination of the surrounding sea and a halt in local fishing activities.

## Drilling for methane

### **Methane hydrate test-drilling in Sea of Japan**

[http://www3.nhk.or.jp/nhkworld/english/news/20130608\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130608_03.html)

Japanese government researchers started a survey on the amount of methane hydrate in the Sea of Japan on Saturday. The purpose is to extract natural gas from the frozen substance.

Methane hydrate takes on the appearance of ice and is formed from methane and water. It's found on the seabed, often at great depths.

Researchers are using sonar to survey the distribution and amount of methane hydrate off the coast of Niigata Prefecture.

In March, the government successfully extracted natural gas from frozen methane hydrate under the sea off the Pacific Ocean coast. The drilling took place hundreds meters beneath the seabed.

Areas to be surveyed will be increased from next year. It's hoped that such methane hydrate deposits can be commercialized in 5 years

June 9, 2013

### **TEPCO completes water transfer in Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20130610\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130610_03.html)

The operator of the crippled Fukushima Daiichi nuclear power plant completed the transfer of radioactive water from leaking underground storage pools to tanks above ground on Sunday.

A series of leaks of highly contaminated water were found in April.

Tokyo Electric Power Company decided to stop using all of the 7 underground storage pools and move about 24,000 tons of contaminated water to tanks above ground.

Workers started the transfer on April 16th and finished it on Sunday afternoon, leaving behind some low-level contaminated water.

TEPCO plans to store all of the water above ground, but the amount of contaminated water at the site is increasing every day.

The utility plans to install more tanks, as well as taking some measures to reduce the amount of the water. But there's only limited space for the tanks.

The utility is also finding it difficult to get an agreement from local fishermen for its plan to release groundwater into the sea before it seeps into the reactor buildings.

TEPCO says the plan would reduce the volume of contaminated water. But fishermen are worried about the harm from rumors spreading that their products could be contaminated.

June 10, 2013

## Decommissioning marred with uncertainties - to say the least

### Major challenges ahead for decommissioning

[http://www3.nhk.or.jp/nhkworld/english/news/20130610\\_30.html](http://www3.nhk.or.jp/nhkworld/english/news/20130610_30.html)

The flexibility in the latest timetable reflects possible unforeseen factors that may hamper the overall removal process of spent nuclear fuel.

The entire decommissioning process of the reactors at the Fukushima Daiichi plant is marred with **uncertainties**.

Removing melted nuclear fuel remains one of the most daunting tasks of all, as it presents an unprecedentedly difficult undertaking.

The Three Mile Island nuclear power plant in the US experienced a meltdown in 1979, but the melted fuel



remained within the reactor core.

In the Fukushima case, the melted fuel rods ate through the reactor cores.

TEPCO still does not know the exact position of the molten fuel in the containment vessels.

Experts say the safest way to extract the fuel rods is to fill the containment vessels with water to hold in the radiation. But the utility has yet to identify the exact damage to the containment vessels.

Development of new technologies, such as robots and remote-controlled TV cameras to monitor the reactor buildings, is also indispensable. The timetable for the decommissioning work largely hinges on when these technologies will become available.

The use of makeshift equipment at the plant has resulted in a series of technological failures and unpredicted problems that have hampered the cleanup efforts.

Jun. 10, 2013 - Updated 09:46 UTC

## **Roadmap to decommission Fukushima reactors**

[http://www3.nhk.or.jp/nhkworld/english/news/20130610\\_27.html](http://www3.nhk.or.jp/nhkworld/english/news/20130610_27.html)

The Japanese government and Tokyo Electric Power Company have decided to accelerate the removal of spent fuel rods from 2 of the reactors at the Fukushima Daiichi nuclear power plant.

Government and TEPCO officials on Monday jointly released a revised timetable aimed at eventually decommissioning all 4 reactors at the plant damaged by the 2011 March 11th earthquake and tsunami.

The revisions reflect instructions made by the industry minister to speed up the removal of damaged fuel rods.

Multiple plans have been drawn up which will allow the removal procedures at the separate reactors to begin on different dates.

The quickest plan calls for the process to begin in the first half of fiscal 2020 at the No.1 and No.2 reactors. That's 18 months earlier than previously planned.

But depending on the speed of the decontamination work at the reactors and the installment of needed equipment, more plans have been presented.

At the latest the removal work is to begin in the latter half of fiscal 2022 at the No.1 reactor, and the first half of fiscal 2024 at the No.2 reactor.

The plan for the No.3 reactor remains unchanged, with the work to begin during the latter half of fiscal

2021, at the earliest.

But the decommissioning process remains marred with challenges, as 3 of 4 reactors suffered meltdowns. High radiation levels at the reactors have made technical advances necessary in order to decommission them, such as improving robots that can be operated remotely.

The government and TEPCO plan to officially approve the timetables before the end of the month, after hearing from local governments.

## From leaky underground to overground (leaky?) tanks

### TEPCO moves all radioactive water from leaky underground tanks

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306100068>

By SHUNSUKE KIMURA/ Staff Writer

Tokyo Electric Power Co. said June 9 that it has transferred all 24,000 tons of highly radioactive water from leaky underground tanks to surface tanks at the crippled Fukushima No. 1 nuclear power plant.

TEPCO built seven underground storage tanks in 2012 and 2013 to hold contaminated water at the Fukushima No. 1 nuclear plant.

The utility moved highly radioactive water to steel surface tanks after leaks were found in the No. 2 and No. 3 underground tanks in early April. The cause of the leaks remains unknown.

At one of the surface tanks, water was found spilling from around a bolt connecting the steel plates that form the tank's wall on June 5. TEPCO said the leak stopped after some of the water was removed and put in another storage tank.

The No. 4 underground storage tank holds 3,000 tons of low-level radioactive water that had accumulated in the basements of the No. 5 and No. 6 reactor buildings.

TEPCO plans to begin moving the water to the basement of the No. 6 reactor turbine building in mid-June.

A total of 300,000 tons of contaminated water is stored in tanks and other facilities on the plant premises. The amount is increasing 400 tons a day as groundwater and rainwater flow into the buildings.

## **TEPCO completes transfer of radioactive water to steel tanks**

<http://mainichi.jp/english/english/newsselect/news/20130610p2g00m0dm001000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Sunday it has completed the transfer of radioactive water from leaky underground storage cisterns to steel tanks.

The amount of water transferred totaled around 24,000 tons, Tokyo Electric Power Co. said. The stored water had been used to cool the reactors at the plant.

There are seven underground cisterns at the plant site, but three were found to be leaking in April. TEPCO has since been transferring the radioactive water to the newly installed steel tanks.

TEPCO has yet to identify the cause of the leaks from the underground cisterns.

The utility initially estimated around 120 tons of contaminated water had leaked from one of the cisterns, but later revised down the amount to about 20 liters.

TEPCO said Wednesday that it had also found radioactive water dripping from one of the newly installed steel tanks.

## **Still far too hot**

### **Inside Fukushima two years on: radiation levels too high to enter reactors**

<http://www.telegraph.co.uk/news/worldnews/asia/japan/9913146/Inside-Fukushima-two-years-on-radiation-levels-too-high-to-enter-reactors.html>

Two years on from the second-worst nuclear disaster in history, The Telegraph's Julian Ryall visits the Fukushima nuclear plant to see what progress - if any - is being made.



A radiation monitor indicates 114.00 microsieverts per hour near No.4 reactor and it's foundation construction Photo: Reuters  
By Julian Ryall, Fukushima Nuclear Plant, Japan

Radiation levels within three of the reactor buildings at the Fukushima Nuclear plant in Japan are still too high for people to start decommissioning the reactors, two years on from the second-worst nuclear disaster in history.

Scientists still do not have a firm understanding of the precise conditions of the reactor cores in three of the six units at the Fukushima Daiichi plant, and are resorting to using remote-controlled vehicles to get inside the tangle of wires, pipes and rubbles that has lain untouched since the tsunami tore through the facility.

The Tokyo Electric Power Co, the plant's operator, insists that much has been achieved to bring the situation at the reactors under control. Radiation levels are declining, work is under way to build a crane that will be able to remove the spent fuel rods from the No. 4 unit at the plant and the debris is being cleared away.

For all the upbeat assessments emerging from TEPCO however, no one has been able to spend more than a couple of minutes at a time inside the three reactor buildings since they were crippled by the massive earthquake and tsunami on March 11, 2011, which killed almost 16,000 people nationwide, and the scale of the problem in those units is still not clear.

## Floodgates

## Shutting the door on disaster

<http://www3.nhk.or.jp/nhkworld/newslines/201306101221.html>

June 11, 2013

## 2020

### Removal of nuke fuel debris at Fukushima plant set for 2020

By JIN NISHIKAWA/ Staff Writer

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306110092>

The extraction of melted nuclear fuel rod debris at the Fukushima No. 1 nuclear power plant could begin in 2020, or 18 months earlier than originally anticipated, the central government and Tokyo Electric Power Co. said June 10.

In releasing a draft amendment to the current decommissioning road map, however, the government and TEPCO said they are not expecting the entire decommissioning process to end earlier than they had initially planned, which is 30 to 40 years after the nuclear disaster that was set off by the March 2011 Great East Japan Earthquake.

The latest draft document is the first to have presented the timeline of fuel debris removal separately for the three reactors that went into meltdowns.

It said the extraction process could begin during the first half of fiscal 2020 at the No. 1 and No. 2 reactors, and during the second half of fiscal 2021 at the No. 3 reactor, if circumstances enable workers to follow the least time-consuming methods that involve basic equipment.

But the No. 1, No. 2 and No. 3 reactors will have to wait until the second half of fiscal 2022, the first half of fiscal 2024 and the second half of fiscal 2023, respectively, for the extraction process to begin if the most time-consuming methods have to be followed, the draft said.

The workers have yet to gain a grasp of the locations and condition of the fuel debris. They have yet to develop extraction equipment and determine removal methods.

The government and TEPCO are expected to meet by the end of June to revise their decommissioning road map on the basis of the latest draft amendment.

## **Japan eyes earlier start of melted fuel removal at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130611p2g00m0dm041000c.html>

TOKYO (Kyodo) -- The government and Tokyo Electric Power Co. said Monday they may be able to start removing the melted fuel inside the crippled nuclear reactors at the Fukushima Daiichi complex within the first half of fiscal 2020 by improving work efficiency, around 18 months earlier than initially planned. The schedule was included in a draft version of a revised road map toward decommissioning the Nos. 1 to 4 reactors at the plant, but prospects are unclear because technology must be developed to perform the work.

The fuel inside the Nos. 1 to 3 units is believed to have melted through the reactor pressure vessels and been accumulating in the outer primary containers, making the task of defueling more challenging than in the case of the 1979 Three Mile Island accident in the United States.

Apparently taking into consideration the uncertainties ahead, the government and plant operator TEPCO maintained the overall timeline for completing the decommissioning process within 30 to 40 years from the point the plant achieved a stable state of cold shutdown in December 2011.

"How much time we need to take out the fuel debris hinges on the situation of the fuel. Our basic policy is to accelerate such work as much as possible, but we are not moving up the goal of spending 30-40 years," an Economy, Trade and Industry Ministry official said.

The revised road map is expected to be compiled later this month after listening to the opinions of local governments and experts, he added.

According to the draft road map, workers may be able to start removing the melted fuel from the Nos. 1 and 2 reactors within the first half of fiscal 2020 at the earliest by installing new structures for fuel removal and restoring existing fuel handling equipment.

As for the No. 3 reactor, fuel removal could start within the latter half of fiscal 2021.

But the time schedules could be delayed depending on how resistant reactor buildings are to earthquakes, or how much the buildings are contaminated with radioactive substances.

The draft showed that fuel removal could start from fiscal 2022 for the No. 1 reactor, fiscal 2024 for the No. 2 reactor, and fiscal 2023 for the No. 3 reactor at the latest.

According to the official, it will be the first time that the specific timing of fuel removal for respective reactors will be included in the decommissioning road map. The current plan has only said that defueling will start in December 2021 without specifying which reactor will be the first.

Prior to removing the melted fuel, TEPCO plans to start taking out fuel assemblies from spent fuel pools located atop the Nos. 1 to 4 reactor buildings.

The work will start from the No. 4 unit later this year. The No. 4 reactor was offline for maintenance work with fuel stored in the spent fuel pool when the huge earthquake and tsunami ravaged the plant on March 11, 2011.

## **TEPCO preparing to remove melted fuel**

[http://www3.nhk.or.jp/nhkworld/english/news/20130611\\_39.html](http://www3.nhk.or.jp/nhkworld/english/news/20130611_39.html)

Tokyo Electric Power Company is continuing preparations to permanently shut down the reactors at the damaged Fukushima Daiichi nuclear plant.

On Tuesday, the utility invited reporters to see the installation of a crane on a 54-meter tall structure that covers the Number 4 reactor building. The crane will be used from November to remove nuclear fuel rods from a storage pool of the reactor.

Media people also saw a tank near a building that houses the Number 1 reactor. The tank will be used to store contaminated water starting later this month.

Until now, contaminated water has been stored in a temporary tank on the north side of the same building.

The tank is at the end of a pipeline through which contaminated water circulates to cool melted down nuclear fuel in the Number 1 to Number 3 reactors.

The utility says the new tank will shorten the length of the pipeline from the current 4 kilometers to 3 kilometers.

It says the change in the pipeline route is meant to reduce the possibility of leaks.

The company says it will study ways to further shorten the pipeline route to reduce the risk of leakage.

## **Don't even know where melted fuel is...**

### **Status of melted fuel in Fukushima reactors uncertain despite push for early removal**

<http://mainichi.jp/english/english/newsselect/news/20130611p2a00m0na010000c.html>

Uncertainty over the location of melted fuel inside the crisis-hit Fukushima No. 1 Nuclear Power Plant continues to cast a shadow over plans to remove the fuel at an early date, as envisaged in a draft version of a revised road map for decommissioning the plants' reactors.

A draft announced by the government and Tokyo Electric Power Co. (TEPCO) on June 10 outlines plans to start removing the melted fuel about 18 months earlier than originally forecast. But the proposed length of time it will take to decommission the reactors has been left unchanged at "30 to 40 years."

**Reactor Nos. 1-3 at the plant contained a total of 1,496 rods of nuclear fuel in their cores. Another 3,106 rods of spent fuel are stored in the pools of the No. 1-4 reactors. The melted fuel inside the reactors has been labeled "debris," and is believed to have hardened after mixing with metal and other substances. Each fuel rod weighs about 300 kilograms, and a high level of technical expertise would be required when undertaking a remote control operation to cut up and retrieve clumps of scattered radioactive materials weighing a combined 450 tons or thereabouts.**

The bid to remove the melted fuel earlier than planned hinges on whether workers can succeed in filling the reactor cores with water. This method to screen off radiation was used in the Three Mile Island accident that occurred in 1979. However, the cores of reactors at the Fukushima plant have holes, and the task at hand is finding which parts have been damaged and repairing them.

It took about six years before fuel began to be removed in the Three Mile Island accident, but in Fukushima, even if the melted fuel is removed earlier than planned, the work won't start until about 10 years from the onset of the disaster.

The government and TEPCO plan to conduct a detailed investigation next fiscal year on the technology needed to decommission the Fukushima plant's crippled reactors, then make a final decision on whether it is possible to start the removal work earlier.

In a news conference on June 10, a representative of the Ministry of Economy, Trade and Industry's Agency for Natural Resources and Energy said that bringing forward the plans would be dependent on developing technology, and suggested that the plans might even end up being delayed.

Minister of Economy, Trade and Industry Toshimitsu Motegi played a leading role in revising the roadmap. This has raised suggestions that announcing plans to start removing the fuel earlier than originally forecast is a way for the government administration to underscore its achievements since taking over the reins of government last year, ahead of the upcoming House of Councillors election.

University of Tokyo professor Satoru Tanaka, who is familiar with the decommissioning of nuclear plants, commented, "There is merit in bringing the plans forward to speed up residents return (to areas contaminated by the nuclear accident). But there remains a lot of uncharted technology, and the government needs to support research and development in the future."



## 4 km of pipes reduces to 3

June 12, 2013

### **Damaged reactor building at Fukushima plant fully covered**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306120039>

By KEISUKE KATORI/ Staff Writer

OKUMA, Fukushima Prefecture--A canopy has been completed over a heavily damaged reactor building at the Fukushima No. 1 nuclear power plant in preparation for removing the spent nuclear fuel inside.

Tokyo Electric Power Co. allowed reporters to tour part of the facility, which experienced reactor meltdowns after the 2011 earthquake and tsunami disaster, on June 11.

The upper part of the No. 4 reactor building was blown off in a hydrogen explosion. The canopy covering it will prevent further leakage of radioactive substances when workers remove spent nuclear fuel from the building.

The No. 4 reactor had been shut down for regular maintenance when the tsunami struck, but its storage pool contains 1,533 spent fuel rod bundles that still generate large amounts of heat.

TEPCO has said it will equip the canopy with a hoist to remove spent nuclear fuel from the pool as part of the decommissioning process at the crippled plant.

The plant operator has also been working to improve the reliability of the reactor cooling system following a series of radioactive water leaks that were found at the plant.

Three reactor buildings currently circulate contaminated water accumulated in the buildings to cool melted nuclear fuel. After radioactive substances and salt are removed, the water is temporarily stored in a 1,000-ton storage tank on elevated land before being put back into circulation.

This water circulation system was set up as a makeshift arrangement and uses about 4 kilometers of pipes.

But a new route for circulating the contaminated water to cool the reactors is almost complete. It will use condensate storage tanks that are designed to turn steam used to rotate turbines for power generation back into water and store it.

The tanks, located between the No. 1, No. 2 and No. 3 reactor buildings and the sea, survived the tsunami two years ago. They were shown to reporters on June 11 for the first time since the disaster.

The length of pipes will be reduced to some 3 km, improving the reliability of the cooling system and reducing the risk of water leakages, TEPCO officials said.

June 17, 2013

## Water leaking from ALPS system

### Decontamination device leaking at Fukushima plant

[http://www3.nhk.or.jp/nhkworld/english/news/20130617\\_30.html](http://www3.nhk.or.jp/nhkworld/english/news/20130617_30.html)

Workers at the disabled Fukushima Daiichi nuclear power plant have found contaminated water leaking from a newly-installed filtering system.

Tokyo Electric Power Company officials say the leak was discovered on Saturday during an inspection of the Advanced Liquid Processing System.

The system can filter almost all types of radioactive material. The utility has been testing the system since March.

The officials say the leak occurred at a welded part of a storage tank for radioactive water. They say water has dripped into a pan below and has not leaked outside of the system.

The officials say they are unable to determine the exact amount of water that leaked as it is mixed with condensation from the surface of the tank.

The radiation level of gamma and beta rays in water on the surface of the welded part was 0.18 millisieverts per hour.

TEPCO has halted the test-run of the system and is investigating the cause of the leak. The officials say faulty welds may be the cause of the problem.

Jun. 17, 2013 - Updated 10:29 UTC

### TEPCO puts water decontamination unit on hold after possible leak

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306170042>

Tokyo Electric Power Co. suspended a test run of a water decontamination system at the Fukushima No. 1 nuclear power plant on June 16 after a suspected leak of highly radioactive water.

A welded part on the surface of the tank for the Alps water decontamination system measured 0.2 millisievert per hour, a radiation level higher than in surrounding areas. TEPCO is investigating the situation.

The cylindrical tank, which is 6 meters tall and 3 meters in diameter, held 25 tons of radioactive water before processing.

A worker who was checking condensation on the surface found traces of brown water at around 11 p.m. on June 15. TEPCO suspects that water leaked from the welded part.

Alps can remove 62 radioactive substances, including strontium, from contaminated water.

The test run, which started in March, was to finish at the end of July. If the leak is confirmed, the completion of the test run will be delayed.

June 18, 2013

## **No damage to No.1 condenser on 3/11, says NRA**

### **NRA denies 3/11 quake damaged condenser pipes at Fukushima No. 1**

<http://www.japantimes.co.jp/news/2013/06/18/national/nra-denies-311-quake-damaged-condenser-pipes-at-fukushima-no-1-2/#.Ub9cc9hBpg4>

Kyodo

The Nuclear Regulation Authority denied Monday that the Great East Japan Earthquake damaged piping related to critical cooling equipment in the building housing reactor 1 at the Fukushima No. 1 power plant before the tsunami hit.

The NRA made the assertion after inspecting the building to study why a water leak developed near the No. 1 reactor's two isolation condensers after the magnitude 9.0 quake struck on March 11, 2011.

An influential nuclear investigation panel said in a report last year that the leak might have been caused by quake-related damage to the piping for the condensers, but the NRA said the water likely splashed out of the reactor's spent fuel pool during the violent quake. The leaked water was radioactive.

The purpose of isolation condensers is to change steam into water and route it back to the reactors to cool them. The condensers stopped functioning right after the quake.

According to the NRA, the members who conducted the field survey in late May did not find any damaged piping that could have lead to the water leak.

A worker who witnessed the leak said that water, not steam, was released, which means it was unlikely that the condensers' pipes were damaged because they are only supposed to be filled with steam. Instead, the NRA believes that a container designed to collect excess water from the spent fuel pool may have leaked.

In the meantime, the NRA plans to conduct another investigation either this month or next month into the cause of the hydrogen explosion that took place in the No. 4 reactor building. The reactor had been defueled for maintenance when the earthquake and tsunami struck and its fuel had been stored in the spent fuel pool perched above it.

Massive hydrogen explosions blew the tops off of reactor buildings 1 and 3 as the zirconium cladding on their uncooled fuel rods melted and reacted with steam from the coolant water to produce the gas.

But no major damage to the fuel assemblies stored in the spent fuel pool of reactor 4 has been confirmed, according to the NRA. That pool also contained fresh fuel rods.

## **Asimo robot for Fukushima**

### **Robot with Honda's ASIMO technology to be used at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130618p2g00m0dm034000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Monday it will conduct a survey at its crippled Fukushima Daiichi nuclear power plant with a remote-controlled robot that uses technology originally developed for Honda Motor Co.'s ASIMO humanoid robot.

The new robot, jointly developed by Honda and the National Institute of Advanced Industrial Science and Technology, will be sent to the plant's No. 2 reactor building Tuesday to check the radiation level and the condition of high areas of the first floor.

The robot has an arm with 11 joints and it can survey areas as high as 7 meters even in a narrow space using a zoom camera, laser range finder and dosimeter at the tip of the arm.

In developing the robot, Honda said it has applied technologies used for ASIMO, such as a system that enables simultaneous control of multiple joints.

The outcome of the survey is expected to be used for the planning of cleaning the radiation-contaminated building. TEPCO is also considering using the robot for surveys at other buildings.

The utility plans to eventually decommission the Nos. 1 to 4 units that were greatly damaged by the nuclear accident, triggered by the devastating earthquake and tsunami on March 11, 2011.

See also on Japan Times:

### **Asimo kin to probe plant**

<http://www.japantimes.co.jp/news/2013/06/19/business/tepc0-minutes-reveal-staff-exodus-concerns/#.UcCN3NhBpg4>

Kyodo

Tokyo Electric Power Co. said Monday it will conduct a probe at its crippled Fukushima No. 1 nuclear plant with a remote-controlled robot that uses technology originally developed for Honda Motor Co.'s Asimo humanoid robot.

The new robot, jointly developed by Honda and the National Institute of Advanced Industrial Science and Technology, will be sent into the reactor 2 building Tuesday to check the radiation level and condition of high areas on the first floor.

The robot has an arm with 11 joints and it can examine areas as high as 7 meters even in a narrow space using a zoom camera, laser range finder and dosimeter at the tip of the arm.

In developing the robot, Honda said it has applied technologies used for the Asimom, including a system that enables simultaneous control of multiple joints.

The outcome of the probe is expected to be used for the planning of cleaning the radiation-contaminated building. Tepco is also considering using the robot to check the inside of other damaged buildings.

The utility plans to decommission reactors 1 to 4 when the process can be safely accomplished. The work is expected to take decades.

## **NRA's declaration in fact not so definite**

### **NRA says quake not responsible for damage to Fukushima cooling condensers**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306180061>

By JIN NISHIKAWA/ Staff Writer

The Nuclear Regulation Authority said June 17 that the earthquake of March 11, 2011, was **tentatively** not responsible for damage to key equipment used to cool a reactor in the event of an emergency at the Fukushima No. 1 nuclear power plant.

But NRA investigators said they will further examine the condition of the isolation condensers at the No. 1 reactor and produce a more definitive assessment.

The NRA expects to compile a report on the matter by the end of the year to submit to the International Atomic Energy Agency in Vienna.

The nuclear watchdog's temporary assessment came after its on-site inspection of the No. 1 reactor building on May 30-31.

Although a Diet investigation panel suggested the possibility that the condensers were damaged by the quake before tsunami inundated the facility, an independent team appointed by the government disagreed.

The NRA investigators said leaking water that workers witnessed near the isolation condensers before the tsunami struck could have been overflowing from the spent fuel storage pool nearby, not from the condensers.

They added if the condensers had been damaged at that time, steam would have been the result, causing the area to appear misty. But the eyewitnesses said the leaks looked like spraying water from a bucket. The isolation condensers cool steam from the reactor's pressure vessel, condense it into water and return the cooling water into the reactor.

**Installed solely in the No. 1 reactor building, the condensers were designed to function in an emergency even without a power source.**

Experts concluded that a meltdown at the No. 1 reactor took place earlier than expected because the condensers barely functioned during a plant blackout, which took place after the tsunami.

The NRA said it will determine the amount of water overflow and study further the piping and the condensers themselves to reach a definitive conclusion.

But additional rounds of on-site investigations are unlikely to come easily, given the high radiation levels at the site.

Whether the condensers were already damaged by the 9.0-magnitude Great East Japan Earthquake has been a key question in the investigation of the Fukushima accident due to the implications on the adequacy of anti-quake preparedness at the Fukushima plant and other nuclear facilities.

## ALPS system is leaking

### NRA Tepco found 2 “pinholes” on multiple nuclide removing system ALPS

<http://fukushima-diary.com/2013/06/tepcos-found-2-pinholes-on-multiple-nuclide-removing-system-alps/>

On 6/15/2013, Tepco reported about the “possible” leakage from the multiple nuclide removing system ALPS. They measured 6,700,000,000 Bq/m<sup>3</sup> of all β from the “possible” leaking water.

(cf, Multiple nuclide removing system ALPS possibly leaks in the test operation [URL])

(cf, 6,700,000,000 Bq/m<sup>3</sup> of all beta detected from the leaking water of multiple nuclide removing system [URL 2])

On 6/18/2013, Tepco reported **they found 2 pinholes (micropore) on the weld line of the tank.**

In addition to ALPS, there are 1,000 tanks to stock contaminated water (1,000 tones each). 270 of them are not even welded.

(cf, 27% of the highly contaminated water tanks will need repairs in 2016, “1,000 tones for each” [URL 3])

↓ Detailed report about the “possible” leakage

**A water droplet found at the batch treatment tank 2A of multi-nuclide removal equipment (ALPS) in Fukushima Daiichi Nuclear Power Station**

<Reference>  
June 17, 2013  
Tokyo Electric Power Company

■ Overview of the incident:

June 15

**Around 11:00 PM** A TEPCO employee found a trace of discolored water in the leaked water receiving pan under the batch treatment tank (2A) of multi-nuclide removal equipment (ALPS). No new water droplet has been found as of now. As we checked surroundings, dew condensation water was attached on the surface of the batch treatment tank, and partially discolored part was found near the welding line. Therefore, we have placed a container to receive the water droplet just in case.

**June 16** No other occurrence of dew condensation water or discolored water droplet has been found upon condition monitoring. Since the cause of the discoloration near the welding line on the surface of the tank is estimated to be rust or a leakage, we have judged that detailed investigation is needed.

**Around 3:00 PM** The incident was reported to the safety inspector.

**Around 4:00 PM** Survey of the discolored part near the welding line and surface of the tank was performed.

**6:17 PM** An operation to stop A system at multi-nuclide removal equipment (ALPS) was started.

**11:20 PM** A system at multi-nuclide removal equipment (ALPS) was stopped.

■ Cause of the incident: Under investigation



**Condition at the Site**

Discolored (brown) part near the welding line was found

Structural drawing of the batch treatment tank

(1) Condition at the bottom part of the tank

(1) Condition at the bottom part of the tank (enlarged image)

■ Measurement results

- Surface of the batch treatment tank (discolored part near the welding line): 7,900cpm
- Surface of the batch treatment tank (part not discolored near the welding line): 700cpm
- Leaked water receiving pan under the tank (part having trace of discolored water): 4,300cpm
- Leaked water receiving pan under the tank (part not discolored): 1,300cpm

Trace of discolored water droplet was found

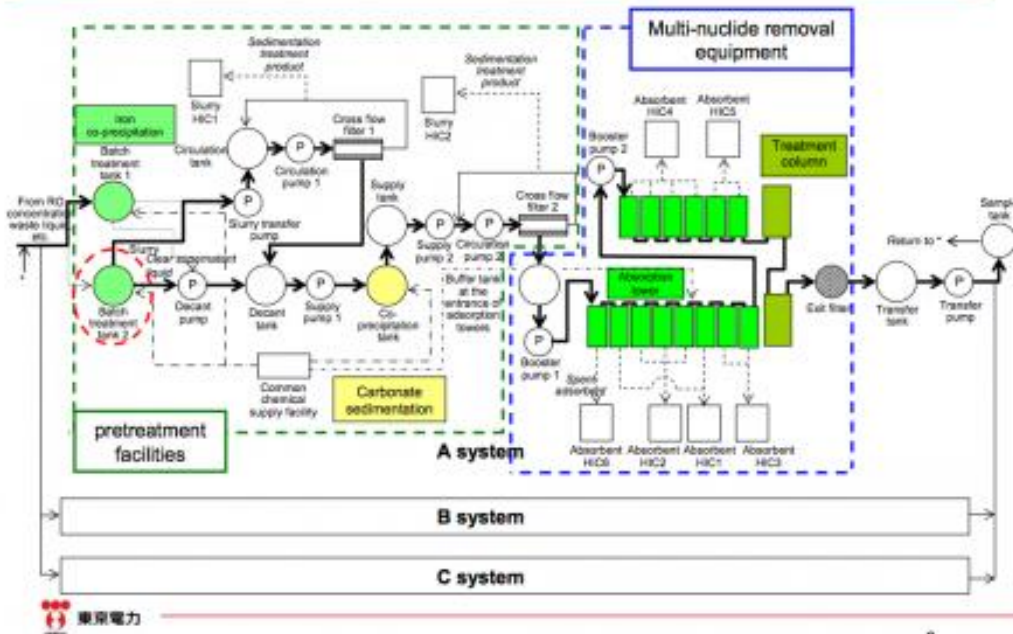
(2) Condition of the leaked water receiving pan

■ Background: 180cpm





## Entire System of Multi-nuclide Removal Equipment (ALPS)



3

## Wind turbine off Fukushima

June 19, 2013

### Marubeni to set up floating wind turbine off Fukushima in world first

by Chisaki Watanabe  
Bloomberg





Breezing up: A 2.4-megawatt wind turbine developed by New Energy and Industrial Technology Development Organization and Tokyo Electric Power Co. stands off Choshi, Chiba Prefecture, in March. A Marubeni Corp.-led group will set up a floating wind farm off Fukushima this month. | BLOOMBERG

A group led by Marubeni Corp. is setting up a floating wind turbine off the coast of Fukushima Prefecture, aiming to commercialize the unproven technology and create an industry in the region ravaged by the 2011 quake, tsunami and nuclear calamities.

The 11-member group plans this month to tow a turbine made by Hitachi Ltd. and mounted to a semisubmersible structure from a dock near Tokyo, said Takahide Soeda, an official at the Ministry of Economy, Trade and Industry.

The 2-megawatt turbine, funded by the central government, is expected to start running in mid-October. "There are test turbines in Portugal and Norway, but there have been no commercial floating offshore turbines in the world," Soeda said in a briefing June 14. "We are bringing together Japanese technology to make floating offshore wind viable."

Surrounded by deep oceans, for Japan floating wind turbines hold the promise of opening up large areas where clean energy can be generated. The technology involves attaching turbines to structures that float in areas too deep for traditional towers that are fixed to the seafloor.

Prime Minister Shinzo Abe's Cabinet earlier this month approved a set of science and technology strategies, including a target to make the floating offshore wind technology viable by 2018.

The project will include a floating substation that will be the first of its kind. It will be located about 20 km from Fukushima's coastline in 120-meter deep waters, according to officials. The group is planning to install two more turbines with 7 megawatts of capacity each. The trade ministry has said capacity may be expanded to 1,000 megawatts.

“Marubeni is considering turning this into a commercial project,” Rentaro Hosoya, an assistant manager at the trading house’s power industry team, said at the briefing. “We’ll make our decision on capacity based on the results of” the project.

Marubeni and Innovation Network Corp. of Japan last year bought Seajacks International Ltd., the operator of self-propelled vessels used to install and maintain offshore wind turbines in the North Sea, between Britain and Scandinavia. A Seajacks unit in Japan was established to develop the offshore wind installation market at home and in other parts of Asia, Marubeni said in a June 3 statement.

METI has earmarked a total of ¥22 billion for the five-year undertaking, exceeding the original estimate of ¥18.8 billion, according to Hiroyuki Iijima, a ministry official in charge of the project.

Some costs were unforeseen, Iijima said. For example, engineers found that geological formations in the area were two layers rather than the single one they initially thought, requiring extra tests before anchors could be set to fix floating structures. Officials are reviewing costs before requesting a budget for the next fiscal year, he added.

Existing offshore substations in European countries, including Britain and Denmark, are mounted on the bottom of the sea, whereas the version off Fukushima will float, Iijima reiterated.

“The challenge is cost, not technology,” said Justin Wu, the Hong Kong-based head of wind analysis at Bloomberg New Energy Finance. “With some testing and refinement, it can work well, but it will be extremely expensive. So by 2018 Japan can have commercial models of floating foundations ready, but they’ll probably cost a lot more than the other types of foundations being used.”

Fukushima Prefecture hopes to create clean energy jobs and is seeking to become a hub in the wind industry with the pilot project, the group said in a statement when it was picked in March 2012 by METI to conduct the pilot project.

## But can TEPCO "quicky determine" anything?

### Fukushima Pref. complains to TEPCO

[http://www3.nhk.or.jp/nhkworld/english/news/20130619\\_38.html](http://www3.nhk.or.jp/nhkworld/english/news/20130619_38.html)

Fukushima Prefecture has demanded that Tokyo Electric Power Company **quicky determine** how the groundwater was contaminated with radioactive material, and take steps to prevent it leaking into the sea.

The prefecture summoned the utility's managing director, Akio Komori, to the prefectural government office on Wednesday.

Komori apologized for the trouble and pledged to determine its cause and to step up monitoring.

The head of the prefecture's environment division, Tetsuya Hasegawa, expressed disappointment that the trouble happened amid repeated requests to guarantee safety in handling contaminated wastewater in the process of scrapping the plant's reactors.

The prefecture later decided to step up its own monitoring of seawater near the plant.

## TEPCO promises increased monitoring

### TEPCO to increase groundwater testing

[http://www3.nhk.or.jp/nhkworld/english/news/20130619\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20130619_31.html)

The operator of the Fukushima Daiichi nuclear plant says it will increase checks for strontium and tritium in groundwater near the damaged reactors.

Tokyo Electric Power Company workers detected the radioactive materials in groundwater taken from an observation well on the sea side of the No.2 reactor building. Company officials say they found no major changes in radiation levels in nearby seawater.

But they plan to set up more monitoring posts and observation wells. And they will reinforce nearby embankments to prevent contaminated groundwater reaching the sea.

TEPCO officials say wastewater spilled out into the sea near the No.2 reactor building in April 2011. They say highly radioactive materials might have seeped into the ground and ended up in the well about 30 meters from the sea.

Workers will also check a nearby underground tunnel to determine how the groundwater was contaminated.

Tokyo Electric has again drawn criticism for a delay in revealing the latest incident.

Workers took a sample of the groundwater on May 24th.

Officials at the plant were aware by May 31st that tritium levels were higher than the government-set level.

But they did not share the data with TEPCO executives until June 11th. It took another week for the company to make the data public.

TEPCO officials say they were waiting for results of strontium tests, which take longer. They apologized for the delay.

## New robot-led survey of inside No.2

June 20, 2013

## **Robot carries out survey inside Fukushima reactor**

[http://www3.nhk.or.jp/nhkworld/english/news/20130620\\_17.html](http://www3.nhk.or.jp/nhkworld/english/news/20130620_17.html)

A remote-controlled robot with a 7-meter-long arm has carried out a survey inside a reactor building at the Fukushima Daiichi nuclear plant.

The newly developed robot is equipped with a camera and dosimeter on the tip of its arm. **Its human operators worked from the building serving as the headquarters for the decommissioning work at the plant.**

Tokyo Electric Power Company used the robot on Tuesday to investigate 6 locations near an interior ceiling of the Number 2 reactor.

**Workers were unable to conduct detailed surveys there due to high radiation levels.**

TEPCO said the highest radiation reading of 19 millisieverts per hour was found at a height of 4.3 meters.

It also said photos from the robot did not show any damage to pipes.

There is an opening near the interior ceiling leading to the damaged containment vessel.

The officials said they will analyze the information collected by the robot to aid their repair work.

June 21, 2013

## **360-liter leak from the desalination unit**

### **Leak found at Fukushima Daiichi desalting device**

[http://www3.nhk.or.jp/nhkworld/english/news/20130621\\_15.html](http://www3.nhk.or.jp/nhkworld/english/news/20130621_15.html)

Tokyo Electric power Company says radiation-contaminated water was found to have leaked from a desalinating device at the crippled Fukushima Daiichi Nuclear Power Plant.

The plant operator adds that the leak stopped when it halted the device, and that the water has not flowed outside the complex.

TEPCO said a worker detected the leak at the device that removes salt from water used for reactor cooling at about 3 AM on Friday.

The company estimates that about 360 liters leaked out. Radioactive cesium was already removed from the water at a different unit, but the water still contains radioactive strontium and other substances.

The utility said the leaked water is contained inside a barrier installed at the building that houses the device.

It also said reactor cooling has not been hampered by the halt of the desalination device, as processed water stored in tanks is used instead.

The device has been hit by similar leaks in the past.

TEPCO is investigating the cause.

### **360 liters of radioactive water leaks from Fukushima No. 1**

Kyodo

<http://www.japantimes.co.jp/news/2013/06/21/national/360-liters-of-radioactive-water-leaks-from-fukushima-no-1/#.UcQ6jdhSb9k>

An estimated 360 liters of radioactive water has leaked from a desalination unit at the ruined Fukushima No. 1 nuclear power plant, Tokyo Electric Power Co. said Friday.

The utility said water did not leave the complex but did not disclose its radiation level.

The leak was discovered after a leak detector went off at around 3 a.m. Friday. A plant worker found the water in a building housing the desalination unit and suspended it.

The desalination unit is used to remove salt from radioactive water after cesium and other radioactive materials have been filtered out.

See also:

### **360 liters of tainted water leaked at Fukushima Daiichi**

<http://mainichi.jp/english/english/newsselect/news/20130621p2g00m0dm036000c.html>

TOKYO (Kyodo) -- An estimated 360 liters of radioactive water has leaked from a desalination unit at the crippled Fukushima Daiichi nuclear power plant, Tokyo Electric Power Co. said Friday.

The contaminated water has not flowed outside of the complex, and radiation doses measured at monitoring posts around it have not changed significantly, according to the utility.

After a leak detector was activated around 3 a.m. Friday, a plant worker confirmed the water leak inside a building housing the desalination unit. The worker suspended the unit.

The desalination unit is used to remove salt from tainted water after cesium and other materials have been taken out.

### **More leaks of contaminated water discovered at Fukushima nuclear plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306210074>

Two more leaks of radioactive water found at the Fukushima No. 1 nuclear plant suspended desalination operations and will likely further delay the full-scale use of a decontamination system, Tokyo Electric Power Co. said.

TEPCO on June 21 confirmed that 360 liters of highly contaminated water spilled from one of the three desalination units in a temporary warehouse at the plant, but the water did not flow outside.

A worker found the water under the desalination unit around 3 a.m. on June 21. The water stopped leaking after the worker shut down the equipment, TEPCO said.

**It was the 11th water leak confirmed in the desalination system.**

An analysis of the leaked water showed radioactivity levels of strontium and other substances at **26 million becquerels per liter. That level is almost the same as that of untreated highly-contaminated water.** Strontium tends to accumulate in human bones.

Almost no radioactive cesium was detected in the water, TEPCO said.

The desalination system removes salinity from water used to cool the reactors at the nuclear plant.

TEPCO said it is investigating the cause of the latest leakage.

On June 20, the company said radioactive water was found leaking from a small fracture on a storage tank in the decontamination system at the plant.

It was the second leak discovered in the Alps multinuclide removal equipment.

TEPCO confirmed on June 16 that radioactive water was leaking from a different tank in the Alps equipment and suspended the system's operations.

The Alps system, which can remove 62 radioactive substances, including strontium, from water, comprises three decontamination units, each using two tanks to store untreated water.

The two leaking tanks are part of the same unit.

TEPCO planned to finish trial operations of the Alps equipment by the end of July, but the leaks will likely delay that schedule.

The company said it has visually checked the other two units and found no problems.

## Fukushima Diary on new leak

### New leakage from desalination system, 26 giga Bq/m<sup>3</sup> of all β, Tepco, “250L, no overflow from the warehouse”

<http://fukushima-diary.com/2013/06/new-leakage-from-desalination-system-26-giga-bqm3-of-all-%CE%B2-tepco-250l-no-overflow-from-the-warehouse/>

According to Tepco, a subcontract company worker found a new leakage from the desalination system on 6/21/2013.

The system was suspended 5 minutes after the leakage was found.

The result of nuclide analysis is below,

Cs-134:  $5.7 \times 10^5$  [Bq/m<sup>3</sup>]

Cs-137:  $1.7 \times 10^6$  [Bq/m<sup>3</sup>]

Co-60:  $1.4 \times 10^5$  [Bq/m<sup>3</sup>]

Sb-125:  $1.5 \times 10^7$  [Bq/m<sup>3</sup>]

All β:  $2.6 \times 10^{10}$  [Bq/m<sup>3</sup>]

From the significantly high readings, Tepco assumes it is untreated water before the desalination system. Tepco states it was 250L, it didn't overflow from the warehouse. They assume it was because “they screwed the cap of the flowmeter so tightly that it had a crack”.

At 21:30, 6/21/2013 (JST), Tepco has published Japanese press release up to Vol.5, but published English press release only up to Vol.3. The accident report is only in Japanese as well. **Currently Tepco is making it difficult to stay updated in English.**

(Related article..English version of Fukushima plant survey map shows atmospheric dose lower than Japanese version by 90% [URL])

The slowly updated English press releases are below,

Press Release (Jun 21,2013)

Water leakage found at the desalination system (reverse osmosis membrane) in Fukushima Daiichi Nuclear Power Station

At around 2:58 AM today (June 21), we found a leak detector of the desalination system 3 (reverse osmosis membrane RO-3) operating in the temporary warehouse.

At 3:03 AM, a cooperative company worker found water leakage and suspended the RO-3.

The leaked water remains in the dam of the temporary warehouse and has not flowed outside the temporary warehouse.

We are currently inspecting the details and the investigation results are to be announced.

No significant change in the monitoring post data has been found.

This is a follow-up report on the investigation statuses of the water leakage found at the desalination system 3 (reverse osmosis membrane RO-3).

The leakage has stopped at present, and leaked amount in the temporary warehouse is estimated to be approx. 360 liters (approx.30m x approx. 12m x approx. 1mm).

We will continue to identify the cause of the leakage.

The details are to be explained at the regular press conference.

This is a follow-up report on the investigation statuses of the water leakage found at the desalination system 3 (reverse osmosis membrane RO-3).

The nuclide analysis results of leaked water are as follows.

Cs-134:  $5.7 \times 10^{-1}$  [Bq/cm<sup>3</sup>]

Cs-137:  $1.7 \times 10^0$  [Bq/cm<sup>3</sup>]

Co-60:  $1.4 \times 10^{-1}$  [Bq/cm<sup>3</sup>]

Sb-125:  $1.5 \times 10^1$  [Bq/cm<sup>3</sup>]

All  $\beta$ :  $2.6 \times 10^4$  [Bq/cm<sup>3</sup>]

According to the above results, we judged that the leaked water was the water before treatment at the entrance of the desalination system 3 (reverse osmosis membrane RO-3).

We will continue to identify the cause of the leakage.

## Solar plant for Iitate

### 'Mega Solar' power plant to be built in Fukushima

[http://www3.nhk.or.jp/nhkworld/english/news/20130621\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20130621_33.html)

The mayor of Iitate Village in Fukushima Prefecture says a large solar power plant will be built in the village that was seriously contaminated by the 2011 nuclear accident.

Located northwest of the crippled Fukushima Daiichi nuclear power plant, Iitate Village has been designated as an exclusion zone due to high radiation levels from the nuclear facility.

All residents were evacuated from the village following the 2011 nuclear disaster. Former residents are allowed to visit their homes but not stay overnight.

Iitate Mayor Norio Kanno told reporters on Friday that the village and a Tokyo-based electric equipment company will jointly build a "Mega Solar" power station at a now-defunct ranch in the village. The 14-hectare lot of land is owned by the village.

Kanno said that the power station will produce 10,000 kilowatts, enough to supply the requirements of about 3,000 households for a year.



All electricity generated by the plant will be sold to a power company taking advantage of the central government scheme that requires major utilities to buy locally-generated renewable energy.

The mayor said that the village expects to make a profit of about 7 million dollars for a period of 20 years. He said that the revenue will be used to support recovery work in the village.

Kanno said that the local government compiled the plan in the hope that the solar plant will be a symbol for the reconstruction of Iitate, and encourage former residents to return.

The local government plans to spend about 40 million dollars to build the large solar power plant.

The mayor said construction will begin in April 2014 after design and decontamination work are completed. The solar power plant is expected to start generating electricity in April 2016.

June 22, 2013

## Just a cap problem...

### **TEPCO: Radioactive water leaked from flowmeter cap at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306220045>

A recent leakage of radioactive water from a desalination unit at the stricken Fukushima No. 1 nuclear power plant was attributed to a crack in a flowmeter cap, the plant operator said June 21.

Tokyo Electric Power Co. detected the leakage in the early hours of June 21 at one of the three desalination units available at the plant to remove salinity from highly radioactive water that was used to cool crippled reactors.

A worker refastened the capping too tightly after removing it to clean the inside. That generated a crack, which leaked water under pressure, TEPCO officials said.

While TEPCO officials initially said an estimated 360 liters of water had leaked, they revised that figure to 250 liters.

June 25, 2013

## Concentration of tritium in sea water soars

### Higher seaborne tritium levels outside Fukushima plant suggest leaks not plugged

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306250085>

Tokyo Electric Power Co. said radioactive water may still be leaking into the sea from the crippled Fukushima No. 1 nuclear power plant after enhanced levels of radioactive tritium were detected in the port area in front of the facility.

The plant operator said June 24 it is investigating the matter with some urgency as the finding suggests that radioactive water, generated on the plant premises, may be leaking into the sea from the ground.

TEPCO said tritium levels of 1,100 becquerels per liter of seawater were recorded June 21 north of the water intakes for the No. 1, No. 2, No. 3 and No. 4 reactors in the port area.

The reading compares with 500 becquerels per liter measured on June 10. It was the highest concentration since the nuclear crisis began to unfurl in March 2011.

Officials said tritium levels of 910 becquerels per liter of seawater were detected at a different location near the water intakes for the No. 1 and No. 2 reactors and close to a well, up from the previous reading of 600 becquerels per liter on June 14.

The previous record for seawater in the port, 920 becquerels per liter, was taken in October 2011.

Tritium levels in the port generally hovered 100 and 200 becquerels per liter during the past 12 months.

Tritium, a naturally existing radioisotope of hydrogen, is generated in coolant water for nuclear reactors. Unlike radioactive cesium, tritium, which exists in the form of water, is difficult to remove by way of absorption. Tritium, once ingested, flushes out of the human body relatively quickly.

Miniscule amounts of tritium are released into the environment during the normal course of operating a nuclear reactor.

The government has set an upper limit of 60,000 becquerels per liter for seaborne tritium concentrations outside a nuclear facility.

TEPCO had said June 19 that 500,000 becquerels of tritium was detected in late May per liter of water from a well on the sea side of the No. 1 and No. 2 reactors.

The utility said the radioactive water likely entered the ground immediately after the nuclear crisis began, and later mixed with groundwater and flowed into the well.

TEPCO also said it would inject a sealing agent into the ground between the well and the sea to prevent the radioactive water from spreading to the ocean and conduct drilling near the well to monitor radioactive concentrations more closely.

"We need more investigations to identify the cause," a TEPCO official said. "We will keep a close watch on the situation."

Tetsu Nozaki, who heads the Fukushima Prefectural Federation of Fisheries Cooperative Associations, expressed concern that fishing operations in local waters could be affected.

"I will be waiting for TEPCO to explain the cause and present its mitigation measures," Nozaki said.

"Although I cannot yet gauge the magnitude of the latest development, I am afraid that a growing number of our members would feel anxious if similar incidences were to recur."

(Jin Nishikawa contributed to this article.)

## **Tritium samples in sea near No. 1 soar**

<http://www.japantimes.co.jp/news/2013/06/25/national/tritium-samples-in-sea-near-no-1-soar/#.UcnhkNhSb9k>

by Reiji Yoshida  
Staff Writer

The density of radioactive tritium in samples of seawater from near the Fukushima No. 1 nuclear plant doubled over 10 days to hit a record 1,100 becquerels per liter, possibly indicating contaminated groundwater is seeping into the Pacific, Tokyo Electric Power Co. said.

The latest sample was taken June 21 from the sea near a water intake point east of the reactor 1 turbine building.

The legally permitted level of tritium is 60,000 becquerels per liter. Water taken from the same place June 10 had a reading of 500 becquerels per liter.

Tepeco said late Monday it was still analyzing the water for strontium-90, which would pose a greater danger than tritium to human health if absorbed via the food chain. The level of cesium did not show any significant change between the two sample dates, according to the embattled utility.

On June 19, Tepeco revealed that a groundwater sample taken from a nearby monitoring well was contaminated with both tritium and strontium-90.

At that time, seawater samples did not show any significant changes in the level of radioactive materials, and Tepeco denied the dirty water was seeping into the sea.

But during a news conference Monday in Tokyo, Masayuki Ono, a **Tepco executive and spokesman, this time did not deny the possibility of leakage into the sea**, while he said Tepco is still trying to determine the cause of the spike.

### **Level of radioactive tritium rising in harbor at Fukushima plant**

Kyodo

<http://www.japantimes.co.jp/news/2013/06/25/national/level-of-radioactive-tritium-rising-in-harbor-at-fukushima-plant/#.UclYSdhSb9k>

Tokyo Electric Power Co. has seen a rise in the level of radioactive tritium in seawater within the harbor at the crippled Fukushima No. 1 nuclear power plant.

A sample collected Friday contained around 1,100 becquerels of tritium per liter, the highest level detected in seawater since the nuclear crisis at the plant started in March 2011, the utility said Monday. An official of the Nuclear Regulation Authority said groundwater containing radioactive substances may be seeping into the harbor from the plant site and there is a need to carry out a careful investigation because the data collected so far are limited.

According to Tepco, the sample with the highest tritium concentration was collected near a water intake on the east side of the reactor 1 turbine building. The level was more than double that of a sample taken on June 10 in the same area.

The latest announcement was made after Tepco detected high levels of radioactive tritium and strontium in groundwater from an observation well at the plant.

The government-set safety limit for tritium is 60,000 becquerels per liter of seawater.

See also:

### **Level of radioactive tritium rising in port at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130625p2g00m0dm043000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Monday it has seen a rise in the level of radioactive tritium in seawater within the port at the crippled Fukushima Daiichi nuclear power plant....

June 27, 2013

### **Roadmap revised for scrapping Fukushima reactors**

[http://www3.nhk.or.jp/nhkworld/english/news/20130627\\_24.html](http://www3.nhk.or.jp/nhkworld/english/news/20130627_24.html)

Japan's government and the operator of the Fukushima Daiichi nuclear power plant have officially endorsed a renewed roadmap for scrapping the crippled reactors.

Officials of the government and Tokyo Electric Power Company approved the revision in a joint panel meeting on Thursday.

The revision is meant to accelerate work to dismantle the plant's 4 reactors, which were disabled in the March 2011 earthquake and tsunami.

**But officials warn the work could fall behind schedule because engineers have yet to determine the exact state of melted fuel inside the reactors.**

The revised roadmap has set different timelines for removing fuel from the No. 1, 2 and 3 reactors. No.4 was offline at the time of the accident.

Removal could start in the first half of 2020 at the earliest at the No. 1 and No. 2 reactors. That's one and a half years sooner than the previous plan.

Officials say decommissioning work, including tearing down reactor buildings, could take as long as 40 years.

The panel also decided to form a new organization to hear from people in the region about how to proceed with the work. Industry minister Toshimitsu Motegi said communications with local people must be strengthened.

Motegi told officials to steadily proceed first with removal of fuel rods from the pool at the No.4 reactor, and make proper decisions for each of the 3 others on when to start the work.

## "Likely flying to sea"

### **Nuclear watchdog: Contaminated water at Fukushima plant likely flowing into sea**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201306270085>

The Nuclear Regulation Authority will order Tokyo Electric Power Co. to take immediate measures to prevent radioactive tritium from spreading in the sea near the Fukushima No. 1 nuclear plant.

The nuclear watchdog on June 26 expressed strong suspicions that high tritium levels detected in the sea were a result of contaminated water leaking from the plant.

TEPCO said earlier this month that high levels of tritium were found in the port area in front of the nuclear plant, but it has not confirmed if the contamination was caused by water leaks from the crippled facility.

The NRA said safety should come before confirmation.

“It is strongly suspected that contaminated water is leaking into the sea,” NRA Commissioner Toyoshi Fuketa told a regular meeting on June 26. “It is very dangerous to deal with the situation based on the presumption (that contaminated water is not leaking).”

The utility said on June 26 that seaborne tritium levels between the water intakes for the No. 1 and No. 2 reactors had been halved to 420 becquerels per liter.

But TEPCO also said that tritium levels in the sea north of the water intakes for the No. 1, No. 2, No. 3 and No. 4 reactors in the port area had risen to 1,500 becquerels per liter when it analyzed seawater that day.

The plant operator said those tritium levels likely increased because contaminated water has accumulated inside a nearby wall being constructed to prevent water from leaking at the plant.

June 28, 2013

## **"Optimistic" scenario for decommissioning Fukushima**

### **Melted fuel removal at Fukushima plant seen optimistically starting in 2020**

<http://www.japantimes.co.jp/news/2013/06/28/national/melted-fuel-removal-at-fukushima-plant-seen-optimistically-starting-in-2020/#.UcyPRdhSb9k>

Kyodo

Work to remove melted fuel from the three crippled reactors at Tokyo Electric Power Co.'s Fukushima No. 1 nuclear plant could start in 2020, the government and Tepco optimistically said Thursday, based on a revised, albeit vague, plan to decommission the stricken complex, a process expected to take decades.

The original melted-fuel extraction was expected to start in 2021, but the government, without elaborating, believes an improvement in work efficiency can move the date forward.

Tepco, however, said an exact start date currently is hard to forecast because the position and state of the fuel in reactors 1, 2 and 3, which suffered core meltdowns, remains unclear and all the utility can do at present is try, with makeshift equipment, to keep water circulating through the damaged containment vessels to prevent further massive radioactive fallout.

The moved-up fuel extraction timetable is the first major revision of the road map outlining the 40-year-long process of scrapping reactors 1 to 4 at the six-reactor complex. The original schedule was released in December 2011, after Fukushima No. 1, ravaged by the March 11, 2011, Great East Japan Earthquake and monster tsunami was deemed in a stable state of "cold shutdown."

The plant is technically currently in the first phase of decommissioning, with Tepco hoping to start in November extracting the fuel inside the spent-fuel pool located outside but atop reactor 4, whose building was ripped apart in a hydrogen explosion.

Reactor 4 was offline for maintenance, and thus empty of fuel, when the catastrophe struck, so only its spent-fuel pool needs to be unloaded, although due to the high levels of radiation in and around the building, this will be a delicate operation requiring high levels of technology. Finding a safe location to store the extracted fuel will also pose hurdles.

The second phase of the decommissioning, based on the revised plan, will entail the removal of the melted fuel from crippled reactors 1 and 2 starting in fiscal 2020 if possible, followed by work to start removing the melted fuel inside reactor 3 in the latter half of fiscal 2021 at the earliest. Reactor 3's fuel is the highly lethal mixed uranium-plutonium oxide (MOX) fuel.

The extractions may be delayed if proper equipment isn't available to deal with the three stricken reactors, whose levels of damage and radiation differ.

The buildings housing reactors 1, 3 and 4 were damaged by hydrogen explosions, while the radiation level inside the reactor 2 building is very high.

Another scenario points to starting the fuel removal of reactor 1 in fiscal 2022, that of reactor 2 in fiscal 2024 and reactor 3's fuel in fiscal 2023.

The original road map only suggested the fuel removal may start in December 2021, without specifying which reactor would be worked on first.

The fuel inside reactors 1, 2 and 3 is believed to have melted through the pressure vessels and accumulated somewhere in the outer primary containers, making the task of extraction more challenging than in the case of the 1979 Three Mile Island accident in Pennsylvania.

June 30, 2013

## More highly contaminated ground water

### Toxic groundwater found in Fukushima No. 1 well just 6 meters from Pacific

JJI

<http://www.japantimes.co.jp/news/2013/06/30/national/toxic-groundwater-found-in-fukushima-no-1-well-just-6-meters-from-pacific/#.Uc8PPdhSb9k>

Tokyo Electric Power Co. said Saturday it has detected high levels of radioactive substances, including strontium, emitting beta rays in groundwater taken from a well at the port of the Fukushima No. 1 nuclear plant.

**Tepco said 3,000 becquerels of radioactive substances per liter were recorded in groundwater from the well, located just 6 meters from the Pacific. That concentration is 100 times higher than the maximum legal limit.**

As levels of radioactive tritium have been rising in seawater around the port, radioactive substances are suspected to have leaked into the ocean.

"It is true that radioactive contamination has been found from groundwater near the sea, but we do not know whether tainted water has made its way into the Pacific," a Tepco official said.

The contamination was found in a water sample collected Friday. **The well is the nearest to the shore among the four wells used for observation purposes at the plant, according to Tepco, and the radiation levels from its groundwater also were the highest detected.**

Also Friday, Tepco recorded 1,400 becquerels of beta ray-emitting radioactive substances such as strontium in groundwater from another of the wells, situated 25 meters from the sea.



The latest revelations came after readings of tritium and strontium-90 were found to be eight to 30 times higher than the permissible limit in ground water from that well in May. After that discovery, Tepco expanded the area it surveys and drilled an additional observation well nearer to the Pacific.

Over the last few months, levels of radioactive tritium in seawater near the water intakes of reactors 1 to 4 at the crippled complex soared to 1,500 becquerels per liter at one point. **A member of the Nuclear Regulation Authority earlier said it is "highly likely" that contaminated groundwater has leaked into the Pacific.**

Following the triple meltdowns at the Fukushima No. 1 plant, huge amounts of highly radioactive water gushed into the Pacific through a duct containing cables for reactor 2, one of the three wrecked units. Tepco sealed the duct in April 2011, but some of the remaining tainted water is believed to have leaked and become mixed with groundwater, officials at the utility said.

June 30, 2013

## Japanese-US "world's first" attempt to measure U and Pu in melted fuel

### Japan, U.S. jointly developing tech to gauge melted fuel at Fukushima plant

Kyodo

<http://www.japantimes.co.jp/news/2013/06/30/national/japan-u-s-jointly-developing-tech-to-gauge-melted-fuel-at-fukushima-plant/#.Uc8PnthSb9k>

Japan and the United States have started to jointly research new technologies that could measure the amount of uranium and plutonium contained in melted nuclear fuel at the Fukushima No. 1 plant, officials involved in the project announced Saturday.

Under Japan's safeguards agreement with the International Atomic Energy Agency, the country is obliged to report to the U.N. watchdog the volume of nuclear substances in fuel at its atomic power plants to confirm that none has been converted for weapons use.

The government aims to begin monitoring the substances from the early 2020s in line with its timetable for scrapping nuclear reactors, said the officials from the Japan Atomic Energy Agency and the U.S. Department of Energy, the entities chiefly responsible for the project.

The JAEA called it the "world's first" attempt to devise such a measuring technique, as technical issues prevented a similar initiative after the 1979 Three Mile Island nuclear accident in the United States.

But the process of measuring the substances may prove difficult because the melted fuel must first be removed from the containment vessels of the Fukushima No. 1 complex's wrecked reactors, the officials said.

The agency and the Energy Department signed a contract on the joint project last November, said Keiichiro Horii, a member of the special JAEA team tasked with introducing new technology for decommissioning the No. 1 plant's reactors.

In February, technical experts held their first meeting at the head office of the JAEA in Tokaimura, Ibaraki Prefecture. The United States was represented by 14 experts, including from the U.S. Nuclear Regulatory Commission and Los Alamos National Laboratory.

A rough outline of the road map has been drafted and several of the technologies that could be applied at the Fukushima plant will be chosen in the current fiscal year, the officials said.

Experts from both nations will also aim to develop a technology in fiscal 2014 and 2015 that could measure the gamma and neutron rays emitted by melted fuel removed from the containment vessels at the No. 1 power station and placed inside a special container. By the end of fiscal 2018, they plan to manufacture measuring equipment and to conduct a trial run the following year, the officials said.

Reactors 1 to 3 at the Fukushima No. 1 facility contained around 1,500 fuel assemblies in total at the time of the March 2011 meltdowns, which forced residents to flee the radioactive fallout spewed over the surrounding area.

See also :

### **Japan, U.S. eye technology to measure melted fuel in Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130630p2g00m0dm031000c.html>

TOKYO (Kyodo) -- Japan and the United States have begun joint research on the development of technologies that can measure the amount of uranium and plutonium contained in melted fuel at the Fukushima Daiichi power plant, Japanese and U.S. officials involved in the project said Saturday. [...]

## **Fukushima update by Greenpeace**

### **Fukushima Nuclear Crisis Update from June 28th to July 1st, 2013**

<http://www.greenpeace.org/international/en/news/Blogs/nuclear-reaction/fukushima-nuclear-crisis-update-for-june-28th/blog/45811/>

Blogpost by **Christine McCann** - July 2, 2013 at 12:52

Here's the latest of our news bulletins from the ongoing crisis at Japan's Fukushima Daiichi nuclear power plant.

### **State of the Fukushima Reactors**

Highlighting renewed security concerns at the Fukushima Daiichi power plant, officials from TEPCO admitted that a worker wilfully drove a highly contaminated cement truck out of the compound and to the town of Naraha, despite being aware that the vehicle was radioactive. He returned an hour and ten minutes later, after picking up concrete at a factory there. The limit for vehicles to leave the plant is 13,000 counts per minute (CPM), but the truck measured 22,000 CPM. Officials did not clarify why the man intentionally violated established guidelines or why he was not stopped at the gates.

TEPCO has found more highly radioactive water at its Fukushima Daiichi plant this weekend, this time in a well located just 6 meters from the ocean. The discovery galvanizes experts' suspicions that contamination water is seeping into the sea. Officials reported that the water contained 3,000 Bq/liter of radioactive substances, including strontium-90. The legal limit is just 30 Bq/liter. Strontium-90 has a half-life of 28.8 years and can accumulate in human bones, causing cancer. TEPCO is continuing to investigate the cause of the contamination, but believes that strontium and tritium, another radioactive substance, entered the soil immediately following the March 2011 meltdowns, and later contaminated nearby groundwater. They have not been able to clarify why the levels have begun to rise precipitously within the last month.

In other water news, TEPCO has finally transferred all contaminated water from seven belowground storage pits, four of which were found to be leaking in April and May. Workers completed transfer of the most highly radioactive water to stainless steel aboveground tanks on June 11, and finished moving the last 3,000 tons of water this week.

The Japan Atomic Energy Agency (JAEA) and the United States Department of Energy (DOE) have begun work on creating new technology to measure the amount of uranium and plutonium contained in melted fuel sitting in the ruined Fukushima Daiichi nuclear reactors, after signing an agreement to do so late last year. The project team was formed after the International Atomic Energy Agency (IAEA) ordered Japan to determine the amount of nuclear substances in the melted fuel, in an effort to ensure that none of it is diverted for use in making nuclear weapons. The team hopes to develop the technology within the next two and a half years, and begin testing it by 2019.

## **TEPCO**

TEPCO's efforts to restart the Kashiwazaki-Kariwa nuclear power plant in Niigata Prefecture encountered yet another challenge this week, after Niigata Governor Hirohiko Izumida once again forcefully objected to the plan. Izumida has criticized the Nuclear Regulation Authority (NRA) for failing to include local representatives in its decision process: "Nobody familiar with local government administration is on the panel. Such an absurd stance is unheard of," he said. In addition, Izumida has questioned the agency's ability to effectively monitor the safety of Japan's reactors without having determined the root causes of the Fukushima meltdowns. TEPCO needs to restart at least some of the seven reactors at Kashiwazaki-Kariwa to return to solvency, but unless the central government overrides local authority, that appears unlikely. "Even if the Kashiwazaki-Kariwa nuclear plant run by TEPCO meets new safety requirements set by the Nuclear Regulation Authority, it won't mean its safety is guaranteed...Before [restarting the reactors], the government must get to the bottom of the Fukushima nuclear crisis. The NRA standards alone won't ensure the safety of prefectural residents," he noted.

## **Other Nuclear Politics in Japan**

Kansai Electric Power Company (KEPCO) has submitted a report to the NRA claiming that a fault line running beneath reactors #3 and #4 at its Oi power plant in Fukui Prefecture is not active. The Oi reactors are the only ones currently producing nuclear power in Japan. KEPCO officials said that the fault has not moved within the last 120,000 to 130,000 years. However, a panel of NRA experts has met twice over the last year, with members sharply divided on the issue; half believe that the fault is, in fact, active. In addition, new NRA safety regulations that go into effect on July 8 will tighten seismic requirements, redefining an “active fault” as any that has moved within the last 400,000 years. Despite the fact that the NRA has been unable to determine whether or not the reactors are at risk of a major earthquake, the agency is allowing them to continue to operate until September, when they will automatically go offline for routine maintenance. NRA officials said that they will continue to investigate whether or not the fault is active. (Source: NHK)

A new exposé by The Asahi Shimbun reveals that government funds that were supposed to be devoted to earthquake recovery have instead been paid to Chubu Electric, to underwrite the cost of maintaining idle nuclear reactors at its Hamaoka power plant and specifically, “to facilitate thermal power generation.” A total of 10 billion yen, raised through recovery surtaxes, was paid to Chubu in fiscal 2011. In essence, nuclear power is even more expensive than it seems; Chubu consumers have been forced to absorb both rate increases and taxpayer subsidies. Asahi reports that all of Japan’s nuclear power providers are eligible for such subsidies, but so far, only Chubu has requested funding. The Ministry of Economy, Trade, and Industry (METI) is defending the payments to the utility, saying that the Hamaoka plant was forced to go offline at the request of the central government.

## **Radiation Contamination, Including Human Exposure**

Despite establishing a policy that says that evacuees cannot return to areas contaminated by the Fukushima nuclear disaster until radiation levels fall below 1 millisievert per year, or .23 microsieverts per hour, Japan’s central government is apparently now backtracking and leaving residents to fend for themselves. Environment Ministry officials reportedly told them to return home by the Bon holiday (in mid-August) and take responsibility for measuring their own radiation exposure levels, even though contamination levels in the area still exceed the annual limit.

The announcement came during a meeting between government officials and residents from the city of Tamura. The government attempted to decontaminate the city, but like many areas affected by the Fukushima disaster, their efforts were ineffective. Radiation levels there remain high, between .32 and .54 microsieverts per hour. Residents at the meeting requested that the Environment Ministry continue decontamination efforts until levels drop, but officials refused. Instead, one official said, “We will offer you a new type of dosimeter, because we want you to check your exposure to radiation yourselves.” Later, the Environment Ministry tried to deny the fact that its officials denied the residents’ request, apparently unaware that the proceedings had been audiotaped and given to media outlets.

July 5, 2013

## Vehicles equipped to analyse radiation

### Mobile radiation analysis lab revealed

[http://www3.nhk.or.jp/nhkworld/english/news/20130705\\_24.html](http://www3.nhk.or.jp/nhkworld/english/news/20130705_24.html)

Japan's nuclear research agency has developed a mobile laboratory that can accurately analyze radioactive substances on site.

The Japan Atomic Energy Agency on Friday unveiled **2 vehicles with equipment capable of analyzing types and quantities of radioactive substances**, as well as other machines at its research center.

The equipment is installed in a way that prevents engine vibrations from affecting the analysis.

The vehicles' ventilation system has special filters that remove radioactive substances to prevent interior contamination that could affect the analysis.

The agency says the vehicles will enable samples to be analyzed before they are affected by factors such as temperature and time. Samples would face these issues if they were taken to a research center.

An agency official said **the vehicles will help improve the accuracy of analysis by cutting the time between the acquisition and analysis of samples**.

The agency will start operating the vehicles in mid-July.

In the Fukushima nuclear disaster in 2011, samples of radioactive substances collected in mountainous regions and rivers had to be taken to research centers far distant from the site for accurate analysis.

July 6, 2013

## More wells to monitor radiation

## **TEPCO to dig more wells to check contamination**

[http://www3.nhk.or.jp/nhkworld/english/news/20130706\\_22.html](http://www3.nhk.or.jp/nhkworld/english/news/20130706_22.html)

The operator of the damaged Fukushima Daiichi nuclear power plant plans to build more wells to monitor the spread of radioactive contamination under the ground.

Tokyo Electric Power Company has detected high levels of radioactive substances since May in samples of underground water collected at a newly dug well close to the ocean.

The company detected on Friday a total of 900,000 becquerels per liter of radioactive substances, including strontium that emits beta particles, in underground water collected from the well. That's the highest level ever detected in samples from observation wells.

The newly dug well is close to a pit from which highly radioactive water was found seeping into the sea in April 2011, shortly after the nuclear accident.

TEPCO suspects that the water leak more than 2 years ago may be linked to the level of contamination of water inside the well.

But the company says it's hard to determine just what happened.

For instance, the reason for the level of strontium is not known. Previously, strontium was thought unlikely to show up in measurable quantities in water because it is believed to remain in the soil.

TEPCO says the level of radioactivity in nearby waters has not greatly changed, and that it is also unknown whether there has been any further leak into the sea.

## **900,000 becquerels per liter at a well near the port**

### **Tritium levels on steep rise at Fukushima Daiichi**

[http://www3.nhk.or.jp/nhkworld/english/news/20130706\\_27.html](http://www3.nhk.or.jp/nhkworld/english/news/20130706_27.html)

The operator of the damaged Fukushima Daiichi nuclear power plant says the level of radioactive tritium found in nearby seawater is the highest it has been for 2 years.

Tokyo Electric Power Company says it detected 2,300 becquerels of tritium per liter of seawater collected from a port near the nuclear plant on Wednesday.

That's twice the amount detected about 2 weeks ago, and the highest since monitoring began in June 2011.

But the figure is still about one-twenty-fifth of the government-set limit for water to be released into the sea.

The tritium found in seawater stayed at around 100 becquerels per liter for one year through April. But it started to rise in May.

On Friday, TEPCO workers tested water collected from a well near the port. They detected **900,000 becquerels of radioactive substances, including strontium, per liter.**

That's the highest level ever found in samples from observation wells.

TEPCO officials say they have yet to confirm the cause of the spike in readings, but **they cannot rule out the possibility that contaminated groundwater seeped into the sea.**

The company plans to build more observation wells and solidify the ground to prevent underground water from reaching the ocean.

### **Highly radioactive water found in another well at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130706p2g00m0dm004000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Friday it has detected highly radioactive water in a well newly built to check the spread of underground contamination at the crippled Fukushima Daiichi nuclear power plant.

The well is only several meters from a pit from which highly radioactive water was found seeping into the adjacent sea in April 2011, shortly after the nuclear crisis commenced at the plant.

According to TEPCO, a water sample collected Monday from the well, around 25 meters from the sea, contained about 900,000 becquerels per liter of radioactive substances such as strontium that emit beta rays.

TEPCO spokesman Masayuki Ono told a press conference that the company will check whether the water leak more than two years ago has affected the contamination level of water inside the well.

Meanwhile, to improve the reliability of the cooling system for the crippled Nos. 1 to 3 reactors, TEPCO started using a 3-kilometer-long water circulation route that is 1 km shorter than previously.

Water once used to cool the damaged reactors is currently recycled as coolant after the level of radioactivity has been lowered in a water-processing facility.

The shortcut became possible because TEPCO created a route that enables water to be sent to the reactors without going through makeshift tanks located northwest of the No. 1 reactor building. **TEPCO plans to shorten the length of the water loop to around 1.3 km by the end of fiscal 2014.**

## Three types of contaminated water

### Column] Summary of Fukushima situation ~Contaminated water problem

Posted by **Mochizuki**

<http://fukushima-diary.com/2013/07/column-summary-of-fukushima-situation-contaminated-water-problem/>

There was a hope in pandora's box.

In Fukushima, the bottom is already melted through.

Most of the people are controlled by mood. Not even emotion. We are not allowed to talk about something real in public.

People who are still concerned about Fukushima are scattered around in the world. It's almost impossible to reach them in the traditional way, but internet, google and SNS make it possible fortunately. I'm happy about that.

I'm trying to explain the situation as simply as possible. However, the situation is getting more complicated and more.

The "hottest" topic about Fukushima is "contaminated water" recently. You can't mistake these 3 types of contaminated water.

#### 1. Contaminated water in the basement floor of the plant

Now 400m<sup>3</sup> of groundwater flows into the basement of the plant everyday.

They have to choose one of these two, "Let it out" or "Let it in". Because they can't spread contamination, they let it in. They are pumping it up and reserving.

#### 2. Leaking contaminated water from reservoir



Because they are in short of contaminated water (The one above) storage, they made underground reservoirs and stocked. However, the vinyl cover was broken and reserved water leaked. It happened this April and they transferred the reserved water to spare tanks. For some reason, they are still detecting high level of radiation from around the reservoirs.

### **3. Contaminated groundwater**

This May, they detected extremely high level of Tritium from groundwater. This is the hottest topic recently. Officially, this has nothing to do with "1" or "2" above. Tepco assumes it is due to the leakage in 2011.

In order to see if it's not flowing to the sea, Tepco is testing seawater, but the radiation level is significantly increasing. It's already leaking to the sea for almost sure.

As countermeasures, Tepco is planning to inject grout into the ground and "watch the contamination trend carefully". The former attempt hasn't been started. The latter attempt is useless.

I hope I made the situation a little bit clearer.

The temperature of reactors look stable, but the contaminated water situation still has a long way to go. Fukushima contamination spreads in various ways, from the sea, air, products, food etc.. It has just started.

Officially, it's going to take 40 years to decommission (If someone develops the technology). Until then, radioactive material keeps spreading and it's accumulated in the environment. We shall calculate from the inevitable result. This is what Fukushima Diary is trying to tell.

July 7, 2013

## **Tritium in groundwater: 600,000Bq/liter**

### **Tritium soaring in water at No. 1 plant**

JJI

<http://www.japantimes.co.jp/news/2013/07/07/national/tritium-soaring-in-water-at-no-1-plant/#.UdmHQqxSb9k>

Tokyo Electric Power Co. said Sunday that 600,000 becquerels per liter of tritium has been detected in groundwater at the crippled Fukushima No. 1 nuclear plant.

It's the first time such a high level of tritium, an isotope of hydrogen, has been measured in the plant's groundwater, Tepco said.

The water, sampled Friday, came from an observation well about 6 meters west of the plant's port. The well is the closest to the sea of the five wells used for radiation monitoring.

On Wednesday, the tritium level in the same well was 510,000 becquerels per liter, Tepco said.

The utility also said it had measured, on Wednesday, a seawater tritium level of 2,300 becquerels per liter — the highest so far — near the water intakes of reactors 1 to 4.

Tritium concentrations in groundwater have become denser on the north side of the intakes, but Tepco also said it has yet to determine whether the tainted water has been leaking into the sea.

A Nuclear Regulation Authority official recently said contaminated groundwater from the plant, which is being fed cooling water from outside, may be seeping into the ocean and that the matter must be addressed carefully because data is limited.

July 9, 2013

## **Masao Yoshida dies of cancer**

### **Former chief of Fukushima nuclear plant has died**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307090081>

THE ASSOCIATED PRESS

Masao Yoshida, the man who led the life-risking battle at Japan's crippled nuclear power plant when it was spiraling into meltdowns, has died of cancer of the esophagus. He was 58.

Officials at Tokyo Electric Power Co. said Yoshida's illness was not related to radioactive exposure. Yoshida led efforts to stabilize the Fukushima No. 1 nuclear power plant after the March 11, 2011, earthquake and tsunami knocking out its power and cooling systems, causing triple meltdowns and massive radiation leaks.

Recalling the first few days when the three reactors suffered meltdowns in succession, Yoshida later said: "There were several instances when I thought we were all going to die here. I feared the plant was getting out of control and we would be finished."

Yoshida, an outspoken, tall man with a loud voice who wasn't afraid of talking back to higher-ups, but also known as a caring figure to his workers.

Even then-Prime Minister Naoto Kan, who was extremely frustrated by TEPCO's initial lack of information and slow handling, said after meeting him that Yoshida could be trusted.

Yoshida stepped down as plant chief in December 2011, citing the cancer, after workers had begun to bring it under control.

TEPCO spokesman Yoshimi Hitosugi said Yoshida died on the morning of July 9 at a Tokyo hospital.

Yoshida brought workers together and kept their spirits up to survive the crisis, and had expressed hopes of returning to work for Fukushima's recovery even after falling ill, TEPCO President Naomi Hirose said.

"He literally put his life at risk in dealing with the accident," Hirose said in a statement. "We keep his wishes to our heart and do utmost for the reconstruction of Fukushima, which he tried to save at all cost."

## **[Breaking] Former Fukushima chief Yoshida died**

Posted by **Mochizuki** on July 9th, 2013 · 2 Comments

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<http://fukushima-diary.com/2013/07/breaking-former-fukushima-chief-yoshida-died/>

According to Tepco, the former Fukushima nuclear plant chief Yoshida died before the noon of 7/9/2013. The cause of death is not announced.

He was 58 years old.

Former chief of Fukushima nuclear plant has died.

## **90-meter embankment to prevent seeping into the ocean**

### **Embankment reinforced at Fukushima Daiichi plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20130709\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20130709_33.html)

The operator of the damaged Fukushima Daiichi nuclear plant is trying to prevent contaminated groundwater from seeping out to sea by reinforcing embankments on the coastal side of the plant.

Tokyo Electric Power Company began work on Monday on a 90 meter-long embankment.

Workers using heavy machinery drilled 14-meter-deep holes at 80-centimeter intervals along the

embankment, and then poured in chemicals to harden and waterproof the soil.

Tokyo Electric hopes to finish the work by the end of this month.

High levels of radioactive materials have been detected in groundwater from one of the wells used for monitoring contamination. The well is located between the No.2 reactor building and the sea.

This suggests that radioactive wastewater from the plant is seeping into the ground and spreading.

The utility has been taking samples of nearby seawater to check for possible seepage.

It says it cannot rule out the possibility that some contaminated water has already made its way out to sea.

July 10, 2013

## **NRA doesn't agree with TEPCO**

### **NRA panel to study ways to prevent leaks into sea**

[http://www3.nhk.or.jp/nhkworld/english/news/20130710\\_28.html](http://www3.nhk.or.jp/nhkworld/english/news/20130710_28.html)

Japan's Nuclear Regulation Authority has decided to form a working group to study ways to keep highly tainted water from the damaged Fukushima nuclear plant from seeping into the sea.

NRA officials met on Wednesday. They said contaminated water is very likely leaking into the sea. A panel including experts is to look into the problem.

The decision followed findings of soaring radioactive cesium levels in observation wells at the plant.

The facility's operator, Tokyo Electric Power Company, has reported high levels of radioactive substances in a well near the sea since May.

The firm said on Tuesday that levels of cesium 137 in a new well near the plant's No. 2 reactor had risen to 22,000 becquerels per liter. That's 100 times the level logged 4 days earlier.

Utility officials had said highly contaminated water that leaked near the reactor in April 2011 may have been detected this time around.

But regulators say this is unlikely, as cesium was also detected in wells near other reactors -- even though it can easily be absorbed by soil.

They also say radioactive substances were recently found in high densities in waters of the plant's port. They say they strongly suspect that highly contaminated water is leaking into soil and then into the sea.

NRA chief Shunichi Tanaka told reporters that examinations by experts are needed to take countermeasures as a top priority.

Tokyo Electric says it will seriously heed the NRA's views.

## Stop the leaks into the ocean

### Expert: TEPCO must stop groundwater leaks

[http://www3.nhk.or.jp/nhkworld/english/news/20130710\\_08.html](http://www3.nhk.or.jp/nhkworld/english/news/20130710_08.html)

A Japanese researcher says the operator of the damaged Fukushima Daiichi nuclear plant must step up measures and monitoring to stop radiation-tainted groundwater from seeping into the sea.

The operator of the plant has said radioactive cesium levels at one observation well near the sea soared over the past several days.

Groundwater expert Atsunao Marui of the National Institute of Advanced Industrial Science and Technology made the comment after levels of radioactive substances surged over a 4 day period at one of the plant's observation wells.

Tokyo Electric Power Company said on Tuesday that levels of cesium 137 had risen to 22,000 becquerels per liter of water, or more than 100 times the level logged last Friday. It also reported on Monday that radioactive cesium levels soared 90 times from last Friday.

Marui says TEPCO must take a multi-layered approach to stop what may be new leaks of contaminated groundwater from the building that houses the No.2 nuclear reactor. He suggests that the utility install steel plates around the reactor in addition to reinforcing embankments on the coastal side of the plant, and fill the gaps with clay or other water-resistant materials.

Marui also says TEPCO must grasp the overall flow of the groundwater, including vertical streams. He says the firm should dig more observation wells on the plant compound and monitor groundwater springing forth under the sea.

TEPCO started drilling holes along the sea bank on Monday ahead of pouring in chemicals to harden and waterproof the soil. It also plans to increase observation wells to strengthen monitoring.

## Cesium concentrations at their highest since 3/11

### Cesium levels rise 100 times at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307100082>

Radioactive cesium levels at a well on the premises of the Fukushima No. 1 nuclear power plant on July 9 were more than 100 times higher than those measured at the same site just four days earlier, Tokyo Electric Power Co. said.

TEPCO said July 10 that 33,000 becquerels of cesium levels per liter, compared to 309 becquerels on July 5, were detected in water samples collected on July 9 from a well on the seaward side of the No. 2 reactor building. The figure means that cesium levels increased by an additional 20 percent from 27,000 becquerels measured a day earlier.

**It is the highest level found since the onset of the March 2011 nuclear disaster.**

TEPCO has said cesium levels have likely surged because radioactive water that leaked from reactors at the time of the disaster spread underground and only reached the well recently.

But the Nuclear Regulation Authority has questioned TEPCO's explanation. During a meeting on July 10, NRA officials pointed out the possibility that contaminated water has continued to leak from somewhere, such as side ditches connecting turbine buildings with the sea.

On July 8, TEPCO began to inject a sealing agent into the ground near the shore protection to prevent radioactive water from leaking into the sea.

The high radioactivity levels were detected at the No. 1-2 observation well, located near the water intake for the No. 2 reactor, from which highly radioactive water leaked into the sea in April 2011.

The 33,000 becquerels consist of 11,000 becquerels of cesium-134, 180 times the legally permitted level, and 22,000 becquerels of cesium-137, 240 times the legally allowed level.

The levels of strontium and other radioactive substances in the well were 900,000 becquerels, just slightly higher than 890,000 becquerels on July 8.

### **Cesium readings further climb in groundwater at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130710p2g00m0dm036000c.html>

TOKYO (Kyodo) -- Radioactive cesium readings in groundwater samples taken from an observation hole by the sea at the Fukushima Daiichi Nuclear Power Station increased further on Tuesday compared with the samples taken the day before, Tokyo Electric Power Co. said early Wednesday.

Tuesday's samples showed 11,000 becquerels of cesium-134 per liter and 22,000 Bq/L of cesium-137. They were 111 times and 105 times greater than the samples on Friday.

Monday's samples registered 9,000 Bq/L of cesium-134 and 18,000 Bq/L of cesium-137.

The reason for the spike in readings remains unknown. TEPCO said it will intensify the monitoring.  
July 10, 2013(Mainichi Japan)

## **NRA suspects contaminated water is reaching the sea**

### **Toxic groundwater reaching sea: NRA**

<http://www.japantimes.co.jp/news/2013/07/10/national/toxic-groundwater-reaching-sea-nra/#.Ud2lOaxSb9k>

*Watchdog says pit may not be only source of radioactive spike*

Kyodo, Bloomberg

The Nuclear Regulation Authority said Wednesday it strongly suspects highly radioactive water at the Fukushima No. 1 nuclear power plant is seeping into the ground and contaminating the Pacific Ocean. "We must find the cause of the contamination . . . and put the highest priority on implementing countermeasures," NRA Chairman Shunichi Tanaka told a meeting of the body's commissioners after they

had examined recent studies carried out on groundwater samples at the plant that detected high levels of cesium, tritium and other radioactive contamination.

Tokyo Electric Power Co. claims it believes the source of contamination to be a pit from which highly radioactive water was found seeping into the sea in April 2011, shortly after the nuclear crisis erupted at the plant. However, the NRA said Tepco's explanation was questionable and noted that toxic water in the area may not be the only source.

The NRA also urged Tepco to speed up completion of a deeply sunken coastal containment wall between the plant and the Pacific to keep the increasingly highly radioactive groundwater from reaching the ocean. Tepco should try to finish the wall earlier than the planned March 2015 completion date and should attempt to remove contaminated water collecting in trenches at the plant, the NRA said in a statement Wednesday.

According to Tepco, the level of radioactive cesium in groundwater collected Tuesday from an observation well near the sea soared over 100 times higher than the level taken Friday.

Tuesday's sample contained 11,000 becquerels of cesium-134 per liter and 22,000 becquerels of cesium-137 per liter.

The nation's nuclear safety guidelines require cesium-137 levels for waste liquids at nuclear plants to remain below 90 becquerels per liter.

The water also contained 900,000 becquerels of other radioactive substances that emit beta rays, including strontium.

The cesium-137 levels had risen from 18,000 becquerels per liter a day earlier, while those of cesium-134 increased to 11,000 becquerels from 9,000, Tepco said. Safety guidelines require cesium-134 levels at plants to remain below 60 becquerels per liter. The nation's safety limit for radioactive materials in drinking water is 10 becquerels per liter.

A separate monitoring well at the turbine complex showed cesium-137 levels stable at 0.74 becquerels per liter between July 8 and 9, while cesium-134 rose slightly to 0.50 becquerels from 0.49 becquerels. Tepco didn't provide a reason for the spike in radiation levels or explain why levels varied so much at different monitoring wells.

The higher radioactivity levels were found in a well Tepco began surveying Sunday as part of its probes into strontium and tritium found in groundwater at the plant.

Tepco has taken measures to enclose the contaminated seawater in areas near the plant, but cannot completely prevent the spread of every radioactive material into the wider ocean, an NRA official said.

The utility has claimed it has detected "no significant impact" on the environment.

Tepco chief Naomi Hirose said last week the utility would seek permission to restart two reactors at its Kashiwazaki-Kariwa nuclear complex in Niigata Prefecture as soon as possible. The firm, which logged a ¥685.3 billion loss last fiscal year, said in May 2012 that it would return to profit this year if reactors at the plant are restarted.

see also:

### **Regulators suspect toxic water at Fukushima plant contaminating sea**

<http://mainichi.jp/english/english/newsselect/news/20130710p2g00m0dm065000c.html>



TOKYO (Kyodo) -- The Nuclear Regulation Authority said Wednesday that it is "strongly suspected" that highly radioactive water at the Fukushima Daiichi nuclear power plant is seeping into the ground and contaminating the Pacific Ocean.[...]

"We must find the cause of the contamination...and put the highest priority on implementing countermeasures," NRA Chairman Shunichi Tanaka told a meeting of its commissioners after they had studied recent surveys on the radiation level of groundwater at the plant, which has shown radioactive substances such as cesium and tritium existing in high density.

Plant operator Tokyo Electric Power Co. believes the source of contamination to be a pit from which highly radioactive water was found seeping into the sea in April 2011, shortly after the nuclear crisis began at the plant, but the NRA said that toxic water in the area may not be the only cause.

According to TEPCO, the density of radioactive cesium in groundwater collected Tuesday from an observation well by the sea soared over 100 times higher than the level in water taken Friday.

The groundwater sample contained 11,000 becquerels of cesium-134 per liter and 22,000 becquerels of cesium-137 per liter.

The water also contained 900,000 becquerels of other radioactive substances that emit beta rays, such as strontium.

TEPCO has taken measures to enclose the contaminated seawater in areas near the plant, but they cannot completely prevent the spread of every radioactive material to the wider sea area, according to an NRA official.

TEPCO has said it has detected "no significant impact" on the environment.

## **Contamination may be due to soil in water, says TEPCO**

### **TEPCO: Soil in water could raise well's radiation**

[http://www3.nhk.or.jp/nhkworld/english/news/20130711\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20130711_02.html)

The operator of the Fukushima Daiichi nuclear plant says high levels of radioactive cesium in groundwater may be due to soil mixed into the water.

Tokyo Electric Power Company announced on Tuesday that the level of radioactive cesium in a newly-dug well between the No. 2 reactor and the ocean increased 100 times over the previous 5 days.

The reading was taken close to a site where highly radioactive water from the reactor leaked into the ocean after the nuclear accident in 2011.

In a news conference on Wednesday, officials said that after they filtered the water sample and measured it again, the cesium reading dropped to levels recorded 5 days earlier.

They said contaminated soil could be to blame for the higher readings in the groundwater, and that the soil was likely mixed with the water when workers pumped up a sample for testing.

But the operator said it has not ruled out other causes, and will continue investigating.

Japan's Nuclear Regulation Authority says it will check other wells near the No. 3 and 4 reactors, as water in those wells is contaminated with cesium as well.

### **Watchdog: Ocean contamination likely at Fukushima**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307100106>

THE ASSOCIATED PRESS

Japan's nuclear watchdog said on July 10 that the crippled Fukushima nuclear power plant is probably leaking contaminated water into the ocean, a problem long suspected by experts but denied by the plant's operator.

Officials from the Nuclear Regulation Authority said a leak is "strongly suspected" and urged plant operator Tokyo Electric Power Co. to determine where the water may be leaking from and assess the environmental and other risks, including the impact on the food chain. The watchdog said it would form a panel of experts to look into ways to contain the problem.

The watchdog's findings underscore TEPCO's delayed response in dealing with a problem that experts have long said existed. On July 10, the company continued to raise doubts about whether a leak exists.

TEPCO spokesman Noriyuki Imaizumi said the increase in cesium levels in monitoring well water samples does not necessarily mean contaminated water from the plant is leaking to the ocean. TEPCO was running another test on water samples and suspects earlier spikes might have been caused by cesium-laced dust slipping into the samples, he said. But he said TEPCO is open to the watchdog's suggestions to take safety steps.

The Fukushima No. 1 power plant was ravaged by the March 2011 earthquake and tsunami and has since struggled with leaks of water used to cool the reactors, hampering decommissioning efforts.

Marine biologists have warned of the possibility of continuous leak of radioactive water into the sea via an underground water system, citing high levels of radioactivity in fish samples taken near the plant.

Since May, TEPCO has reported spikes in cesium levels in underground water collected from a coastal observation pit, while the water-soluble element strontium showed high levels in seawater samples taken

in areas just off the coast of the plant. The company says most of the contamination has been there since the 2011 accident.

TEPCO has said it has detected "no significant impact" on the environment. It says cesium tends to be absorbed in the soil, and denies water contaminated with that element reached the sea.

But the Nuclear Regulation Authority said July 10 that samples from both the pit water and coastal seawater indicated that contaminated underground water likely had reached the sea.

Watchdog chairman Shunichi Tanaka said he thinks that the seawater contamination has been happening since the accident, but that it was worst early in the crisis.

"What's most important is to minimize the leak to the outside and reduce the impact on the human society," he said.

TEPCO says that it has taken steps to prevent seawater contamination in areas near the plant, but that it is impossible to completely prevent the contamination from spreading into wider areas.

Atsunao Marui, underground water expert at the National Institute of Advanced Industrial Science and Technology, said there is a possibility of new leaks from reactor buildings. He said TEPCO will have to expand its sea water sampling and its investigation of the underground water system to assess the extent of possible contamination.

"It is important to apply several layers of protection," he told NHK television.

The plant, which still runs on jury-rigged systems to cool the reactors, has been plagued by problems, including repeated leaks of contaminated water from storage tanks. Managing the contaminated water and its storage has been a chronic headache.

"When something unexpected happens, we can only take stopgap measures, which shows how unstable Fukushima No. 1 plant still is," Tanaka said. "Given the situation, we can only use the best of our wisdom and do what we can."

July 11, 2013

## NRA doesn't have (all the) answers

### Japanese Nuclear Plant May Have Been Leaking for Two Years

[http://www.nytimes.com/2013/07/11/world/asia/japanese-nuclear-plant-may-have-been-leaking-for-two-years.html?\\_r=1&](http://www.nytimes.com/2013/07/11/world/asia/japanese-nuclear-plant-may-have-been-leaking-for-two-years.html?_r=1&)

By HIROKO TABUCHI

TOKYO — The stricken nuclear power plant at Fukushima has probably been leaking contaminated water into the ocean for two years, ever since an earthquake and tsunami badly damaged the plant, Japan's chief nuclear regulator said on Wednesday.

In unusually candid comments, Shunichi Tanaka, the head of the Nuclear Regulation Authority, also said that **neither his staff nor the plant's operator knew exactly where the leaks were coming from, or how to stop them.**

The operator, Tokyo Electric Power, has reported spikes in the amounts of radioactive cesium, tritium and strontium detected in groundwater at the plant, adding urgency to the task of sealing any leaks. Radioactive cesium and strontium, especially, are known to raise risks of cancer in humans.

Mr. Tanaka's comments bring into sharp relief the precariousness of the cleanup at the Fukushima Daiichi Nuclear Power Plant, where core meltdowns occurred at three of the six reactors. A critical problem has been the groundwater that has been pouring into the basements of the damaged reactor buildings and becoming contaminated. Workers have been pumping the water out to be stored in dozens of tanks at the plant, but have not stopped the inflow.

Until recently, Tokyo Electric, known as Tepco, flatly denied that any of that water was leaking into the ocean, even though various independent studies of radiation levels in the nearby ocean have suggested otherwise. In recent days, Tepco has retreated to saying that it was not sure whether there was a leak into the ocean.

Mr. Tanaka said that the evidence was overwhelming.

"We've seen for a fact that levels of radioactivity in the seawater remain high, and contamination continues — I don't think anyone can deny that," he said Wednesday at a briefing after a meeting of the authority's top regulators. "We must take action as soon as possible.

“That said, considering the state of the plant, it’s difficult to find a solution today or tomorrow,” he added. “That’s probably not satisfactory to many of you. But **that’s the reality we face after an accident like this.**”

By acknowledging that the Fukushima Daiichi plant is not watertight, Mr. Tanaka confirmed suspicions held by experts that the plant has continued to leak radiation into the ocean long after the huge initial releases seen in the disaster’s early days.

A study released earlier this year by Jota Kanda, an oceanographer at the Tokyo University of Marine Science and Technology, examined Tepco’s own readings of radiation levels in the waters near the plant’s oceanfront site. The study concluded that it was highly likely the plant was leaking.

“If there was no leak, we would see far lower levels of radioactive cesium in waters off the plant,” Professor Kanda said last month. He said that natural tidal flushing of the water in the plant’s harbor should have dispersed the initially released radioactivity by now, with a far more rapid drop in radiation levels than had been detected.

“This suggests that water might be leaking out from the plant through damaged pipes or drains, or other routes Tepco doesn’t know about,” he said. “We need to find out where exactly these leaks are, and plug them.”

Unexplained spikes since May in cesium levels detected in groundwater, coupled with higher strontium and tritium readings off shore, have added to the urgency.

Tepco said Wednesday that it was not sure that any contaminated water was reaching the ocean. It has said in the past that the stricken plant was now having “no significant impact” on the marine environment.

“We can’t say anything for sure,” Noriyuki Imaizumi, a Tepco spokesman, said Wednesday at a news conference in Tokyo. “But we aren’t just sitting back. We are first analyzing why there have been high radiation measurements in recent weeks.”

The struggle to seal the plant has raised questions about the government’s push to restart Japan’s other nuclear power stations, which were shut down in the wake of the Fukushima disaster. Some critics have said that the work of certifying and reopening other plants will distract from the cleanup at Fukushima. To allay public fears, the government has promised that restarts will be authorized only for reactors that pass rigid new standards that took effect this month.

Four utilities across Japan have applied to restart a total of 10 reactors, applications that must now be assessed by the nuclear regulator with a staff of just 80 people. Tokyo Electric has said that it intends to apply to restart two of the seven reactors at a power plant on the coast of the Sea of Japan. That workload may leave the agency with few resources to devote to monitoring the messy cleanup at Fukushima.

Tepeco has taken some measures in the hope of keeping contaminated groundwater away from the sea, including fortifying an underwater wall that runs along much of the shoreline at the plant site. Mr. Tanaka said it was doubtful whether those measures would be effective.

**“We don’t truly know whether that will work,” Mr. Tanaka said. “Of course, we’d hope to eliminate all leaks, but in this situation, all we can hope for is to minimize the impact on the environment. If you have any better ideas, we’d like to know.”**

## **NRA has strong suspicions**

### **Radioactive water at Fukushima plant 'strongly suspected' of seeping into sea: NRA**

<http://mainichi.jp/english/english/newsselect/news/20130711p2a00m0na010000c.html>

The Nuclear Regulation Authority (NRA) said on July 10 that it "strongly suspects" that highly radioactive water at the crippled Fukushima No. 1 Nuclear Power Plant is finding its way into the ground and seeping into the Pacific Ocean.

The nuclear watchdog has decided to set up a task force to identify the source of the contamination and consider measures to prevent the spread of the contaminated water. Prompt action should be taken to prevent possible damage from harmful rumors about contamination of local marine resources.

The highly radioactive water was detected in multiple observation wells that are located within 30 meters of the shoreline. The highest levels of radiation detected up until late on the afternoon of July 10 are: 600,000 becquerels per liter of tritium; 900,000 becquerels per liter of radioactive substances such as strontium which emit beta rays; 11,000 becquerels per liter of cesium-134; and 22,000 becquerels per liter of cesium-137.

On the cause of the contamination, Tokyo Electric Power Co. (TEPCO), the operator of the nuclear complex, explained, "When contaminated water leaked from near the water intake at the No. 2 reactor in April 2011, shortly after the outbreak of the accident, some of the water remained in the ground." It added, "Significant effects on the environment have not been observed."

The NRA pointed out at its regular meeting on July 10 that the levels of radiation in the seawater in the port as well as the water inside the impermeable wall on the sea side of the nuclear complex, which is not easily affected by the flux and reflux of the tides, tend to be high. Therefore, the NRA said, "TEPCO's explanation is open to question." The NRA believes that there is a possibility that contaminated water leaked from reactor buildings is mixing with groundwater and flowing out into the ocean.

NRA Chairman Shunichi Tanaka said at a news conference on July 10, "I think the contamination of seawater is continuing to a greater or lesser extent. NRA Commissioner Toyoshi Fuketa also said, "We need to ascertain the extent of the danger." The NRA's task force will have experts from outside listen to TEPCO's opinions to identify the cause and consider measures to prevent the spread of the contamination.

Contaminated water is produced when groundwater flows into damaged reactor buildings and comes into contact with nuclear fuel that remains there. About 400 metric tons of such contaminated water accumulates each day at the nuclear complex. The government has unveiled its plan to build an underground dam called an "impervious wall of frozen soil" by freezing ground soil around the reactor buildings to construct a wall designed to prevent the water inflow. But it remains to be seen how effective such a wall will be. The number of tanks to store contaminated water on the premises of the nuclear complex continues to increase.

On the fact that high levels of radioactive cesium were detected in the area near the No. 2 reactor, TEPCO denied on July 10 that the highly radioactive water was leaking from damaged reactor buildings and elsewhere, saying, "There is a high possibility that contaminated soil was mixed with the water at the time of water sampling."

TEPCO filtered water samples taken on July 8 and 9 in order to check on the cause of the contamination. As a result of filtering, contaminated soil from around the observation wells was removed and the radiation density of both cesium-134 and cesium-137 was reduced to about one-hundredth, TEPCO said. But it did not say why the contaminated soil had been mixed with the water.

July 12, 2013

## Spreading underground seaward

### Strontium detected in well on seaward side of Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307120076>

By SHUNSUKE KIMURA/ Staff Writer

Radioactive materials, including strontium, have been found on the premises of the crippled Fukushima No. 1 nuclear power plant **in a well farther afield from those in which high levels of radioactivity were previously detected**, Tokyo Electric Power Co. said.

TEPCO, operator of the plant, said levels of strontium and other radioactive substances as high as 1,400 becquerels per liter were detected in water collected from the No. 3 observation well on July 11. That is 200 meters south of wells where high radioactive levels were found earlier.

The latest discoveries suggest the possibility radioactive materials may be **spreading underground on the seaward side of the reactor complex**.

“We cannot decide whether radioactive contamination has been spreading underground until we analyze more data,” a TEPCO official said.

In May, the utility began increased surveillance after radioactive contamination was first discovered in groundwater at the nuclear complex, which suffered a triple meltdown following the Great East Japan Earthquake and tsunami in March 2011.

July 13, 2013

## TEPCO's theory of spread of toxic water questionable



## **TEPCO's plan to halt spread of radioactive water based on shaky theory**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307130066>

By SHUNSUKE KIMURA/ Staff Writer

Tokyo Electric Power Co. has started taking measures to contain highly radioactive groundwater at the Fukushima No. 1 nuclear plant, but its strategy is based on a theory that is disputed by industry experts.

TEPCO insists that recently detected radioactive substances originated during the early stages of the disaster in 2011, and it is setting up barriers near the area of the initial water leak problems.

However, even the Nuclear Regulation Authority (NRA) says it is currently impossible to pinpoint where the latest leaks are coming from. Some say the leakage could be anywhere within the intricate system to cool the melted reactors and the underground maze of pipes at the plant site.

The utility's measures, intended to prevent the underground radioactive water from spilling into the sea, could end up exacerbating the problem, some experts have warned.

The efforts to locate the cause of the leaks and prevent their further spread started more than a month after the problem was detected. Contaminated water is already believed to be draining into the sea.

On July 12, TEPCO said the No. 3 observation well at the plant produced a total reading of 1,400 becquerels of radioactive substances that emit beta rays, including strontium, per liter of water sampled on the previous day. No radioactivity had been detected in the No. 3 well a week earlier.

The No. 3 well is about 200 meters south of the No. 1 well, where high radioactive levels have been detected for some time.

Water sampled on July 8 from another well, 21 meters seaward of the No. 1 well, produced a record 630,000 becquerels of tritium, a radioactive isotope of hydrogen. That level is about 10 times higher than the legal safety limit.

The latest developments date back to late May, when water from the No. 1 well, on the seaside of the No. 2 reactor turbine building, produced high levels of radioactive substances. The readings were 500,000 becquerels of tritium per liter, or eight times the legal limit, and 1,000 becquerels of strontium per liter, or 30 times the legal limit.

TEPCO had earlier dug a number of observation wells to check for any new influx of radioactive water into the sea because seaborne levels of radioactive cesium had been slow to decline.

After the spread of radioactive substances was confirmed, TEPCO rushed to dig four additional observation wells near the No. 1 well. It also began analyzing seawater north of the water intakes for the reactors.

High radioactivity levels continue to be detected in the observation wells. TEPCO officials said they need more data to determine how the radioactive materials have been spreading.

But the plant operator believes it knows the origin of these substances. According to TEPCO, the materials represent the spread of highly radioactive water that leaked during the early phase of the 2011 nuclear disaster and have since permeated the ground.

Toyoshi Fuketa, a commissioner for the NRA, emphasized during a July 10 meeting that the origin of the leaks remains an open question.

“We have yet to learn in the first place if the spread represents leaks during the early phase of the disaster that subsequently remained stagnant, or **if the spread represents leaks that came out later**, and whether such leaks continue to this day,” Fuketa said.

NRA officials said the nuclear watchdog plans to soon set up a task force and begin efforts to identify the cause and block a further spread of the radioactive water.

During the chaotic early stages of the nuclear disaster, which began after the Great East Japan Earthquake and tsunami struck the plant on March 11, 2011, water used to cool the overheating reactors flowed into the basements of the reactor buildings. The highly radioactive water eventually entered underground pits for pipes and power cables seaward of the turbine buildings.

In April 2011, some of that water leaked from the end of a No. 2 reactor pit and flowed into the port at the plant via a water intake. Radioactive water also escaped from the end of a No. 3 reactor pit in a similar manner the following month.

At the time, TEPCO blocked the leaks by injecting concrete and liquid glass into the pit ends.

The company says the recently detected substances came from the early spread of this radioactive water.

According to TEPCO figures, the No. 2 reactor pits and the No. 3 reactor pits currently hold about 5,000 tons and 6,000 tons, respectively, of highly radioactive water.

However, industry experts say they cannot rule out the possibility that the radioactive materials detected in the wells derive from water that has leaked elsewhere and mixed with groundwater.

After high radioactive levels were found in the No. 1 observation well, TEPCO on July 8 began work to inject a water-sealing agent into the ground near a levee on the seaside of the No. 2 reactor turbine building as a stopgap measure to prevent leaks to sea. It plans to create a two-layered wall by the end of July, TEPCO officials said.

**But waterproofing the levee could simply divert the flow of groundwater on the seaside of the turbine building, leading to a spread of radioactive contamination to unforeseen locations,** according to some industry experts.

TEPCO is also considering pumping up radioactive water from the pits and funneling it into decontamination devices as part of efforts to dispose of the water.

However, the pits are connected with the turbine buildings, meaning that pumping up the radioactive water would only result in more water coming in from the turbine buildings.

Given the high radiation levels on the plant site, devising a method to block the water flow between the pits and the turbine buildings is expected to pose a major challenge.

July 18, 2013

## **Suspicious steam out of No.1**

## Steam rising from reactor building in Fukushima

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307180037>

REUTERS

Steam is rising from a destroyed building that houses a reactor at Japan's crippled Fukushima No. 1 nuclear power plant, the operator of the plant, Tokyo Electric Power Co., said on July 18.

The utility, widely known as TEPCO, said the levels of radioactivity around the plant had remained unchanged and it was looking into what triggered the emission.

"We think it's possible that rain made its way through the reactor building and having fallen on the primary containment vessel, which is hot, evaporated creating steam," said TEPCO spokeswoman Mayumi Yoshida, adding it was still investigating the matter.

Each reactor is surrounded by a primary containment vessel. This is made of strengthened steel four to eight inches thick. It provides the most critical line of defense against leaking radiation from the reactor. A massive earthquake and tsunami in 2011 killed nearly 20,000 people and set off the world's worst nuclear crisis in 25 years when the Fukushima plant was destroyed causing reactor meltdowns, hydrogen explosions and leaking radiation into the sea and air.

The steam rising from the reactor No.3 building was spotted at 8:20 a.m. (2320 GMT) by a subcontractor who was filming the destroyed building and preparing to remove rubble from the site. It was still visible some two hours later, Yoshida said.

The latest findings underscore the difficulties TEPCO is facing in trying to keep the ravaged plant under control. About a week ago a huge spike in radioactive cesium was detected in groundwater 25 meters from the sea.

The operator has been flushing water over the damaged reactors to keep them cool for more than two years, but contaminated water has been building up at the rate of an Olympic-size swimming pool per week.

In April, TEPCO warned it may run out of space to store the water and asked for approval to channel what it has described groundwater with low levels of radiation around the plant and to the sea through a "bypass." Local fishermen oppose the proposal.

July 19, 2013

## TEPCO says no more steam

### Steam coming out from Fukushima reactor building disappeared: TEPCO

<http://mainichi.jp/english/english/newsselect/news/20130719p2g00m0dm067000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Friday that no steam-like gas could be seen at the No. 3 reactor building at the accident-stricken Fukushima Daiichi nuclear power plant following a sighting the previous day.

The plant operator initially noticed through a monitoring camera on Thursday that vapor was rising from near the central area of the top floor of the reactor building, which was severely damaged by a hydrogen explosion that occurred during the 2011 nuclear crisis.

But when it checked the same area at 7:55 a.m. Friday, it did not find any steam, according to TEPCO.

Workers cannot access the floor because the radiation level is too high and work to remove the rubble is done by remote control. Operations were suspended once the steam was observed.

TEPCO suspects that rain on Wednesday and Thursday may have found its way to the lid of the reactor's primary containment vessel and may have evaporated due to the warmth of the container.

The Nuclear Regulation Authority said in a press release Friday that it has not detected any significant changes in either the temperature of the primary containment vessel or in radiation levels at the plant.

July 22, 2013

## **New oil leak**

### **Press Release (Jul 22,2013)Oil Leakage at the Desalination System 3 (RO-3-1) in Fukushima Daiichi Nuclear Power Station**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1229115\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1229115_5130.html)

At around 5:00 AM today (July 22), an associated company worker found oil leaking near a high-pressure pump of the desalination system 3 (RO-3-1) in Fukushima Daiichi NPS.

The high-pressure pump was suspended, and the oil leakage was confirmed to be stopped as a result of a visual inspection at the site around 6:00 AM.

The leaked oil was lubricating oil accumulated on a weir of concrete floor, and leaked range is estimated to be approx. 1.5 liters (approx.1.5m x approx. 1m x approx. 1mm).

The incident was reported to Tomioka fire department at 5:45 AM today (July 22).

We will continue to inspect the condition and the cause of the leakage.

July 23, 2013

## Steam again - What is it this time?

### **Steam again seen at No. 3 reactor building at Fukushima Daiichi plant**

<http://mainichi.jp/english/english/newsselect/news/20130723p2g00m0dm072000c.html>

FUKUSHIMA, Japan (Kyodo) -- Tokyo Electric Power Co., the operator of the disaster-hit Fukushima Daiichi nuclear power plant, said Tuesday it has confirmed "something like steam" is coming out of the No. 3 reactor building again.

Tokyo Electric, known as TEPCO, said one of its monitoring cameras showed what appeared to be steam coming out of the building's fifth floor just above the reactor container at around 9:05 a.m. Tuesday.

The steam continued to be seen at 10:30 a.m., TEPCO officials said.

Last Thursday, a similar phenomenon was confirmed at the same reactor building. But no steam was seen the following day.

As rain hit the power plant Monday night, rainwater may have evaporated after falling on the lid of the reactor container, whose temperature was around 38 C.

At around 9 a.m. Tuesday, the ambient temperature was 20.3 C and the humidity level was 91.2 percent around the reactor building, TEPCO said.

No major change was reported in the radiation level around the reactor building, the officials said.

TEPCO has suspended work to remove rubble at the reactor building due to the apparent steam emission, they said.

## **TEPCO admits it!**

### **TEPCO: Fukushima nuke plant radioactive water into sea likely**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307230014>

THE ASSOCIATED PRESS

A Japanese utility said on July 22 its crippled Fukushima nuclear plant is likely leaking contaminated water into sea, acknowledging for the first time a problem long suspected by experts.

Tokyo Electric Power Co., which operates the Fukushima No. 1 nuclear power plant, also came under fire July 22 for not disclosing earlier that the number of plant workers with thyroid radiation exposures exceeding threshold levels for increased cancer risks was 10 times what it said released earlier.

The delayed announcements underscored the criticisms the company has faced over the Fukushima crisis. TEPCO has been repeatedly blamed for overlooking early signs, and covering up or delaying the disclosure of problems and mishaps.

Company spokesman Masayuki Ono told a regular news conference that plant officials have come to believe that radioactive water that leaked from the wrecked reactors is likely to have seeped into the underground water system and escaped into sea.

Nuclear officials and experts have suspected a leak from the Fukushima plant since early in the crisis. Japan's nuclear watchdog said two weeks ago a leak was highly suspected and ordered TEPCO to examine the problem.

TEPCO had persistently denied contaminated water reached the sea, despite spikes in radiation levels in underground and sea water samples taken at the plant. The utility first acknowledged an abnormal increase in radioactive cesium levels in an observation well near the coast in May and has since monitored water samples.

Ono said plant officials believe a leak is possible because the underground water levels in suspected areas fluctuate in accordance with tide movements and rainfalls.

"We are very sorry for causing concerns. We have made efforts not to cause any leak to the outside, but we might have failed to do so," he said.

Ono said the radioactive elements detected in water samples are believed to largely come from initial leaks that have remained since earlier in the crisis. He said the leak has stayed near the plant inside the bay, and officials believe very little has spread further into the Pacific Ocean.

TEPCO is currently injecting chemical solution into the coastline embankment to solidify underground structure and block contaminated underground water from escaping into sea--an operation revealed to the Japanese media on July 22.

"Many things have fallen a step behind. You should be ahead of the curve to foresee risks and take measures," said deputy industry minister Kazuyoshi Akaba, who inspected the operation, Japanese media reported.

Marine biologists have warned that the radioactive water may be leaking continuously into the sea from the underground, citing high radioactivity in fish samples taken near the plant.

Most fish and seafood from along the Fukushima coast are barred from domestic markets and exports.

Ono said that an estimated 1,972 plant workers, or 10 percent of those checked, had thyroid exposure doses exceeding 100 millisieverts--a threshold for increased risk of developing cancer--instead of the 178 based on checks of 522 workers reported to the World Health Organization last year.

## **TEPCO admits radioactive groundwater is leaking into the sea at Fukushima**

Source : JDP

<http://japandailynews.com/tepcu-admits-radioactive-groundwater-is-leaking-into-the-sea-at-fukushima-2332707/>

Tokyo Electric Power Co. (TEPCO), operator of the disaster-stricken Fukushima nuclear power facility, has admitted for the first time that radioactive groundwater may be seeping out of the nuclear plant area



and out into sea. In tests earlier this month, the embattled utility company said that groundwater samples have shown an increase in levels of cancer-causing cesium-134, but that the contaminated groundwater was contained at the current location by concrete foundations and steel sheets. TEPCO has changed its assessment of the situation on Monday.

“We believe that contaminated water has flown out to the sea,” a TEPCO spokesman said on Monday. The spokesman also insisted the impact of the radioactive water on the ocean would be limited, but the citizens of Fukushima have heard TEPCO make the same claims before, only to take them back when they were pressured to reveal damaging information. “Seawater data have shown no abnormal rise in the levels of radioactivity,” the same spokesman added. At a news conference in Tokyo, another company representative said that TEPCO “sincerely apologizes for worrying many people, especially people in Fukushima.”

To reduce the contamination levels of groundwater, the utility operator said that it would step up efforts to consolidate soil near the harbor in the nuclear facility. Groundwater – in this case contaminated by radioactive elements released by the disastrous meltdowns of the reactors in the plant – usually flows out to sea, and environmental experts say that this kind of leakage may affect marine life, and eventually the people who eat produce from the sea. Tetsu Nozaki, chairman of Fukushima Prefectural Federation of Fisheries Co-operative Associations, said that everyone was deeply concerned at TEPCO’s new revelations. “It was quite shocking,” he in an interview. “TEPCO’s explanation is totally different from the one in the past.” Fishing around Fukushima has been halted and the Japanese and local government has banned beef, milk, mushrooms and vegetables from being produced in the surrounding areas.

### **TEPCO admits toxic water is leaking into sea from Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130723p2g00m0dm038000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. admitted for the first time Monday that contaminated water has seeped from under its disaster-struck Fukushima Daiichi nuclear plant into the Pacific Ocean.

Earlier this month the Nuclear Regulation Authority said that highly radioactive water was "strongly suspected" to be seeping into the ground and contaminating the ocean.

"We have been aiming at preventing the toxic water from spreading to outside of the plant. We offer our sincere apology," a TEPCO official told a press conference at the company's headquarters in Tokyo.

But the company believes that the contamination has been limited mostly to within the port area, saying it has detected no significant impact on the environment.

Concern over the threat of radioactive material escaping into the general environment has spike anew since radioactive substances were recently detected in groundwater collected from an observation well by the sea.

TEPCO said it judged toxic water was seeping into the ocean after it determined underground water was moving between the plant site and the ocean as it detected water levels in observation wells moved up and down in tandem with the tides.

### **Fukushima fishermen angry over contaminated water leaks into sea**

<http://mainichi.jp/english/english/newsselect/news/20130723p2a00m0na009000c.html>

FUKUSHIMA -- Tokyo Electric Power Co. (TEPCO) said on July 22 that radioactive water was leaking from under its crippled Fukushima No. 1 nuclear plant into the Pacific Ocean, raising serious concerns and questions among local fishermen who still face a self-imposed ban on working the sea.

Local fishermen expressed their anger over contaminated water leaking into the ocean, which would spur harmful rumors and cause further damage to the fish industry in Fukushima Prefecture.

Local fisheries cooperatives had planned to start test fishing for whitebait and other fish offshore of Iwaki in September for the first time since the March 2011 disaster. TEPCO's announcement came after cooperative chairmen and related parties had a meeting on the matter with experts on July 22.

"We sensed that contaminated water might be leaking into the ocean," a cooperative-related source in Fukushima commented. Another person questioned the timing of the announcement, saying "I wonder why TEPCO chose the day after (the House of Councillors) election (to admit that the contaminated water was leaking)."

TEPCO officials including managing director Tsunemasa Niitsuma visited the Fukushima prefectural fishery cooperative association in Iwaki to explain the situation at around 3:30 p.m. on July 22. Prefectural cooperative chairman Tetsu Nozaki and chairmen of Iwaki and Soma-Futaba cooperatives reportedly pressed the company to take immediate action to address the problem.

The prefectural fishery cooperative and TEPCO have been discussing the operation of a bypass system, which pumps underground water out into the ocean, as a measure to control the amount of radioactive contaminated water.

Senior cooperative officials said they would continue explaining the situation to their union members, but feelings of growing hostility among fishermen toward TEPCO are "unavoidable."

"It's a tough situation," commented Masakazu Yabuki, chairman of Iwaki fishery cooperative association. "It's TEPCO and the national government's responsibility to restore the ocean in Fukushima," he added.

Hiroyuki Sato, chairman of Soma-Futaba fishery cooperative which started test fishing last summer, expressed his frustration, saying "We have worked so hard to catch 15 types of fish that came in under the national limit (100 becquerels per kilogram) for radioactive contamination screening."

Meanwhile, some 100 Fukushima fishermen expressed their anger and slammed TEPCO for its slow action on handling the situation during an information session held by the company in Iwaki on July 23.

## **TEPCO seen injecting chemicals into soil**

### **TEPCO shows media work to harden soil, halt leak**

[http://www3.nhk.or.jp/nhkworld/english/news/20130723\\_20.html](http://www3.nhk.or.jp/nhkworld/english/news/20130723_20.html)

The operator of the crippled Fukushima Daiichi nuclear plant has shown the media the work under way to prevent radiation-tainted groundwater from seeping into the sea.

17 reporters and cameramen were guided to the site on Monday evening. Workers, who must wear protective suits and masks, are doing most of the work after sunset to avoid heatstroke.

Tokyo Electric Power Company has been injecting chemicals into soil along the embankment separating the plant site from the ocean to solidify it and prevent further radioactive groundwater from seeping through.

The work started after radioactivity spiked in the plant's monitoring wells near the sea in May.

The reporters were allowed to watch the work only for about 30 minutes from inside a bus due to radiation at the site.

TEPCO officials say levels of radiation there are as high as 200 microsieverts an hour. At that level, 5 hours of exposure is equivalent to the amount allowable for an ordinary person in one year.

Under lights, the workers were signaling to each other to operate the chemical injection machinery.

TEPCO says it is inserting the chemical solution as deep as 14 meters at 80 centimeter intervals to create 90-meter long double walls. The process is scheduled to finish by around August 10th.

On Monday, TEPCO formally acknowledged for the first time that tainted groundwater from the Daiichi plant site is seeping into the sea.

Fishermen in Fukushima said they were shocked to hear the announcement as it could further delay any chance of their restarting fishing.

## **Contaminated Water Leaking into the Ocean**

<http://www3.nhk.or.jp/nhkworld/newsline/201307232005.html>

video from NHK

**Investigation on the source(s) of the radioactive leak into the ocean is not sufficient. More expert must contribute. TEPCO cannot manage this crisis on their own.**

July 24, 2013

## **High radiation around No.3**

### **High radiation levels found near area where steam spotted at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307240036>

High levels of radiation were detected near an area where steam was spotted July 23 at the No. 3 reactor building of the stricken Fukushima No. 1 nuclear plant, Tokyo Electric Power Co., the plant operator, said.

TEPCO gave a measurement of 562 millisieverts per hour.

The Nuclear Regulation Authority, the government's nuclear industry watchdog, instructed TEPCO to investigate further because the dose level is high.

What appeared to be steam was spotted near an equipment storage pool on the fifth floor of the No. 3 reactor building around 9:05 a.m. There was a similar occurrence on the morning of July 18.

In the latest incident, TEPCO measured radiation levels in 24 other locations around the fifth floor of the reactor building. The maximum dose was 2,170 millisieverts per hour, while the minimum was 137 millisieverts per hour.

TEPCO officials said rain that fell on the night of July 22 likely made its way to around the No. 3 reactor's containment vessel and evaporated due to heat from nuclear fuel that remained trapped.

Workers have not been able to approach the fifth floor of the No. 3 reactor building due to high levels of radiation following an explosion after the March 11, 2011, Great East Japan Earthquake and tsunami.

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## Same route as in April 2011?

### Radioactive material may have leaked from tunnel

[http://www3.nhk.or.jp/nhkworld/english/news/20130724\\_24.html](http://www3.nhk.or.jp/nhkworld/english/news/20130724_24.html)

Japan's nuclear regulators suspect that contaminated wastewater may be seeping into the sea from an underground utility tunnel at the Fukushima Daiichi nuclear plant.

Highly radioactive substances have been detected in coastal observation wells on the plant's premises, and in nearby seawater, since May this year.

The plant's operator, Tokyo Electric Power Company, admitted for the first time on Monday that wastewater is leaking into the sea.

Members of the Nuclear Regulation Authority discussed the issue on Wednesday. They pointed out that **highly contaminated wastewater that has filled an underground utility tunnel between the turbine building and the sea may have seeped through layers of gravel that cover the floor of the tunnel.**

This is the same route through which contaminated wastewater is believed to have leaked out to sea in April 2011.

The authority's chairman Shunichi Tanaka said the contamination must be prevented from spreading

outside the harbor.

The authority plans to launch an expert panel to discuss measures to this end.

## TEPCO "working intensely"

### Tepco 'Working Intensely' On New Contamination Prevention Measures

<http://www.nucnet.org/all-the-news/2013/07/24/tepcos-working-intensely-on-new-contamination-prevention-measures>

Tokyo Electric Power Company (Tepco) says it is "working intensely" to speed up contamination prevention measures in an effort to stop the radioactive isotopes tritium and strontium-90 leaking into the sea near the Fukushima-Daiichi nuclear plant.

The plant operator said in a statement that the measured total beta-radiation activity (all- $\beta$ ) at one groundwater monitoring post on the east side of the turbine buildings of units 1 to 4 on 23 July 2013 was **150,000 becquerels per litre (Bq/l)**. This was higher than the past highest density of 120,000 Bq/l detected in a sample taken at the same monitoring post on 18 July 2013.

Tepco said it is continuing to tackle the problem of radioactive leaks into the groundwater, and potentially into the sea, by speeding up work such as improvements to the foundations of protection barriers and adding additional monitoring posts at water outlets and in the seawater port neighbouring the plant.

Last month Tepco found elevated concentrations of tritium and strontium-90 in the groundwater below units 1 to 4 of the plant. The company said levels of tritium had been detected at 0.5 million Bq/l and of strontium-90 at 1,000 Bq/l.

Tepco said it was likely the radioactive material entered the environment after water poured over the melted fuel in Unit 2 and leaked out via the turbine building, which is between the reactor and the ocean.

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July 25, 2013

## Can't cope

### **NRA chairman says release of radioactive water into sea is inevitable**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307250040>

By JIN NISHIKAWA/ Staff Writer

The head of Japan's nuclear watchdog body has acknowledged for the first time that Tokyo Electric Power Co. has no choice but to release radioactive water accumulating at the crippled Fukushima No. 1 nuclear power plant into the sea.

**“The Fukushima No. 1 plant is filling up with water,”** Shunichi Tanaka, chairman of the Nuclear Regulation Authority, told a news conference on July 24. **“Inevitably the contaminated water will have to be discharged into the sea after TEPCO processes it properly and lowers (its radioactivity levels) below the standards.”**

Taking into account that local fishery associations and other organizations oppose TEPCO's plans to release processed water into the sea, Tanaka said it is important to provide a detailed explanation to gain their approval. He indicated that the NRA will conduct a long-term investigation to assess the environmental impact of radioactive water discharged into the sea.

At the Fukushima plant, an estimated 400 tons of groundwater is flowing into its reactor buildings daily. The groundwater is mixed with water used to cool the melted fuel, and is accumulating with high radioactive levels at the plant.

Purification systems can remove some radioactive substances, including cesium, from water, but cannot isolate tritium.

A research team, jointly set up by the government and TEPCO, is seeking a way to remove tritium from contaminated water.

## **TEPCO July 25 press releases about suspension of cooling**

## **Press Release (Jul 25, 2013) Suspension of Reactor Cooling During the Logic Verifying Test of Unit 6 Emergency Diesel Generator at Fukushima Daiichi Nuclear Power Station (Follow-up Information 2)**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1229226\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1229226_5130.html)

This is a follow-up report on the statuses of suspension of the residual heat removal B system after the 6.9 kV metal-clad (power panel) C at Unit 6 was suspended during the logic verifying test (automatic starting test) of Unit 6 emergency diesel generator at Fukushima Daiichi Nuclear Power Station at around 10:16 AM today (July 25).

At 12:06 PM, the residual heat removal B system and cooling of the reactor was restarted. After that, emergency gas treatment system A was suspended at 12:32 PM and emergency gas treatment system B was suspended at 12:34 PM, since air conditioning of the Reactor Building was restarted at 12:22 PM. No abnormality was found in the operation status after the restart of the air conditioning.

The water temperature of the reactor as of 13:00 PM is 28.0°C, which is stable.

We will continue to investigate the cause of the suspension of the residual heat removal B system.

## **Press Release (Jul 25, 2013) Suspension of Reactor Cooling During the Logic Verifying Test of Unit 6 Emergency Diesel Generator at Fukushima Daiichi Nuclear Power Station (Follow-up Information)**

This is a follow-up report on the statuses of suspension of the residual heat removal B system after the 6.9 kV metal-clad (power panel) C at Unit 6 was suspended during the logic verifying test (automatic starting test) of Unit 6 emergency diesel generator at Fukushima Daiichi Nuclear Power Station at around 10:16 AM today (July 25).

At 12:06 PM, we have restarted the residual heat removal B system and cooling of the reactor.

No abnormality was found in the operation status after the restart of the system.

The water temperature of the reactor as of 12:00 PM is 27.6°C, which is sufficiently lower than the maximum allowed temperature (100°C). We are currently investigating the cause of the suspension of the residual heat removal B system.



## **Press Release (Jul 25, 2013) Suspension of Reactor Cooling During the Logic Verifying Test of Unit 6 Emergency Diesel Generator at Fukushima Daiichi Nuclear Power Station**

At around 10:16 AM today (July 25), the residual heat removal B system, which was cooling the reactor, has stopped after the 6.9 kV metal-clad (power panel) C at Unit 6 was suspended during the logic verifying test (automatic starting test) of Unit 6 emergency diesel generator at Fukushima Daiichi Nuclear Power Station.

Currently, we are proceeding with the preparation to restart the reactor cooling by the residual heat removal B system, and it is expected to be restored within about an hour.

The other statuses are as follows.

- Air conditioning of the Reactor Building has stopped, and the emergency gas treatment system\* has started.

(The negative pressure of the Reactor Building is being maintained.)

- Cooling system of the spent fuel pool is operating continuously.

- Water temperature of the reactor as of 10:43 AM is 27.1°C. The increase rate of reactor water temperature is estimated to be approx. 1°C per hour.

\* Emergency gas treatment system

A device, which closes regular ventilation system automatically and maintains the negative pressure inside the Reactor Building as well as removing radioactive iodine and particle radioactive material in the building utilizing charcoal filter, high performance particle filter, etc. to reduce the emission of radioactive material to the environment in case radioactive leakage accident occurs in the Reactor Building.

We are now confirming the status and preparing toward restoration, and will announce the status as soon as we know it.

### **Failure of cooling system (at No. 6) during emergency test**

#### **Cooling system shuts down during Fukushima test**

[http://www3.nhk.or.jp/nhkworld/english/news/20130725\\_30.html](http://www3.nhk.or.jp/nhkworld/english/news/20130725_30.html)

A cooling system shut down for 2 hours at the crippled Fukushima Daiichi nuclear plant when workers failed to follow procedures during an emergency backup power test.

Tokyo Electric Power Company says the No. 6 reactor's cooling system stopped suddenly on Thursday morning when workers turned off a power panel to try and test a backup diesel generator.

They restarted the system after 2 hours. The temperature in the reactor rose by 0.5 degrees to 27.1 degrees Celsius.

TEPCO officials say the rise was too small to affect the reactor's safety. They also said monitoring posts around the plant showed no change in radiation levels.

The officials say workers failed to take necessary measures to avoid the stoppage of the cooling system when they activated the emergency generator.

The No. 6 reactor was not seriously damaged in the 2011 accident, but it has been kept shut down. Its nuclear fuel is being kept at a cool temperature.

July 26, 2013

## Corrosion holes in tanks

### Leaks from treatment device delay battle against Fukushima radioactive water

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307260051>

By SHUNSUKE KIMURA/ Staff Writer

Recent leaks from a novel type of radioactive water treatment device, currently under trial runs at the crippled Fukushima No. 1 nuclear power plant, occurred from corrosion holes in welds, Tokyo Electric Power Co., the plant operator, said July 25.

The finding was presented to a session of a joint government-TEPCO council that is tasked with promoting measures for decommissioning the stricken reactors at the Fukushima plant.

While the trial runs of the "Alps" multi-nuclide removal equipment were scheduled to end in mid-August, solving the leak problem is expected to push back that date by four months, further exacerbating the uphill fight against radioactive water that keeps accumulating at an alarming pace at the hobbled plant.

The Alps device is considered a key weapon for fighting the increasing volume of radioactive water. It can eliminate 62 sorts of radioactive substances, including strontium, from contaminated water. Although the device cannot eliminate tritium, a radioactive isotope of hydrogen, it is expected to help reduce the overall risk levels in the event of a radioactive water leak.

The Alps equipment has three channels, called A, B and C, made of the same composition. Each channel is supposed to treat up to 250 tons of radioactive water a day.

The leaks occurred in stainless-steel tanks for holding untreated radioactive water in channel A. The first discovery came on June 15, when a TEPCO worker found brown-hued traces of water that had dripped from one of the tanks during a trial run.

TEPCO halted the operation of the channel to conduct investigations, which led to the discovery of very small holes. The chloride ion and hypochlorous acid contents in radioactive water had corroded welds in the tanks that are 9 millimeters thick, TEPCO officials said.

According to the officials, TEPCO plans to cover the interiors of the tanks with rubber lining to deal with the problem. TEPCO also plans to halt channel B, currently under a trial run, in early August to repair the tanks and take similar measures in channel C, which has yet to enter a trial run.

The suspension of trial runs in all channels will leave TEPCO without the means to treat radioactive water over a period of one-and-a-half months.

The Alps equipment was initially scheduled to have entered trial runs in September 2012. But it took workers more time than expected to deal with weaknesses found in its radioactive waste containers. The device only entered trial runs at the end of March.

## Highly radioactive water in service tunnel

July 27, 2013

### **Massive radioactive contamination found in water at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130727p2a00m0na008000c.html>

Water in a service tunnel on the seaward side of the stricken Fukushima No. 1 nuclear plant is contaminated with 2.35 billion becquerels of radioactive material per liter, plant operator Tokyo Electric Power Co. (TEPCO) revealed on July 27.

TEPCO believes the water is the source of the contamination the utility recently admitted had been found in an observation well on the plant grounds, leading to suspicions that radioactive water was seeping into the Pacific Ocean.

According to the utility, about 750 million becquerels per liter is cesium-134, which has a half-life of about two years, while cesium-137 -- with a half-life of roughly 30 years -- makes up 1.6 billion becquerels per liter of the contamination. Another 750 million becquerels is thought to be strontium and other radioactive elements that emit beta radiation.

In April 2011, soon after the meltdowns at the Fukushima plant, there was a leak of highly-contaminated water near the No. 2 reactor's water intake. Tests of that spill showed radioactive cesium contamination of 3.6 billion becquerels per liter. TEPCO believes that the water in the service tunnel may be left over from the April 2011 leak.

TEPCO says it will start operations to clean up the service tunnel in September this year.

## **Fukushima trench water crisis returns**

Kyodo

<http://www.japantimes.co.jp/news/2013/07/27/national/fukushima-trench-water-crisis-returns/#.UfP6zaxSb9k>

Tokyo Electric Power Co. said Saturday that the trench problem at the crippled Fukushima No. 1 nuclear plant has cropped up again and is sending highly radioactive water into the sea.

The water in the underground passage, which runs under the turbine building of reactor 2, contains 2.35 billion becquerels of cesium per liter, roughly the same as that measured right after the crisis began in spring 2011.

The latest sample, taken Friday from a trench, contained 750 million becquerels of cesium-134, 1.6 billion becquerels of cesium-137 and 750 million becquerels of other radioactive substances, the utility said.

A sample from April 2011 contained 1.8 billion becquerels of both cesium-134 and cesium-137 per liter. Cesium has a half-life of about 30 years.

The trench is believed to be the source of the groundwater problem that's been baffling Tepco's experts for months. Their current theory is that the highly radioactive water found and left in the trench in 2011 is now leaking directly into the groundwater, which is seeping into the sea.

Tepeco finally admitted Monday that contaminated water was getting into the Pacific. The admission came after the Nuclear Regulation Authority pointed out that highly radioactive water was “strongly suspected” to be seeping into the ground under the site and making its way to the sea.

The utility hopes to halt the problem by building a wall out of liquid glass between the reactors and the sea and removing the contaminated water from the underground passage.

### **Water in plant's tunnel still highly contaminated**

[http://www3.nhk.or.jp/nhkworld/english/news/20130727\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20130727_25.html)

The operator of the damaged Fukushima Daiichi nuclear power plant says contaminated water found in one of the plant's tunnels is as highly radioactive as the water that leaked into the sea in April 2011, soon after the accident.

Highly radioactive substances have been detected in coastal observation wells on the plant's premises and in nearby seawater since May of this year.

Tokyo Electric Power Company, or TEPCO, admitted that contaminated water was leaking into the sea but has not been able to identify its source.

The firm says 2.35 billion becquerels of cesium per liter was detected in samples collected on Friday in a tunnel located near the plant's Number 2 reactor and 50 meters from the coast.

Contaminated water with a similar level of radioactivity leaked into the sea in April 2011, soon after the nuclear accident.

The utility says contaminated water that accumulated after the accident is believed to have remained in the tunnel.

The company says there may be other causes, but that it has not been able to identify them.

TEPCO plans to continue to measure the concentration and level of contaminated water in coastal tunnels near the Number 2 and 3 reactors.

It also intends to take measures to reduce the amount of contaminated water and prevent it from leaking into the sea.

## **Shouldn't the NRA take over Fukushima Daiichi?**

## Time to take over Daiichi?

<http://www.japantimes.co.jp/opinion/2013/07/26/commentary/time-to-take-over-daiichi/#.UfP7cKxSb9k>

by Christopher Hobson  
Special To The Japan Times

It's been almost 2½ years since the disaster at Fukushima No. 1 (Fukushima Daiichi) nuclear plant commenced, but the precarious condition of the nuclear plant remains a constant fixture in the news. A sentence that has been reappearing in stories in recent months has been some variation of "the incident has brought the Fukushima plant's vulnerable state into sharp relief" (New York Times, July 18).

The problem is that "the incident" being referred to could be one of many: a rat causing a power outage, radioactive water leaking from storage tanks, steam being emitted from one of the reactors or, most recently, confirmation by Tokyo Electric Power Co. that contaminated water is escaping into the ocean. Fukushima No. 1 seems to lurch from one problem to the next as Tepco struggles to bring the situation there fully under control. When this litany of recent issues is combined with the company's checkered safety record and its deeply flawed handling of the 2011 nuclear accident, there should be serious doubts over Tepco's ability to continue managing the damaged plant.

Japan's Nuclear Regulation Authority (NRA) has just adopted its new regulatory standards, leaving the way open for offline reactors to be examined and potentially approved for restarts. Already four utilities have applied to have 12 reactors checked, with more applications expected.

With Prime Minister Shinzo Abe and the Liberal Democratic Party having won big in the Upper House elections, it is likely that calls for speeding up a return to nuclear power will become louder. The NRA must manage being sufficiently rigorous to ensure its own credibility while being conscious of the mounting political pressure to restart reactors. This is made all the more challenging by the NRA having a small workforce, with a staff of only 80 people to assess these applications and around 500 people in total.

**Given the NRA's limited resources, it must be asked if it is wise to spread them so thinly. A real danger is that it will result in both tasks — monitoring the Fukushima plant and assessing restart applications — being completed at a substandard level.**

The Fukushima plant may have technically achieved "cold shutdown," but it is far from being stabilized. Tepco is not able to properly assess the state of the melted fuel that remains in the damaged reactors, and they have yet to begin removing the fuel rods from No. 4 reactor.

Tepco and the NRA are still struggling to find a solution to the ongoing problem of the spread of contaminated water. When the situation is so bad that Shunichi Tanaka, the NRA chairman, is stating in a press conference, with regard to water leaks, that "if you have any better ideas, we'd like to know," it

should be clear that Fukushima No. 1 still requires the upmost attention. It would be wise for the NRA and the Japanese government to invest more resources and exert more control in dealing with the situation there.

This recent spate of problems raises a serious question that the Japanese government certainly does not want to consider but must:

- **At what point should it intervene and directly take control of Fukushima No. 1?**
- **How many more incidents and issues are acceptable before enough is enough?**
- **How much longer should Tepco's apologies for "any inconvenience caused" and their assurances that "everything is under control" be accepted?**

Considering that the Japanese government has already taken control of much of the company, there is little to stop it taking the next step and putting the Fukushima plant directly under the NRA.

A significant conclusion of the Kurokawa Report into the nuclear accident was that multiple warning signs had been ignored: "There were many opportunities for taking preventive measures prior to March 11. The accident occurred because Tepco did not take these measures, and NISA [Nuclear and Industrial Safety Agency] and the Nuclear Safety Commission went along."

If the NRA is serious about differentiating itself from its predecessors, it should not repeat the same mistakes. This recent series of incidents should be the canary in the coal mine telling us that Fukushima No. 1 remains vulnerable and unstable.

Considering that Japan has been more seismically active since the 2011 earthquake, there remains a real risk that another disaster could strike the already damaged plant. Japan cannot afford the luxury of relying on best-case scenarios; it must prepare for the worst.

This means **preparing for the possibility that more things could go wrong at Fukushima No. 1**. Indeed, recent incidents suggest that the chances of more problems are very high.

Yoichi Funabashi, chairman of the Independent Investigation Commission on the Fukushima No. 1 Nuclear Accident, has observed that "the problems were not with the law or the manual, but with the humans who formulated the 'anticipated' risks that fell in line with corporate and political will — but did not represent the actual risks the nuclear plant faced and posed."

It is important this lesson is learned. Rather than relying on Tepco and a bare bones staff of regulators, it is time for the NRA and the Japanese government to seriously consider directly taking control of Fukushima No. 1. This certainly would not be an easy decision, but safety must be given priority ahead of political considerations. Instead of rushing toward restarting reactors, Japan should heed the warning signs at Fukushima and focus on stabilizing the situation there first.

Dr. Christopher Hobson is a research fellow at the Institute for Sustainability and Peace, United Nations University, Tokyo. Follow him on Twitter at @hobson\_c

## **Waterborne radioactive levels in Fukushima plant pit unchanged from 2011**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307270065>

Water in a pit on the grounds of the crippled Fukushima No. 1 nuclear power plant has been found to contain high levels of radioactive substances, the plant operator said July 27.

Tokyo Electric Power Co. said the radioactive water likely flowed into the pit during the initial stages of the March 2011 reactor meltdowns because the elevated figures are of levels found in the plant compound in the immediate aftermath of the nuclear disaster.

According to TEPCO, 2.35 billion becquerels of radioactive cesium were detected per liter of water that was sampled July 26 from a cable pit on the ocean side of the No. 2 reactor.

The breakdown was 750 million becquerels of cesium-134 and 1.6 billion becquerels of cesium-137.

A liter of the water was also found to contain 750 million becquerels of radioactive substances that emit beta rays, such as strontium.

Those concentration levels are almost the same as measurements taken during the early phases of the disaster, TEPCO said.

"We believe the highly radioactive water is staying within the pit," a TEPCO official said, adding that the utility will nevertheless check carefully for possible leaks into surrounding soil and seal the ground to block such leaks from reaching the sea.

July 28, 2013

## **Tritium 145 times the legal limit**

### **Tritium level also high in Fukushima trench water**

JJI

<http://www.japantimes.co.jp/news/2013/07/28/national/tritium-level-also-high-in-fukushima-trench-water/#.UfUaTKxSb9k>

Tokyo Electric Power Co. said Sunday it had detected a high level of tritium in water under its stricken Fukushima No. 1 power plant.

Tepco detected 8.7 million becquerels of tritium per liter in water taken Friday from a cable trench running under the turbine building of the No. 2 reactor at a point about some 50 meters from the Pacific Ocean. The reading is 145 times the legal limit.



While tritium is a common hazard at nuclear power plants, the revelation came a day after the utility announced that the same water sample contained 2.35 billion becquerels of cesium and 750 million becquerels of other, unnamed radioactive substances, including strontium, that emit beta rays.

All would likely pose a higher risk of cancer if ingested by humans.

Tepco has been unable to figure out why the groundwater is being tainted with radiation. Its latest theory appears to be that the water in the observation wells on its premises is being tainted by water from the cable trench.

Last week, Tepco admitted that groundwater tainted with radioactive substances leaked into the Pacific from the plant and that the water level in the wells was rising and falling with the ocean tides.

## Extremely high tritium (follow-up)

July 29, 2013

### Extremely high tritium level found in water in pit at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201307290043>

Tokyo Electric Power Co. said on July 28 that an extremely high level of radioactive tritium has been detected in a pool of water that has accumulated in a pit in the compound of its crippled Fukushima No. 1 nuclear power plant.

The level stood at 8.7 million becquerels per liter of water, which was 145 times that of the permissible level stipulated under the law, the plant operator said.

Radioactive water apparently flowed into the pit, located on the ocean side of the turbine building for the No. 2 reactor, immediately following the March 2011 nuclear accident and has remained there, the utility said.

On June 26, the Nuclear Regulation Authority expressed concerns that high tritium levels detected in the sea near the plant were a result of contaminated water leaking from the site.

It is believed that more than 5,000 tons of radioactive water still remain in the pit after flowing from the No. 2 reactor building to the turbine building and, then, into the pit.

On July 22, TEPCO admitted that some radioactive water is leaking into the sea from the compound of the nuclear plant.

It is suspected that some of the water that accumulated in the pit could have permeated the soil and leaked into the sea.

On July 27, the utility announced that an extremely high level of 2.35 billion becquerels of radioactive cesium per liter of water has been detected from the water that has accumulated in the pit.

A TEPCO official said the utility believes the radioactive water is remaining within the pit, although it would check for leaks into the soil and seal the ground to prevent leaks into the sea.

## Clean-up that tunnel! But how?

### **TEPCO ordered to drain contaminated tunnel water**

[http://www3.nhk.or.jp/nhkworld/english/news/20130729\\_27.html](http://www3.nhk.or.jp/nhkworld/english/news/20130729_27.html)

Japan's nuclear regulator has ordered the operator of the Fukushima Daiichi nuclear plant to remove radioactive wastewater from underground tunnels.

The Nuclear Regulation Authority told Tokyo Electric Power Company on Monday it must stop the water from leaking into the sea.

High levels of radioactivity have been detected in wells in the plant site and an adjacent port since May. TEPCO admitted last week that contaminated water is leaking into the sea from the site.

The regulators pointed out a possible leak of highly-radioactive wastewater in the plant's underground tunnels through gravel laid on the floor.

The contaminated water is believed to be coming from turbine buildings connected to the tunnels. The turbine buildings are highly-contaminated as a huge amount of water has been used to cool nuclear fuel in

nearby reactor buildings.

The operator says it will start **injecting chemicals into the gravel layers to block the water.**

The company says it will decontaminate the water in the tunnels from September by circulating it through a purifier. From next April it says it will drain the tunnels.

But TEPCO has yet to come up with measures to stop the original leak from the turbine building. **It also has to find a site to store the drained water.**

July 30, 2013

## **Fukushima is a mess**

<http://ecowatch.com/2013/fukushima-continues-to-wreck-havoc/>

Harvey Wasserman

Radiation leaks, steam releases, disease and death continue to spew from Fukushima in a disaster which is far from over. Its most profound threat to the global ecology—a spent fuel fire—is still very much with us.

The latest steam leak has raised fears around the planet. A worst-case scenario of an on-going, out-of-control fission reaction was dismissed by the owners, Tokyo Electric Power Company (Tepco), because they didn't find xenon in the plume. The company says the steam likely came from rain water being vaporized by residual heat in one of plant's stricken reactors.

But independent experts tend to disbelieve anything Tepco says, for good reason. Reactor Units One, Two and Three have exploded at Fukushima despite decades of official assurances that commercial atomic power plants could not explode at all. The company has been unable to clear out enough radioactive debris to allow it to put a cover over the site that might contain further airborne emissions.

Tepco has also been forced to admit that it has been leaking radioactive water into the ocean ever since the disaster began on March 11, 2011. In one instance it admitted to a 90-fold increase of Cesium in a nearby test over a period of just three days.

Earlier this year a rat ate through critical electrical cables, shorting out a critical cooling system. When Tepco workers were dispatched to install metal guards to protect the cabling, they managed to short out the system yet again.

Early this month Fukushima's former chief operator, Masao Yoshida, died of esophageal cancer at the age of 58. Masao became a hero during the worst of the nuclear disaster by standing firm at his on-site command post as multiple explosions rocked the reactor complex. Tepco claimed his ensuing cancer and death were "unlikely" to have been caused by Fukushima's radiation.

The impact of work in and near the reactors has become a rising concern. Critics have warned that there are not enough skilled technicians willing to sacrifice themselves at the plant. Tepco has worsened the situation by applying to open a number of its shut reactors elsewhere in Japan, straining its already depleted skilled workforce even further.

Meanwhile, a staggering 40 percent rise in thyroid irregularities among young children in the area has caused a deepening concern about widespread health impacts from Fukushima's fallout within the general public. Because these numbers have come in just two years after the disaster, the percentage of affected children is expected to continue to rise.

And the worst fear of all remains unabated. At Unit Four, which apparently did not actually explode, the building's structural integrity has been seriously undermined. Debate continues to rage over exactly how this happened.

But there's no doubt that a pool containing many tons of highly radioactive, used fuel, is suspended 100 feet in the air, with little left to support the structure. Should an earthquake or other trauma knock the pool to the ground, there's a high likelihood the fuel rods could catch fire.

In such an event, the radioactive emissions could be catastrophic. Intensely lethal emissions could spew for a very long time, eventually circling the globe many times, wrecking untold havoc.

The Japanese have removed two apparently unused rods from the fuel pool so far. But intense international pressure to clear out the rest of them has thus far been unsuccessful.

So while a depleted, discredited and disorganized nuclear utility moves to restart its other reactors, its stricken units at Fukushima continue to hold the rest of us at the brink of apocalyptic terror.

July 31, 2013

### **Stopping leakage of tainted water to be studied**

[http://www3.nhk.or.jp/nhkworld/english/news/20130801\\_05.html](http://www3.nhk.or.jp/nhkworld/english/news/20130801_05.html)

The operator of the Fukushima Daiichi nuclear plant is struggling to come up with new ways to prevent contaminated water from leaking into the sea.

The operator learnt on Wednesday that its efforts to prevent radiation-tainted groundwater from seeping into the sea are failing.

High levels of radioactivity have been detected in monitoring wells in the plant site and nearby waters since May.

TEPCO has been trying to solidify the embankment of the crippled power plant by a depth of 16 meters to stop the tainted water from reaching the ocean.

But TEPCO says water levels in one of the contaminated wells have risen by about 1 meter since the work began in early July.

It says this is likely the result of its work to solidify the ground, using chemicals.

The company says soil up to 2 meters below the ground cannot be hardened, and water may be seeping

out.

TEPCO says it's also studying why the level of radioactive tritium has been rising in seawater near the plant's embankment.

The failures prompted the head of the state's nuclear regulator Shunichi Tanaka to step up his criticism of the utility on Wednesday. Tanaka said TEPCO had no sense of crisis, despite the emergency.

## Liquid glass didn't help

August 1, 2013

### **Liquid glass fails to stop radioactive water leak into ocean from Fukushima No. 1 plant**

<http://mainichi.jp/english/english/newsselect/news/20130801p2a00m0na004000c.html>

Tokyo Electric Power Company (TEPCO) confirmed on July 31 that its efforts to firm up the seawall by inserting liquid glass into the earth has failed to prevent radioactive water from leaking into the ocean from its Fukushima No. 1 Nuclear Power Plant.

The foundation improvement construction was a major supplemental initiative aimed at preventing the leakage of tainted water into the ocean. It proved impossible to solidify shallow areas of earth using the glass, however, resulting in the contaminated water leaking into the ocean when groundwater levels were high.

TEPCO officials said that they had constructed a liquid glass shielding wall around 100 meters in length, at a depth of two to 16 meters underground, in order to cover the seawall near the plant's No. 2 reactor.

At present, however, the level of the groundwater near the seawall is exceeding that of the shielding wall by a depth of around one meter below ground level.

"We cannot deny that now (even after the shielding wall was constructed), the groundwater is leaking into the ocean," TEPCO said.

## The deeper, the more cesium

### Cesium levels in water under Fukushima No. 1 plant soar the deeper it gets, Tepco reveals

<http://www.japantimes.co.jp/news/2013/08/01/national/cesium-levels-in-water-under-fukushima-no-1-plant-soar-the-deeper-it-gets-tepco-reveals/#.UfqPS6xSab0>

JJI, Kyodo

Tokyo Electric Power Co. said Thursday it has detected high levels of radioactive cesium in water taken from deep under its disaster-hit Fukushima No. 1 nuclear plant.

Tepco found that water in a hole dug for a cable pipe contained up to 950 million becquerels of cesium per liter.

The pipe is located near another at the turbine building of reactor 2, where water has been found to contain high levels of radioactive substances.

Tepco said it believes this water was among the first contaminated in the early stages of the March 2011 meltdowns.

Studying water taken from 1 meter, 7 meters and 13 meters underground at a point some 65 meters from the Pacific, Tepco found 950 million becquerels of cesium and 520 million becquerels of beta ray-emitting radioactive substances, including strontium, in the water from 13 meters underground.

Water from 1 meter down contained 340 million becquerels, and a sample from 7 meters down contained 350 million becquerels.

Salt concentrations in water from 13 meters down were more than 10 times higher than water from 1 meter and 7 meters underground.

On July 26, Tepco detected 2.35 billion becquerels of cesium in water collected from a different cable trench closer to the ocean. Cesium, a metallic element, is subject to gravity.

It has already been widely reported that highly radioactive groundwater from under the plant had been flowing to the Pacific and that test wells dug near the shore showed water levels in the wells rose and fell with the tides, revelations Tepco has been criticized for being late to report.

## New International Research Institute for Nuclear Decommissioning

## **New research body for reactor decommissioning**

[http://www3.nhk.or.jp/nhkworld/english/news/20130801\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20130801_25.html)

Public and private sector groups in Japan will jointly set up a new research organization to pursue ways to decommission the crippled reactors at the Fukushima Daiichi nuclear power plant.

Industry minister Toshimitsu Motegi on Thursday handed a charter for the body to Kyoto University Professor Hajimu Yamana, who will head the International Research Institute for Nuclear Decommissioning.

Motegi said he hopes all related parties will join forces to achieve results in response to the high expectations of the residents of Fukushima Prefecture and other citizens.

Taking part will be more than 500 experts from 17 groups, including government-affiliated research institutes, electric companies and reactor makers.

The members plan to develop remote-controlled robots to work at sites with high radiation doses and technologies to remove melted nuclear fuel.

Scrapping the Fukushima reactors is said to be a challenge that could take as long as 40 years.

Yamana says the new organization will bring together Japanese technological prowess and actively solicit ideas from abroad to establish decommissioning technologies as soon as possible.

## **Q&A regarding contaminated water**

### **Tepco trying to keep radioactive water from reaching sea, but can it?**

by Kazuaki Nagata

Staff Writer

[http://www.japantimes.co.jp/news/2013/07/31/reference/tepco-trying-to-keep-radioactive-water-from-reaching-sea-but-can-it/#at\\_pco=tcb-1.0&at\\_ord=6](http://www.japantimes.co.jp/news/2013/07/31/reference/tepco-trying-to-keep-radioactive-water-from-reaching-sea-but-can-it/#at_pco=tcb-1.0&at_ord=6)

Tokyo Electric Power Co. only recently admitted radioactive water is flowing from its crippled Fukushima No. 1 plant into the Pacific.

Although Tepco is giving assurances that it is taking and planning steps to prevent more tainted groundwater from reaching the sea, it's unclear how effective those efforts are, considering the difficulty of even pinpointing the problem.

Here are questions and answers regarding the tainted flow.

#### **When was the leak noticed?**

According to Tepco, the utility began more closely monitoring the radiation levels of groundwater in wells 25 meters from shore in May.

In June, the utility announced it had detected high levels of radioactive material in the groundwater taken from the wells near the reactor 2 turbine building.

Though the groundwater flows toward the sea, Tepco initially ruled out the possibility it was reaching the Pacific.

Last week, it finally changed its tune. The firm said data showed the well water levels were changing with the tides, indicating the seawater and the groundwater are intermingling.

### **How did the groundwater become radioactive?**

Inside trenches connecting the reactor 2 turbine building and a pump room right by the shore, there are pipes to carry seawater for cooling as well as electrical cables.

Since the start of the Fukushima crisis, tainted water has accumulated in these trenches, which rest on highly permeable gravel. Experts believe radioactive water is leaking from cracks in the trenches and passing through the rushed rock, reaching the groundwater.

“It’s very important information that there is crushed rock (under the trenches),” Kunihiro Shimazaki, a commissioner at the Nuclear Regulation Authority, told an NRA meeting last week.

Tepco also suspects that residual water from a leak of highly radioactive water that reached the Pacific through a section of the trenches in April 2011 may be a source of the groundwater contamination.

A sample taken last Friday from the trench contained 750 million becquerels of cesium-134, 1.6 billion becquerels of cesium-137 and 750 million becquerels of other radioactive substances, according to Tepco.

A sample from April 2011 contained 1.8 billion becquerels of both cesium-134 and cesium-137 per liter.

Meanwhile, the basement of the turbine building is flooded with the tainted water from a leaking containment vessel. Radioactive water there is possibly leaking into the trenches connected to the basement.

### **How much radioactive water has flowed into the sea?**

Tepco said it is unclear how long tainted water has been leaking into the sea — or how much. It continues to claim that the contamination of the sea is limited to the plant’s port.

### **What is Tepco doing to stop the flow?**

Tepco is trying to remove the source of contamination and block the flow of the tainted groundwater. It is currently injecting liquid glass between the reactor 2 turbine building and the sea, hoping the glass will serve as a wall to stop the groundwater from reaching the Pacific.



Tepco also plans to build a wall in the immediate harbor to contain the radioactive water. Its construction won't be completed until September 2014. The utility is also planning to remove and process the tainted water in the trenches and backfill a part of them with filling materials.

### **Are such measures enough to end the problem?**

Experts remain uncertain.

"The underground situation is complex. It's not necessarily easy to figure out," said Shigeaki Tsunoyama, president of the University of Aizu, one of the NRA panel members monitoring the Fukushima No. 1 plant. "Building walls seems simple in a drawing, but when you think about a complex underground structure, it won't be that easy," he said, adding that it is still not certain where exactly the contamination is coming from.

Although it is a difficult job, Tsunoyama said Tepco should try to figure out what is really going on underneath the plant.

The NRA also urged Tepco to dig more wells to determine how far the radioactive groundwater has spread. Reactors 1, 2 and 3 all suffered core meltdowns, and unit 4's building was destroyed in a hydrogen explosion, exposing its spent-fuel pool.

There are monitoring wells around the other damaged reactors, but unit 2 appears to so far be the only area where radioactive groundwater is showing up.

## **Water monitoring stepped up**

### **Fukushima steps up tainted water monitoring**

[http://www3.nhk.or.jp/nhkworld/english/news/20130731\\_34.html](http://www3.nhk.or.jp/nhkworld/english/news/20130731_34.html)

The government of Fukushima Prefecture in northeastern Japan has stepped up monitoring of seawater around the crippled Fukushima Daiichi nuclear power plant.

The prefecture took the move after the plant's operator, Tokyo Electric Power Company, admitted last week that groundwater contaminated with radioactive substances was leaking into the sea.

The government increased the number of sampling sites from 2 to 6 and monitoring frequency from once every 3 months to every month.

About 185 liters of seawater is to be sampled at each of 6 points from the plant's port to 3.5 kilometers offshore to analyze levels of 4 radioactive substances, including cesium and tritium.

A ship of the prefecture left a port in Iwaki City, south of the plant, for monitoring on Wednesday.

Shunji Watanabe, the chief of Fukushima's radiation monitoring section, says the prefecture has stepped up its activities to conduct its own monitoring of the sea. He says research results will be released as soon as possible.

August 2, 2013

## **Radioactivity levels higher in water deeper underground at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308020045>

By JIN NISHIKAWA/ Staff Writer

Radioactive cesium levels were much higher in water deep underground at the crippled Fukushima No. 1 nuclear plant than in samples taken closer to the surface, Tokyo Electric Power Co. said on Aug. 1.

TEPCO measured the radioactivity of water samples taken from the vertical shafts of two concrete trenches for pipes each connected to the turbine buildings of the No. 2 and No. 3 reactors.

The samples were collected on July 31 at a depth of 1 meter, 7 meters and 13 meters on the seaward side of the plant.

Cesium-134 levels of 300 million becquerels and cesium-137 readings of 650 million becquerels per liter were found in water samples from a depth of 13 meters in the trench for the No. 2 reactor turbine building, according to TEPCO.

Levels of radioactive materials that emit beta rays, including strontium, were 520 million becquerels at the same site, TEPCO said.

In the trench for the No. 3 reactor turbine building, cesium levels of 39 million becquerels were found in water at a depth of 1 meter.

Immediately after the Great East Japan Earthquake and tsunami struck the plant and triggered the nuclear disaster on March 11, 2011, a huge amount of highly radioactive water leaked from reactor buildings to the trenches.

In April 2011, TEPCO found radioactive water leaking into the sea from somewhere near the quay walls for the No. 2 reactor building. The following month, the utility discovered a similar leak near the water intake for the No. 3 reactor building.

The level of radioactive cesium detected at that time at the plant was 3.6 billion becquerels per liter.

Last month, TEPCO confirmed a level of 2.35 billion becquerels of cesium in water samples collected on July 26 from the power cable trench for the No. 2 reactor turbine building.

August 3, 2013

## 20 to 40 trillion becquerels of tritium...

### Huge leak of tritium feared in Fukushima

Kyodo

<http://www.japantimes.co.jp/news/2013/08/03/national/huge-leak-of-tritium-feared-in-fukushima/#.Uf0gAaxSab0>

Tokyo Electric Power Co. said Friday that **an estimated 20 trillion to 40 trillion becquerels of tritium** from the Fukushima No. 1 nuclear plant may have flowed into the Pacific Ocean since May 2011.

The utility reported the estimate Friday to the Nuclear Regulation Authority after recently admitting that toxic water from the emergency cooling system set up after the nuclear crisis began on March 11, 2011, is leaking into the sea.

Nevertheless, Tepco said the size of the release is roughly in the allowed range of 22 trillion becquerels a year but acknowledged it didn't take place in a controlled manner. Tritium has a half-life of about 12 years.

Since it doesn't know when the leak began, the utility has assumed the beginning was in May 2011, after it attempted to stop the toxic water from entering the ocean when it was discovered in April 2011.

The constant injection of water that is needed to keep the damaged reactors cool after the core meltdowns of March 2011 are generating a new radiation crisis at the plant that officials appear unable to solve without tainting the ocean and marine life.

## **TEPCO urged to stop tainted water leakages**

[http://www3.nhk.or.jp/nhkworld/english/news/20130803\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20130803_13.html)

The operator of the Fukushima Daiichi nuclear power plant has come up with plans to stop radioactive waste water from leaking into the sea. One idea is to build a new facility to collect underground water in the compound.

Tokyo Electric Power Company presented the plans to a working group of the Nuclear Regulation Authority on Friday. The group, tasked to stop leakages, met for the first time.

TEPCO admitted during the meeting that contaminated underground water may have moved aboveground along seawalls that were solidified to stop leakages.

TEPCO's proposals include construction of a new facility to gather underground water flowing toward the seaside of the plant and begin pumping water in late August.

Experts in the group urged TEPCO to implement the measures ahead of schedule, citing the seriousness of the problem.

The Nuclear Regulation Authority plans to set up another working group to assess the spread of radioactive materials in the sea and its impact on the environment.

TEPCO said that an estimated 20 trillion to 40 trillion becquerels of radioactive tritium have flowed into the sea between May 2011 and last month.

The utility said the amount is equivalent to the annual release allowed under safety regulations.

## **Doubting TEPCO's plans...**

### **Doubts cast over TEPCO's plan to block radioactive water at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308030046>

After nearly 30 months of failure, Tokyo Electric Power Co. is still providing little reason for confidence in its ability to deal with the radioactive water leaking at its Fukushima No. 1 nuclear plant.

The utility continues to face criticism for its delay in releasing vital information about conditions at the crippled plant. Fishermen and residents have lost patience over the many setbacks in TEPCO's preparations to decommission the reactors.

And now, the Nuclear Regulation Authority is raising doubts about the utility's latest plan: constructing underground walls to prevent the contaminated water from reaching the Pacific Ocean.

The immediate concern is radioactive water seeping along the seaward side of the No. 1 to No. 3 reactors and spilling into the sea.

TEPCO is currently solidifying soil with chemicals near a levee to prepare the ground for the walls.

But as work has progressed, the water level in observation wells has risen sharply to about 1 meter from the ground's surface, apparently due to the accumulation of groundwater blocked from the ocean.

Due to limitations in construction methods, the walls can only be built with their tops at 1.8 meters beneath the surface. That means the water levels in the observation wells have already risen above the top edges.

If such a situation continues, the completed barriers will be unable to prevent the water from reaching the ocean. In addition, calculations show that if the water levels continue to rise at the current pace, contaminated water will flood the surface in about three weeks.

One huge problem facing TEPCO in dealing with the water is the maze of pits constructed beneath the Fukushima No. 1 plant site for pipes and power cables.

Immediately after the nuclear accident started in March 2011, an estimated 11,000 tons of highly radioactive water spilled into the pits under the No. 2 and No. 3 reactors. Some of that water is believed to have leaked further underground from cracks in the pits caused by the magnitude-9.0 Great East Japan Earthquake.

The reactor buildings are still connected to the pits, making it difficult to shut off the flow of water that becomes contaminated in the cooling process of the melted nuclear fuel that remains in the reactors.

A working group of the NRA held its first meeting on Aug. 2 regarding the leaking of contaminated water at the Fukushima plant.

The nuclear watchdog raised concerns that TEPCO's plan to construct walls to block the leakage would be insufficient, and proposed pumping up the contaminated groundwater.

However, a TEPCO official said installing a pump would have to wait until late August because of the continuing construction work on the walls.

According to one calculation, about 100 tons of groundwater would have to be pumped up daily to prevent the water from leaking into the ocean. But the plant is running out of storage space for the contaminated water.

TEPCO officials remain confident that the completion of the walls in October will alleviate the water problem.

"There should be considerable improvement once we complete the additional measures," Masayuki Ono, acting general manager of TEPCO's Nuclear Power and Plant Siting Division, said at an Aug. 2 news conference.

TEPCO has also floated a plan to pump up groundwater flowing from the mountain before it enters the damaged reactor buildings and becomes contaminated. This “clean” water would be released into the ocean, thereby reducing the volume of contaminated water at the site.

However, local fishermen oppose the move in part because of their anger at the latest leaks of contaminated water into the ocean. They have also steadily lost trust in TEPCO.

Water contaminated with extremely high levels of radiation reached the ocean from the pits in the No. 2 and No. 3 reactors in April and May 2011.

TEPCO implemented measures to stop the leaks, and officials said they believed they had properly dealt with the problem at that time.

But in reality, contaminated water continued to flow into the ocean. TEPCO officials did not admit to that problem until July 22.

On Aug. 2, TEPCO officials said between 20 trillion and 40 trillion becquerels of radioactive tritium had leaked into the ocean. That is about 10 to 100 times the volume emitted over a one-year period of operating the nuclear plant.

“There is only a minor effect on the environment because it is about the same level as the upper limits of emission standards during operating periods,” a TEPCO official said.

However, TEPCO officials noted an increase in the volume of contaminated groundwater reaching the ocean since May, when concentrations of tritium in the water within the port at the Fukushima No. 1 plant began rising.

The utility estimated that between 20 trillion and 40 trillion becquerels will have entered the ocean by the end of July.

The company will make estimates of the flow of strontium, which has greater effects on the environment and tends to accumulate in human bones.

## Contaminated water an "emergency"

August 5, 2013

### **Exclusive: Japan nuclear body says radioactive water at Fukushima an 'emergency'**

<http://www.reuters.com/article/2013/08/05/us-japan-fukushima-panel-idUSBRE97408V20130805>

By Antoni Slodkowski and Mari Saito

TOKYO

(Reuters) - Highly radioactive water seeping into the ocean from Japan's crippled Fukushima nuclear plant is creating an "emergency" that the operator is struggling to contain, an official from the country's nuclear watchdog said on Monday.

This contaminated groundwater has breached an underground barrier, is rising toward the surface and is exceeding legal limits of radioactive discharge, Shinji Kinjo, head of a Nuclear Regulatory Authority (NRA) task force, told Reuters.

Countermeasures planned by Tokyo Electric Power Co are only a temporary solution, he said.

Tepco's "sense of crisis is weak," Kinjo said. "This is why you can't just leave it up to Tepco alone" to grapple with the ongoing disaster.

"Right now, we have an emergency," he said.

Tepco has been widely castigated for its failure to prepare for the massive 2011 tsunami and earthquake that devastated its Fukushima plant and lambasted for its inept response to the reactor meltdowns. It has also been accused of covering up shortcomings.

It was not immediately clear how much of a threat the contaminated groundwater could pose. In the early weeks of the disaster, the Japanese government allowed Tepco to dump tens of thousands of metric tons of contaminated water into the Pacific in an emergency move.

The toxic water release was however heavily criticized by neighboring countries as well as local fishermen and the utility has since promised it would not dump irradiated water without the consent of local townships.

"Until we know the exact density and volume of the water that's flowing out, I honestly can't speculate on the impact on the sea," said Mitsuo Uematsu from the Center for International Collaboration, Atmosphere and Ocean Research Institute at the University of Tokyo.

"We also should check what the levels are like in the sea water. If it's only inside the port and it's not flowing out into the sea, it may not spread as widely as some fear."

#### NO OTHER OUTLET FOR WATER

Tepco said it is taking various measures to prevent contaminated water from leaking into the bay near the plant. In an e-mailed statement to Reuters, a company spokesman said Tepco deeply apologized to residents in Fukushima prefecture, the surrounding region and the larger public for causing inconveniences, worries and trouble.

The utility pumps out some 400 metric tons a day of groundwater flowing from the hills above the Fukushima Daiichi nuclear plant into the basements of the destroyed buildings, which mixes with highly irradiated water that is used to cool the reactors in a stable state below 100 degrees Celsius.

Tepco is trying to prevent groundwater from reaching the plant by building a "bypass" but recent spikes of radioactive elements in sea water has prompted the utility to reverse months of denials and finally admit that tainted water is reaching the sea.

In a bid to prevent more leaks into the bay of the Pacific Ocean, plant workers created the underground barrier by injecting chemicals to harden the ground along the shoreline of the No. 1 reactor building. But that barrier is only effective in solidifying the ground at least 1.8 meters below the surface.

By breaching the barrier, the water can seep through the shallow areas of earth into the nearby sea. More seriously, it is rising toward the surface - a break of which would accelerate the outflow.

"If you build a wall, of course the water is going to accumulate there. And there is no other way for the water to go but up or sideways and eventually lead to the ocean," said Masashi Goto, a retired Toshiba Corp nuclear engineer who worked on several Tepco plants. "So now, the question is how long do we have?"

Contaminated water could rise to the ground's surface within three weeks, the Asahi Shimbun said on Saturday. Kinjo said the three-week timeline was not based on NRA's calculations but acknowledged that if the water reaches the surface, "it would flow extremely fast."

A Tepco official said on Monday the company plans to start pumping out a further 100 metric tons of groundwater a day around the end of the week.

The regulatory task force overseeing accident measures of the Fukushima Daiichi nuclear power station, which met Friday, "concluded that new measures are needed to stop the water from flowing into the sea that way," Kinjo said.

Tepco said on Friday that a cumulative 20 trillion to 40 trillion becquerels of radioactive tritium had probably leaked into the sea since the disaster. The company said this was within legal limits.

Tritium is far less harmful than cesium and strontium, which have also been released from the plant. Tepco is scheduled to test strontium levels next.

The admission on the long-term tritium leaks, as well as renewed criticism from the regulator, show the precarious state of the \$11 billion cleanup and Tepco's challenge to fix a fundamental problem: How to prevent water, tainted with radioactive elements like cesium, from flowing into the ocean.

(Additional reporting by Kentaro Hamada; Editing by Edmund Klamann and Raju Gopalakrishnan)

## What IS going on?

August 6, 2013

### **Radioactivity levels in Fukushima groundwater increase 47-fold over 5 days**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308060059>

Radioactivity levels soared 47-fold over just five days in groundwater from a monitoring well on the ocean side of the crippled Fukushima No. 1 nuclear power plant, the plant operator said Aug. 5.

Tokyo Electric Power Co. said 56,000 becquerels of radioactive substances, including strontium, were detected per liter of groundwater sampled on Aug. 5 in the "No. 1-5" monitoring well, which is adjacent to the turbine building for the No. 1 reactor. The previous measurement for the well water was made on July 31.

Highly radioactive water has been detected for some time in groundwater near reactor and turbine buildings of the nuclear plant. A record high level of 900,000 becquerels per liter was found in early July in water taken from a different monitoring well.

TEPCO has been struggling to deal with the enormous amounts of water used to cool the damaged reactors and block the flow of contaminated water into the ocean.



## TEPCO swamped

### **Tokyo Electric can't stop radioactive flow at Fukushima plant**

AP

<http://www.japantimes.co.jp/news/2013/08/06/national/tokyo-electric-cant-stop-radioactive-flow-at-fukushima-plant/#.UgEfBKxSab0>

Tokyo Electric Power Co. said Tuesday it is struggling in its latest efforts to stop radioactive groundwater from flowing into the sea at the Fukushima No. 1 nuclear plant.

Tepco said some of the water is getting over or around "chemical walls" it created by injecting chemicals into the soil that solidify into a wall.

The latest problem involves groundwater that has built up over the last month, since Tepco started creating the chemical walls in an embankment to stop leaks after it detected radiation spikes in groundwater samples.

Tepco spokesman Yoshikazu Nagai said the company was slow to deal with the underground water problem while focusing on the melted reactors, which pose greater risks.

Measures to contain contaminated underground water leaks have lagged while "we devoted ourselves to cool the reactors," which was the foremost task, Nagai said.

The plant still runs on makeshift equipment and has been plagued with blackouts and leaks from underground tanks.

Tepco has been repeatedly criticized for delayed handling and disclosures of problems and mishaps.

The Nuclear Regulation Authority set up a special panel with Tepco and met Friday to assess the water problem and discuss measures to resolve it. Watchdog officials have urged Tepco to pump the contaminated water inland and expand underground and seawater sampling. The utility is also building more layers of chemical walls around the embankment.

Officials acknowledged last month for the first time that the plant has been leaking radioactive water into the ocean for some time. After a major leak a month after the meltdowns, Tepco said it had contained the problem, and denied further underground leaks into the ocean until recently, though many experts have suspected that from early on.

Data provided by Tepco showed underground water at coastal monitoring points has risen over the chemical wall, obviously leaking into the sea.

## **Fukushima Pref. asks Gov't to step in**

### **Fukushima asks govt. to take steps to stop leaks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130806\\_37.html](http://www3.nhk.or.jp/nhkworld/english/news/20130806_37.html)

Fukushima Prefecture has asked Japan's government to ensure that the operator of the crippled Fukushima Daiichi nuclear power plant take steps to prevent further leakage of radiation-tainted water into the sea.

Tokyo Electric Power Company, or TEPCO, admitted late last month that contaminated groundwater is leaking into the sea.

The prefecture's Vice Governor Masao Uchibori visited the Nuclear Regulation Authority to submit a written request on Tuesday.

Fukushima asks in the document that the government instruct TEPCO to prevent further leaks and dispose of radiation-tainted water in underground tunnels of the plant's compound.

It also asks that the government take responsibility for decommissioning damaged reactors at the facility.

Uchibori told an official of the authority that some of the utility's measures have adverse effects such as increasing risks of further leaks. He said he's worried that TEPCO is taking only makeshift measures.

The official said speed is the key in dealing with the problem.

Uchibori also handed the request to senior vice industry minister Kazuyoshi Akaba.

Uchibori told reporters that TEPCO was late in admitting the water leaks, resulting in delayed measures. He said he wants the government to take the lead in handling the matter and quickly produce results.

## **Prefectural monitors inspect water leak site**

[http://www3.nhk.or.jp/nhkworld/english/news/20130806\\_40.html](http://www3.nhk.or.jp/nhkworld/english/news/20130806_40.html)

Experts and local government officials have inspected the Fukushima Daiichi nuclear plant compound to assess the risk of contaminated groundwater leaking into the sea.

They are members of the Fukushima prefectural government's council to monitor the process of decommissioning the plant by its operator, Tokyo Electric Power Company.

On Tuesday, they inspected an underground tunnel believed to be filled with highly radioactive wastewater.

They also checked how embankments are being reinforced between one of the reactors and the sea to prevent groundwater from reaching the ocean.

But the reinforcement work has led to a rise in the groundwater level. This is further escalating the risk of contaminated water overflowing into the sea.

After the inspection, many council members voiced frustration with Tokyo Electric's approach of dealing with problems as they occur instead of taking preventive measures.

Plant chief Akira Ono promised to quickly implement whatever steps are possible, and to see things from the perspective of the general public rather than the utility's.

## **Pumping operation**

### **TEPCO plans pump at Fukushima plant to combat radioactive water leak**

<http://mainichi.jp/english/english/newsselect/news/20130806p2a00m0na022000c.html>

Fukushima No. 1 nuclear plant operator Tokyo Electric Power Co. (TEPCO) plans to pump water out of the ground near the stricken plant's sea wall to try and prevent more radioactive water from seeping into the ocean, the utility announced on Aug. 5.

Groundwater contaminated with radioactive substances from the No. 1 plant's stricken reactors has likely been flowing into the ocean with the rise and fall of the tide. To counteract the seepage, the Nuclear Regulation Authority (NRA) ordered TEPCO on Aug. 2 to pump out groundwater before it reaches the waterfront.

TEPCO's pumping plans call for sinking a well on the site and pumping out some 100 metric tons of groundwater per day. The above-ground storage tanks for contaminated water are, however, already

almost full, and the utility is considering using the No. 2 reactor turbine building and other alternative sites to store the groundwater.

To prevent contaminated groundwater from reaching the ocean, TEPCO had already begun work on a subterranean wall made by applying sodium silicate -- or "liquid glass" -- to soil near the ocean, hardening it and creating a barrier. However, getting the wall all the way up to the last 1.8 meters beneath the surface is not technically feasible.

The NRA ordered the pumping operation after pointing out that TEPCO "should know that the measures now underway will not stop the leakage."

The well for the pumping operation will be sunk on the inland side of the plant grounds. TEPCO also announced it will step up radiation monitoring in the plant harbor and the nearby sea to track the impact of the radioactive water leak.

## "A race against the clock"

August 7, 2013

### **Radioactive water may be seeping over underground barrier at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308070027>

THE ASSOCIATED PRESS

The operator of Japan's wrecked Fukushima nuclear power plant is struggling to stop contaminated underground water from leaking into the sea.

Tokyo Electric Power Co. said some of the water is seeping over or around an underground barrier it created by injecting chemicals into the soil that solidified into a wall.

The latest problem involves underground water which has built up over the last month since the company began creating the chemical walls to stop leaks after it detected radiation spikes in water samples in May.

TEPCO spokesman Yoshikazu Nagai said Aug. 6 the company was slow to deal with the underground water leaks because it was focusing on cooling the damaged reactors, which posed greater risks.

Three reactors at the Fukushima No. 1 nuclear power plant suffered meltdowns after a massive March 2011 earthquake and tsunami destroyed power and cooling systems. The plant is still running on makeshift equipment and has been plagued with blackouts and leaks from underground tanks.

TEPCO has been repeatedly criticized for delays in handling and disclosing problems at the plant. Alarmed by the latest problem, a panel of officials from local towns and villages rushed to the plant Aug. 6 for an inspection, demanding TEPCO limit the impact on the sea.

Japan's nuclear watchdog set up a separate special panel with TEPCO and met Aug. 2 to assess the water problem and discuss ways to resolve it. Watchdog officials have urged TEPCO to pump the contaminated water inland and expand underground and seawater sampling. TEPCO is also building more chemical walls around the plant.

TEPCO officials were unable to answer many of the watchdog officials' questions, including ones about the leaks' origin, their routes and how they can be plugged. They also acknowledged that they have neglected large amounts of highly contaminated water that has remained in maintenance trenches since the crisis, a risk also cited by the watchdog.

"It's a race against the clock," said Toyoshi Fuketa, a commissioner of the Nuclear Regulation Authority. "The top priority is to keep the water from escaping into the sea."

Officials acknowledged last month for the first time that the plant has been leaking radioactive water into the ocean for some time. After a major leak a month after the meltdowns, TEPCO said it had contained the problem and denied further underground leaks into the ocean were occurring, although many experts suspected they were.

While the extent of sea contamination remains unknown, TEPCO has estimated that up to 40 trillion becquerels of radioactive tritium, a water soluble element that can affect DNA but is believed to be less dangerous than cesium or strontium, might have leaked into the sea over the past two years. The company says the amount is within legal limits, but is much higher than is released under normal operations.

The amount of contaminated water at the plant increases by 400 tons a day. TEPCO plans to secure storage facilities capable of holding 800,000 tons more water by 2015.

“For the next two to three years, I think water management would be their biggest challenge,” said Dale Klein, a former U.S. Nuclear Regulatory Commission chairman who now oversees TEPCO’s reform committee. “But there will be more surprises,” he said, citing possible power outages, leaks and other “unknowns.”

## 300 tons a day into the ocean

### **Fukushima plant leaks 300 tons of contaminated water daily**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308070093>

REUTERS

A Japanese government official said an estimated 300 tons of contaminated water is leaking into the ocean each day from the crippled Fukushima nuclear plant, after Prime Minister Shinzo Abe pledged on Aug. 7 to step up government efforts to stem radioactive water leakage.

Abe ordered the Minister of Economy, Trade and Industry to urgently deal with the water situation and ensure the plant's operator, Tokyo Electric Power Co, takes appropriate action to deal with the cleanup, which is expected to take more than 40 years and cost \$11 billion.

The ministry official also said the utility would begin pumping out groundwater to reduce leakage and had aimed to be removing 300 tons per day by December, but would end up 60 tons short of that goal.

**Removing 300 tons of groundwater, however, would not necessarily halt leakage into the sea**, he said.

### **300 tons of nuclear water leaks to sea daily**

[http://www3.nhk.or.jp/nhkworld/english/news/20130807\\_42.html](http://www3.nhk.or.jp/nhkworld/english/news/20130807_42.html)

Japan's industry ministry estimates that about 300 tons of radiation-tainted water leaks from the crippled Fukushima Daiichi nuclear power plant into the sea daily.

The ministry says some 1,000 tons of groundwater flows from a mountainside into the plant premises every day.

Of the volume, 300 tons is tainted with radioactive substances when it flows through an area near wells before leaking into the sea. High levels of radioactive materials have been detected in the wells.

Some 400 of the remaining 700 tons flows into the basements of the plant's No.1 to No.4 reactor buildings. 300 tons of untainted water flows into the sea.

The plant's operator Tokyo Electric Power Company has been solidifying an embankment of ground at the plant to prevent contaminated water leakage into the sea.

It is also paving the ground surface with asphalt to keep out rainwater.

The ministry expects some 60 tons of tainted water to continue leaking into the sea even after these steps.

It says the figures are based on water table data offered by the utility, not detailed analyses of various data.

The ministry also says it cannot rule out the possibility that contaminated groundwater started leaking into the sea just after the nuclear accident at the plant.

## Start pumping

### **TEPCO to pump out contaminated groundwater**

[http://www3.nhk.or.jp/nhkworld/english/news/20130808\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130808_03.html)

The operator of the crippled Fukushima Daiichi nuclear power plant says it will start pumping out contaminated groundwater in an attempt to stop it from leaking into the ocean.

Tokyo Electric Power Company says it will begin work on Friday.

The company has been solidifying an embankment to prevent groundwater from leaking into the ocean. But there are concerns that the level of tainted groundwater has already overflowed the embankment.

The company says it will bore a small-scale well near the embankment and then pump out contaminated water in an effort to lower the water level.

The utility says it will then sink nearly 30 pipes measuring 5 meters long into the ground along the embankment and pump out groundwater from them as well starting next week.

It hopes to drain 100 tons of water per day.

Industry ministry officials said on Wednesday that 300 tons of tainted water is estimated to be leaking into the ocean daily.

TEPCO says it still does not know the exact amount of water that is leaking.

The utility has also failed so far to identify the cause of a recent surge in the radiation levels of groundwater in a well in the plant. The well was newly built near an underground tunnel where highly radioactive water had collected.

A government panel will meet on Thursday to discuss how best to deal with the contaminated groundwater.

## From Beyond Nuclear

### New radioactive “Emergency” in worsening Fukushima nuclear disaster

<http://www.beyondnuclear.org/japan/2013/8/7/new-radioactive-emergency-in-worsening-fukushima-nuclear-dis.html>

Japan’s fledgling Nuclear Regulation Authority (NRA) has declared a new “emergency” in the worsening Fukushima Daiichi nuclear catastrophe with the disclosure of the ongoing uncontrolled release of radioactivity into groundwater that is flowing into the Pacific Ocean. The announcement comes with the admission by a Tokyo Electric Power Company (TEPCO) spokesman, now more than two years after the multiple nuclear meltdowns, that “We understand that this water discharge is beyond our control and we do not think that the current situation is good.” Japanese Prime Minister Shinzo Abe has only recently pledged the government’s support in a new hope to gain control of the radioactive contamination of the sea. In fact, Fukushima’s radioactive water crisis as now finally disclosed has only just begun.

An estimated 400 tons of groundwater highly contaminated by radioactivity each day flows in an aquifer that runs beneath the Fukushima Daiichi reactor wreckage. In an effort to control the flow of radioactive contamination from the reactor site into the Pacific Ocean, TEPCO injected a makeshift underground dam-like chemical barrier that has now been breached by radioactive water welling up to the surface and threatening to flow over the top of the barrier structure on its way down to the sea.

TEPCO has estimated that a “cumulative 20 trillion to 40 trillion Becquerels of radioactive tritium had probably leaked into the sea” since the accident began on March 11, 2011. But these figures are unreliable as the bankrupt electric utility also admits it has no idea how much radioactive water has already leaked or passed through the wrecked atomic site. Tritium, radioactive hydrogen that cannot be economically filtered out, is the most mobile of all the isotopes and likely only the leading edge of a slower moving but growing and more highly contaminated radioactive plume. A sample taken from a Fukushima Daiichi Unit 2 onsite test well that is approximately 150 feet from the ocean confirmed that the level of radioactive cesium-137 has increased in moving groundwater by more than 47 times in the first days of August 2013. TEPCO, like an atomic age “Sorcerer’s Apprentice”, is desperately pumping radioactive water into now more than one thousand temporary onsite storage tanks slated for future decontamination treatment. But that collection and decontamination effort now appears to be completely overwhelmed and admitted by TEPCO to have failed.

Of additional concern, there is also the periodic release of radioactive steam to the atmosphere from the exploded reactor wreckage at Unit 3. Technical experts have not been able to confidently explain what is causing the on-again off-again releases of steam to the atmosphere. Beyond Nuclear remains concerned that melted reactor core(s) material, or “corium”, has already burned through the concrete foundation of



the reactor site and bored into the earth underneath the site where it is coming in contact with water, generating steam and creating highly radioactive plumes in the aquifer. Recovery and containment of corium material from the earth would prove extremely difficult and if unsuccessful will result in a constant uncontrolled high-level radioactive release into the biosphere far, far into the future.

The worsening situation and growing uncertainty adds more evidence and justification for a full-scale international and technical intervention into the catastrophe to stem the radioactive contamination of the world's oceans. Japan's sovereignty rights must be weighed against the clear and present danger from global marine environment contamination and degradation.

August 8, 2013

## **Solutions by the end of September...**

### **Experts to study ways to reduce contaminated water**

[http://www3.nhk.or.jp/nhkworld/english/news/20130808\\_35.html](http://www3.nhk.or.jp/nhkworld/english/news/20130808_35.html)

Japan's industry minister has instructed a panel to reduce contaminated water at the damaged nuclear plant in Fukushima.

**Industry, Economy and Trade Minister Toshimitsu Motegi told the panel of experts on Thursday to come up with concrete proposals by the end of September.**

The move came after recent revelations that tainted water continues to leak into the ocean almost 29 months after the March 11th, 2011 accident.

Tokyo Electric Power Company is struggling to stop the leaks by solidifying an embankment at the plant. But fundamental measures are needed to deal with water flowing from nearby mountains into the plant compound.

At the panel meeting, Motegi called for study on how to pump out groundwater before it gets into the contaminated reactor buildings. He also suggested building an underground wall to prevent contaminated water from reaching the ocean.

Among the approaches he suggested was the possibility of releasing into the sea groundwater that is below the legal limits of contamination.

In May, TEPCO sought support from local fishermen on a plan to flush groundwater into the sea before it

reaches the compounds of the reactors. The fishermen opposed it, saying it's hard to tell groundwater and contaminated water apart.

## Japan to use public funds to deal with radioactive water in Fukushima

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308080053>

The central government is going ahead with a plan to use public funds in an attempt to stop radioactive water at the crippled Fukushima No. 1 nuclear power plant from flowing into the ocean, as operator Tokyo Electric Power Co. is seen as incapable of coping with the problem on its own.

"The problem of contaminated water is the most pressing. Rather than leave it up to TEPCO, the central government will come up with the measures to deal with it. The industry minister will instruct TEPCO in order to implement swift and multilayered measures," Prime Minister Shinzo Abe told a meeting of the Nuclear Emergency Response Headquarters on Aug. 7.

The Agency for Natural Resources and Energy released the results of a study that estimated about 1,000 tons of groundwater was flowing daily from nearby mountains to the ocean in the vicinity of the Fukushima No. 1 plant. Of that amount, about 400 tons is being contaminated with radiation after flowing into reactor buildings and other facilities at the plant site.

Of the remaining 600 tons of groundwater, about half was coming into contact with soil contaminated by radioactive materials around the reactor buildings and flowing into the ocean, according to the report.

Those involved in the study have been unable to determine when the contaminated water began flowing into the ocean. The possibility that contaminated water has been flowing into the ocean from the outset of the disaster cannot be denied.

**The remaining 300 tons of groundwater is believed to be flowing into the ocean without being contaminated and poses no risk.**

TEPCO plans to begin pumping up contaminated groundwater from wells on the plant site from Aug. 9. While about 100 tons will be pumped up daily at first, plans also call for digging more wells. The contaminated water will be stored in tanks on site.

According to TEPCO officials, tanks that have already been installed can hold about 380,000 tons. They are at the 320,000-ton mark now.

Plans call for installing tanks to increase the capacity to 700,000 tons by 2015 and 800,000 tons by fiscal 2016.

TEPCO officials hope to reduce the volume of contaminated groundwater to 60 tons a day and store that water in the tanks. One measure being considered for that reduction is to solidify contaminated soil with chemicals to construct a wall that would block out groundwater.

**However, TEPCO plans do not take into consideration the possibility that contaminated water may leak from the reactor buildings.**

Moreover, while the concentration of radioactive materials in the water is being measured at the wells, the results have fluctuated depending on the timing and location for the collection of the water samples. That makes it difficult to determine the level of radioactive materials in the water.

**TEPCO officials have also been unable to determine where the water is leaking from, nor the extent of the area that has been contaminated.**

Such uncertainty will likely force the utility to undertake a comprehensive review of measures that have been implemented until now to deal with the problem.

TEPCO also has an untested plan to freeze soil around the Fukushima No. 1 plant to block the flow of groundwater into the reactor and turbine buildings. However, because the project would cost several tens of billions of yen, TEPCO alone will be unable to finance it. The central government will cover part of the costs.

The Ministry of Economy, Trade and Industry plans to ask for funds in the fiscal 2014 budget for research purposes for the soil freezing project without specifying how much it wants.

The central government and TEPCO finalized the plan in May and are planning to complete the project by the first half of fiscal 2015.

Under the proposal, the wall of frozen soil will be built by inserting cooling pipes into the ground at intervals of about one meter around the buildings. The pipes would be inserted as deep as 30 meters into the ground. Coolant of about minus 50 degrees would be circulated through the pipes to freeze the surrounding soil.

Compared to constructing walls using clay or concrete, the frozen soil wall would better block the water and the time needed for completing the project would also be shorter.

TEPCO officials are confident they can surround all the buildings reasonably quickly.

One problem is that a huge amount of funds would be needed to continuously circulate the coolant.

In the meantime, TEPCO has other plans to construct a wall to block out water by injecting chemicals into the foundation near the levee to prevent contaminated water from flowing into the ocean. The utility will also pump up contaminated water.

However, those measures would not completely stop the flow of water into the ocean. An additional problem is where to store the pumped water.

If the water can be blocked from flowing into the reactor buildings, the contaminated water now accumulated in the basement of the buildings could be extracted to allow for the decommissioning of the reactors. However, the extraction of that water will likely be a difficult task because workers are unable to approach the buildings because of high levels of radiation.

## NBCnews on Fukushima leak (+ video)

### Wrecked Fukushima nuke plant leaking 330 tons of contaminated water a day

[http://worldnews.nbcnews.com/\\_news/2013/08/07/19910577-wrecked-fukushima-uke-plant-leaking-330-tons-of-contaminated-water-a-day?lite](http://worldnews.nbcnews.com/_news/2013/08/07/19910577-wrecked-fukushima-uke-plant-leaking-330-tons-of-contaminated-water-a-day?lite)

By Arata Yamamoto, Producer, NBC News

Japanese Prime Minister Shinzo Abe on Wednesday ordered increased efforts to stop radiation-contaminated water from spilling into the Pacific Ocean from the wrecked Fukushima nuclear plant. A government official told reporters Wednesday that an estimated 300 metric tons (330 tons) of contaminated water was leaking into the ocean every day from the Daiichi plant, which was devastated by the March 2011 earthquake and tsunami, Reuters reported.

The official also said the government believed the leaks had been happening for two years.

Few people are granted access to the radioactive Fukushima exclusion zone in Japan, which remains abandoned and frozen in time on March 11, 2011 — the day a massive earthquake and subsequent tsunami caused a triple nuclear meltdown in the city. Channel 4's Alex Thomson reports.

The plant's operators Tokyo Electric Power Company has been building an underground wall by injecting "liquid glass" into the ground in an attempt to contain the contaminated water.

TEPCO has insisted that so far the level of contamination in the ocean does not pose a risk to health. But some of the contaminated water has made its way through parts of the underground barrier and started to rise above ground.

In response, TEPCO announced that it would begin pumping out the contaminated underground water at a rate of 100 metric tons (110 tons) a day starting this week.

The main government spokesman, Chief Cabinet Secretary Yoshihide Suga, told the press that the government was considering providing financial assistance to help with the project.

The cleanup operation is expected to take more than 40 years and cost \$11 billion, Reuters reported.

*Reuters contributed to this report.*

August 9, 2013

## **TEPCO has started pumping**

### **TEPCO begins pumping contaminated groundwater at damaged Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130809p2a00m0na019000c.html>

Tokyo Electric Power Co. (TEPCO) began pumping up contaminated groundwater on Aug. 9 from a well built near the No. 2 reactor of the crippled Fukushima No. 1 Nuclear Power Plant.

An estimated 300 tons of contaminated groundwater is leaking into the Pacific Ocean daily, and TEPCO is trying to reduce the amount of such water flowing into the sea. The Tokyo-based utility hopes to pump up a maximum 100 tons of contaminated water a day to be transported to the No. 2 reactor's turbine building.

In an effort to block water contaminated with radioactive substances at the Fukushima plant, TEPCO encased revetment ground in water glass in a wall-like formation. However, technical difficulties prevented the company from erecting a wall shallower than about 1.8 meters from the surface of the ground. As a result, the level of contaminated groundwater accumulating in the ground rose past the wall's upper edge -- and subsequently began leaking into the ocean.

The Nuclear Regulation Authority ordered TEPCO on Aug. 2 to pump up contaminated groundwater at the Fukushima plant, which was rocked by the 2011 Great East Japan Earthquake and tsunami.

In order to pump up the contaminated groundwater, TEPCO dug a well of 2.5 meters in both depth and diameter inside the water glass wall in the ground. It also plans to drive about 30 tubes up to 3 meters

deep into several locations near the well in order to pump up radioactive water. If these facilities are completed, TEPCO says, it will be able to pump up 100 tons of contaminated groundwater per day.

The government will allocate taxpayer money under the fiscal 2014 budget to deal with contaminated water. On Aug. 8, Economy, Trade and Industry Minister Toshimitsu Motegi ordered a government panel on contaminated water to consider releasing contaminated groundwater into the ocean.

## **TEPCO starts pumping to prevent water leak**

[http://www3.nhk.or.jp/nhkworld/english/news/20130809\\_19.html](http://www3.nhk.or.jp/nhkworld/english/news/20130809_19.html)

The operator of the Fukushima Daiichi nuclear power plant has begun pumping up radioactive groundwater there to keep it from flowing into the sea.

Tokyo Electric Power Company dug a small well near an embankment facing the sea and began the pumping at about 2 PM on Friday.

The pumped-up water is moved to an underground trench and then stored in tanks in the plant's compound.

The utility has hardened soil near the embankment since last month to prevent tainted groundwater from seeping into the sea.

But rising levels of groundwater have raised concerns that it could overflow.

Tokyo Electric Power said it will also put nearly 30 pipes, each 5 meters long, in the ground near the embankment next week to pump up more groundwater.

The utility added that it hopes the measures will allow it to draw about 100 tons of groundwater a day.

On Thursday, a government panel agreed to compile measures to fully deal with the leakage before the end of next month. They may include pumping up and releasing groundwater into the sea so that it is not contaminated in the compound.

Radioactive water is increasing at the plant every day as groundwater is contaminated while passing through the plant's premises.

The government says about 300 tons of contaminated groundwater may be flowing into the ocean every day.

## Gov't to help using taxpayer money

### **Editorial: Gov't should speed up radioactive water disposal at crippled Fukushima plant**

<http://mainichi.jp/english/english/perspectives/news/20130809p2a00m0na009000c.html>

The government has decided to use taxpayer funds from the fiscal 2014 state budget to prevent water contaminated with radioactive materials, which has accumulated on the premises of the tsunami-hit Fukushima No. 1 Nuclear Power Plant, from leaking into the sea.

Since plant operator Tokyo Electric Power Co. (TEPCO) has failed to properly respond to this problem, it is only natural for the government to take the initiative in dealing with the matter. It can be even said that the government's decision came too late.

Still, TEPCO is primarily responsible for the nuclear disaster. Since the use of public funds means that the efforts to bring the nuclear crisis under control will come at taxpayer cost, the government must not waste any of the money. In order to win the public's understanding, the government should fully disclose a road map toward disposing of the contaminated water, and should also outline how much taxpayers should expect the work to cost.

The Natural Resources and Energy Agency, which is under the Economy, Trade and Industry Ministry, estimates that 1,000 tons of underground water is flowing onto the premises of the damaged power station per day -- and that 300 tons of the water has leaked into the sea after being contaminated with radioactive materials. Although there is no sign that the sea off the power plant is contaminated with radioactive substances, the agency has not ruled out the possibility that such contaminated water has been leaking into the sea since shortly after the outbreak of the nuclear crisis in March 2011.

The fact that such a serious estimate is being released now -- more than two years after the accident -- demonstrates that the crisis is far from being brought under control.

With these circumstances fully in mind, Prime Minister Shinzo Abe said, "Disposing of contaminated water is an urgent task. Instead of leaving the matter up to TEPCO, the government will take countermeasures." The prime minister then instructed Economy, Trade and Industry Minister Toshimitsu Motegi to take prompt action to this effect.

Specifically, the ministry is considering using taxpayers' money to lay pipes around affected reactor buildings, which will be used to send cooling liquid that is dozens of degrees Celsius below the freezing point in order to freeze the ground -- thereby preventing contaminated water from leaking.

A total of about 400 tons of underground water is flowing into each of the No. 1 to 4 reactor buildings, where it is being contaminated with radioactive substances. The project aims to decrease the amount of radioactive water on the premises of the reactor buildings by freezing the ground around the structures, and blocking underground water from flowing into their compounds. Such large-scale construction work is unprecedented, and the government and the Nuclear Regulation Authority (NRA) accordingly need to monitor how the project will be implemented.

Even if the construction work progresses smoothly and steadily, the system cannot be put into operation until 2015. Consequently, stopgap measures that are presently being implemented or considered include pumping contaminated water, improving the ground, and implementing an underground water bypass

system wherein a well will be drilled to direct underground water into the sea before it flows onto the premises of the reactor buildings.

Such an underground water bypass system has not won consent from local fisheries cooperatives, however, which are worried about possible harmful rumors regarding the contamination of the sea where their members operate.

Motegi has asked a government panel on contaminated water disposal to consider how to confirm the safety of pumped underground water, and how to release the water into the sea. However, the government must also provide a detailed explanation of the project to the local communities hosting the power plant. The NRA decided last month to set up a working team to analyze radioactive water on the premises of the power plant, which will help ensure the objectivity of relevant data.

The process of decommissioning reactors at the Fukushima No. 1 nuclear plant is expected to take 30 to 40 years. Unless the problem of contaminated water is solved, the decommissioning process will not move forward.

As the entities responsible for decommissioning the Fukushima reactors, the government and the NRA should consider and implement countermeasures against radioactive water at the power plant in a proactive manner.

August 10, 2013

## IAEA to the rescue?

### **U.N. agency says it's monitoring Fukushima and ready to help**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308100023>

REUTERS

VIENNA--The U.N. atomic energy agency is following closely the leak of radioactive water from Japan's stricken Fukushima nuclear plant into the sea and is ready to help out if asked, it said on Aug. 9.

Fukushima plant operator Tokyo Electric Power Co. (TEPCO) has struggled to contain highly radioactive water that is pouring from the plant wrecked by a 2011 tsunami, prompting the government to step in to try to help with the clean-up.

"Japanese authorities have explained their planned countermeasures against current leakage and further leakages," Serge Gas, the Vienna-based International Atomic Energy Agency's (IAEA) director of public information, said in a statement.

He noted the IAEA had already provided recommendations to Japanese authorities on how to manage liquid waste, and that a report from a mission in April had encouraged TEPCO to review its strategy for handling water that had accumulated at the site.

The report “noted that it was of utmost importance to have adequate measures in place for detecting leaks promptly and mitigating their consequences,” he said, adding: “The IAEA continues to be ready to provide assistance on request.”

August 11, 2013

## Contaminated water flows over underground wall

### TEPCO says radioactive water likely flowed over underground wall

<http://mainichi.jp/english/english/newsselect/news/20130811p2g00m0dm011000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Saturday groundwater contaminated with radioactive substances from the damaged Fukushima Daiichi nuclear power plant likely flowed over an underground wall meant to prevent the water from reaching the sea.

TEPCO said so after measuring underground water near the seawall and finding a high concentration of radioactive materials in the water.

The government said earlier this week it estimates that about 300 tons of radioactive-contaminated water has flowed into the Pacific daily, the latest crisis in Japan's struggle to contain the 2011 nuclear disaster.

The water-shielding wall on the sea bank was completed Friday. But necessary chemicals are unable to be injected from the ground surface to a depth of about 1.8 meters. And as a result, radioactive-contaminated water is leaking into the ocean.

Since construction of the wall began in early July, the water levels have risen. As a stopgap measure, TEPCO on Friday started pumping up water, but whether that has an effect remains to be seen, a company official.

Radioactive water is increasing at the Fukushima complex daily because groundwater is contaminated as it passes through the plant's premises, where three reactors suffered meltdowns following the March 2011 earthquake and tsunami disaster.

## Underground wall unable to stop leak



## **TEPCO:Underground wall not effective against leaks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130811\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20130811_01.html)

The operator of the damaged Fukushima nuclear power plant has confirmed that an underground wall is unable to keep contaminated groundwater from seeping into the sea.

Officials of the Industry Ministry estimate that 300 tons of groundwater pass through the contaminated area before flowing into the Pacific Ocean every day.

Engineers with Tokyo Electric Power Company have hardened the soil along the coast to create a 100-meter-long underground wall.

They injected chemicals into the ground to a depth of 16 meters. But it is technically difficult to harden the soil up to 1.8 meters from the surface.

The workers recently dug a well just inside the wall to see how the level of underground water has risen due to the construction of the wall.

They found that the water level in the well was about 60 centimeters higher than the top of the wall.

The operator began pumping up contaminated groundwater on Friday, as a temporary measure to lower the water level.

## **Pumping**

### **TEPCO starts pumping up contaminated water**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308100048>

By SHUNSUKE KIMURA/ Staff Writer

Tokyo Electric Power Co. started pumping up groundwater at its crippled Fukushima No. 1 nuclear power plant on Aug. 9 to stop the spread of water with high levels of radiation leaking into the Pacific Ocean.

The work was being done at a well near a quay wall at the harbor.

TEPCO on July 22 admitted that radioactive water was leaking into the sea.

Officials said that around 13 tons of contaminated water had been pumped up from a newly dug well on the east side of the turbine building for the No. 2 reactor by 8 p.m.

However, all the contaminated water in the ground cannot necessarily be collected through pumping operations. Therefore, TEPCO will need to build more wells to continue the job.

The pumped-up radioactive water is transferred to a pit between the turbine building, which is connected to the pit, and the quay wall. Contaminated water stored in the reactor building and turbine building is put in on-site storage tanks after being treated.

But with so much water being stored, managing the operation is expected to be difficult.

The government's Agency for Natural Resources and Energy estimated that 300 tons of groundwater contaminated with radioactive materials are leaking into the sea daily from the nuclear plant.

TEPCO began constructing underground walls in early July to prevent the contaminated water from reaching the Pacific Ocean. However, water levels in the well rose sharply due to the accumulation of groundwater.

There were also fears that contaminated water could overflow from the well.

The International Atomic Energy Agency announced Aug. 9 that it is ready to offer support on the crisis if it is asked, according to a wire report.  
By SHUNSUKE KIMURA/ Staff Writer

## **Pumping plan**

### **TEPCO reveals pumping plan of contaminated water**

[http://www3.nhk.or.jp/nhkworld/english/news/20130812\\_32.html](http://www3.nhk.or.jp/nhkworld/english/news/20130812_32.html)

The operator of the damaged Fukushima Daiichi nuclear power plant says it plans to pump up radiation-contaminated water to prevent it from seeping into the ocean.

Tokyo Electric Power Company presented the proposal on Monday to a panel of the Nuclear Regulation

Authority.

The industry ministry estimates 300 tons of tainted groundwater is leaking into the ocean everyday.

Workers have created an underground wall to prevent tainted groundwater from leaking into the ocean. But the water level has continued to rise despite the barrier.

On Monday, the power company said it will start pumping out 60 tons of groundwater per day near the embankment between the Number One and Number Two reactors.

TEPCO also said it will start pumping out a total of 80 tons per day between the Numbers Two and Three reactors and between the Numbers Three and Four reactors in September, before creating similar underground walls.

The authority instructed the power company to step up the monitoring on the groundwater level, as it fluctuates with rain. It also warned of the approaching typhoon season.

Aug. 12, 2013 - Updated 11:06 UTC

## TEPCO orderd to check underground trench

August 13, 2013

### **Nuclear watchdog orders TEPCO to check trench at Fukushima plant over leaks**

<http://mainichi.jp/english/english/newsselect/news/20130813p2a00m0na017000c.html>

The Nuclear Regulation Authority (NRA) instructed Tokyo Electric Power Co. (TEPCO) on Aug. 12 to check an underground trench connected to the No. 1 reactor at the Fukushima No. 1 Nuclear Power Plant as highly radioactive substances were detected at the seawall on the east side of the reactor.

The instruction came on the heels of a revelation that groundwater contaminated with radioactive substances from the crippled Fukushima nuclear complex likely flowed into the Pacific Ocean over an underground wall on the east side of the No. 2 reactor. There is a possibility that highly radioactive water left inside the trench for the No. 2 reactor, which is believed to be the "source of contamination," moved into the trench for the No. 1 reactor. The NRA also decided to conduct an on-the-spot investigation on Aug. 23.

The NRA held its working group meeting on Aug. 12. At the meeting, TEPCO reported that it had detected 34,000 becquerels of tritium per liter in the groundwater sample collected from a newly built observation well on the east side of the No. 1 reactor. The radiation level is quite high as compared with 1,500 to 210

becquerels detected at the seawalls on the east side of the No. 3 and No. 4 reactors. NRA Commissioner Toyoshi Fuketa said, "We have to take seriously the fact that highly radioactive substances were detected in front of the No. 1 reactor as well."

According to TEPCO, the operator of the crippled Fukushima nuclear power station, water contaminated with low levels of radiation (89 becquerels of radioactive cesium-137) is still remaining in the trench for the No. 1 reactor, but TEPCO conducted its last survey in December last year, and therefore it has not recently checked the radiation levels. **The NRA instructed the utility to re-inspect the water in the trench for the No. 1 reactor and drill wells around the trench to monitor radiation levels as it saw the possibility of highly radioactive water moving into the trench for the No. 1 reactor through the trench for the No. 2 reactor.**

## Everything "normal" again?

### **Tepco Says Radiation Levels Normal After Localised Surge Of Dust In Fukushima**

<http://www.nucnet.org/all-the-news/2013/08/13/tepcosays-radiation-levels-normal-after-localised-surge-of-dust-in-fukushima>

The Tokyo Electric Power Company (Tepco) is investigating the cause of an alarm indicating a high radiation dose rate at the continuous dust monitor in front of the main anti-earthquake building at Fukushima-Daiichi nuclear power plant on 12 August.

The alarm went off at approximately 12:30 PM local time and an instruction was given for all personnel to put on full-face or half-face masks while the status of the radiation levels was confirmed using a portable dust monitor.

The result of the dust measurement in front of the building showed 14 becquerels per cubic metre (Bq/m<sup>3</sup>) and later 12 Bq/m<sup>3</sup> total beta activity. This was below the recommended value for the use of full-face masks at Fukushima-Daiichi (200 Bq/m<sup>3</sup>).

Tepco also says the heads and faces of ten people waiting for a bus in front of the main anti-earthquake building showed high levels of surface contamination (up to 19 becquerels per square centimetre – 19 Bq/cm<sup>2</sup>) upon being tested at the entrance control building. Their bodies were wiped and their contamination level was confirmed to be below the internal operation management value of 4 Bq/cm<sup>2</sup>.

It was presumed that the contamination of the personnel could have originated from the mist generator, which sprays water mist in front of the main anti-earthquake building to clean the air and prevent stroke by reducing the air temperature.

Tepco says the use of water in the building was prohibited at approximately 13:15 and a measurement of

possible contamination was conducted. Samples were taken from the water supply of the main anti-earthquake building, the mist generator, the entrance control building and the purification plant.

The results showed levels of gamma and beta radiation below the detection limit – less than 3 becquerels per litre (Bq/ℓ) for Cesium-134 and -137 and less than 13 Bq/ℓ for total beta radioactivity.

Tepeco considers the cause of the incident to be a “localised surge of dust in front of the main anti-earthquake building” and will continue to investigate other possibilities.

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August 14, 2013

## **Fishermen furious at TEPCO's pumping**

### **TEPCO begins pumping up contaminated groundwater**

[http://www3.nhk.or.jp/nhkworld/english/news/20130815\\_28.html](http://www3.nhk.or.jp/nhkworld/english/news/20130815_28.html)

The operator of the Fukushima Daiichi nuclear power plant began pumping up radioactive groundwater on a larger scale on Thursday to minimize leakage into the ocean.

The government says some 300 tons of contaminated water may be flowing into the sea every day.

Tokyo Electric Power Company has created an underground wall by injecting soil-hardening chemicals into the ground near the most heavily contaminated reactors -- No.1 and No.2 -- to prevent tainted water from leaking. It caused the level of groundwater to continue to rise.

TEPCO began pumping up the contaminated water as an emergency measure on Friday.

The firm has also been installing nearly 30 pipes, each 5 meters long, into the ground on the near side of the underground barrier to increase the volume of water that it can draw up.

TEPCO says after it completes the installation of the pipes on Sunday, it plans to pump up about 60 tons of water a day. The removed water is to be ultimately stored in tanks above ground in the plant's compound.

TEPCO says after it started to pump up water from a small well that it dug near the barrier, the level of groundwater at a nearby observation point dropped by about 50 centimeters.

The problem of the leaking water has yet to be fundamentally resolved, as 35 tons of groundwater is

projected to escape every day even after work to solidify the ground from the No.1 to No.4 reactors is completed.

## **Fishermen furious as TEPCO pumps up radioactive water at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130814p2a00m0na016000c.html>

FUKUSHIMA -- Local fishery operators in Fukushima and neighboring prefectures are becoming even more furious and anxious as Tokyo Electric Power Co. (TEPCO) started pumping up contaminated groundwater at the crippled Fukushima No. 1 Nuclear Power Plant to prevent the further spread of toxic water into the Pacific Ocean.

It has been more than two years and five months since the outbreak of the crisis at the Fukushima nuclear power station. But fishery workers, who have devoted their efforts to resuming their operations, became even more irate about TEPCO's belated acknowledgement that contaminated water has been flowing into the ocean, with some of them saying, "Harmful rumors will be aggravated," and "All our efforts will be for nothing." So, how long will they have to wait before being able to fish without concerns?

Fishery operators in Fukushima Prefecture still refrain voluntarily from coastal fishing. The Soma-Futaba Fisheries Cooperative Association, which launched fishery operations on a trial basis in June 2012, decided on Aug. 9 to postpone its plan to resume test-fishing in September. Many members of the association expressed their indignation, saying things like, "Harmful rumors will be reinforced." The association has taken about a year to expand the scope of its test-fishing to a total of 16 fish species for shipment. Association chairman Hiroyuki Sato, 57, said, "It is a matter of the greatest regret for those fishery operators who have continued to make efforts."

The Iwaki City Fishery Cooperative Association has also decided to postpone its first test-fishing which was originally scheduled to begin in September. Yasuo Yoshida, a 46-year-old member of the association, cautioned the government against considering pumping up ground water and releasing it into the Pacific Ocean before it reaches the premises of crippled reactors and is contaminated with radioactive substances. He said, "Our efforts will be wasted. If the government releases the water into the ocean under its own responsibility, the government should also be responsible enough to take measures against harmful rumors."

Whitebait was recently being unloaded at the Otsu fishing port in the city of Kitaibaraki, Ibaraki Prefecture, about 80 kilometers south of the damaged Fukushima nuclear power complex. The captain of a fishing boat said, "The trading price is one-tenth of what it was before the (nuclear) accident." On the problem of contaminated water flowing into the ocean on top of other worries, 63-year-old fisherman Eiji Watanabe said, "I want to tell TEPCO 'Don't lie to us!'" He said that because he believes that TEPCO had

known that the contaminated water was flowing into the ocean for quite some time, he wants to say, "Don't try to fool us!"

"We want the government to respond in a responsible manner," said Kunio Shirai, a 67-year-old fisherman who resumed fishing last autumn from the Arahama fishing port in Watari, Miyagi Prefecture, about 70 kilometers north of the Fukushima nuclear power station. As he has a new boat built with the help of a government subsidy after losing his old one to tsunami, he harbors mixed feelings. "We have to wait and see for now," he said.

### **NRA approves TEPCO's reactor decommission plan**

[http://www3.nhk.or.jp/nhkworld/english/news/20130814\\_28.html](http://www3.nhk.or.jp/nhkworld/english/news/20130814_28.html)

Japan's nuclear regulator has approved Tokyo Electric Power Company's plan to decommission its stricken Fukushima Daiichi nuclear plant. The approval came 5 months later than initially expected.

The Nuclear Regulation Authority in December started examining the plan, including specific procedures and safety measures. The work is expected to take about 40 years.

The authority accepted the plan in a meeting on Wednesday, despite commissioners' requests that Tokyo Electric properly handle treatment of contaminated water and removal of spent fuel.

The NRA commissioners also said the utility must do more to cope with leakage of radioactive water from the plant and contaminated groundwater into the sea.

NRA's approval schedule was pushed back due to a series of problems at the plant. They include longer-than-expected time to inspect a facility to remove radioactive substances from tainted water as well as handling of contaminated water leaks.

The authority plans to step up its monitoring of the firm's safety measures in the decommissioning procedure and order it to repeat safety steps until they are conducted properly.

August 15, 2013

### **NRA approves decommissioning plan**

## **NRA approves TEPCO's Fukushima decommissioning plan, urges solution for water problem**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308150073>

By JIN NISHIKAWA/ Staff Writer

The Nuclear Regulation Authority approved Tokyo Electric Power Co.'s plan to decommission damaged reactors at the Fukushima No. 1 nuclear plant. But it called for a quick solution to the radioactive water accumulating at the site and flowing into the ocean.

The many safety problems that continue at the plant could compromise the feasibility of the decommissioning road map.

TEPCO's decommissioning plan, which received NRA approval on Aug. 14, details methods and procedures concerning the monitoring of nuclear reactors and other facilities, the treatment of radioactive water and radiation dose control to ensure worker safety.

The plan says fuel extraction and other work will be completed early at the No. 1 through No. 4 reactors, which have officially been earmarked for decommissioning, and includes safety measures to keep the No. 5 and No. 6 reactors, whose fate remains in limbo, in a state of cold shutdown.

The Great East Japan Earthquake and tsunami of March 2011 caused meltdowns at the Nos. 1, 2 and 3 reactors at the Fukushima No. 1 nuclear plant that were running at the time.

The Nos. 4, 5 and 6 reactors were shut down for routine inspections when the disaster took place. Hydrogen explosions rocked the buildings housing the Nos. 1, 3 and 4 reactors.

The government and TEPCO have already worked out a road map, including work schedules, toward decommissioning the reactors. The latest document, called an "implementation plan," is intended to lower the overall risk levels at plant facilities and ensure safety both on and off the plant site.

In November, the NRA gave special status to the Fukushima No. 1 nuclear plant under the law on the regulation of nuclear reactors. The designation gave the NRA the power to order the submission of an implementation plan and improvements on plant facilities.

The NRA enlisted the participation of outside experts to screen the implementation plan TEPCO submitted in December. In approving the plan on Aug. 14, the NRA said the plan was adequate from the viewpoint of disaster prevention.

The Fukushima No. 1 plant, however, continues to be plagued by problems, including recent findings that radioactive water keeps leaking into the ocean.

With that situation in mind, the NRA presented a list of 12 problems that TEPCO must deal with. The NRA said, for example, that highly radioactive water should be removed quickly from underground pits on the ocean side of the plant site. It also said a new type of purification facility for treating radioactive water should be put into operation as soon as possible.



August 16, 2013

## 8 times more cesium than after 3/11

### Cesium levels in Fukushima water 8 times higher than after disaster

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308160041>

By SHUNSUKE KIMURA/ Staff Writer

Tokyo Electric Power Co. has reported finding radioactive cesium levels in underground water at the crippled Fukushima No. 1 nuclear power plant that is eight times greater than what it recorded right after the accident.

TEPCO, which operates the facility, said Aug. 15 that it detected 11,600 becquerels of radioactive cesium per liter of contaminated water in a tunnel near the No. 1 reactor building on the side facing the ocean.

That compares with 1,490 becquerels per liter it recorded at the site shortly after the accident in March 2011.

TEPCO said it believes the readings have soared due to rainwater containing cesium flowing into the tunnel. But the amount detected is roughly one-100,000th of that found in radioactive water in a tunnel near the No. 2 reactor building.

The utility said cesium levels are lower in the tunnel near the No. 1 reactor building because sea water from tsunami had already flooded it. In contrast, water in the underground tunnels near the No. 2 and No. 3 reactor buildings was exceedingly more radioactive as highly contaminated water from their turbine buildings filled the tunnels.

In the meantime, TEPCO said it began vacuum pumping contaminated water from the damaged facility on Aug. 15 by inserting steel pipes underground in the revetment near the No. 1 and No. 2 reactor buildings.

The company plans to install 28 of the pipes in total in a bid to pump up to 70 tons of contaminated water a day. The aim is to reduce the flow of contaminated underground water into the ocean, which the government estimated at 300 tons per day.

## TEPCO press release

### **Press Release (Aug 14, 2013) Alarm Went off at the Dust Monitor Installed in front of the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station (Revision 2)**

[http://www.tepco.co.jp/en/press/corp-com/release/2013/1229723\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1229723_5130.html)

We would like to correct the content of the follow-up information No.3 of an alarm indicating high radiation dose went off at the continuous dust monitor installed in front of the Main Anti-earthquake Building at Fukushima Daiichi Nuclear Power Station today (On August 12) as follows.

After revision: "Contamination level of 10 people who were found to be contaminated was lower than the screening level (40Bq/cm<sup>2</sup>), which makes possible for them to exit the Entrance Control Building. However, wiping of the contaminated bodies was conducted just in case, and they leaved the Entrance Control Building at 2:13 PM. The largest amount of contamination of the 10 people after wiping was 6.9Bq/cm<sup>2</sup>."

Before revision: "Since wiping of the contaminated bodies of 10 people was conducted, and the contamination level was confirmed to be below the internal operation management value\*2 (4Bq/cm<sup>2</sup>), they leaved the Entrance Control Building at 2:13 PM on the same day."

We deeply apologize for the mistake.

The details of the incident will be provided at the regular press conference to be held this evening.

August 17, 2013

## The price to pay for years of "duct tape fixes "

### **Fukushima apocalypse: Years of 'duct tape fixes' could result in 'millions of deaths'**

<http://rt.com/news/fukushima-apocalypse-fuel-removal-598/>



Damaged Tokyo Electric Power Co (TEPCO) number 1 daiichi nuclear power plant at Okuma town in Fukushima prefecture (AFP Photo)

Even the tiniest mistake during an operation to extract over 1,300 fuel rods at the crippled Fukushima nuclear power plant in Japan could lead to a series of cascading failures with an apocalyptic outcome, fallout researcher Christina Consolo told RT.

Fukushima operator TEPCO wants to extract 400 tons worth of spent fuel rods stored in a pool at the plant's damaged Reactor No. 4. The removal would have to be done manually from the top store of the damaged building in the radiation-contaminated environment.

In the worst-case scenario, a mishandled rod may go critical, resulting in an above-ground meltdown releasing radioactive fallout with no way to stop it, said Consolo, who is the founder and host of Nuked Radio. But leaving the things as they are is not an option, because statistical risk of a similarly bad outcome increases every day, she said.

**RT:** *How serious is the fuel rod situation compared to the danger of contaminated water build-up which we already know about?*

**Christina Consolo:** Although fuel rod removal happens on a daily basis at the 430+ nuclear sites around the world, it is a very delicate procedure even under the best of circumstances. What makes fuel removal at Fukushima so dangerous and complex is that it will be attempted on a fuel pool whose integrity has been severely compromised. However, it must be attempted as Reactor 4 has the most significant problems structurally, and this pool is on the top floor of the building.

There are numerous other reasons that this will be a dangerous undertaking.

- The racks inside the pool that contain this fuel were damaged by the explosion in the early days of the accident.

- Zirconium cladding which encased the rods burned when water levels dropped, but to what extent the rods have been damaged is not known, and probably won't be until removal is attempted.

- Saltwater cooling has caused corrosion of the pool walls, and probably the fuel rods and racks.

- The building is sinking.
  - The cranes that normally lift the fuel were destroyed.
  - Computer-guided removal will not be possible; everything will have to be done manually.
  - TEPCO cannot attempt this process without humans, which will manage this enormous task while being bombarded with radiation during the extraction and casking.
  - The process of removing each rod will have to be repeated over 1,300 times without incident.
  - Moving damaged nuclear fuel under such complex conditions could result in a criticality if the rods come into close proximity to one another, which would then set off a chain reaction that cannot be stopped.
- What could potentially happen is the contents of the pool could burn and/or explode, and the entire structure sustain further damage or collapse. This chain reaction process could be self-sustaining and go on for a long time. This is the apocalyptic scenario in a nutshell.
- The water build-up is an extraordinarily difficult problem in and of itself, and as anyone with a leaky basement knows, water always 'finds a way.'

**'Trivial in light of other problems at Fukushima, water situation could culminate in the chain reaction scenario'**

At Fukushima, they are dealing with massive amounts of groundwater that flow through the property, and the endless pouring that must be kept up 24/7/365 to keep things from getting worse. Recently there appears to be subsidence issues and liquefaction under the plant.

TEPCO has decided to pump the water out of these buildings. However, pumping water out of the buildings is only going to increase the flow rate and create more of these ground issues around the reactors. An enormous undertaking - but one that needs to be considered for long-term preservation of the integrity of the site - is channelling the water away, like a drain tile installed around the perimeter of a house with a leaky basement, but on an epic scale.

Without this effort, the soils will further deteriorate, structural shift will occur, and subsequently the contents of the pools will shift too.



The damage to TEPCO's No.1 Fukushima nuclear power plant's third reactor building in the town of Okuma, Fubata district in Fukushima prefecture (AFP Photo)

Any water that flows into those buildings also becomes highly radioactive, as it is likely coming into contact with melted fuel.

Without knowing the extent of the current liquefaction and its location, the location of the melted fuel, how long TEPCO has been pumping out water, or when the next earthquake will hit, it is impossible to predict how soon this could occur from the water problem/subsidence issue alone. But undoubtedly, pumping water out of the buildings is just encouraging the flow, and this water problem needs to be remedied and redirected as soon as possible

**RT:** *Given all the complications that could arise with extracting the fuel rods, which are the most serious, in your opinion?*

**CC:** The most serious complication would be anything that leads to a nuclear chain reaction. And as outlined above, there are many different ways this could occur. In a fuel pool containing damaged rods and racks, it could potentially start up on its own at anytime. TEPCO has been incredibly lucky that this hasn't happened so far.

**'One of the worst, but most important jobs anyone has ever had to do'**

My second biggest concern would be the physical and mental fitness of the workers that will be in such close proximity to exposed fuel during this extraction process. They will be the ones guiding this operation, and will need to be in the highest state of alertness to have any chance at all of executing this plan manually and successfully. Many of their senses, most importantly eyesight, will be hindered by the apparatus that will need to be worn during their exposure, to prevent immediate death from lifting compromised fuel rods out of the pool and placing them in casks, or in the common spent fuel pool located a short distance away.



Think for a moment what that might be like through the eyes of one of these workers; it will be hot, uncomfortable, your senses shielded, and you would be filled with anxiety. You are standing on a building that is close to collapse. Even with the strongest protection possible, workers will have to be removed and replaced often. So you don't have the benefit of doing such a critical task and knowing and trusting your comrades, as they will frequently have to be replaced when their radiation dose limits are reached. If they exhibit physical or mental signs of radiation exposure, they will have to be replaced more often.



The stricken Tokyo Electric Power Company (TEPCO) Fukushima daiichi No.1 nuclear power plant reactor number three (L) and four (R), with smoke rising from number three at Okuma town in Fukushima prefecture (AFP Photo)

It will be one of the worst, but most important jobs anyone has ever had to do. And even if executed flawlessly, there are still many things that could go wrong.

**RT:** *How do the potential consequences of failure to ensure safe extraction compare to other disasters of the sort – like Chernobyl, or the 2011 Fukushima meltdown?*

**CC:** There really is no comparison. This will be an incredibly risky operation, in the presence of an enormous amount of nuclear material in close proximity. And as we have seen in the past, one seemingly innocuous failure at the site often translates into a series of cascading failures.

### **'The site has been propped up with duct tape and a kick-stand for over two years'**

Many of their 'fixes' are only temporary, as there are so many issues to address, and cost always seems to be an enormous factor in what gets implemented and what doesn't.

As a comparison: Chernobyl was one reactor, in a rural area, a quarter of the size of one of the reactors at Fukushima. There was no 'spent fuel pool' to worry about. Chernobyl was treated in-situ...meaning everything was pretty much left where it was while the effort to contain it was made (and very expeditiously I might add) not only above ground, but below ground.

At Fukushima, we have six top-floor pools all loaded with fuel that eventually will have to be removed, the most important being Reactor 4, although Reactor 3 is in pretty bad shape too. Spent fuel pools were never intended for long-term storage, they were only to assist short-term movement of fuel. Using them as a long-term storage pool is a huge mistake that has become an 'acceptable' practice and repeated at every reactor site worldwide.



A destroyed building of TEPCO's Fukushima Daiichi (No. 1) atomic power plant at Okuma town in Fukushima prefecture (AFP Photo)

We have three 100-ton melted fuel blobs underground, but where exactly they are located, no one knows. Whatever 'barriers' TEPCO has put in place so far have failed. Efforts to decontaminate radioactive water

have failed. Robots have failed. Camera equipment and temperature gauges...failed. Decontamination of surrounding cities has failed.

**'If and when the corium reaches the Tokyo aquifer, serious and expedient discussions will have to take place about evacuating 40 million people'**

We have endless releases into the Pacific Ocean that will be ongoing for not only our lifetimes, but our children's' lifetimes. We have 40 million people living in the Tokyo area nearby. We have continued releases from the underground corium that reminds us it is there occasionally with steam events and huge increases in radiation levels. Across the Pacific, we have at least two peer-reviewed scientific studies so far that have already provided evidence of increased mortality in North America, and thyroid problems in infants on the west coast states from our initial exposures.

We have increasing contamination of the food chain, through bioaccumulation and biomagnification. And a newly stated concern is the proximity of melted fuel in relation to the Tokyo aquifer that extends under the plant. If and when the corium reaches the Tokyo aquifer, serious and expedient discussions will have to take place about evacuating 40 million people from the greater metropolitan area. As impossible as this sounds, you cannot live in an area which does not have access to safe water.

The operation to begin removing fuel from such a severely damaged pool has never been attempted before. The rods are unwieldy and very heavy, each one weighing two-thirds of a ton. But it has to be done, unless there is some way to encase the entire building in concrete with the pool as it is. I don't know of anyone discussing that option, but it would seem much 'safer' than what they are about to attempt...but not without its own set of risks.

And all this collateral damage will continue for decades, if not centuries, even if things stay exactly the way they are now. But that is unlikely, as bad things happen like natural disasters and deterioration with time...earthquakes, subsidence, and corrosion, to name a few. Every day that goes by, the statistical risk increases for this apocalyptic scenario. No one can say or know how this will play out, except that millions of people will probably die even if things stay exactly as they are, and billions could die if things get any worse.





Workers spraying resin on the ground near the reactor buildings to protect the spread of radioactive substances at TEPCO's Fukushima Daiichi nuclear power plant at Okuma town in Fukushima prefecture (AFP Photo)

**RT:** *Are the fuel rods in danger of falling victim to other factors, while the extraction process is ongoing? After all, it's expected to take years before all 1,300+ rods are pulled out.*

**CC:** Unfortunately yes, the fuel rods are in danger every day they remain in the pool. The more variables you add to this equation, and the more time that passes, the more risk you are exposed to. Each reactor and spent fuel pool has its own set of problems, and critical failure with any of them could ultimately have the end result of an above-ground, self-sustaining nuclear reaction. It will not be known if extraction of all the fuel will even be possible, as some of it may be severely damaged, until the attempt is made to remove it.

**RT:** *Finally, what is the worst case scenario? What level of contamination are we looking at and how dire would the consequences be for the long-term health of the region?*

**CC:** Extremely dire. This is a terrible answer to have to give, but the worst case scenario could play out in death to billions of people. A true apocalypse. Since we have been discussing Reactor 4, I'll stick to that problem in particular, but also understand that a weather event, power outage, earthquake, tsunami,

cooling system failure, or explosion and fire in any way, shape, or form, at any location on the Fukushima site, could cascade into an event of that magnitude as well.

**'Once the integrity of the pool is compromised that will lead to more criticalities'**

At any time, following any of these possible events, or even all by itself, nuclear fuel in reactor 4's pool could become critical, mostly because it will heat up the pool to a point where water will burn off and the zirconium cladding will catch fire when it is exposed to air. This already happened at least once in this pool that we are aware of. It almost happened again recently after a rodent took out an electrical line and cooling was stopped for days.

Once the integrity of the pool is compromised that will likely lead to more criticalities, which then can spread to other fuel. The heat from this reaction would weaken the structure further, which could then collapse and the contents of the pool end up in a pile of rubble on the ground. This would release an enormous amount of radioactivity, which Arnie Gunderson has referred to as a "Gamma Shine Event" without precedence, and Dr. Christopher Busby has deemed an "Open-air super reactor spectacular."

This would preclude anyone from not only being at Reactor 4, but at Reactors 1, 2, 3, 5, 6, the associated pools for each, and the common spent fuel pool. Humans could no longer monitor and continue cooling operations at any of the reactors and pools, thus putting the entire site at risk for a massive radioactive release.

**'At least the northern half of Japan would be uninhabitable, and some researchers have argued that it already is'**

Mathematically, it is almost impossible to quantify in terms of resulting contamination, and a separate math problem would need to be performed for every nuclear element contained within the fuel, and whether or not that fuel exploded, burned, fissioned, melted, or was doused with water to try to cool it off and poured into the ocean afterward.



Workers using a German-made pump to pump water from the spent fuel pool in Unit 4 at Fukushima No.1 (Dai-Ichi) nuclear power plant in the town of Okuma in Fukushima prefecture (AFP Photo)

Some researchers have even ventured to say that other nuke plants on the east coast of Honshu may need to be evacuated if levels get too high, which will lead to subsequent failures/fires and explosions at these plants as well. Just how profound the effect will be on down-winders in North America, or the entire northern hemisphere for that matter, will literally depend on where the wind blows and where the rain falls, the duration and extent of a nuclear fire or chain-reaction event, and whether or not that reaction

becomes self-sustaining. At least the northern half of Japan would be uninhabitable, and some researchers have argued that it already is.

This is already happening to the nuclear fuel in the ground under the plant, but now it would be happening above ground as well. There is no example historically to draw from on a scale of this magnitude. Everything is theory. But anyone who says this can't happen is not being truthful, because nobody really knows how bad things could get.

The most disturbing part of all of this is that Fukushima has been this dangerous, and precarious, since the second week of March 2011. The ante will definitely be upped once the fuel removal starts.

**'The mainstream media, world governments, nuclear agencies, health organizations, weather reporters, and the health care industry has completely ignored three ongoing triple meltdowns that have never been contained'**

An obvious attempt to downplay this disaster and its consequences have been repeated over and over again from 'experts' in the nuclear industry that also have a vested interest in their industry remaining intact. And, there has been a lot of misleading information released by TEPCO, which an hour or two of reading by a diligent reporter would have uncovered, in particular the definition of 'cold shutdown.'

Over 300 mainstream news outlets worldwide ran the erroneous 'cold shutdown' story repeatedly, which couldn't be further from the truth...[it was] yet another lie that was spun by TEPCO to placate the public, and perpetuated endlessly by the media and nuclear lobby.

Unfortunately, TEPCO waited until a severe emergency arose to finally report how bad things really are with this latest groundwater issue...if we are even being told the truth. Historically, everything TEPCO says always turns out to be much worse than they initially admit.

**'Unfortunately there is no one better qualified to deal with this than the Russians, despite their own shortcomings'**

I think the best chance of success is...that experts around the world drop everything they are doing to work on this problem, and have Russia either lead the containment effort or consult with them closely. They have the most experience, they have decades of data. They took their accident seriously and made a Herculean effort to contain it.

Of course we also know the Chernobyl accident was wrought with deception and lies as well, and some of that continues to this day, especially in terms of the ongoing health effects of children in the region, and monstrous birth defects. Unfortunately there is no one better qualified to deal with this than the Russians, despite their own shortcomings. Gorbachev tried to make up for his part in the cover-up of Chernobyl by opening orphanages throughout the region to deal with the affected children.





Underwater silt fence with orange floats being set in the sea near the drain of TEPCO's Fukushima nuclear power plant at Okuma town in Fukushima prefecture (AFP Photo)

But as far as Fukushima goes, the only thing that matters now is if world leaders and experts join forces to help fix this situation. Regardless of what agendas they are trying to protect or hide, how much it will cost, the effect on Japan or the world's economy, or what political chains this will yank.

The nuclear industry needs to come clean. If this leads to every reactor in the world being shut down, so be it. If the world governments truly care about their people and this planet, this is what needs to be done. Renowned theoretical physicist Michio Kaku stated in an interview a few weeks after the initial accident that "TEPCO is literally hanging on by their fingernails." They still are, and always have been. The Japanese have proven time and time again they are not capable of handling this disaster. Now we are entrusting them to execute the most dangerous fuel removal in history.

We are extremely lucky that this apocalyptic scenario hasn't happened yet, considering the state of Reactor 4. But for many, it is already too late. The initial explosions and spent fuel pool fires may have already sealed the fate of millions of people. Time will tell. Anyone who tells you otherwise is not being honest, because there is just no way to know.

August 19, 2013

**NHK Nuclear Watch**

## Nuclear watch

<http://www3.nhk.or.jp/nhkworld/newsline/201308191510.html>

For Pr Kanda of Tokyo University, who has been studying the effects of radiation on the sea since the Fukushima disaster, the official figures don't add up:

**A daily leakage of 300 tons contaminated groundwater into the ocean cannot explain the current levels of contamination of the ocean.**

In his opinion, there must be **other contamination routes**. It is therefore not enough to focus on groundwater only. These other sources of contamination must be identified.

There may be sources of very highly contaminated water within the plant and if this should get into the ocean, it will have a devastating impact.

## Two more Fukushima workers irradiated

### Fukushima operator says workers dusted with radioactive particles

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308190107>

REUTERS

The operator of Japan's crippled Fukushima No. 1 nuclear power plant said on Aug. 19 two workers were found to be contaminated with radioactive particles, the second such incident in a week involving staff outside the site's main operations center.

Two dust monitors sounded alarms earlier on Aug. 19 outside the operations center, where radiation levels are usually low enough to avoid the need for full face masks, Tokyo Electric Power Co said in an emailed statement.

Two workers waiting for a bus at the end of their shift were found to have been contaminated with radioactive particles, which were wiped off their bodies before they left the site, Tokyo Electric, also known as TEPCO, said. Full body checks of the staff members showed no internal contamination.

The utility said it could not be sure the alarms were connected with the discovery of the contamination of the workers. The incident is being investigated.

Last week, the same monitors sounded alarms and 10 workers waiting for a bus were found to have been contaminated with particles. TEPCO said it suspected they came from a mist sprayer used to cool staff down during the current hot summer.

The mist sprayer has been turned off since last week.

The Fukushima plant was crippled by an earthquake and tsunami in March 2011, the world's worst nuclear disaster in a quarter century.

The government said this month it would step up its involvement in the plant's cleanup after announcing the station was leaking contaminated water into the ocean, following months of denials of a leakage by TEPCO.

### **Dust monitoring alarm went off again / 2 workers had the heads contaminated**

<http://fukushima-diary.com/2013/08/dust-monitoring-alarm-went-off-again-2-workers-had-the-heads-contaminated/>

Dust monitoring alarm went off at 10:04 AM again.

It's located in front of the seismic isolation building. It went off on 8/12/2013 too.

**This time the mist was turned off, which proves the contamination source is not the mist.**

At 10:20 AM, two workers were found contaminated. They were waiting for the bus in front of the seismic isolation building.

Both of the workers had their top of heads contaminated. Tepco reported the highest contamination level was 13 Bq/cm<sup>2</sup>.

Tepco "wiped" the contaminated part to release the workers.

## **2 more workers at Fukushima Daiichi irradiated**

[http://www3.nhk.or.jp/nhkworld/english/news/20130819\\_24.html](http://www3.nhk.or.jp/nhkworld/english/news/20130819_24.html)

Two more workers at the damaged Fukushima Daiichi nuclear power plant were found exposed to radiation above the safety limit. This is the second incident in a week. Tokyo Electric Power Company, the plant operator, is looking for a cause.

An alarm went off indicating rising radiation levels in the air when the 2 workers waited for a bus in front of a plant building on Monday morning. The building is used for preparations in decommissioning the damaged reactors.

Tests they took before leaving the plant compound showed radiation levels of nuclear substances up to 13 becquerels per square centimeter. That's 3 times the safety limit set by the operator.

TEPCO says the workers showed no immediate signs of illness. They received a health check, and the company says there was no indication of internal radiation exposure.

Last week, 10 workers waiting for a bus at the same spot were found to have unusually high radioactivity levels. Some blamed a mist-generating machine designed to prevent heatstroke. But this time the machine was not in use.

## **2 more Fukushima workers radioactively contaminated**

<http://mainichi.jp/english/english/newsselect/news/20130819p2a00m0na010000c.html>

Radioactivity of up to 13 becquerels per square centimeter was detected on the heads of two workers at the crippled Fukushima No. 1 Nuclear Power Plant on Aug. 19, plant operator Tokyo Electric Power Co. (TEPCO) announced.

The two workers had been waiting for a bus in front of the plant's main quake-resistant building. TEPCO is investigating the cause of the contamination. The radioactivity limit set by the government is 40 becquerels per square centimeter.

TEPCO said that at shortly after 10 a.m. on Aug. 19, a dust monitor alarm at the main quake-resistant building sounded, which led to the discovery that the two workers were contaminated.

On Aug. 12, 10 workers were contaminated around the same area.



Officials said there had been no changes in the amount of water being injected into the plant's damaged reactors or the water temperatures of the fuel pools, and no variations had been registered at monitoring posts.

## **Radiation in the air**

### **Airborne radiation rising at Fukushima Daiichi**

[http://www3.nhk.or.jp/nhkworld/english/news/20130820\\_05.html](http://www3.nhk.or.jp/nhkworld/english/news/20130820_05.html)

TEPCO officials say they have detected radioactive substances above the alert level in air around the damaged Fukushima Daiichi nuclear power plant.

The officials said an alarm went off at 9:30AM on Monday to indicate that radiation levels in the air were rising.

2 workers were exposed to radiation above the safety limit. They were waiting for a bus in front of a plant building.

TEPCO officials say the workers' health conditions remain normal and they were not subjected to internal exposure.

A similar incident occurred on August 12th when 10 workers were waiting for a bus at the same location.

Some experts blamed a misting machine designed to prevent heatstroke. They suggested the water used by the device could have been contaminated.

But the machine was not in use this time.

TEPCO officials said they will try to determine the source of the airborne radioactive substances.

August 20, 2013

## **Highly radioactive leakage from storage tanks continuing**



Tread carefully: Water that had apparently leaked from the drainpipe near a water tank (top right) is seen Monday morning at the Fukushima No. 1 nuclear power plant. | TEPCO/KYODO National

## **Toxic puddles found near water tanks at Fukushima plant**

Kyodo

Puddles of water with extremely high radiation levels have been found near water storage tanks on the premises of the crippled Fukushima No. 1 nuclear power plant, nuclear regulators and plant operator Tokyo Electric Power Co. said Monday.

The radiation level, measured around 50 cm above the toxic water, stood at about 100 millisieverts per hour, Tepco said, while acknowledging that the water likely came from the tanks. It is possible that around 120 liters of water has so far leaked out.

Tepco denied that toxic water had flowed into the Pacific Ocean, but the Nuclear Regulation Authority ordered the utility to study the possibility that the toxic water had escaped into the sea through nearby drains.

The NRA released a preliminary assessment of a level 1 incident on an eight-point international scale, defined as an “anomaly.”

A low barrier around the tanks is meant to block water from escaping when a leak occurs, but drain valves attached to the barrier may have been left open, allowing water to flow outside the barrier.

A Tepco employee found water leaking from a valve at about 10 a.m. Monday while patrolling the site. One of the puddles outside the barrier was around 3 square meters in size and about 1 cm deep.

A massive amount of radioactive water is accumulating at the plant as a result of continuing water injections into the Nos. 1, 2 and 3 reactors that suffered meltdowns in the midst of the March 11, 2011, nuclear crisis, which was triggered by a huge earthquake and tsunami.

Tepco also said the same day that it had found two workers contaminated with up to 13 becquerels per 1 sq. cm of radioactive material when they were waiting for a bus to leave the site. The contamination was detected on their heads.

Airborne radioactive substances where the workers were waiting were around eight times the alert level. The two workers did not suffer internal exposure.

A similar incident, involving 10 people waiting for a bus, occurred a week earlier. Their contamination was up to 19 becquerels per square cm, lower than the state limit of 40 becquerels.

### **300 tons of highly toxic water leak from tank at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130820p2g00m0dm038000c.html>

TOKYO, Japan (Kyodo) -- An estimated 300 tons of highly radioactive water have leaked from one of the water storage tanks at the crippled Fukushima Daiichi power plant, making it the worst leakage incident from such containers, plant operator Tokyo Electric Power Co. said Tuesday.

TEPCO detected in the leaked water 80 million becquerels per liter of radioactive substances emitting beta rays, such as strontium-90, and admitted that it has not yet identified from which area of the tank the polluted water is escaping.

"We think the leakage is continuing," TEPCO spokesman Masayuki Ono told a press conference, but denied that toxic water is flowing into the adjacent Pacific Ocean on the grounds that the radiation level of the water in a nearby gutter was not high.

TEPCO calculated the amount of leakage based on the water level within the tank, which was about 2.9 meters lower than it should have been. The tank originally contained about 1,000 tons of contaminated water.

TEPCO has collected around 4 tons of the leaked water. Admitting that the toxic water has most likely flowed into the soil, TEPCO said it is currently working to prevent the spread of contamination.

The latest revelation came a day after TEPCO said puddles with extremely high radiation levels had been found near the tanks.

A massive volume of radioactive water has been accumulating at the Fukushima plant as a result of continuing water injections into the Nos. 1 to 3 reactors that suffered meltdowns during the nuclear crisis triggered by a huge earthquake and tsunami on March 11, 2011.

### **TEPCO estimates leak at 300 tons**

[http://www3.nhk.or.jp/nhkworld/english/news/20130820\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20130820_25.html)

The operator of the disabled Fukushima Daiichi nuclear plant says about 300 tons of highly radioactive water appears to have leaked from a storage tank. It says some of the water could have seeped into the ground.

The tank is one of 26 installed on the inland side of the No.4 reactor. The tanks are surrounded by a low barrier.

Tokyo Electric Power Company initially found water forming a puddle near the barrier on Monday morning. The water had apparently leaked through the barrier's rainwater drainage pipe.

TEPCO officials say an inspection showed a drop in the water level inside one of the 26 tanks. They estimate that the tank has lost about 300 out of the roughly 1,000 tons of water it held.

Officials say water inside the tanks has been treated to reduce radioactive cesium. But a test of the leaked water found it contained up to 80-million becquerels per liter of beta-ray emitting substances, including strontium.

The utility plans to remove soil near the tank. It will also measure radiation levels in the area to determine the scale of the latest water leakage at the troubled nuclear plant.

## **TEPCO urged to act**

### **Nuclear regulators ask TEPCO to investigate**

[http://www3.nhk.or.jp/nhkworld/english/news/20130820\\_37.html](http://www3.nhk.or.jp/nhkworld/english/news/20130820_37.html)

Japan's nuclear regulator has ordered the operator of the Fukushima Dai-ichi plant to determine whether the radioactive water that leaked from a storage tank is entering the sea through a drainage pipe.

The Nuclear Regulation Authority issued the instruction to Tokyo Electric Power Company after agency inspectors found increased radiation levels in sand bags set up near a drainage pipe leading to the ocean.

The inspectors have so far found no abnormal rise in levels of radiation inside the pipe.

The deputy head of the nuclear regulator, Hideka Morimoto, told a news conference the agency is not ruling out the possibility that the contaminated water is seeping into the ocean through the pipe.

### **Fukushima governor urges government action**

[http://www3.nhk.or.jp/nhkworld/english/news/20130820\\_38.html](http://www3.nhk.or.jp/nhkworld/english/news/20130820_38.html)

Fukushima Governor Yuhei Sato has urged the central government to take the initiative in dealing with the wastewater leak at Fukushima Daiichi nuclear plant.

The prefecture's top officials held an emergency meeting on Tuesday following Monday's revelation of a massive leak of radioactive water from a storage tank.

The governor described the situation as a national emergency, and stressed the need for the government to draw up specific measures to deal with the problem.

Senior Fukushima prefectural official Shoji Furuichi summoned Tokyo Electric officials to his office on Tuesday and asked them to quickly find out whether the leak has contaminated the environment.

Furuichi called the leak extremely regrettable and said the utility must make a company-wide effort to deal with it.

He said the prefectural government wants the firm to determine the cause and take steps to prevent leaks from other storage tanks.

The TEPCO officials apologized for the leak and promised to respond quickly.

## **Largest ever tank leak since 3/11**

### **TEPCO: Largest ever tank leak since crisis**

[http://www3.nhk.or.jp/nhkworld/english/news/20130820\\_26.html](http://www3.nhk.or.jp/nhkworld/english/news/20130820_26.html)

The operator of the disabled Fukushima Daiichi nuclear power plant says a leak of 300 tons of contaminated water from a tank there is the largest since the 2011 crisis.

Tokyo Electric Power Company said on Tuesday that the water leaked from one of 11 meter-high tanks installed on the hill side of the plant's reactors, about 500 meters from the ocean.

The tank belongs to a group of 26 surrounded by a 30-centimeter-high concrete barrier. Each is designed to hold 1,000 tons of water.

Tokyo Electric officials say the tank leaked about 300 tons of water, but that most of it stayed inside the barrier.

The tanks are made of steel sheets bolted together. But others with the same structure have leaked a number of times where the sheets are joined. The operator says workers check the bolts twice a day.

The barrier did not work as expected, as pipes attached to it were left open to drain rainwater. The firm says it plans to review the method.

Japan's Nuclear Regulation Authority has assessed the problem as a level 1 incident, the 2nd-lowest on an 8-point international scale.

It has instructed the firm to quickly identify the cause and clean up soil that has absorbed water.

## **Fishermen briefed on leak**

### **TEPCO, government brief fishermen on water leak**

[http://www3.nhk.or.jp/nhkworld/english/news/20130820\\_43.html](http://www3.nhk.or.jp/nhkworld/english/news/20130820_43.html)

Officials from the operator of the damaged Fukushima Daiichi nuclear plant and the government have briefed local fishermen on how to deal with the ongoing leakage of radioactive groundwater into the sea.

About 200 fishermen attended Tuesday's briefing in Iwaki City, organized by Tokyo Electric Power Company and the Natural Resources and Energy Agency.

Tokyo Electric explained that it has begun pumping up the contaminated groundwater to prevent it from seeping into the sea. The utility also briefed the fishermen on a plan to create an underground shielding wall around the reactor building over the next year or so.

The session also covered Monday's disclosure that 300 tons of wastewater has been leaked from a storage tank.

The fishermen criticized what they described as the utility's stop-gap measures, and demanded to know when they can resume catching fish.

Some fishermen supported Tokyo Electric's plan to pump up uncontaminated groundwater and release it into the ocean before it is polluted by radioactive substances.

The head of the local fishermen's association, Tetsu Nozaki, said he will sum up members' opinions on whether to back the plan.

## Another promise

### **TEPCO to step up control of Fukushima water leaks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130821\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20130821_02.html)

Tokyo Electric Power Company says it will step up monitoring and control of radioactive water leaks at its wrecked Fukushima nuclear plant in northeast Japan.

The utility faces the challenge after the finding on Monday that at least 300 tons of highly radioactive water has leaked from a storage tank into the ground.

TEPCO started to remove the remaining 700 tons of contaminated water from the tank on Tuesday to find out how the leak occurred.

Most of the leaked water is believed to have flowed out of a low barrier around the tank.

Under the instruction of the nation's nuclear regulator, the utility is also examining soil and groundwater to see if the tainted water has flowed into the sea.

The plant has seen a series of water leaks from tanks and other problems as it tries to clean up the

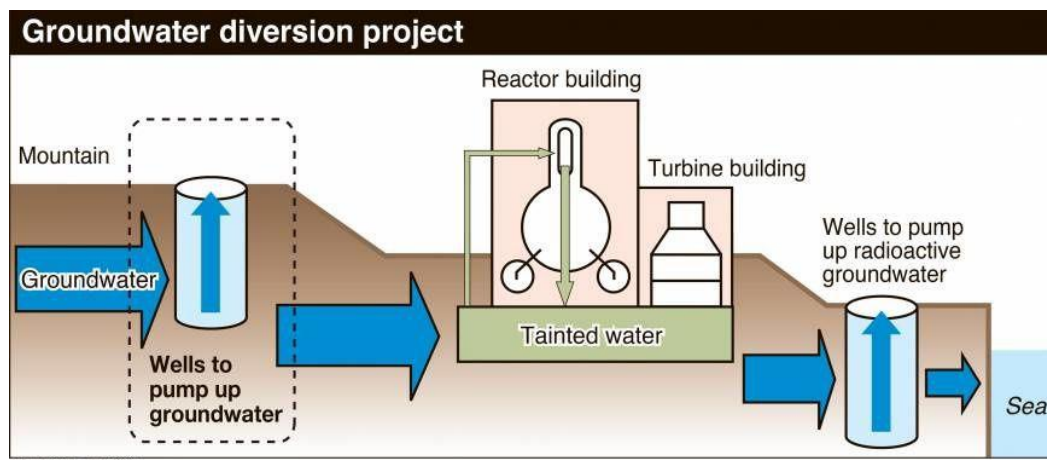
accident caused by the 2011 earthquake and tsunami.

Contaminated groundwater has also been found to be leaking into the sea, requiring the utility to find drastic steps to contain the radioactive water building up at the plant.

## Figuring out the flow of groundwater essential

### Tepco yet to track groundwater paths

<http://www.japantimes.co.jp/news/2013/08/20/national/tepcos-yet-to-track-groundwater-paths/#.UhRhI39Sab0>



SOURCE: TEPCO

Staff Writer

Tokyo Electric Power Co. has radioactive water problems at its crippled Fukushima No. 1 nuclear plant that seem uncontrollable, as seen in the latest case to beset the utility: tanks used to store highly tainted water that was used to cool its melted reactors but now must be safely stored are leaking.

The plant, part of which was built on filled-in land, also faces the risk of liquefaction if another big temblor hits.

The tank leaks come as Tepco struggles to halt the flow, some 300 tons a day, of highly radioactive groundwater into the Pacific, where it is believed wreaking environmental havoc.



And **the groundwater problem will probably dog Tepco over the next four decades** or so as it tries to scrap and entomb the spent fuel from reactors 1 to 4 and the melted fuel inside units 1 to 3.

A key to minimizing the exposure of groundwater to the highly radioactive coolant water leaking into the basements of the buildings housing the crippled reactors is to learn the courses the groundwater takes from the landward mountains to the sea under the plant, experts say.

“Figuring out the flow of the groundwater is vital, as it will help spot where the sources of contamination are and stop it from spreading further in the future,” said Atsunao Marui, a groundwater expert and principal senior researcher at the National Institute of Advanced Industrial Science and Technology, a Tokyo- and Ibaraki-based semi-public research body.

At the moment, Tepco has a rough idea of where the groundwater is flowing.

About 1,000 tons of groundwater flows from the mountains under the complex daily, and about 400 tons of it penetrates the basement walls of the buildings housing reactors 1 to 4 of the six-reactor plant, thus mixing with the highly radioactive coolant water leaking from the containment vessels.

The remaining 600 or so tons apparently flows to the sea and Tepco suspects about half of it gets contaminated somewhere else under the plant.

But the exact paths the groundwater takes have yet to be pinpointed.

Tepco compiled a groundwater flow simulation for an Aug. 12 meeting with experts from the Nuclear Regulation Authority, but the utility said the simulation was inaccurate.

According to Marui, the simulation was not difficult to draw up, but Tepco needs to collect more data from a wider area, even outside the plant, where it doesn't have monitoring wells to check groundwater flows.

“If the government is really planning (to take a step forward to reducing the tainted groundwater), it needs to (support Tepco in) widening the monitoring points to outside the plant,” including from the source of the groundwater and the mountainside, said Kazunari Yoshimura, an expert in water-related matters, who runs Global Water Japan, a water-consulting company.

To reduce the amount of groundwater flowing under the reactor buildings, Tepco dug a number of wells on the nearby mountains and plans to pump the water up before it has a chance to mix with radioactive water.

Aware of Tepco's struggles, Prime Minister Shinzo Abe said earlier this month that taxpayer money will be pumped into a project to build barriers around the reactor buildings to prevent tainted groundwater from flowing to the sea.

Considering Tepco will have to deal with radioactive groundwater for about 40 years until the reactors are safely neutralized, getting accurate data about the groundwater, including the amount, depth and detailed flow paths, is essential if it is to take effective measures, said Yoshimura, who has advised Tepco on the problem.

Tepco must be aware that more monitoring wells need to be built but it is probably hesitant to do so outside the complex, in part because it lacks manpower, Yoshimura said.

The large volume of groundwater flowing under the plant is creating another problem — the possibility that the land it stands on will liquefy if another major earthquake hits.

The east side of the reactor buildings, in an area close to the sea where land was filled in, appears more vulnerable to liquefaction. Marui said the reclaimed land consists of clay and crushed rocks, through which water can easily pass.

Tepco recently injected liquid glass into the filled land, thereby forming an underground barrier to help prevent groundwater from reaching the sea.

Due to technical reasons, the barrier had to be built 1.8 meters below ground, meaning tainted groundwater can flow to the sea above it. Tepco officials believe that is happening now.

And because the wall is blocking a certain amount of groundwater, the level of groundwater has risen in the fill area, raising the risk of liquefaction if and when another earthquake hits, Tepco said. However, the plant's turbine buildings are likely to withstand any earthquake because they are built on the bedrock, it said.

Before the nuclear crisis started on March 11, 2011, Tepco pumped up about 850 tons of groundwater per day from sub-drains to prevent it from flowing under the complex.

It recently started pumping groundwater from under the fill area to reduce the accumulation.

“(Tepco) is seeing a danger that the area near the sea might become like mud, so it is pumping up the groundwater,” said Marui.

Yoshimura of GWJ said if a another big quake hits the Fukushima plant, there is a risk that the highly radioactive water that is presently flooding the basements of the reactor buildings could flow out and further contaminate the groundwater.

August 21, 2013

## Leaks- Q & A (BBC article)

### Q&A: Fukushima leak problems

<http://www.bbc.co.uk/news/science-environment-23779560>

By Matt McGrath Environment correspondent, BBC News

Our environment correspondent Matt McGrath assesses the ongoing efforts to deal with contaminated water at the damaged Fukushima nuclear power plant in Japan. It has been revealed that some of the storage facilities used in the clean-up have been leaking highly radioactive water.

This isn't the first water leak at the plant. What is going on?

The ongoing problem with water seems to be coming, in the main, from poorly constructed storage tanks. Tepco, the company that operates Fukushima, is using huge volumes of water every day to cool the reactors that once generated electricity at the plant.

When the water comes in contact with fuel rods at the heart of the reactors, it becomes highly radioactive and has to be stored in large containers on the site where the water is then processed to remove some of the most dangerous elements.

Every day, the company has an extra 400 tonnes of irradiated water to store. This is roughly a 10th of an Olympic-sized swimming pool.

The water is held in some of the 1,000 water tanks the company has erected on site. But there are problems with these tanks, says Prof Neil Hyatt, from the University of Sheffield, UK.

"To keep up with the rate at which radioactive cooling water is accumulated, Tepco has opted to use containment tanks incorporating plastic seals. Seepage from these joints was the cause of the latest leak of radioactive water."

It is believed that about a third of the storage is constructed in this way. Four previous, smaller leaks all came from these type of tanks.

Finding the small leaks is very difficult, according to Prof Hyatt.

"It is very challenging. They have a real problem with the high level of background radiation, so the small leaks are hard to find."

#### Increase in radioactive water stored at Fukushima



Satellite images show how the number of water storage tanks has increased in the past two years. The tanks store contaminated water that has been used to cool the reactors.

How dangerous are the levels of radioactivity?

Officials have said that the level of radiation close to this latest leak is extremely high. The water is said to be 8 million times above the safe level for drinking water.

According to Prof Paddy Regan, at the University of Surrey, UK, this leak must be kept in some perspective.

"The numbers reported for dose from these concentrated sources are high - standing there for any more than a few minutes would not be encouraged - but the risks are measurable and the potential doses received should be monitored by workers in the immediate area," he said.

The overall level of radiation that has been emitted by the Fukushima disaster also needs to be kept in perspective. According to Dr Ken Buesseler, senior scientist at the Woods Hole Oceanographic Institution, US, the release of the radioactive element caesium from Fukushima is between a 10th and a third of what was released from the accident in Chernobyl, and perhaps one fortieth of what was released by nuclear bomb testing globally in the 1950s and 1960s.

The proposal to raise the incident level from one to three means it's more serious than we thought? Raising the threat level to three on the International Nuclear Event Scale (Ines) makes it the most serious nuclear incident since the reactors themselves melted down in the wake of the tsunami in 2011.

Each step on the seven-step scale represents a tenfold increase in severity. Level 3 means the danger is contained on the site and there is no imminent threat to the public.

According to the International Atomic Energy Agency (IAEA), Level 3 can be assigned when there is "severe contamination in an area not expected by design, with a low probability of significant public exposure."

Prof Andrew Sherry from the University of Manchester, UK, says the measures taken by Tepco are the right ones.

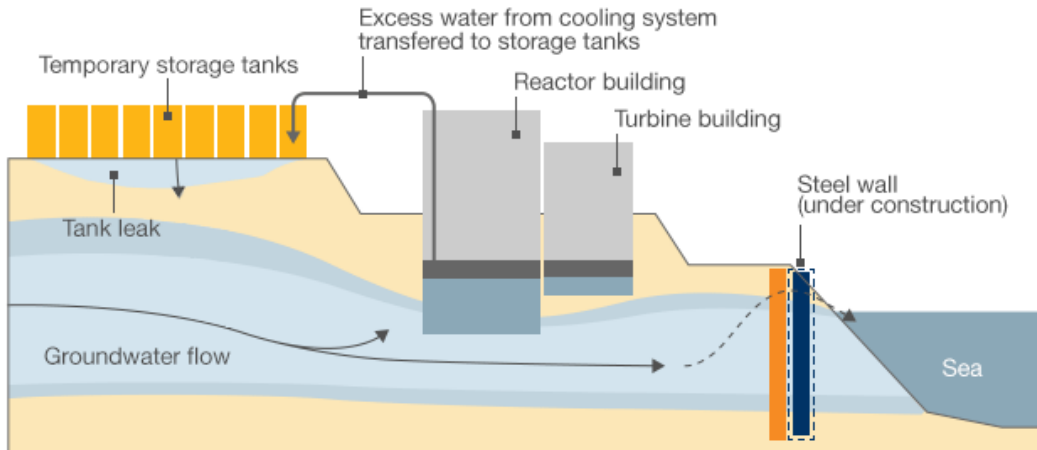
"Though serious, this leak is a long way from the Level 7 incident we were facing in 2011. The approach taken by Tepco to drain the tank, pump leaked water to temporary storage, and protect the drainage of contaminated water to ground water, is entirely sensible," he explained.

Is storing water the only problem?

If only. The Fukushima site suffers from its location, where groundwater from the hills surrounding the plant flows down and into the radioactive areas. Tepco wants to channel some of this water, with low levels of radiation, into the sea, but local fishermen are strenuously opposing this.

Given the plant is so close to the sea, Tepco is working on a series of plans to stop more radioactive water getting into the ocean, including erecting steel barriers and injecting chemicals into the earth to create an impermeable layer.

## Groundwater contamination at Fukushima



Source: Reuters

Water from the storage tanks has seeped into the groundwater and then into the sea. Efforts to use a chemical barrier to prevent sea contamination have not worked.

But given that the plant is in an active earthquake zone, there is a danger that further tremors could spill much of the stored water.

"It is a potential; it is realistic," said Prof Neil Hyatt. "I would be saying to the government and to Tepco to make clear that in the event of an emergency, there are plans in place to deal with this."

Underlying all the water problems is the key issue of what to do with the damaged reactor cores. If these can be dealt with, then the water becomes much less of a problem. Tepco had planned to remove some of the 400 tonnes of highly irradiated spent fuel in Reactor No 4 later this year. This won't be easy.

"It is on another scale entirely, a nightmare really," said Prof Hyatt.





Some experts believe the whole clean-up will take more than a century

Why hasn't the Japanese government stepped in?

In essence, they already have. In May last year, the Japanese government injected \$12.5bn (£8bn) in return for more than half the shares in the company. It was part of a 10-year restructuring plan.

According to the trade and industry minister, Yukio Edano, the capital injection was needed to ensure the utility company could continue to supply electricity and pay for compensation and decommissioning costs.

Where will all this end?

In the very short term, Tepco will have to invest in more robust storage tanks, and cope with continuing problem of groundwater. Its ultimate hope is that this water can be treated and cleaned, and then released into the sea.

Tepco will then have to tackle the fuel rods, which a slow and tricky task. The IAEA says it could take 40 years. Some experts believe the whole clean-up will take more than a century.

## Level 3?

### **NRA may raise Fukushima leak severity rating**

[http://www3.nhk.or.jp/nhkworld/english/news/20130821\\_17.html](http://www3.nhk.or.jp/nhkworld/english/news/20130821_17.html)

Japan's Nuclear Regulation Authority may raise the severity rating of the latest contaminated-water leakage at the troubled Fukushima nuclear power plant by 2 notches from its initial assessment.

Members of the NRA are discussing the matter at a meeting on Wednesday.

On Monday, highly radioactive water was found leaking from one of the tanks built on a hillside by the Number 4 reactor.

The NRA tentatively ranked the problem as level 1 on an 8-point international scale for nuclear accidents, which is the 2nd from the lowest.

But **the authority is now considering raising the assessment to level 3**, as it was found on Tuesday that more than 300 tons of contaminated water has been released from the tank.

The water is believed to contain thousands of trillions of becquerels of radioactive substances.

Level 3 incidents are the 5th highest on the international scale, and are classified as serious accidents.

In 1997, fire and explosions at a reprocessing plant in Tokai Village, Ibaraki Prefecture, caused radioactive materials to leak. Thirty-seven people were exposed to radiation. The incident was given a level 3 assessment.

The 1999 criticality accident at a nuclear fuel processing plant, also in Tokai Village, was given a level 4 assessment.

The NRA plans to seek advice from the International Atomic Energy Agency on the current Fukushima leak assessment.

## Leaking tanks

Multitude of problems: Tanks (foreground) containing radioactive water and reactor buildings (background) at the Fukushima No. 1 nuclear plant are photographed in February. | KYODO





## **Tank at No. 1 lost 300 tons of radioactive water**

<http://www.japantimes.co.jp/news/2013/08/20/national/tank-at-no-1-lost-300-tons-of-radioactive-water/#.UhrGL39Sab0>

***Tepeco claims barrier keeping leaked toxins from the Pacific***

by Reiji Yoshida  
Staff Writer

About 300 tons of highly radioactive water had leaked from a tank at the damaged Fukushima No. 1 nuclear power plant as of Tuesday afternoon, Tokyo Electric Power Co. said.

Tepeco claims none of the water, which had been used to cool its stricken reactors and is highly radioactive, has flowed directly into the Pacific, apparently contained by a 30-cm-high waterproof concrete barrier surrounding dozens of tanks, including the leaking No. 5 tank. But some of the water may have been absorbed into the ground, joining with already tainted groundwater.

Where the leak is occurring in the tank, which is bolted together and has sealed seams, remains elusive, however, even after workers finished pumping water from inside the barrier Tuesday afternoon.

Rain was forecast across much of the Tohoku region, including Fukushima, Tuesday afternoon.

The pump is powerful enough to keep water from flowing over the 30-cm-high barrier fence, even if rainfall is heavy, Tepco executive and spokesman Masayuki Ono said at a news conference, adding: "We apologize again for causing anxiety among the public."

The Nuclear Regulation Authority released a preliminary assessment of a level 1 incident on the eight-notch international severity scale for nuclear accidents.

The amount of beta rays being emitted by radioactive materials in the leaked water, including strontium, was 80 million becquerels per liter, Tepco said.

At 9:50 a.m. Monday, Tepco workers on patrol found a pool of at least 120 liters of highly contaminated water thought to have escaped from concrete barrier's drain valves. The valves had been opened to drain rainwater.

The radiation level measured around 50 cm above the toxic water stood at about 100 millisieverts per hour, Tepco said.

Exposure to 100 millisieverts increases the incidence of death by cancer by 0.5 percent, according to the International Commission on Radiological Protection. It is also the legal upper limit for a nuclear worker over five years.

On Tuesday, Tepco said the water level in tank No. 5 had dropped by 3 meters, meaning about 300 tons of contaminated water had been lost. From Monday to Tuesday, about 10 tons were lost, indicating this amount may have leaked every day over the past 30 days, a senior Tepco official told The Japan Times.

"So far, we had four similar (tank) leakage cases. The problem this time is that we didn't detect it for as long as 30 days," the official said.

All five leaks were in temporary water tanks made of steel plates bolted together with waterproof packing to seal the seams. In contrast, welded steel tanks are more watertight.

The temporary tanks are supposed to be replaced or repaired every five years.

Tepco has set up more than 1,000 huge above-ground water tanks to hold the ever-increasing amounts of highly contaminated coolant water. It must inject water to cool the melted nuclear fuel inside the damaged reactors.

Of those tanks, 350 are temporary, according to Tepco.

Ono stressed that the cause of the leak has not been determined, adding that Tepco has used temporary tanks of this type for about two years.

It started using the first tanks of this type on Dec. 12, 2011.

A temporary tank can be set up in just over a week. Although Tepco acknowledges welded steel tanks are more robust, it plans to set up more temporary tanks to contain the contaminated water at the plant.

## Leak rating changed to level 3

### Japan NRA Revises Classification Of Water Tank Leak To INES Level 3

<http://www.nucnet.org/all-the-news/2013/08/21/japan-nra-revises-classification-of-water-tank-leak-to-ines-level-3>

The Japan Nuclear Regulatory Authority (NRA) has revised its rating of the leak of radioactive water from a tank at Fukushima-Daiichi nuclear plant from a Level 1 to a Level 3 on the International Nuclear Event Scale (INES).

The revision took place at a meeting of the NRA's Regulatory Commission earlier today.

The NRA said it decided to revise the rating of the event due to new information being reported by the plant operator, the Tokyo Electric Power Company (Tepco).

The NRA said it was specifically concerned about the reported high level of beta radioactivity of the leaked water – 80 million becquerels per litre – and the total amount of contaminated water (300 cubic metres), which correspond to the INES level 3 criteria.

The NRA also said that the incident occurred in an area where it was not expected in the design of the installation and therefore sufficient defence in depth is not ensured.

Considering the potential impact, NRA concludes that a level-3 classification ('serious incident') is justified for this criterion as well.

The event was first reported on 19 August when water was discovered inside as well as outside the dike

surrounding a water tank used for storing contaminated water at Fukushima-Daiichi nuclear plant.

Tepco said today that it has collected the rest of the water from the tank and the dike in a temporary vessel and has started to transfer it to another water tank in the vicinity. No further leaks have been detected.

Tepco also said it has measured the radioactivity of the seawater at a nearby sampling location. The result shows a level of caesium-134 and -137 as well as total beta radioactivity below the detection limit.

**This is the first time Japan has declared an event on the INES scale since the March 2011 earthquake and tsunami.**

## Has it leaked into the ocean?

### **Radioactive water leak from tank at Fukushima No. 1 may have reached sea: Tepco**

AFP-JIJI

<http://www.japantimes.co.jp/news/2013/08/21/national/radioactive-water-leak-from-tank-at-fukushima-no-1-may-have-reached-sea-tepco/#.UhXZ5X9Sab0>

Several hundred tons of radioactive water that leaked from a storage tank at Tokyo Electric Power Co.'s crippled Fukushima No. 1 nuclear plant may have flowed to the sea, Tepco admitted Wednesday, adding that it is "hurriedly checking" to learn if 350 similar tanks are also leaking.

Tepco is desperately trying to seal the tank, which has leaked about 300 tons of radioactive water. The tank, considered temporary, is made of steel plates bolted together with sealed seams. Tepco is also using more durable welded tanks to store the highly radioactive water, which is accumulating daily.

The water was used to cool the three melted reactors, then stored for later possible decontamination. So far, Tepco has built more than 1,000 tanks on site.

Spokesman Tsuyoshi Numajiri said traces of radioactivity were detected in a drainage stream.

"There is a possibility that earth and sand contaminated with the leaked water flowed into the drainage. We cannot rule out the possibility that part of the contaminated water flowed into the sea," he said.

"We intend to make detailed examinations."

A Tepco official said earlier Wednesday the tank was believed to still be leaking but the utility has yet to pinpoint where the hole is. The water is apparently being absorbed into the ground and possibly mixing with the groundwater that flows under the stricken plant.

Tepco was also desperately trying to determine if 350 similar temporary tanks at the plant were also leaking.

Numajiri said workers are removing soil contaminated by the leaked water, and pumping the remaining water from the leaky tank.

He said there were no significant changes in radiation levels outside the plant.

An earthquake-generated tsunami knocked out reactor cooling systems and sparked the three meltdowns at the plant in March 2011, in the worst nuclear plant calamity since Chernobyl in 1986.

## **Highly contaminated water likely leaking directly into sea from Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130822p2a00m0na016000c.html>

Water contaminated with an estimated 30 trillion becquerels of radioactive substances is highly likely to have leaked directly into the sea from the premises of the tsunami-hit Fukushima No. 1 Nuclear Power Plant, its operator announced on Aug. 22.

Tokyo Electric Power Co. (TEPCO) officials explained that the water that had accumulated in underground tunnels in the power station's No. 2 and 3 reactors since shortly after the March 2011 accident is likely to be leaking into the sea.

The utility estimates that the water it believes has already flowed into the sea was contaminated with up to 10 trillion becquerels of strontium-90 and up to 20 trillion becquerels of cesium-137. The two radioactive substances could total 30 trillion becquerels, more than 100 times the upper limit on the amount of such substances that can be released into the sea per year, which is set at 220 billion becquerels.

TEPCO made the estimation from the density of radioactive substances detected in the port and harbor facility on the premise of the power station on the assumption that the water has been leaking into the sea since May 2011.

The utility had previously explained that underground water that was contaminated after getting mixed with radioactive water was leaking. However, since such a large amount of radioactive substances is highly unlikely to be released from underground water alone, TEPCO came to the conclusion that highly contaminated water is likely to be leaking directly into the sea from the underground tunnels for the No. 2 and 3 reactors through a crushed stone stratum.

The power company plans to pump up highly radioactive water from the underground tunnels and remove cesium and other radioactive substances in the plant's water treatment facility. Treated water will be stored in above-ground tanks.

On Aug. 2, TEPCO released its estimate that underground water contaminated with up to 40 trillion becquerels of tritium had leaked into the sea from the compounds of the crippled power station.

## **Highly toxic water leaked from tank could have flowed into sea**

<http://mainichi.jp/english/english/newsselect/news/20130822p2g00m0sp043000c.html>

TOKYO (Kyodo) -- Highly radioactive water that leaked from a storage tank at the Fukushima Daiichi nuclear power plant could have flowed into the adjacent Pacific Ocean through drainage channels, data provided by Tokyo Electric Power Co. showed Wednesday.

TEPCO is studying the possibility in detail, Executive Vice President Zengo Aizawa told a press conference.

TEPCO first noticed on Monday puddles with high radiation levels near an area where many storage tanks stand. The seriousness of the situation escalated when the utility later found that 300 tons of toxic water had likely leaked from a tank that should have been holding about 1,000 tons.

The Nuclear Regulation Authority said Wednesday it is considering raising the severity assessment of the event to level 3 on an eight-point international scale from level 1.

Level 3 on the International Nuclear and Radiological Event Scale is defined as a "serious incident." The Fukushima nuclear accident, triggered by a huge earthquake and tsunami in March 2011, has been rated as the maximum level 7, on a par with the 1986 Chernobyl disaster.

The NRA hopes to reach a conclusion on the issue after consulting with the International Atomic Energy Agency on whether it is appropriate to apply the so-called INES scale to an incident at facilities set up to deal with a nuclear crisis that has still not come to an end.

TEPCO has still not been able to determine from where in the tank the radioactive water is escaping. The container is 12 meters in diameter and 11 meters high, built of steel plates held together by bolts.

TEPCO has collected 4 tons of the leaked water, and said most of the remaining water likely seeped into the ground.

But TEPCO also said Wednesday it detected 6 millisieverts per hour of radiation inside a drainage channel not far from the tank, possibly indicating some of the leaked water entered the gutter.

The channel connects to another drainage channel which leads to the sea.

However if any toxic water did flow into the sea, confirming that fact would be difficult once it mixed with seawater.

A seawater sample taken near the drainage channel outlet contained a small amount of radioactive cesium-137, but the density of radioactive substances emitting beta rays was at an undetectable level.

A low concrete wall exists near the tanks to prevent leaked water from spreading, but TEPCO left open drain valves attached to the wall, thinking that would make it easier to detect leaks.

The valves are now closed. TEPCO also finished transferring the water that was left inside the troubled tank to other tanks nearby by Wednesday night.

Several types of tanks are used at the Fukushima plant to store a massive volume of radioactive water resulting from the continuing injection of water into the three reactors that suffered meltdowns. Some 300 are the same type as the one found to have leaked.

The situation is arousing concern in neighboring countries such as China and South Korea. Those two countries have requested Japan provide detail information about the issue.

### **TEPCO: 10 trillion becquerels of strontium may have leaked into ocean**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308220038>

Tokyo Electric Power Co. calculated that up to 10 trillion becquerels of radioactive strontium and 20 trillion becquerels of cesium 137 were in contaminated water from the stricken Fukushima No. 1 nuclear power plant that flowed into the sea since the outset of the disaster.

TEPCO released the results of calculations on Aug. 21. The figures for both radioactive elements are more than 100 times the managed emissions of 220 billion becquerels over the course of one year of normal operations at the nuclear plant.

However, TEPCO officials said the calculated estimates were still below the central government's standards.

Based on the concentration of radioactive materials found in seawater within the port by the nuclear plant, estimates were made that between 3 billion and 10 billion becquerels of strontium flowed into the ocean daily, while between 4 billion and 20 billion becquerels of cesium 137 flowed into the ocean.

On the assumption that contaminated water mixed with groundwater and flowed into the ocean from May 2011, soon after the nuclear crisis unfolded, the estimates represent the maximum amounts of strontium and cesium that might have flowed into the ocean.

The plant was wrecked by the March 11, 2011, Great East Japan Earthquake and tsunami.

### **Nuclear regulator urges checking all tanks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130821\\_34.html](http://www3.nhk.or.jp/nhkworld/english/news/20130821_34.html)

Japan's nuclear regulator has called for an immediate check of all water storage tanks at the Fukushima Daiichi power plant.

The head of the Nuclear Regulation Authority, Shunichi Tanaka, told a news conference on Wednesday that there are about 350 other tanks at the site structurally identical to the one which leaked 300 tons.

He said that if a leak occurs in one tank, it must be assumed that something similar will occur in others.

He said the operator of the plant, the government and the regulatory agency must all do their best to prevent the situation at the plant from getting any worse.

August 22, 2013

## Well, has it?

### **TEPCO: 30 trillion becquerels leaked to sea**

[http://www3.nhk.or.jp/nhkworld/english/news/20130822\\_05.html](http://www3.nhk.or.jp/nhkworld/english/news/20130822_05.html)

The operator of the crippled Fukushima Daiichi nuclear plant says 30 trillion becquerels of radioactive strontium and cesium may have leaked into the sea since May 2011.

The figure is dozens of times higher than agreed limits, despite excluding the first 2 months of the crisis, when discharges were highest. The crisis was triggered by the March 11, 2011 tsunami and earthquake.

The new estimates are included in a Tokyo Electric Power Company report on the ongoing leak of contaminated groundwater into the sea. The report was released on Wednesday.

The company says up to 10 trillion becquerels of strontium and 20 trillion becquerels of cesium have leaked into the sea since May 2011.

The total is hugely beyond TEPCO'S in-house annual emission limit of 220 billion becquerels -- under normal circumstances.

The company says the calculation was based on radioactive levels detected within the plant's bay and on the assumption that the leaks have been ongoing.

The figure is expected to grow since TEPCO has failed to completely stop the flow of contaminated groundwater into the sea.

The utility warns it's difficult to determine the exact amount of leaked cesium and strontium because they are easily absorbed into soil. It says it will further assess the situation by consulting experts.

## Inspect those tanks!



## **TEPCO checking tanks for leaks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130822\\_23.html](http://www3.nhk.or.jp/nhkworld/english/news/20130822_23.html)

Inspectors at the crippled Fukushima Daiichi nuclear-power plant are checking for leaks in about 350 water-storage tanks.

Plant operator Tokyo Electric Power Company found Monday that one tank had leaked more than 300 tons of highly radioactive water.

They fear the contaminated water is seeping via a drainage system into the sea.

Personnel on Wednesday night finished transferring the remaining 700 tons of water to another tank.

They are now examining the tank to identify the source of the leak.

But they can only start a full investigation next week due to the high radiation level inside the tank.

So the TEPCO workers have turned their attention to about 350 tanks of the same kind. The tanks are made from steel plates bolted together rather than welded.

TEPCO operatives are carrying out visual inspections and measuring radiation levels around the tanks. They plan to finish the work as early as Friday.

## **Regulator orders stricter watch on leaked tanks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130822\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130822_03.html)

Japan's nuclear regulator has ordered the operator of the crippled Fukushima Daiichi nuclear plant to step up measures to prevent more radioactive leaks.

Tokyo Electric Power Company said on Tuesday that about 300 tons of highly radioactive water had leaked from a storage tank in the plant compound.

The Nuclear Regulation Authority convened an emergency meeting on Wednesday evening to discuss the leaks.

Some experts at the meeting criticized TEPCO for leaving open valves at a barrier surrounding the tanks. Others said checks for leaks in the storage area needed to be more frequent.

Toyoshi Fuketa, a commissioner with the agency, said he doubts the current system is in any way capable of preventing further leakage.

The regulators instructed TEPCO to install water-level gauges to all tanks to warn of future leaks. They also demanded the operator consider storing the water elsewhere.

About 350 structurally-identical tanks have been built without welding, using steel plates and bolts, to temporarily store waste water from damaged reactors.

The panel members plan to inspect the tanks on Friday.

### **TEPCO's struggle (NHK video)**

<http://www3.nhk.or.jp/nhkworld/newsline/201308221707.html>

### **TEPCO: Contaminated water from leaking tank likely reached ocean**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308220060>

Tokyo Electric Power Co. acknowledged Aug. 21 that water contaminated with radiation that leaked from a storage tank at the Fukushima No. 1 nuclear power plant may have reached the ocean.

As it reels from this latest blow, TEPCO announced moves to deal with what it called a "crisis situation."

The surface of a drainage ditch near the tank where the leak occurred had radiation readings of 6 millisieverts per hour. The ditch is directly connected to the ocean to the south of the No. 4 reactor.

Highly radioactive water was detected about 50 meters east of the tank where the leak was confirmed. The water was about 650 meters from the ocean. The concrete drainage ditch is about 2.2 meters wide and 1.2 meters deep.

Workers who checked the ditch on Aug. 21 noticed a stain that indicated contaminated water may have flowed down the ditch. While the surface of the ditch had radiation readings of 6 millisieverts, the reading at a height of 1 meter was 0.06 millisievert per hour.

The radiation was lower than the water surface of the tank containing the contaminated water. That led TEPCO officials to believe the radiation of the leaked water may have become diluted after mixing with rain.

TEPCO officials had said previously that no water from the leaking tank appeared to have reached the ocean. Sandbags had been placed around the leaking tank to prevent contaminated water from spreading.

A working group of the Nuclear Regulation Authority held a meeting on the evening of Aug. 21 to discuss the new crisis. An NRA official suggested the leak in the tank was coming from a crack on the bottom.

Although there had been suspicions that water had leaked from the connected areas held together by bolts, there are no signs such a leak occurred.

The NRA group instructed TEPCO to determine the cause of the leak without delay.

The remaining water in the tank that leaked was moved to another tank around 9 p.m. on Aug. 21. TEPCO is frantically trying to determine precisely where the leak took place as well as its cause.

It pledged to make greater efforts to monitor other tanks for possible leaks.

At an Aug. 21 news conference, Zengo Aizawa, TEPCO executive vice president in charge of the nuclear power division, apologized for the latest tank leak and said, "The problem of contaminated water is the largest crisis facing management and we will place priority on dealing with the issue."

He said he would remain full-time at the Fukushima plant site to take charge of the problem.

TEPCO announced measures to collect dirt contaminated by the water as well as to improve the monitoring of the tanks. The company also indicated it would review the organization now set up to deal with decommissioning reactors and handling the contaminated water.

There are about 350 storage tanks similar in structure to the one that leaked. Most do not have meters to measure water levels inside.

Doubts about the reliability of those tanks were also raised because inspections for leaking before the tanks were used were conducted in the rain.

TEPCO officials have said they will inspect all of the tanks.

## High radiation levels on two tanks

### High-level radiation detected along seams of two Fukushima water tanks

JJI

<http://www.japantimes.co.jp/news/2013/08/22/national/high-level-radiation-detected-along-seams-of-two-fukushima-water-tanks/#.UhZvdm9Sab0>

Tokyo Electric Power Co. said Thursday it has detected high levels of radiation along the seams of two temporary storage tanks containing contaminated water at its crippled Fukushima No. 1 nuclear power station.

The seams on the bottom of the 1,000-ton tanks were dry, and no water was found near them, Tepco said. Radiation levels of up to 100 millisieverts per hour were measured at each of the two tanks in question, according to the utility.

The cause of the high-level radiation along the seams of the two tanks remains unclear and the possibility of leaks cannot be ruled out, Tepco said.

The two tanks are the same type as the one that has leaked an estimated 300 tons of contaminated water at the plant, which suffered three reactor core meltdowns after the March 2011 mega-quake and tsunami. The leaking tank was discovered Sunday.

There are some 350 such tanks at the plant and about 300 are being used to temporarily store highly radioactive water. On Thursday, Tepco checked all 300 tanks. They are made of steel plates bolted together, with sealed seams. Tepco is also using more durable welded steel tanks.

### High radioactivity found on 2 tanks

[http://www3.nhk.or.jp/nhkworld/english/news/20130822\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20130822_33.html)

The operator of the Fukushima Daiichi nuclear power plant has detected high levels of radiation on the surface of 2 tanks storing radioactive wastewater.

Tokyo Electric Power Company made the discovery on Thursday while checking about 300 tanks for leaks. TEPCO revealed on Monday that one tank leaked more than 300 tons of highly radioactive water.

The tanks are of the same type, made from steel plates bolted together rather than welded. These tanks are considered more vulnerable to leaks.

Radioactivity of 100 and 70 millisieverts per hour was measured on the joints of 2 tanks.

TEPCO says the surface of the tanks is dry and there are no signs of recent leaks and no changes in water levels inside. It says the leaks may be old. The company is checking radiation levels around the tanks.

TEPCO is concerned that water from the first tank may already have reached the sea via a drainage

system.

Engineers on Wednesday night finished transferring the remaining 700 tons of water in the damaged tank. They will examine the joints and the bottom of the empty tank to identify the source of the leak.

## 30 trillion becquerels

### Rate of radioactive flow to Pacific alarming

<http://www.japantimes.co.jp/news/2013/08/22/national/rate-of-radioactive-flow-to-pacific-alarming/#.UhZvRH9Sab0>

#### ***Fukushima No. 1 leaks estimated at 30 trillion becquerels since May 2011***

by Kazuaki Nagata  
Staff Writer

Water releasing as much as 10 trillion becquerels of radioactive strontium and 20 trillion becquerels of cesium-137 from the Fukushima No. 1 power plant has flowed into the Pacific Ocean since May 2011, Tokyo Electric Power Co. estimates.

The combined figure of 30 trillion becquerels, announced late Wednesday, implies that highly radioactive water is entering the trenches under the damaged reactors' turbine buildings.

The three reactors that had core meltdowns are being flooded by emergency cooling water needed to keep the leaky units stable, but the water is leaking from the reactors into the basements, where it is mixing with groundwater penetrating the walls of the 40-year-old plant.

Since the 30 trillion becquerels can't be accounted for just by groundwater alone, it is likely the toxic water from the trenches is entering the mix as well, the beleaguered utility said after conducting various simulations.

The Fukushima complex was built on a maze of trenches that guide cables and pipes needed to transport electricity and water. The pipes lead to the sea because the power plant, like all the others in Japan, needs seawater for cooling purposes.

The 30 trillion figure is about 100 times more than what Tepco had been allowing to enter the sea each year before the crisis.

Containment fences set up in the plant's man-made harbor are failing to keep the flow from reaching the greater Pacific.

Tepco belatedly acknowledged last month that about 300 tons of groundwater from the mountains behind the crippled plant flows daily to the sea after mixing with radioactive water leaking from the reactor buildings' cracked foundations.

This week, however, it discovered that about 300 tons of filtered water from one of its hundreds of temporary storage tanks had escaped. The water had been cleansed of most of the cesium but still contains other harmful materials, including tritium. The incident has been rated level 3 on the International Nuclear Event Scale. The meltdowns were rated level 7, a status that remains unchanged.

Tepco first claimed the tank water had not reached the sea, only to reverse itself Wednesday after detecting a relatively high reading of 6 millisieverts per hour in a drainage channel running from the tanks to the sea. The channel, made to prevent rainwater from flooding the tank premises, is not covered.

Tepco said Thursday that two more tanks are leaking.

On Monday, when Tepco announced the first tank leak, it confirmed seeing traces of water running from the tank to the drainage channel, and detected 96 millisieverts per hour of radiation in the air near it.

Tepco has been unable to locate the leak but said it finished transferring the water to other tanks nearby Wednesday night. It plans to check for more tank leaks.

While some of the water might have gone into the sea, it is hard to determine where it all went. Tepco projects that it's been losing about 10 tons a day for the past 30 days from the tank, which is considered a temporary model as it is made of steel sheets bolted together with their seams sealed, instead of the more reliable welded tanks.

The leak was discovered after workers noticed water puddles near the tank Monday. Nuclear Regulation Authority officials and outside experts said Wednesday that if 10 tons of tainted water flowed out over 30 days, it is hard to imagine no one would notice it before Monday.

At an NRA meeting Wednesday evening on the tainted water issue, the panelists pointed out a long-held suspicion: that the water may be going into the ground through cracks in the concrete base.

“It is more natural to think the water went underground,” said Masaya Yasuhara, a researcher at the National Institute of Advanced Industrial Science and Technology. Tepco rejects that scenario because concrete isn’t that permeable.

## Removing contaminated soil

### TEPCO to remove radiation-soaked soil

[http://www3.nhk.or.jp/nhkworld/english/news/20130823\\_04.html](http://www3.nhk.or.jp/nhkworld/english/news/20130823_04.html)

The operator of the crippled Fukushima Daiichi nuclear power station on Friday will start removing soil soaked with radioactive water from the plant.

TEPCO workers found on Monday that one of the storage tanks near the Number 4 reactor has leaked more than 300 tons of highly radioactive wastewater. Some of the water may have flowed into the sea through a drainage system.

Much of the water that has leaked is believed to have soaked into soil near the tank as there is little water left on the ground and little contamination in the drainage system.

**TEPCO workers plan to collect the soil on Friday to prevent the contamination from spreading further underground.**

The workers will dig up about 50 centimeters of soil with heavy equipment and then measure radiation levels. If the levels are high, the workers will dig deeper to remove the soil until the levels are equal to those in untainted spots.

However, it is not known where and how much escaped water has penetrated the ground. In addition, some places have a network of cables underground.

TEPCO says **its workers will first collect earth in places where no equipment is buried.** But it is not clear how much soil they can remove.

## More leaks

## **TEPCO struggling to prevent more leaks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130823\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130823_03.html)

The operator of the Fukushima Daiichi power plant is struggling to stop radioactive water from leaking into the sea.

On Thursday, Tokyo Electric Power Company started pumping out highly contaminated water built up inside an underground tunnel.

The tunnel is about 60 meters from the sea, close to a building that houses the Number 2 reactor turbine. TEPCO estimates 210 tons of contaminated water is in the tunnel.

TEPCO has known about the water since immediately after the nuclear accident in March, 2011. It says it has only recently realized that the radioactive water had been leaking out to sea.

In May, the utility discovered high levels of radiation in sea-side monitoring wells and a port for the power plant.

After being pumped out, the water will be filtered to lower its radiation levels before being stored inside steel tanks.

TEPCO must also urgently pump out an estimated 15,000 tons of highly radioactive wastewater from underground tunnels.

TEPCO says the work will be technically challenging and it doesn't know when it will be completed.

Careful operation is needed to prevent a further flow of contaminated water from the nearby turbine buildings into tunnels.

## **International SOS**

### **Radioactive Leaks in Japan Prompt Call for Overseas Help**

By Yuji Okada, Jacob Adelman & *Peter Langan* - Aug 22, 2013 4:54 AM GMT+0200

<http://www.bloomberg.com/news/2013-08-21/tepcos-shares-plunge-on-report-of-serious-radiated-water-leak.html>

The crippled nuclear plant at Fukushima is losing its two-year battle to contain radioactive water leaks and its owner emphasized for the first time it needs overseas expertise to help contain the disaster.

Tokyo Electric Power Co. (9501) is grappling with the worst spill of contaminated water since the March 2011 earthquake and tsunami caused a meltdown at the Fukushima Dai-Ichi plant. The call for help from Zengo Aizawa, a vice president at the utility, follows a leak of 300 metric tons of irradiated water. Japan's



nuclear regulator labeled the incident “serious” and questioned Tepco’s ability to deal with the crisis. Prime Minister Shinzo Abe made similar comments earlier this month.

“We will revamp contaminated-water management to tackle the issue at the Fukushima Dai-Ichi plant and seek expertise from within and outside of the country,” Aizawa said at a press conference last night in Tokyo. “There is much experience in decommissioning reactors outside of Japan. We need that knowledge and support.”

The International Atomic Energy Agency in Vienna and the U.S. Nuclear Regulatory Commission said they are prepared to help.

### **Toxic Sludge**

Tepco was storing 330,000 tons of radioactive water as of Aug. 13 in tanks covering an area equal to 37 football fields, according to the company. The utility is clearing forest to make room for more tanks as it adds to the stored water at a rate of 400 tons a day after pumping it out from under the plant’s reactors, which melted down as a result of the March 2011 earthquake and tsunami.

The water is treated to remove some of the cesium particles before it is stored, which has left 480 filters clogged with the radioactive material at the site. Each weigh 15 tons and are warehoused in what the utility calls temporary storage, though it will take hundreds of years for the radiation to decay. Other radioactive contaminants remain in the water even after treatment. That includes strontium, which has been linked to bone cancers.

Besides radiated water, the site north of Tokyo has more than 73,000 cubic meters of contaminated concrete, 58,000 cubic meters of irradiated trees and undergrowth, and 157,710 gallons of toxic sludge, according to the utility.

### **‘Biggest Concern’**

Japan’s nuclear watchdog has ratcheted up alarm over the potential for more leaks of highly radioactive water from the hundreds of storage tanks at the Fukushima atomic plant.

The possibility of leaks from other tanks “is the biggest concern,” said Nuclear Regulation Authority Chairman Shunichi Tanaka at a press conference yesterday. “This will need to be handled carefully on the assumption that one incident could bring another.”

Late last night, Tepco said water leaking from the storage tank probably ran into the ocean, citing high radiation readings in a drainage ditch.

As much as 20 trillion becquerels of cesium and 10 trillion becquerels of strontium leaked into the ocean since May 2011, Tepco spokeswoman Mayumi Yoshida said today. The total amount of cesium and strontium is equivalent to about 100 times the annual limit on radiation from the plant to the ocean under normal conditions, according to calculations based on Tepco data.

### **Tepco’s Effort**

The release is about a million times less than the contaminants spilled into the world’s oceans after nuclear bomb tests in the 1950s and 60s, said Peter Burns, a radiation physicist based in Melbourne, who

was formerly Australia's representative on the United Nations' committee on the effects of atomic radiation.

Radiation levels are rapidly diluted by the ocean and should pose few hazards outside of the harbor that is directly receiving the contaminants, said Kathryn Higley, a radiation health physicist at Oregon State University in Corvallis.

At least one commissioner at Japan's nuclear regulator questioned the accuracy of data being released by Tepco and whether the incident had been fully reported. The leak, along with a separate spill of 300 tons of radioactive water a day into the Pacific Ocean, is raising doubts about the utility's ability to handle the 40-year task to decommission the nuclear site.

Tepco is providing the regulator with information, company spokesman Yoshikazu Nagai said by phone, declining to comment further. The company's shares fell as much as 15 percent in Tokyo yesterday, their biggest intraday slide since June 5, and were down 4.9 percent to 530 yen at 10:57 a.m. in Tokyo.

### **Leaking Tanks**

Japan's government has ordered an investigation into the safety of hundreds of other tanks storing contaminated water in Fukushima, the site of the world's worst civilian nuclear disaster since the Chernobyl reactor exploded in 1986.

There are 226 tanks of similar bolted design to the leaking unit with the same 1,000-ton capacity at the site, said Tatsuya Shinkawa, director of the nuclear accident response office in the government's Agency for Natural Resources and Energy, which called for the probe.

Nuclear incidents and accidents are ranked by order of severity on the International Nuclear and Radiological Event Scale or INES, which has seven categories and was set up by the International Atomic Energy Agency.

On Aug. 19, Tepco said about 300 tons of highly radioactive water had leaked from a storage tank and was ranked as category one on INES, the lowest.

Japan's NRA raised that to category three yesterday, or a "serious incident." The 2011 meltdown of the three reactors at Fukushima is in the highest severity category of seven on the INES scale, the same as Chernobyl.

### **Overseas Concern**

"This INES evaluation is based on the 300-ton leak, but I really wonder if we can trust data provided by Tepco," Toyoshi Fuketa, a commissioner at the NRA, said at a meeting in Tokyo. "I really wonder if we should judge based on Tepco's data."

In two separate incidents this month, workers were exposed to radioactive releases at the plant. Prime Minister Abe has said that Tepco alone isn't able to handle the clean-up, promising more government funds without detailing how they'd be used.

### **Nuclear Accidents**

Tepco needs "to stop going from crisis to crisis and have a systematic approach to water management," Dale Klein, the chairman of an advisory panel to Tepco and a former head of the U.S. Nuclear Regulatory Commission, said yesterday in an interview.

INES is a means to measure nuclear accidents in terms of their effects on health and the environment, according to the International Atomic Energy Agency. Each of its seven steps represents a ten-fold

increase in severity. The IAEA last night said it takes the leaks in Japan “seriously” and that it “remains ready to provide assistance on request,” according to a statement on its website. The U.S. Nuclear Regulatory Commission is also ready to provide assistance if requested, agency spokesman Scott Burnell said.

A seven rating means there has been a “major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures,” according to the INES fact sheet.

Japan’s regulator raised the INES rating on the water leak based on radiation levels reported by the utility this week and on an evaluation of measures at the plant to prevent such incidents. The IAEA will be the final arbiter of where the leak will sit on the severity scale.

To contact the reporters on this story: Jacob Adelman in Tokyo at [jadelman1@bloomberg.net](mailto:jadelman1@bloomberg.net); Yuji Okada in Tokyo at [yokada6@bloomberg.net](mailto:yokada6@bloomberg.net); Peter Langan in Tokyo at [plangan@bloomberg.net](mailto:plangan@bloomberg.net)

## **Fukushima disaster worsens, Japan sends first international SOS**

<http://www.beyondnuclear.org/japan/2013/8/22/fukushima-disaster-worsens-japan-sends-first-international-s.html>

For the first time since Japan’s nuclear catastrophe erupted two and half years ago at the Fukushima Daiichi nuclear power station, Tokyo Electric Power Company (TEPCO) requested international aid in an increasing desperate fight to bring the worsening disaster under control.

TEPCO Vice President Zengo Aizawa sent the country’s first international SOS since the March 2011 catastrophe as highly radioactive water continues to leak at higher rates and in greater concentrations of contamination into the aquifer that flows under the reactor wreckage into the Pacific Ocean. Another storage tank has failed spilling 300 more tons of radioactive water onto the site from the growing number of units in a makeshift tank farm now containing nearly 400,000 tons of highly contaminated water. Contaminated water used to keep the melted reactor cores cool is being continuously pumped up out of reactor building basements into the tank farm. The continuous pumping operations are overwhelming an already dubious plan to decontaminate the growing toxic backlog before release. The storage tanks themselves are now beginning to fail.

Efforts to divert and dam the movement of groundwater flowing from the mountains, under the damaged reactor site and on into the Pacific Ocean have not only failed but are increasing the risk of a new and larger catastrophe as the site is increasingly unstable. More than 1000 tons of groundwater are estimated to flow daily under Fukushima Daiichi towards the ocean. A glassified dam, five feet tall, injected below grade into the earth between the reactors and the ocean has failed to stop the radioactive flood into the Pacific. This build-up of contaminated groundwater is now topping the glass dam and saturating the ground around and under the reactor site so that another significant earthquake could liquefy the earth under the damaged complex including a huge nuclear waste storage pool that is common to all six units. In total, Fukushima Daiichi’s nuclear waste storage pools contain an estimated 2,000 tons of irradiated nuclear fuel bundles that must remain gamma ray-shielded underwater as well as continuously cooled. Hundreds of tons of this high-level nuclear waste remain in precarious roof top storage ponds elevated more than fifty feet up in the remains of six units, including the four that are severely damaged after multiple reactor meltdowns and hydrogen explosions. If any of these storage pools were to

catastrophically fail, a renewed atomic fire could ignite and burn in the open atmosphere in an expanding nuclear catastrophe of global proportions.

An international aid program will need to be a generous, open ended and most importantly transparent if its agenda is to protect the public health, safety and the environment rather than continue to shield and promote an increasingly desperate global nuclear industry.

## Wall Street Journal: "TEPCO has lost control"

### "Tepco Has Lost Control" - What Is Really Happening At Fukushima In Four Charts

<http://www.zerohedge.com/node/477904>

Submitted by Tyler Durden

After a self-imposed gag order by the mainstream media on any coverage of the Fukushima disaster (ostensibly the last thing the irradiated Japanese citizens needed is reading beyond the lies of their benevolent government, and TEPCO, and finding out just how bad the reality is especially since the key driver behind Abenomics is a return in confidence at all costs), the biggest nuclear catastrophe in history is once again receiving the attention it deserves. This follows the recent admission by TEPCO of the biggest leak reported at Fukushima to date, which forced the Japanese government to raise the assessment of Fukushima from Level 1 to Level 3, even though this is merely the catalyst of what has been a long and drawn out process in which Tepco has tried everything it could to contain the fallout from the exploded NPP, and failed. And today, in a startling and realistic assessment of Fukushima two and a half years after the explosion, the WSJ finally tells the truth: "**Tepco Has Lost Control.**"

Here is how the mainstream media, in this case the Wall Street Journal, catches up with a topic covered extensively in the "alternative" media for the past several years:

"**This is what we have been fearing,**" said Shunichi Tanaka, chair of Japan's Nuclear Regulation Authority, answering questions about the leak at a news conference. "We cannot waste even a minute" to take action.

Behind the leak is a more serious problem: During the past few months **it has become clear that Tepco has lost control over the flow of water at the plant and that the problem is escalating,** nuclear experts say.

**Every day, the utility has to find a place to store around 400 tons of contaminated water that it pumps out of the radioactive reactor buildings, and Wednesday it warned that it is fast running out of space.** Storage tanks set up on the fly during plant emergencies have started springing leaks, and Tepco can't replace them with sturdier ones fast enough. Groundwater-contamination levels are spiking at the seaward side of the plant, and **water is flowing into the ocean past a series of walls, plugs and barriers that have been flung up to impede its passage.**

What does "losing control" mean in practical terms?

That lack of control is a big liability, said Kathryn Higley, a specialist in the spread of radiation and head of the Department of Nuclear Engineering and Radiation Health Physics at Oregon State University, who spent a week in Fukushima earlier this year.

"You have to find ways to control water coming through the site," Ms. Higley said. "With any sort of accident, you want to control the timing of what's released and when it gets released."

So far, the levels of radioactivity that have escaped to the outside remain relatively low, but some experts warn they may not stay that way—particularly as equipment ages and the heavy-duty work of dismantling the damaged buildings and removing the melted fuel rods proceeds. **The radioactivity of the water in the most recent leak was so high that workers couldn't get close enough to search for the cause until the remaining fluid in the tank was removed.**

Tepco said it doesn't think that water has flowed into the sea **but can't say for sure**. Some of the flooded reactor basements are similarly too hot to approach, **and it is still not clear where the melted fuel cores are**, or in what state.

The last statement bears repeating: ***"it is still not clear where the melted fuel cores are."*** Well as long as TEPCO is 100% confident there are no uncontrolled chain reactions taking place... Then again hundreds of tons of coolant must be cooling something.

**"In the future there might be even more heavily contaminated water coming through,"** said Atsunao Marui, head of the groundwater research group at Japan's National Institute of Advanced Industrial Science and Technology and a member of a blue-ribbon panel set up in May to figure out ways of managing the radioactive water. **"It's important to think of the worst-case scenario."**

Indeed the "worst-case scenario" is an appropriate topic because as covered here over the weekend, it involves the potential death of millions of largely oblivious Japanese citizens. As for the long overdue *mea culpa* by a nationalized TEPCO, which also speaks for the entire Japanese government, it sounds hollow at best and makes one wonder what else is left unsaid.

Mr. Marui and others say the biggest reason for the scramble now is that Tepco—and the government bodies that oversee it—**weren't planning far enough ahead and waited too long to respond to problems they should have seen coming long ago.**

"They're only responding after the fact—they're not thinking ahead," said Hajimu Yamana, a professor of nuclear engineering at Kyoto University who earlier this month was named chair of a new institute charged with helping develop measures to tackle the longer-term work of dismantling the plant. "As an expert, I was watching it with frustration."

**"We have not remained idle, but we admit that we have been reactive,"** Zengo Aizawa, Tepco executive vice president for nuclear public relations, said at a news conference Wednesday, during which the company was grilled about the leak. **"We are very, very sorry for causing concern."**

The concerns are piling up. Earlier today Reuters reported that TEPCO "admitted to new spots of high radiation had been found near storage tanks holding highly contaminated water, raising fear of fresh leaks as the disaster goes from bad to worse."

In an inspection carried out following the revelation of the leakage, high radiation readings - 100 millisieverts per hour and 70 millisieverts per hour - were recorded at the bottom of two tanks in a different part of the plant, Tepco said.

Although no puddles were found nearby and there were no noticeable changes in water levels in the tanks, the possibility of stored water having leaked out cannot be ruled out, a Tokyo Electric spokesman said.

The bottom line, and what has become painfully clear, is that Japan simply can't fix the problem. Even China has now figured it out.

China said it was "shocked" to hear contaminated water was still leaking from the plant, and urged Japan to provide information "in a timely, thorough and accurate way".

What is strangest of all is that the Japanese people are far less concerned about the government's cover up. Oh well: they have their distractions - like a plunging currency, and (transitorily) soaring stock market, in nominal terms of course.

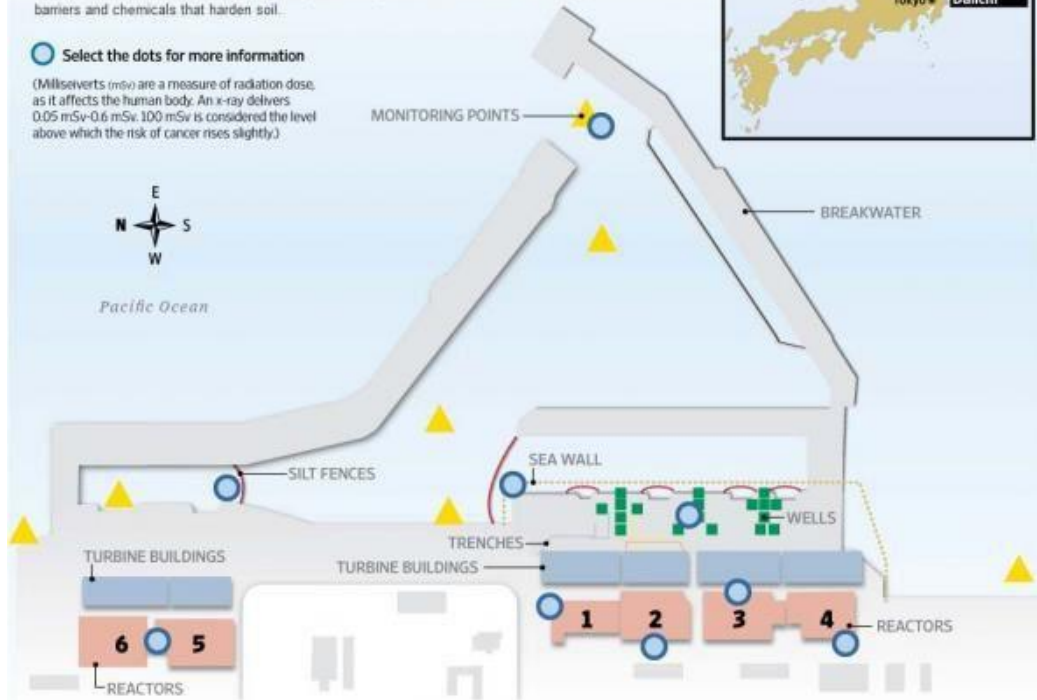
Finally the following four charts from the WSJ provide a full breakdown of the current state of play at the devastated nuclear power plant.

## Contamination and Containment

A large part of the battle at Fukushima Daiichi is preventing radioactive contamination from spreading out from the plant. Right after the accident, much of the radiation released from the meltdowns was spread through the air. That's now less of a concern: The plant is no longer spewing radioactive steam, and Tepco has taken steps to keep radioactive dust and other particles from flying out of the damaged reactor buildings. But contaminated water is still a big problem, with Tepco finding high levels of radioactive elements in wells and trenches at the site, and in the sea itself. Tepco is trying to keep the water problem contained with walls, caps, barriers and chemicals that harden soil.

### Select the dots for more information

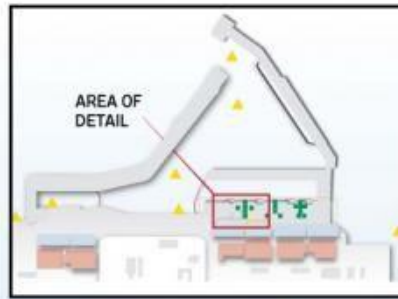
(Milliseverts (mSv) are a measure of radiation dose, as it affects the human body. An x-ray delivers 0.05 mSv-0.6 mSv. 100 mSv is considered the level above which the risk of cancer rises slightly.)



Sources: Tepco, Ministry of Economy, Trade and Industry, staff reports. Approximate graphics based on Tepco's diagrams.

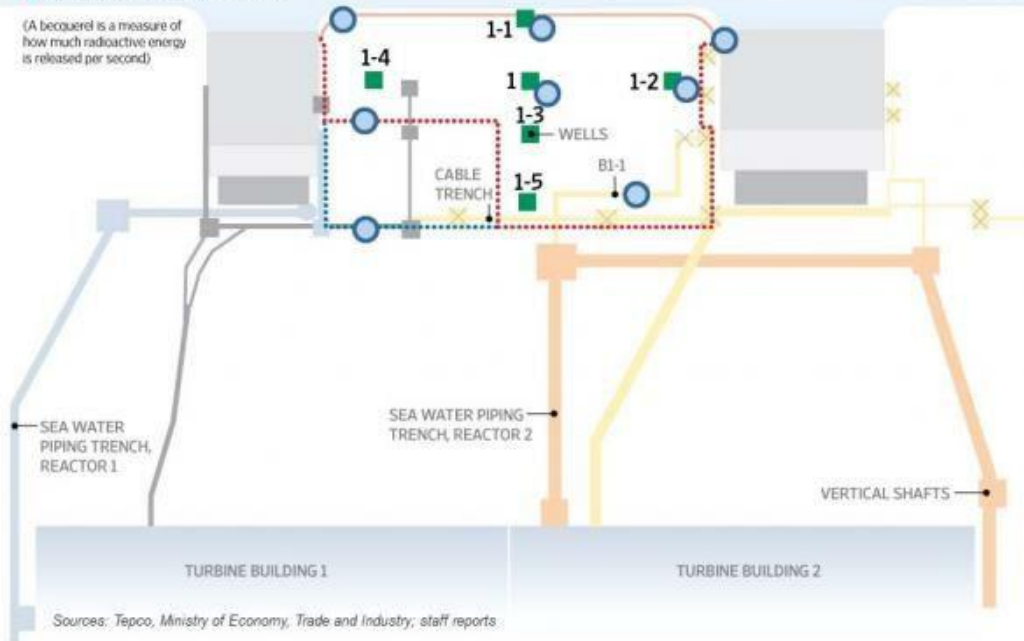
## Trenches and Wells

Tepco is finding highly contaminated water on the seaward side of the damaged reactors, raising fears that some could be flowing into the sea. Wells dug to monitor radiation in groundwater have turned up levels of some elements at hundreds of times past the legal limits. Tepco has found even higher radioactive levels in trenches that housed pipes and cables leading to the sea from reactors 1-4. Some of this water may have been trapped there since the March 2011 accident, when Tepco plugged the ends of the trenches and patched leaks to keep the radioactive contents from contaminating the ocean. More water may have seeped into the trenches from leaks in the heavily contaminated turbine buildings. Tepco plans to draw the contaminated water out and fill in the trenches so more water won't collect there.



Select the dots for more information

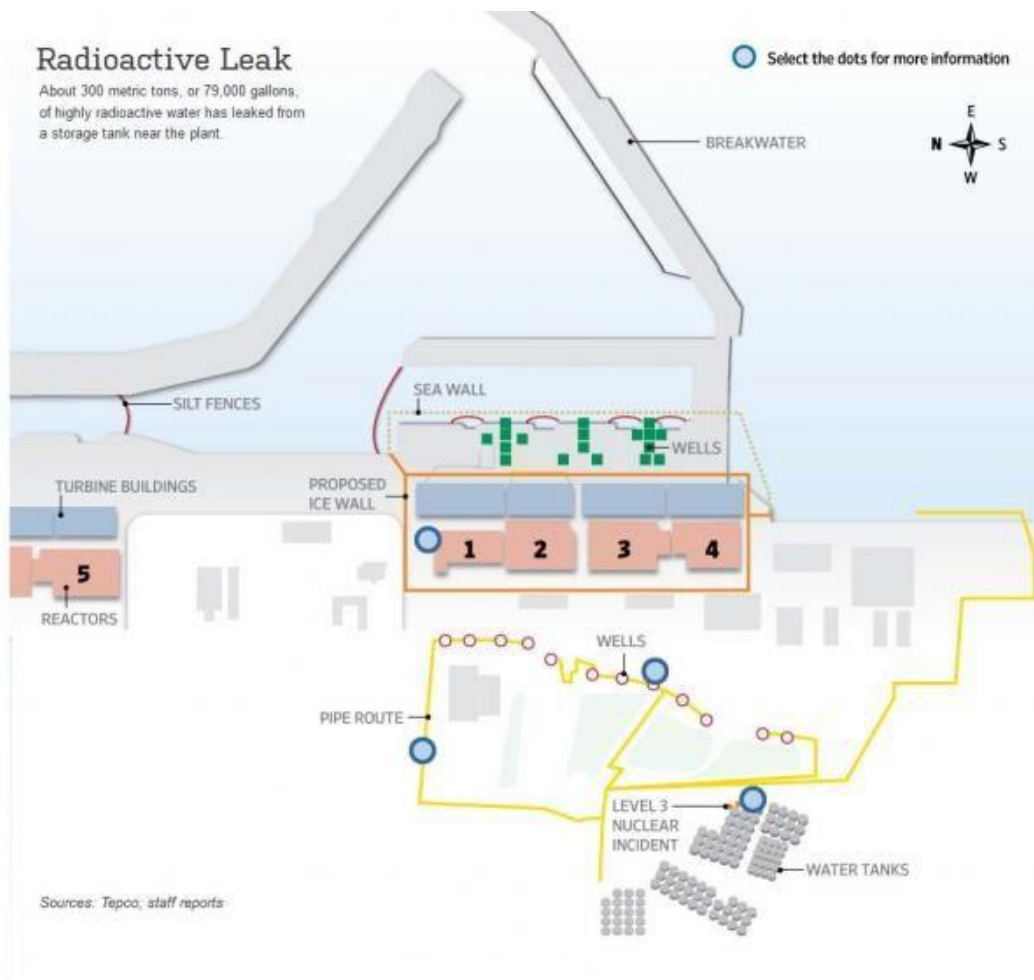
(A becquerel is a measure of how much radioactive energy is released per second)





## Radioactive Leak

About 300 metric tons, or 79,000 gallons, of highly radioactive water has leaked from a storage tank near the plant.



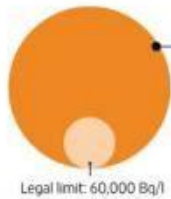
## Groundwater Radiation on the Rise

Teppo has logged spiking levels of radioactive elements in groundwater near the damaged reactors. Although nearby trenches have shown higher levels, the radioactive groundwater is raising fears the contamination could spread.

Bq/l= becquerel per liter

### TRITIUM

- ◆ A radioactive form of hydrogen
- ◆ Byproduct of nuclear fission; also found in nature
- ◆ Tends to flow along with water
- ◆ HALF-LIFE: **around 12 years**



#### HIGHEST LEVELS

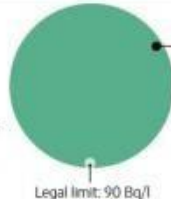
**630,000** Bq/l  
or **10 times** the legal limit.  
Found July 8 in groundwater at the Fukushima Daiichi site, near the coast. This was 20% higher than found in the area in May

#### DANGER

- Thought to be one of the least dangerous radioactive elements
- Far less harmful to the human body than radioactive forms of cesium

### CESIUM-137

- ◆ Radioactive form of cesium, a soft, silvery metal
- ◆ Byproduct of nuclear fission
- ◆ Dissolves easily in water
- ◆ Tends to bind with dirt
- ◆ HALF-LIFE: **around 30 years**



#### HIGHEST LEVELS

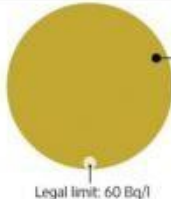
**22,000** Bq/l  
or **240 times** the legal limit  
Found July 9, up 22% from a day earlier

#### DANGER

- Emits strong gamma radiation, which can cause cancer
- Concentrates in muscle tissue but tends to be excreted within a relatively short time
- Long half-life makes it a major concern for radioactive contamination on land

### CESIUM-134

- ◆ Another radioactive form of cesium
- ◆ HALF-LIFE: **around 2 years**



#### HIGHEST LEVELS

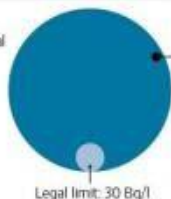
**11,000** Bq/l  
or **180 times** the legal limit  
Found July 9, up 22% from a day earlier

#### DANGER

- Similar to cesium-137 but with much shorter half-life

### STRONTIUM-90

- ◆ A radioactive form of strontium, a silvery metal
- ◆ Byproduct of nuclear fission
- ◆ HALF-LIFE: **around 29 years**



#### HIGHEST LEVELS

**1,200** Bq/l  
or **33 times** the legal limit  
Found June 7

#### DANGER

- Tends to accumulate in bone and bone marrow
- Estimated to be twice as harmful to the human body as cesium-137
- Internal exposure has been linked to bone cancer and leukemia

Sources: Teppo; U.S. Environmental Protection Agency; International Commission on Radiological Protection

August 23, 2013

## NRA in Fukushima

### Nuclear regulators visit Fukushima plant over toxic water leak

<http://mainichi.jp/english/english/newsselect/news/20130823p2g00m0dm082000c.html>

TOKYO (Kyodo) -- Officials of the Nuclear Regulation Authority visited the crippled Fukushima Daiichi nuclear power plant on Friday to check a storage tank from which 300 tons of highly radioactive water is believed to have leaked.

The tank may not be the only source of leaked polluted water, as plant operator Tokyo Electric Power Co. said Thursday that it measured high radiation levels around the bottom of two more tanks of the same type, a sign that water may have oozed out from the containers.

As TEPCO continues to struggle with its cleanup efforts at the stricken plant, a memorial service for Masao Yoshida, who headed the plant when the nuclear crisis erupted there in March 2011, was held in Tokyo the same day.

Yoshida died of esophageal cancer at a hospital on July 9, after stepping down as plant chief in December 2011.

The memorial service was organized by TEPCO. President Naomi Hirose praised Yoshida for "devoting his full strength" to a kind of emergency that no one had ever experienced.

Naoto Kan, who was at that time Japan's prime minister, told reporters after attending the event that "It is because of Yoshida that the situation (at the plant) did not further deteriorate."

TEPCO said Yoshida's radiation dose after the accident was 70 millisieverts, less than the 100-millisievert limit for nuclear workers over a five-year period, and believe there was little causal relationship between his disease and his exposure to radiation.

### **More tanks at embattled Fukushima plant may have leaks**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308230054>

More tanks at the stricken Fukushima No. 1 nuclear power plant site may have leaks as Tokyo Electric Power Co., the plant operator, said on Aug. 22 that high radiation levels were detected near a second section of storage tanks.

Although no confirmation was made of a leak or water accumulating in that area, a TEPCO official said, "We cannot deny the possibility that a minor leak of contaminated water occurred."

TEPCO officials said the latest detection of radiation was in a different section of tanks than the section in which 300 tons of contaminated water was found to have leaked from a tank on Aug. 19.

Radiation levels of between 70 to 100 millisieverts per hour were detected at the bottom of two of the section's 11 storage tanks.

The tanks each hold about 1,000 tons of contaminated water, from which radioactive cesium has been removed.

An inspection of those tanks found that water levels had not dropped and there were no obvious signs of a leak. The area where the high radiation was detected will be decontaminated so workers can search for the source of the radiation.

The latest radiation detection occurred as workers were checking all 300 tanks that have similar structures to the one from which contaminated water leaked, which feature steel shafts connected by steel bolts instead of being welded together.

The tanks were installed to hold the vast amount of radioactive water that is being generated in cooling the plant's crippled reactors.

## **TEPCO failed to properly monitor tanks and to keep records of inspections**

### **Agency: TEPCO's monitoring of failing storage tanks inadequate**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308230088>

REUTERS

The operator of the wrecked Fukushima nuclear power plant **failed to properly monitor storages tanks** holding dangerously contaminated water that have sprung leaks and are a source of international concern, the country's nuclear regulator said on Aug. 23.

Tokyo Electric Power Co. also **failed to keep records of inspections of the tanks**, Nuclear Regulation Authority member Toyoshi Fuketa, told a press briefing in Hirono village, after a visit to the nearby Fukushima No. 1 nuclear power plant.

Japan's nuclear crisis this week escalated to its worst level since a massive earthquake and tsunami crippled the Fukushima plant more than two years ago, with TEPCO saying a tank holding highly contaminated water leaked 300 tons of fluids. It was the fifth and most serious breach of the same type of tank.

The U.N.'s International Atomic Energy Agency (IAEA) said on Aug. 21 it viewed the situation at Fukushima "seriously" and was ready to help if called upon, while nearby China said it was "shocked" to hear contaminated water was still leaking from the plant, and urged Japan to provide information "in a timely, thorough and accurate way."

## Digging-up contaminating soil

### Tepco testing tainted earth at No. 1 plant

Jiji, Kyodo, AFP-JIJI

<http://www.japantimes.co.jp/news/2013/08/23/national/tepcos-testing-tainted-earth-at-no-1-plant/#.UheVKX9Sab0>

#### *Utility begins digging ground to assess extent of contamination*

FUKUSHIMA – Tokyo Electric Power Co. on Friday started digging up soil tainted with highly radioactive water discharged from a storage tank at its Fukushima No. 1 nuclear plant to test its radiation levels.

The utility will dig areas measuring 12 sq. meters in total to a depth of 40 to 50 cm where pools of leaked radioactive water formed, and then measure levels to determine how far the contamination has spread and how much soil needs to be removed.

Some 300 tons of highly radioactive water recently spewed into the Pacific from one of 26 tanks built in an area just 500 meters from the plant's seawall. The tanks are surrounded by dikes, but some 120 liters of the water leaked outside of them, making it necessary to collect soil to prevent the contamination from spreading.

Meanwhile, a 15-member team from the Nuclear Regulation Authority visited the Fukushima No. 1 complex Friday to check the storage tank from which the 300 tons of water is thought to have escaped.

The tank may not be the only source of leaked water, as Tepco said Thursday that it had detected high radiation levels around the bottom of two more tanks of the same design, an indicator that water may have leaked from those containers as well.

The nuclear watchdog's team began the inspection Friday morning, an NRA official said.

Tepco has said puddles of water near the leaking tank were so toxic that anyone exposed to them would receive the same amount of radiation in an hour that a nuclear plant worker in Japan is allowed to receive in five years — 100 millisieverts.

Groundwater that mixed with the tainted water has already flowed to the ocean, and Tepco said Friday it has launched an operation to pump it out of 28 wells.

Meanwhile, a memorial service for Masao Yoshida, who headed the complex when the crisis started in 2011, was held in Tokyo the same day. Yoshida, who stepped down as plant chief in December 2011, died of esophageal cancer July 9.

The memorial service was organized by Tepco, and its president, Naomi Hirose, praised Yoshida for “devoting his full strength” to the kind of emergency no one had ever previously experienced in Japan. Naoto Kan, prime minister when the crisis started, said after the event that “it is because of Yoshida that the situation did not further deteriorate.”

Tepco said Yoshida's radiation dose after the accident was 70 millisieverts, less than the 100-millisievert five-year limit for nuclear workers, and that it believes there was little causal relationship between his radiation exposure and the cancer.

## **Repeating it is doing its best is not sufficient**

### **Nuclear regulator urges TEPCO to seek help**

[http://www3.nhk.or.jp/nhkworld/english/news/20130823\\_30.html](http://www3.nhk.or.jp/nhkworld/english/news/20130823_30.html)

An official from Japan's nuclear regulator has urged the operator of the damaged Fukushima Daiichi nuclear plant to seek government help if it cannot handle the massive volumes of radioactive water on its own.

Nuclear Regulation Authority Commissioner Toyoshi Fuketa visited the plant on Friday. The move comes as the Tokyo Electric Power Company found on Monday that 300 tons of highly radioactive water had leaked from one of many storage tanks installed at the plant.

Fuketa inspected an area near the tank. He later told reporters that the utility had not considered the possibility of leakage from a tank and was ill-prepared. Fuketa also criticized the company for not keeping records of radiation levels near the tanks on a regular basis. He said such records would have helped workers notice abnormalities more quickly.

**Fuketa said company officials told him they would need 4 times the current number of workers to reinforce inspections.** The commissioner said he told the officials to ask for help if they needed it.

**Fuketa said he wants the plant operator to have the courage to admit the limits of its efforts, instead of simply repeating that it is doing its best.** He added if there are problems with funding or manpower they should be conveyed to relevant government offices.

The utility is battling to contain a series of leaks of contaminated water that is building up on the compound.

The industry ministry earlier estimated that 300 tons of radioactive groundwater was leaking into the ocean on a daily basis.

August 24, 2013

## High concentrations of tritium in Fukushima port

### High-level radioactive tritium found in seawater at Fukushima plant port

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308240067>

Concentrations of radioactive tritium in seawater from the port of the stricken Fukushima No. 1 nuclear power plant have risen between eight and 18 times in one week, Tokyo Electric Power Co. said Aug. 23.

It seems highly likely that the contaminated water is spreading into the sea beyond the port.

The latest levels are the highest since June, when TEPCO, the plant operator, strengthened its monitoring after discovering that groundwater contaminated with radioactive materials around the No. 1, No. 2 and

No. 3 reactors was leaking into the sea. The latest concentration levels were still lower than the permissible standards stipulated by the government.

According to TEPCO, 68 becquerels of radioactive tritium per liter of water were detected in seawater collected Aug. 19 in the entrance area to the port, which is located some 500 meters from the nuclear plant. On Aug. 12, the concentration in the same area was lower than the limit for detection.

Fifty-two to 67 becquerels of radioactive tritium were also detected in seawater taken in four other locations in the port.

Meanwhile, after an on-site investigation on Aug. 23, the Nuclear Regulation Authority said that TEPCO has not properly recorded results of regular inspections on tanks used to store highly contaminated water.

The slipshod manner in managing the contaminated water in the tanks led to the leakage of a large amount of water from one of the tanks, according to the NRA.

The nuclear watchdog immediately instructed TEPCO to strengthen its inspection and management of the contaminated water in the tanks.

The utility has conducted inspections on those tanks twice a day to check for leaks. However, it failed to notice the leakage of about 300 tons of water from one of the tanks.

There are concerns the contaminated water has leaked into the sea.

On Aug. 23, Toyoshi Fuketa and other members of the NRA conducted an on-site investigation of the nuclear plant. They demanded that TEPCO show records of regular inspections on the storage tanks. However, it was found that the utility did not have the records on radiation levels, the time inspections were carried out or other details.

The NRA said that if TEPCO had measured radiation levels and recorded them, it likely would have noticed the leakage of contaminated water from the tank much earlier. However, TEPCO only observed the exteriors of the tanks to check for leaks.

On Aug. 23, a government committee to deal with contaminated water held a meeting in which many members called for a review of the storage methods for contaminated water. However, they were unable to find a drastic method to solve the leakage of contaminated water.

If an appropriate method cannot be found, the only option will be to lower the concentration of radioactive materials in water stored in the tanks. That will reduce the risk to the environment in the event of further leaks.

TEPCO has long intended to get what is known as the Advanced Liquid Processing System, which can remove a variety of radioactive materials from contaminated water, fully operational. Even though the process cannot remove tritium, NRA Chairman Shunichi Tanaka said, "If the ALPS is used, the risks will decrease drastically."

But that hasn't gone according to plan. Initially, TEPCO planned to start test operations last September. However, the start was delayed to March this year. Corrosion was discovered in some of the ALPS equipment during a test run of the system in July. The system is currently undergoing repairs and it is not known when it will be fully operational.

TEPCO is also grappling with the problem of halting contaminated groundwater around the No. 1, No. 2 and No. 3 reactors from flowing into the sea. The government estimates that about 300 tons of groundwater is flowing daily to the sea.

TEPCO has constructed shielding walls in the ground by solidifying the soil with a chemical agent. As a result, however, the levels of contaminated groundwater have risen, and there now exists the danger that water will rise beyond the shielding walls and flow into the ocean.



On Aug. 23, TEPCO completed the assembly of equipment to pump out groundwater to lower the water level in the ground. Using vacuum pumps, the equipment can remove a maximum of 70 tons of groundwater per day from 28 locations.

However, the shielding walls cannot completely prevent leakage of contaminated water into the sea. TEPCO also said it is likely that of the highly contaminated water that has accumulated in pits, about 10 liters are flowing into the sea every day. On Aug. 22, TEPCO started to pump out the water from the pits. Elsewhere, the latest developments prompted the Fukushima prefectural fishery recovery council on Aug. 23 to postpone the restart of commercial fishing on an experimental basis. The council had initially planned to restart fishing in early September.

## The Economist: "No end in sight"

<http://www.economist.com/news/asia/21584054-fukushima-nightmare-lingers-no-end-sight>

THE agonising efforts to clean up the crippled Fukushima Dai-ichi nuclear power plant hit new obstacles this week. On August 21st the Nuclear Regulation Authority (NRA) said that leaks of radioactive water were a level three, or "serious", incident on a scale that goes up to seven. Some help from American experts aside, Japan has been dealing with the disaster itself. Now, even Tokyo Electric Power (TEPCO), the plant's owner, would welcome foreign help.

TEPCO is under intense fire at home. It "has no sense of crisis at all", grumbled Shunichi Tanaka, chairman of the NRA, as the leaks worsened. Another NRA commissioner questioned whether TEPCO's data could even be trusted. After months of denial, the firm has only just admitted that contaminated water is leaking into the Pacific. China and South Korea have both expressed concern.

The plant's melted reactor cores are tainting both the hundreds of tonnes of water pumped into them each day and the groundwater, producing vast quantities of radioactive liquid. After underground pools leaked, TEPCO has hastily built around 1,000 surface storage tanks. Several are leaking from joints sealed with plastic. The most recent leak, of 300 tonnes, prompted the NRA alert. Experts say many more tanks are at risk.

A shortage of cash may have heightened the crisis. TEPCO faces massive bills for replacement fuels and compensating evacuees. It failed to install even the most basic system to monitor water leaks. Its workers stand on tanks and memorise water levels. The NRA this week ordered TEPCO to install water gauges at once. "What's needed is tanks with stainless-steel seals, but that would take time and money," says Neil Hyatt, professor of radioactive-waste management at the University of Sheffield.

Another explanation for the neglect at Fukushima Dai-ichi is that Japan, under the pro-nuclear Liberal Democratic Party, is rushing to turn its nuclear reactors back on. All but two are now closed. Importing energy hits Japan's trade balance as well as TEPCO. Instead of scrutinising the operator's jerry-rigged water tanks, the NRA has been busy drafting new safety regulations. Public opposition already meant that

restarting reactors would cause a big fight. With Fukushima Dai-ichi ever more visibly out of control, Japan's energy conundrum just got worse.

August 25, 2013

## Seals?

### **Tepco's tank leaks blamed on seals, reassembly**

AP, AFP-JIJI, Kyodo

<http://www.japantimes.co.jp/news/2013/08/25/national/tepc-to-drain-two-suspect-water-tanks-at-fukushima-no-1/#.Uhod9H9Sab0>

The huge radioactive water leak discovered at a storage tank last week at the Fukushima No. 1 nuclear plant was likely caused by deteriorating rubber seams and distortions that emerged after the tank was reassembled, Tokyo Electric Power Co. says.

Tepco said Saturday that the temporary tank, which held water used to cool the melted fuel in three of the plant's shattered reactors, was moved and reassembled after it began sinking two years ago amid subsidence at the site.

On Aug. 19, Tepco revealed that 300 tons of the tainted water had vanished from the tank, marking the fifth and worst leak there since the March 2011 mega-quake and tsunami triggered the man-made disaster.

All five of the temporary tanks involved in the leaks were collapsible and held together by rubber seals, meaning they were less durable than those with welded seams.

Tepco spokesman Noriyuki Imaizumi said the tank passed a water-tightness test and other safety requirements after it was reassembled, but that the leak might have started when the seals began deteriorating, leading to contortions in the tank.

Tepco has not pinpointed the source of the leak but is concerned that moving and rebuilding it contributed to the incident, rated Level 3 on the International Nuclear Event Scale.

In all, three of the temporary tanks have had to be dismantled and moved because of sunken foundations, the beleaguered utility said. The tanks were relocated in September 2011.

The water in the other two, which are also at risk of leaking, was put in other tanks Sunday.

Nuclear regulators have raised concerns about the flaws of rubber-seam tanks and are urging Tepco to switch to welded-seam tanks, which take longer to assemble and are more expensive.

Tepco said it believes the water went directly into the ground, but that some might have flowed into the Pacific via a rain gutter.

About one-third of the plant's nearly 1,000 storage tanks are of the rubber-seal type.

Nuclear regulators who toured the crippled plant after the leak was reported declared Friday that the handling of water storage at the site was "sloppy."

More than two years since the crisis began, Tepco is stumbling badly on the cleanup while the water threatens to spark another environmental disaster.

Calls are growing for outside experts to step in and take control of the operation.

## **Ground subsidence could have damaged leaky tank at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308250040>

A tank that caused a serious leakage of radioactive water in the compound of the crippled Fukushima No. 1 nuclear power plant **was transferred to its current location after causing the ground to subside where it was previously situated**, Tokyo Electric Power Co., operator of the plant, said on Aug. 24.

TEPCO said the tank may have been damaged or distorted when the ground settled unevenly, which led to the leakage of about 300 tons of water highly contaminated with radioactive materials. The utility has acknowledged that the water may have reached the ocean, triggering a new crisis as it searches for the cause of the leak.

The 11-meter-high cylinder-shaped tank, with a diameter of 12 meters, has a storage capacity of 1,000 tons of water. It is made of steel plates connected with bolts, rather than being welded, which is considered a more sturdy construction method.

According to TEPCO, three tanks, including one that leaked the contaminated water, were initially installed at the previous location in June 2011.

The next month, workers poured water into the tanks to see whether they would leak. At that time, the ground subsided about 20 centimeters. Because of that occurrence, they dismantled the tanks.

Subsequently, the workers installed the tanks in the current location in October 2011. At that time, a subcontractor that checked the effects of the ground subsidence told TEPCO that there were no problems with them. They also poured water into the tanks at that time and confirmed that they were not leaking. TEPCO plans to transfer highly contaminated water not only from the leaking tank, but also from the other two tanks on the site as a precautionary measure.

About 350 tanks of the same structure are currently being used in the compound of the nuclear plant to store water that was contaminated with radioactive materials.

"We are considering replacing them with new ones," Zengo Aizawa, TEPCO executive vice president in charge of the nuclear power division, told reporters in the Fukushima prefectural government office in Fukushima on Aug. 24.

## **Tank where toxic water leaked may have been deformed: TEPCO**

<http://mainichi.jp/english/english/newsselect/news/20130825p2g00m0dm006000c.html>

TOKYO (Kyodo) -- A huge storage tank from which about 300 tons of highly radioactive water leaked at the crisis-ridden Fukushima Daiichi nuclear power plant may have deteriorated and become deformed as a result of being moved and reassembled, plant operator said Saturday.

Tokyo Electric Power Co. said the tank was first installed at a different location in June 2011, after the Fukushima nuclear disaster was triggered by a huge earthquake and tsunami in March 2011.

But after its foundation was found to have cracked after the tank sank in the ground, it was dismantled and reassembled at its current location where the leak occurred, the utility said.

TEPCO is investigating whether partial damage or deterioration in the tank, whose foundation sank about 20 centimeters, had anything to do with the leakage.

The tank was one of three tanks that had to be dismantled and relocated because their foundations sank, the utility said. The tanks were relocated in September 2011.

The contaminated water in the two other tanks, which are also at risk of leaking, will be transferred to other tanks on Sunday.

TEPCO said workers, before reusing the tanks after reassembly, confirmed with their naked eyes that there were no leaks when they filled them with water.

On Monday TEPCO first noticed puddles with high radiation levels -- about 100 millisieverts per hour -- near where many storage tanks stand.

Some of the radioactive water might have flowed into the adjacent Pacific Ocean via drainage channels, data provided by TEPCO showed Wednesday. The same day, the Nuclear Regulation Authority said it is considering raising the severity assessment of the event to level 3 on an eight-point international scale from level 1.

Level 3 on the International Nuclear and Radiological Event Scale is defined as a "serious incident."

August 26, 2013

## Don't count on ALPS before September

### ALPS filter off till at least September

<http://www.japantimes.co.jp/news/2013/08/26/national/alps-filter-off-till-at-least-september/#.UhtjRX9Sab0>

Bloomberg

Tokyo Electric Power Co. said Monday that one of two radioactive water filters will be shut until at least September at its stricken Fukushima No. 1 nuclear plant, even as it searches for the cause of a leak that prompted the biggest escalation in the crisis since it started in March 2011.

The loss of the advanced liquid processing system, taken offline Aug. 8 due to corrosion, compounds concerns that the utility is losing its battle, now raging for two years, to manage the buildup of radioactive water. The lost layer of filtration adds to the contamination levels of water in the plant's storage tanks, hundreds of which may be susceptible to leaks.

Tepco said Monday it will set up a special unit to deal with the storage of highly radioactive water, most of which had been used to keep its three melted reactors cool and is increasing at a rate of 400 metric tons a day. The step comes a week after a storage tank leaked 300 tons of highly radioactive water, an event the Nuclear Regulation Authority labeled a “severe incident” in its worst assessment of the problems at Fukushima since the earthquake and tsunami of 2011 led to the three meltdowns.

“We are inspecting all the parts now,” Tepco spokeswoman Mayumi Yoshida said of the idled ALPS unit, which was made by Toshiba Corp. “We are aiming for September,” she said regarding the ALPS restart. ALPS, which began operating in March, was taken offline after the radioactive water it was designed to filter was found corroding its pipes and basins, Yoshida said. It’s being treated with a protective coating. ALPS is used to filter strontium and other radioactive elements from water after it’s used to cool the melted reactor fuel. Water is pumped through the system after being first treated via a separate filtration unit for removing cesium. That system remains in operation.

After the two layers of filtration, only tritium should remain in the water when it is added to the hundreds of thousands of tons already in storage at the site.

The tank that leaked had levels of beta radiation of 80 million becquerels per liter, including strontium, Tepco said Aug. 20. That’s 8 million times the safety limit for drinking water under health ministry guidelines. Strontium has been linked to bone cancers.

There are about 300 tanks with designs similar to the leaky unit. Two others have had radioactive hot spots detected on their seams. The NRA said the chance of other tanks leaking is the biggest concern at Fukushima No. 1.

An inspection of the leaky tank, which can hold 1,000 metric tons of radioactive water, was inconclusive, Tepco official Noriyuki Imaizumi said Saturday. He said the tank had been built in a different location before earth subsidence forced it to be disassembled and moved to its current site. He said it isn’t known if this contributed to the leak.

The tanks were installed by a joint venture of Shimizu Corp., Taisei Corp. and Hazama Ando Corp., Yoshida said.

The NRA rated the leak as a 3 on the 7-stage International Nuclear and Radiological Event Scale, or INES, denoting a “serious incident.” That was the highest-level accident since the March 2011 start of the crisis, which received a level 7, the same as Chernobyl.

## **Decontamination work**

JJI

FUKUSHIMA

If the first round of decontamination work fails to sufficiently reduce radiation levels in evacuation areas near the crippled nuclear power plant in Fukushima Prefecture, a second round will be considered, a senior government official indicated Monday.

Once the first round is finished the central government will monitor radiation levels in those areas, Senior Vice Environment Minister Shinji Inoue told reporters at the Fukushima Prefectural Government office.

Municipalities in the prefecture are seeking further decontamination since radiation levels have not declined to an annual dose of 1 millisievert.

## New task force for leaks : 8 teams in Tokyo, 4 in Fukushima

### TEPCO sets up task force for water leaks

[http://www3.nhk.or.jp/nhkworld/english/news/20130826\\_35.html](http://www3.nhk.or.jp/nhkworld/english/news/20130826_35.html)

Tokyo Electric Power Company says it will set up a task force to manage radioactive water leaks at the Fukushima Daiichi nuclear power plant.

TEPCO President Naomi Hirose told reporters on Monday that he will directly oversee the task force. He called the leaks an urgent and pressing issue for the utility.

**The task force will have 8 teams at the company headquarters in Tokyo, and 4 at the crippled plant.**

The teams will include officials from company divisions. A leader will gather information from all teams, and address potential risks.

TEPCO has been criticized for mishandling problems because of insufficient information-sharing between divisions.

The utility will invite Japanese and foreign experts as technical advisors for the task force. Vice President and nuclear division chief, Zengo Aizawa, will be stationed in Fukushima.

TEPCO also announced measures to prevent leaks of radioactive wastewater from storage tanks.

TEPCO says the leaks may have come from open valves connected to barriers surrounding the tanks. The company says the valves will be closed from now.

The company will also install water gauges on all tanks.

In addition, tanks with bolted plates will be replaced with those more resistant to leaks.

## Meanwhile... it is still leaking

### Radioactive water leakage continues

[http://www3.nhk.or.jp/nhkworld/english/news/20130826\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20130826_33.html)

Contaminated water continues to accumulate at the crippled nuclear power plant nearly 2 and half years after the accident in Fukushima Prefecture. Workers are still unable to say when they will be able to stop the water from seeping into the ocean.

In May, highly radioactive groundwater was detected in an observation well on the sea side of one of the reactor buildings. Levels of radioactive materials in nearby waters have since risen.

The plant operator, Tokyo Electric Power Company has been trying to contain tainted groundwater from leaking into the ocean since the accident.

Measures include solidifying the ground facing the coastal area by using chemicals and pumping out groundwater near the embankments.

But all the attempts have been unsuccessful. In addition, the utility has yet to pinpoint the cause of the contaminated groundwater.

TEPCO workers are struggling to remove the existing contaminated water from under the ground. There is also a need to monitor the arrival of large amounts of groundwater to prevent it from being contaminated. But there is a lack of funds and technology.

Earlier this month, more than 300 tons of contaminated water in a storage tank leaked and some of it is believed to have seeped into the ocean through a ditch.

TEPCO has come under fire for failing to detect the problem quickly and minimizing the leakage. The plant operator has also been criticized for not confirming the soundness of the tanks.

A government expert panel and other groups are demanding that speedy measures be taken to deal with the crisis.

### **TEPCO countermeasures against leaks**

[http://www.tepco.co.jp/en/press/corp-com/release/betu13\\_e/images/130826e0201.pdf](http://www.tepco.co.jp/en/press/corp-com/release/betu13_e/images/130826e0201.pdf)

Countermeasures to mitigate risks regarding the water leak from the tank

**Interesting – go directly on TEPCO’s site to check their press release(s)**

August 27, 2013

### **Debris removal at reactor 4 pool**

## Fuel removal of reactor4 pool] Tepco released the debris map of SFP4 -Complete mess

<http://fukushima-diary.com/2013/08/fuel-removal-of-reactor4-pool-tepco-released-the-debris-map-of-sfp4-complete-mess/>

Posted by **Mochizuki**

Tepco plans to start fuel removal of reactor4 spent fuel pool from mid November.

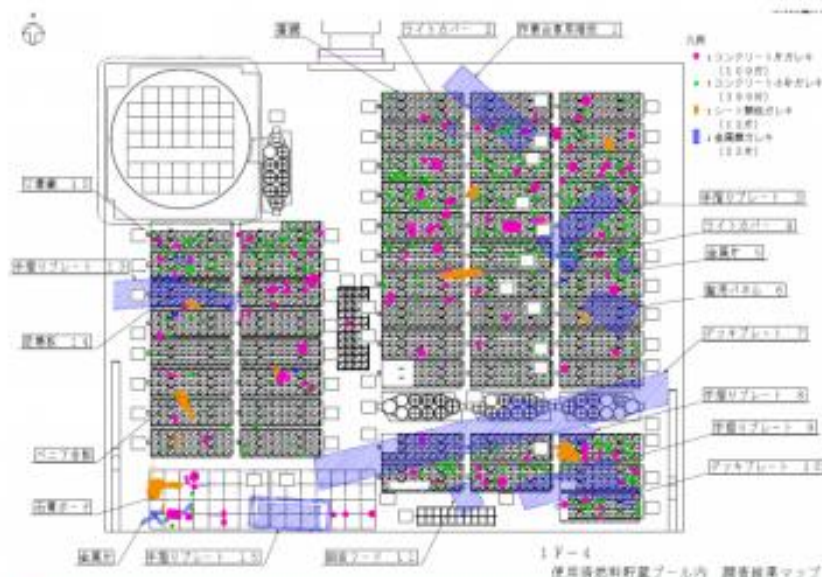
On 8/26/2013, Tepco released the debris map of SFP4 but it looks extremely difficult to remove the assemblies.

Even as long as announced, deck plate of 10m long (200kg), steps for cart of 2m×1m (200kg), stage plank of 1.5m (10kg) and countless numbers of the pieces of concrete debris are on the fuel assemblies.

Tepco states all the debris removal will be operated by human workers.





↓ The colored pieces are all debris to be removed.

### 使用済燃料プールのガレキ散乱状況





## 使用済燃料プール内のガレキ（一例）

<p>デッキプレート</p>  <p>10000× 600× 50 200kg)</p>	<p>作業台車用階段</p>  <p>2000× 600× 1000 200kg)</p>
<p>足場板</p>  <p>1500× 50× 200 (0kg)</p>	<p>小片ガレキ</p>  <p>150× 150× 150程度以下</p>

※ 寸法および重さについては全て概算値となります。

単位 mm



東京電力

4

## Motegi at Fukushima Daiichi

Industry minister inspects Fukushima nuke plant following radioactive water leakage

<http://mainichi.jp/english/english/newsselect/news/20130827p2a00m0na011000c.html>



Economy, Trade and Industry Minister Toshimitsu Motegi, right, inspects storage tanks at the Fukushima No. 1 Nuclear Power Plant in Okuma, Fukushima Prefecture, on Aug. 26. (Mainichi)

OKUMA, Fukushima -- Economy, Trade and Industry Minister Toshimitsu Motegi inspected the crippled Fukushima No. 1 Nuclear Power Plant on Aug. 26 following massive leaks of highly radioactive water from a storage tank there.

Following the inspection, Motegi told reporters that he instructed plant operator Tokyo Electric Power Co. (TEPCO) to take measures including stepped-up patrols of aboveground tanks, the site of the highly publicized water leakage.

"The major problem lies in that the utility failed to manage the tanks properly," Motegi told reporters.

TEPCO also announced additional countermeasures the same day, including setting up a task force and inviting experts from here and abroad.

Besides the storage tanks, Motegi also inspected the site where work is underway to tackle radioactive water leaks.

"The government will take control of the matter hereafter," Motegi told reporters after the inspection.

Because the storage tank in question has bolted joints, the minister instructed TEPCO to add smaller tanks with welded joints -- which are less likely to leak water. He also said he instructed the utility to boost patrols of those tanks from twice a day to four times a day.

Motegi revealed that his ministry will create a new post of director-general level to deal with radioactive water, as well as increase the number of ministry employees stationed at the Fukushima No. 1 nuclear plant.

## Do we have weeks?

### **TEPCO: Tank leak investigation will take weeks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130828\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130828_03.html)

Tokyo Electric Power Company has hinted that it will take weeks to find out why radioactive wastewater leaked from a tank at the Fukushima Daiichi nuclear plant.

TEPCO presented a plan to investigate the problem to the Nuclear Regulation Authority on Tuesday.

About 300 tons of highly contaminated water leaked from the storage tank and it is feared that some of this seeped into the ocean.

TEPCO officials said possible causes of the leak include loose joints, deteriorated parts and corrosion at the bottom or sides of the tank.

The officials said radiation levels in the tank are high, and they plan to remove radioactive materials in the coming week to enable investigators to go inside and check the cause of the leak. The plant operator will then dismantle the tank for further checks.

Nuclear regulators told TEPCO to speed up its investigation. They said if the cause is a problem that could occur in the same type of container, measures must be taken for all of the roughly 300 tanks at the plant.

## And now on the other side

### **TEPCO: High radiation found on other side of tank**

[http://www3.nhk.or.jp/nhkworld/english/news/20130827\\_11.html](http://www3.nhk.or.jp/nhkworld/english/news/20130827_11.html)

The operator of the disabled Fukushima Daiichi nuclear plant says radioactive water may have flowed out of a leaking storage tank in 2 opposite directions.

Tokyo Electric Power Company found on Monday last week that more than 300 tons of highly radioactive wastewater had leaked from one of its storage tanks.

The utility said at the time that the water seeped out of a low barrier around the tanks through an open rainwater drainage valve on the northeastern side.

The company now says workers detected last Thursday a radiation level of 16 millisieverts per hour near an open valve on the southern side as well. The reading was higher than in nearby areas.

TEPCO officials fear contaminated water may have come out from this valve as well. They've decided to remove soil from a wider area as the runoff may have seeped into the ground.

The utility still doesn't know the cause of the leakage or the extent of contamination. Officials suspect some of the water may have flowed into the ocean through a drainage ditch.

August 28, 2013

## Level 3 officialized

### **NRA formally raises Fukushima water leak to INES Level 3 incident**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308280037>

REUTERS

Japan's nuclear regulator said on Aug. 28 it has officially raised the severity rating of the latest radioactive water leak at the crippled Fukushima No. 1 nuclear plant to Level 3 on an international scale for radiological releases.

The upgrade by the Nuclear Regulation Authority (NRA) raises the rating of what was Japan's first warning on the International Nuclear and Radiological Event Scale (INES) since the three reactor meltdowns at the Fukushima plant in March 2011, which were triggered by a massive earthquake and tsunami. Those meltdowns were classified as Level 7, the highest INES rating.

The plant's operator, Tokyo Electric Power Co., said last week that 300 tons of highly radioactive water leaked from a storage tank at the facility. The utility still does not know how long the water may have been leaking and said it was possible the contaminated water may have reached the Pacific Ocean.

The NRA had said last week that it may upgrade the severity of the crisis from a Level 1 "anomaly" to a Level 3 "serious incident" on the INES scale, after consultations with the International Atomic Energy Agency.

### **Fukushima Daiichi leak raised to level 3 severity**

[http://www3.nhk.or.jp/nhkworld/english/news/20130828\\_26.html](http://www3.nhk.or.jp/nhkworld/english/news/20130828_26.html)

Japan's nuclear regulators have raised the level of severity of the radioactive water leak from a tank at the Fukushima Daiichi nuclear plant. It is now a level-3 serious incident.

The revision from level 1 is based on estimates of the volume of radioactive substances leaked.

The leak was found earlier this month at one of the tanks storing highly radioactive water. The plant operator estimates 300 tons of contaminated water flowed out of the tank and through a ditch into the sea.

Officials at the Nuclear Regulation Authority on Wednesday ranked the incident 2 notches higher on the international scale of nuclear and radiological events.

The scale is from zero to 7 and grades nuclear events ranging from no significant safety threat to a major accident.

The International Atomic Energy Agency supports the revision. They say the tank leak can be assessed separately from the Fukushima Daiichi crisis as a level 3 incident. The crisis overall has been ranked as a level-7 major accident.

Japanese experienced a level-3 nuclear event in 1997 with the fire and explosions at a fuel reprocessing plant in Tokai Village, Ibaraki Prefecture. 37 workers there were exposed to the leaked radioactive substances.

### **Japan raises toxic water leak severity at Fukushima plant to level 3**

<http://mainichi.jp/english/english/newsselect/news/20130828p2g00m0dm066000c.html>

TOKYO (Kyodo) -- Japan's Nuclear Regulation Authority decided Wednesday to raise the severity assessment of a recent toxic water leak incident at the crippled Fukushima Daiichi nuclear power plant to level 3 on an eight-point international scale.

The NRA decided to rate the incident two notches higher from its initial assessment after plant operator Tokyo Electric Power Co. said that the highly radioactive water that leaked from one of the huge steel tanks is estimated to total 300 tons, making it the worst leak from the containers.

Level 3 on the International Nuclear and Radiological Event Scale is defined as a "serious incident." The Fukushima nuclear accident, triggered by a huge earthquake and tsunami in March 2011, was rated as the maximum level 7, on a par with the 1986 Chernobyl disaster.

Based on data provided by TEPCO, regulators have said the amount of the leaked radioactive substances totaled several thousand terabecquerels when converted into radioactive molybdenum 99.

The NRA has been consulting with the International Atomic Energy Agency on whether it is appropriate to apply the so-called INES scale to the facilities as they were built as emergency response measures in a nuclear crisis and that the crisis at the Fukushima crisis was already rated as level 7.

The IAEA said that INES is applicable, but noted that frequent changes of rating will not help to communicate the actual situation in a clear manner, according to the IAEA answer sheet provided by the NRA.

"It is important that the information required to properly determine the INES rating against all relevant criteria is collated, and that a defensible rating is determined," the IAEA said.

NRA Chairman Shunichi Tanaka said during a meeting of other commissioners that the NRA should not rush too much to evaluate the problems at the Fukushima plant hereafter and should consider ways to efficiently disseminate information on what is happening and how the problems could affect the environment.

TEPCO is currently using hundreds of tanks at the plant's premises to store a massive amount of radioactive water created as a result of ongoing water injection into three reactors that have suffered meltdowns.

Some of the 300 tons of leaked water could have flowed into the adjacent Pacific Ocean by entering drainage channels.

TEPCO has still not been able to determine from where in the tank the radioactive water escaped. The container, 12 meters in diameter and 11 meters high, is assembled by joining steel plates with bolts.

August 29, 2013

## **More comprehensive monitoring of the sea needed**

### **NRA urges monitoring of Fukushima sea**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201308290075>

THE ASSOCIATED PRESS

Japan's nuclear regulator says the impact that radiation-contaminated water leaks from the country's wrecked nuclear plant is having on the Pacific is not known and the situation must be monitored more closely.

Nuclear Regulation Authority Chairman Shunichi Tanaka said on Aug. 29 that the Fukushima No. 1 nuclear power plant's leaks cannot be plugged immediately. He said the monitoring of the leaks is insufficient and urged a more comprehensive effort to monitor the ocean near the plant.

The plant suffered triple meltdowns after the massive earthquake and tsunami in March 2011. The plant's operator, Tokyo Electric Power Co., must constantly cool the reactors with water, and is struggling to contain the waste.

TEPCO recently acknowledged the chronic leaking of radiation-tainted underground water into the Pacific, plus a 300-ton (300,000-liter, 80,000-gallon) seepage from a storage tank.

## Gov't planning countermeasures asap

### Govt. to bolster tainted water treatment equipment

[http://www3.nhk.or.jp/nhkworld/english/news/20130830\\_06.html](http://www3.nhk.or.jp/nhkworld/english/news/20130830_06.html)

Japan's industry ministry plans to craft a set of far-reaching measures next month to address the growing problem of radioactive water at the troubled Fukushima Daiichi nuclear plant.

Workers at the plant found in July that highly radioactive water was flowing with groundwater into the sea. They also discovered this month that more than 300 tons of contaminated water leaked from one of the storage tanks. Some of the water may have escaped into the sea.

To tackle the situation, a panel of experts at the industry ministry plans to compile a number of countermeasures at the earliest possible date in September. The steps will include preventing tainted water from leaking into the sea and blocking groundwater from entering areas near reactor buildings. Groundwater is mixing with radioactive water in the basement of the reactor buildings.

The plant's operator, Tokyo Electric Power Company, plans to restart a trial run of a system to remove radioactive substances from toxic water as early as mid-September. The operation ran into problems previously.

The expert panel will consider beefing up the treatment equipment to reduce the increasing amount of contaminated water at the plant, including more than 300,000 tons of tainted water stored in tanks.

Meanwhile, TEPCO announced that its workers at the **Fukushima plant were exposed to radiation**

**earlier this month due to contaminated dust spread by debris removal work nearby.**

A total of 12 workers were exposed to radiation on August 12th and 19th in front of the head office for efforts to decommission the damaged reactors.

TEPCO says **the tainted dust came from the rooftop of the No.3 reactor, southeast of the headquarters building.** Workers recently removed large pieces of rubble from the rooftop, possibly making it easier for toxic dust underneath to spread.

TEPCO will widen the areas where it tries to prevent dust from spreading when debris is removed. It will also cover the headquarters' entrance with sheets.

TEPCO initially blamed the exposure on a misting machine designed to prevent heatstroke. But it has since found that exposure occurred even when the machine was not in use.

August 30, 2013

## **Summary of Fukushima situation – The difference among contaminated water, groundwater and sea contamination**

<http://fukushima-diary.com/2013/08/column-summary-of-fukushima-situation-the-difference-among-contaminated-water-groundwater-and-sea-contamination/>

The contaminated water situation is getting increasingly complicated. I think some people are too busy to follow up. Here I'd like to summarize the situation short so you can read it before the next metro station.

■ The difference among contaminated water, groundwater and sea contamination.

### **1. Contaminated water**

Contaminated water comes from the coolant water because the buildings are crippled. It's retained in the building, tanks, and the trenches underground. It keeps increasing and Tepco is building the storage tanks in a hurry. Some of the tanks had leakage recently.

### **2. Groundwater**



Groundwater becomes contaminated groundwater when it comes close to the plant buildings. This is the main cause of the sea contamination. Tepco is also stocking this in the tanks. It's less contaminated than (1) but the volume is huge. It's overflowing to the sea, flowing into the plant buildings to overwhelm the storage capacity, and also coming up to the ground surface near the seaside. (It doesn't "leak" because it's outside from the beginning)

### 3. Sea contamination

Sea contamination is mostly caused by the contaminated groundwater. To know the actual sea contamination situation, they need to take samples near the sea surface, bottom of the sea, and in the middle, inside of the plant port and outside, also offshore the plant. However currently the sea contamination is not entirely researched.

## Is NRA report enough to rule out quake damage to coolant system?

### NRA: Quake did not damage coolant pipes

[http://www3.nhk.or.jp/nhkworld/english/news/20130830\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20130830_31.html)

Japan's nuclear regulator has answered a question concerning the 2011 Fukushima Daiichi meltdown disaster: whether a reactor coolant system was damaged by the March 11th earthquake before the massive tsunami struck the plant.

The Nuclear Regulation Authority compiled a draft investigative report on the disaster in a meeting on Friday. Discussions focused on an unexplained puddle of water spotted by plant personnel on the 4th floor of the facility's No.1 reactor soon after the quake.

A Diet panel had said the water could have leaked from the reactor's coolant system due to quake damage. But the report says the water came from an upper-floor fuel pool that overflowed in the quake.

The report says the conclusion was reached when witness accounts matched results of an analysis of how water from the pool may flow. It also says damage to the coolant system would have caused leakage of steam, not liquid water.

Experts at the meeting did not object to the conclusion. But **one said ruling out damage to the system without checking its pipes in detail may be premature.** Another said the regulator should draw lessons from its inquiry to improve nuclear safety rules.

Commissioner Toyoshi Fuketa indicated that the authority will continue to look into the impact of the quake on the system.

## Nuclear Watch on contaminated water (NHK)

### Nuclear Watch aired on Aug. 30: Contaminated water

<http://www3.nhk.or.jp/nhkworld/newsline/201308302000.html>

According to TEPCO, the 1,000 tanks contain about 340,000 tons of water

Summary of the present situation at the plant and the measures taken by TEPCO to tackle the water crisis

But it is not clear how effective these measures will be

TEPCO cannot manage on its own. Gov't needs to take charge.

August 31, 2013

## So many problems linked to water tanks



## Tepco bolsters tank team but leak eludes

<http://www.japantimes.co.jp/news/2013/08/31/national/tepco-bolsters-tank-team-but-leak-eludes/#.UiIwaH9Sb9k>

*Storage patrols beefed up while replacement scheme pends*

by Kazuaki Nagata and Mizuho Aoki

Tokyo Electric has a plan to better monitor the 930 radioactive water tanks at its Fukushima No. 1 plant, but it is unclear whether it will be able to lock down the storage problem before the trickle turns into a flood.

The tainted water generated by the makeshift cooling apparatus set up after the nuclear meltdowns has become the second stage of the nuclear crisis for beleaguered Tokyo Electric Power Co., which is unable to protect the Pacific Ocean from its radioactive waste and is coming under increasing pressure to seek outside help.

The immense volume of the water forced Tepco, as the utility is known, to build storage tanks at a rapid pace, but some are dangerously prone to leaks, as well as major quakes, and the safer ones can't be built in time to help, experts say.

Compounding the problem is Tepco's inability to quickly confirm the amount of water in the tanks or determine where it is leaking from.

To attack the water crisis, Tepco President Naomi Hirose announced Monday that a new team for the tank issue will be formed and put directly under his control.

"We will spend the necessary resources and equipment to firmly deal with the issue of the tanks . . . We recognize this as an extremely important issue for the company's management," Hirose said in Fukushima. The measures include increasing the number of workers used to patrol the storage areas, installing water gauges in the tanks, and eventually replacing the leakier flange-type tanks with welded ones that are more watertight.

Tepco's monitoring of the tanks has drawn fire from experts and regulators alike. Its patrols had consisted of two people conducting visual checks of the 930 tanks set up for the water so far in just two to three hours, twice a day. Since the estimated 300 tons of tainted water lost in the most recent leak probably escaped over a month before it was discovered on Aug. 19, the Nuclear Regulation Authority put the patrols under intense scrutiny.

Starting next Monday, Tepco said it will conduct three patrols of 30 people each during the day but only use four people at night.

The tanks, however, are a different problem. At the moment, Tepco has no choice but to continue using flange-type tanks, which have been involved in at least three other leaks, for the immediate future.

About 300 of the 930 tanks on site are flange-type units consisting of steel plates bolted together and sealed with waterproof packing at the seams. The tanks, about 10 meters high and 12 meters in diameter, are less watertight than those made with welded seams because of the multitude of bolted parts, which could turn into leak points.

Tepco has no idea how the water in the 300-ton leak escaped, but on Friday it said that any hole in it is probably somewhere in the bottom and about 25 mm long by 1 mm wide, based on the 5 cm the water level dropped within six hours on Aug. 20. No holes have been found yet.

“I don’t know if this is because of corrosion or deterioration, something needs to be done to the bottom part, otherwise it is possible the water will leak from other spots,” said senior NRA official Masaya Yasui during a meeting on the issue Tuesday.

Corrosion is a possibility because the tainted water contains salt from seawater used to cool the reactors and spent-fuel pools in the early stages of the crisis. It also ruined the reactors.

Tepco plans to transfer the tainted water from the flange-type tanks to welded tanks but has not developed a schedule yet because of complex logistic issues.

One of these issues is the lengthy assembly time required for a welded tank, which take about six months to put together and set up. There are 300 hundred tanks to replace.

Another issue is the salt.

“Salt is a problem. The tanks are not made of stainless steel but just steel, so they will get rusty,” said metals expert Hiromitsu Ino, professor emeritus at the University of Tokyo. Ino said, however, that it will take years for the tanks to rust out, making that more of a long-term issue.

Kazunari Yoshimura, a water expert who runs the consultancy Global Water Japan, said the salt issue will force Tepco to apply a protective coating to the tanks, which will lengthen the build time.

In addition, if the welded tanks are built hastily, and shortcuts taken, poor welds could lead to more leaks.

Meanwhile, there is the looming question of whether the storage tanks can survive major earthquakes.

Tepco said it is “debatable” whether the tanks can withstand a quake as strong as the one on March 11, 2011, but they are designated as having class-B quake resistance, which is the second-highest rating under Japanese regulations and means they can weather relatively large quakes.

The utility said the flange-type tanks were set up on concrete foundations unanchored because installing anchors would cause a quake’s power to focus on those spots, which it claimed would be dangerous.

September 1, 2013

## High radiation levels detected around tanks

### Leaks suspected from more tanks at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309010021>

By RYUTA KOIKE/ Staff Writer

Radiation levels of up to 1,800 millisieverts per hour have been detected at four locations at the crippled Fukushima nuclear plant, as the operator checks storage tanks following a leak of 300 tons of radioactive water.

Tokyo Electric Power Co. said Aug. 31 it found between 70 and 1,800 millisieverts per hour around five tanks in three areas.

**An exposure of 1,800 millisieverts per hour for about four hours is considered fatal to a human. But a worker can be shielded from the radiation with proper protection because it is mostly beta rays, which have weak penetrating power.**

High radiation levels may be discovered at more locations as the utility continues to examine other storage tanks.

TEPCO detected between 220 and 1,800 millisieverts per hour around joints at the bottom of two tanks in an area called H3 on Aug. 31. Radiation levels between 70 and 100 millisieverts per hour had been found at the same locations on Aug. 22.

The utility also detected 230 millisieverts per hour at a section connecting two tanks in an H5 area and 70 millisieverts per hour around the bottom of a tank in an H4 area.

In the H5 area, a drop of water fell when a worker on patrol pressed insulation outside the connecting section of the tanks. A radiation level of 230 millisieverts per hour was measured on a section of the floor.

TEPCO officials said they believe radioactive water has not spread outside barriers surrounding tanks. They said water levels had not dropped in any of the five tanks, and drain valves on the barriers had been closed.

The five tanks are a so-called flange type that utilizes steel sheets connected by bolts. They are of the same design as the one from which TEPCO said on Aug. 19 an estimated 300 tons of radioactive water leaked.

The Nuclear Regulation Authority assessed the severity of the leakage at Level 3 (serious incident) on the eight-level International Nuclear and Radiological Event Scale (INES).

Flange-type tanks are said to be durable for about five years, and they account for 350 of the approximately 1,000 storage tanks at the Fukushima No. 1 plant.

TEPCO has announced plans to switch to tanks whose sheets are welded together, which are said to be more durable. But at least one month is required to complete a welded tank, while a flange-type tank can be installed in a week or so.

The company will have to continue to use flange-type tanks for the time being, which leaves the possibility that more radioactive water may escape them.

### **High radiation readings suggest new tank water leak at Fukushima**

<http://mainichi.jp/english/english/newsselect/news/20130901p2g00m0dm003000c.html>

TOKYO (Kyodo) -- Very high radiation levels were observed Saturday at three tanks and one of the pipes connecting them at the troubled Fukushima Daiichi nuclear plant, pointing to the possibility that radioactive water may have newly leaked, Tokyo Electric Power Co. said.

The radiation readings were from 70 to 1,800 millisieverts per hour, although none of the tanks showed any visible fall in their water levels, the plant operator said, adding it is investigating the cause.

The tanks are built of steel plates held together by bolts in the same structure with the tank that was found last week to have leaked 300 tons of highly toxic water.

Traces of water leak were found below the pipe where 230 millisieverts per hour was measured, it said.

### **High radiation detected at Fukushima Daiichi tanks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130901\\_08.html](http://www3.nhk.or.jp/nhkworld/english/news/20130901_08.html)

The operator of the crippled Fukushima Daiichi nuclear power plant has detected extremely high levels of radiation on some of its storage tanks.

Tokyo Electric Power Company announced on Saturday that high levels of radioactivity were found in 4 areas in the complex where tanks containing contaminated water are located.

It has been monitoring more than 900 storage tanks since about 300 tons of radioactive wastewater leaked from a tank on August 20th.

TEPCO says one of Saturday's readings was 1,800 millisieverts per hour. Radiation at this level can kill a person in 4 hours.

The number is 18 times higher than the level of radioactivity at the same tank measured on August 22nd.

In another area, radioactivity of 230 millisieverts per hour was measured at a puddle underneath a pipe connecting tanks.

Although no change of water levels was detected at the tanks, TEPCO believes new leaks are possible. It is checking whether contaminated water has reached the ocean.

## Leaky pipe fixed but 4 hotspots discovered

### Tepco fixes leaky pipe but finds hot spots, jump in radiation

<http://www.japantimes.co.jp/news/2013/09/01/national/tepcos-reports-leaking-pipe-four-hot-spots/#.UiN60H9Sb9k>

*Toxic drip sealed with tape amid lethal radiation at Fukushima No. 1*

Tokyo Electric Power Co., manager of the stricken Fukushima nuclear plant, said Sunday it halted a slow leak from a pipe connecting two water storage tanks by patching it with tape just hours after stumbling upon a **potentially lethal radioactive hot spot**.

Tepco has been unable to safely contain the growing volume of water used to cool the three reactors hit by meltdowns triggered by the March 2011 earthquake and tsunami, and the government is in the process of taking over the cleanup.

The discovery of the dripping pipe came just after Tepco said late Saturday it had found hot spots at four sites near the water tanks, with one giving off 1.8 sieverts per hour — enough to kill a human being in four hours.

The other three hot spots were not detailed.

The pipe, which was leaking a drop about every 90 seconds, was sealed using absorption material and plastic tape. A puddle of giving off 230 millisieverts per hour was found below it, Tepco said.

“We have to suspect that the high radiation levels were caused by the toxic water oozing from the flange connections,” a Tepco spokesman said, adding that no conclusions had been reached.

The beleaguered utility also said it recorded 900 becquerels of tritium per liter in a groundwater interdiction well, compared with 450 becquerels per liter in February.

Since the well is near the H4 area, where a tank lost 300 tons of radioactive water last month without anyone noticing, Tepco is looking into whether the rise in tritium is related to that incident. Tritium is one of the elements Tepco’s makeshift filtering system, which is partially offline, can’t remove.

On Sunday, the utility said it logged 920 becquerels of strontium-90 per liter of liquid emitting beta rays in the drainage ditch south of H4 that leads from the tanks to the Pacific. Tepco logged 580 becquerels in the ditch on Aug. 22.

Last week, Tepco revealed that 300 tons of toxic water had disappeared from a huge tank — one of 930 on site — before anyone noticed. The spill sparked fears that the toxic water may have escaped into the ocean or seeped into the ground, and was categorized — by Japan’s Nuclear Regulatory Agency — as a Level 3 event on the International Nuclear Radiological Event Scale (INES), the most serious incident since the meltdown itself, which was rated Level 7.

The hot spots were discovered during daily inspections Saturday near three tanks and a pipe connecting them to the crippled plant.

Although it was unclear whether the hot spots indicated that a fresh spill had taken place, traces of water reading 230 millisieverts per hour were found below the pipe.

In response to growing domestic and international pressure on Tepco to stop tainting the ocean and to seek outside help, Prime Minister Shinzo Abe on Thursday promised the world that his government will play a greater role in solving the water crisis.

“The accident in Fukushima cannot be left entirely to Tokyo Electric Power. There is a need for the government to play a role with a sense of urgency, including taking measures to deal with the waste water,” he said.



Abe's pledge came as the world's nuclear watchdog urged Japan to explain more clearly what is happening at Fukushima and avoid sending "confusing messages" about the disaster, including the Level 3 rating.

The International Atomic Energy Agency recently questioned why last week's 300-ton leak of radioactive water prompted the NRA to rate the event on its INES scale, when no other incident since the meltdowns had.

## Not as bad as it seems, says TEPCO

### **Explanation regarding the high radiation (maximum 1,800 mSv) found at tanks in Fukushima Daiichi NPS on August 31, 2013**

[http://www.tepco.co.jp/en/announcements/2013/1230191\\_5502.html](http://www.tepco.co.jp/en/announcements/2013/1230191_5502.html)

We deeply apologize for the great anxiety and inconvenience caused by the recent contaminated water issues at the Fukushima Daiichi NPS, which affects the residents near the power station and the broader society.

Regarding the high radiation (maximum 1,800 mSv) found at tanks in Fukushima Daiichi NPS on August 31, some articles reported that "by simple calculation, if a person is exposed this much radiation amount for four hours continuously, that would lead to death" or "it takes only one minute to reach the annual radiation exposure limit for workers," etc. We would like to explain more about the 1,800 mSv.

We used measuring equipment that measures both beta radiation and gamma radiation. The 1,800 mSv is the total amount of beta radiation and gamma radiation. Gamma radiation was 1 mSv and most of the 1,800 mSv was beta radiation.

Since 1,800 mSv is approximately 3.5 times higher than the control level of equivalent dose for skin which is 500 mSv/year, we should carefully control radiation exposure. Since beta radiation travels only a short distance, radiation level decreases considerably if we keep a distance. Moreover, since beta radiation is weak and can be blocked by a thin metal sheet such as aluminum, we think that we can control radiation exposure by using proper equipments and cloths.

Additionally, although 1,800 mSv was detected at 5 cm above the floor, the radiation level of 50 cm above the floor was 15 mSv. Thus, 1,800 mSv does not mean the radiation level of the whole nearby place.

Some articles reported that "if a person is exposed this much radiation amount for four hours continuously, that would lead to death" comparing with the radiation level that would result in death (7,000 mSv), or "it takes only one minute to reach the annual radiation exposure limit for workers" comparing with the annual radiation exposure limit for workers (50 mSv). However, we believe that simply comparing the 1,800 mSv with those standard levels is not proper, since the standard levels are accumulation of effective dose (not equivalent dose) that express effects for whole body.

We will find out the cause of this issue and make proper counter measures immediately, and continue to make every effort to secure safety of workers.

September 2, 2013

## **More radiation, more leaks**

### **More tank leaks found at Japan nuke plant**

<http://mainichi.jp/english/english/newsselect/news/20130902p2g00m0dm069000c.html>

TOKYO (AP) -- Japan's top nuclear regulator has raised safety concerns about hastily built storage tanks and their foundations amid reports of new leaks of radiation-contaminated water.

Nuclear Regulation Authority Chairman Shunichi Tanaka said Monday that a small leak and signs of possible leaks have been spotted at several other Fukushima Dai-ichi storage tanks. Officials say part of the leak has escaped into the sea.

He said the discoveries were the result of closer inspections after a 300-ton leak two weeks ago. Tanaka raised concerns about the tanks' foundations and urged careful monitoring.

The plant's operator says it suspects other possible leaks because radioactivity has been detected near the tanks, although it is not considered deadly.

The latest leaks have triggered further concerns about the plant's ability to manage the contaminated water.

### **High radiation readings suggest new water tank leak at Fukushima**

<http://mainichi.jp/english/english/newsselect/news/20130902p2g00m0dm001000c.html>

TOKYO (Kyodo) -- Very high radiation levels were observed Saturday at three tanks and one of the pipes connecting them at the crippled Fukushima Daiichi nuclear plant, pointing to the possibility that radioactive water may have newly leaked, Tokyo Electric Power Co. said.

The radiation readings were from 70 to 1,800 millisieverts per hour, although none of the tanks showed any visible drop in their water levels, the plant operator said, adding it is investigating the cause.

The tanks are built of steel plates held together by bolts, the same structure as the tank that was found last week to have leaked 300 tons of highly toxic water.

Traces of water leakage were found below the pipe where 230 millisieverts per hour was measured, it said.

The utility also said that 900 becquerels per liter of tritium had been detected at a water well to pump groundwater before it reaches a reactor building, compared with 450 becquerels per liter recorded in February.

As the well is located near the "H4" area where the tank confirmed to have leaked stands, TEPCO is investigating if the rise in the tritium level is related to the leakage of toxic water.

On Sunday, the utility said it had detected 920 becquerels per liter of radioactive substances emitting beta rays, such as strontium-90, in a drainage ditch located south of the H4 area, compared with 580 becquerels recorded on Aug. 22. The drainage ditch leads to the Pacific

### **High radiation levels detected in water leaking from Fukushima plant tank pipes**

<http://mainichi.jp/english/english/newsselect/news/20130902p2a00m0na005000c.html>

High levels of radiation have been detected in water leaking from pipes connecting tanks holding contaminated water at the crippled Fukushima No. 1 Nuclear Power Plant, it has been announced.

Tokyo Electric Power Co. (TEPCO), the operator of the plant, said on Sept. 1 that 300 million becquerels of radiation per liter was detected in water leaking from the tank-connecting pipes in the plant's "H5" area.

The announcement came following the detection of up to 230 millisieverts per hour of radiation underneath those pipes. TEPCO said on Sept. 1 that the radioactive water drops "are believed to be leaks of contaminated water."

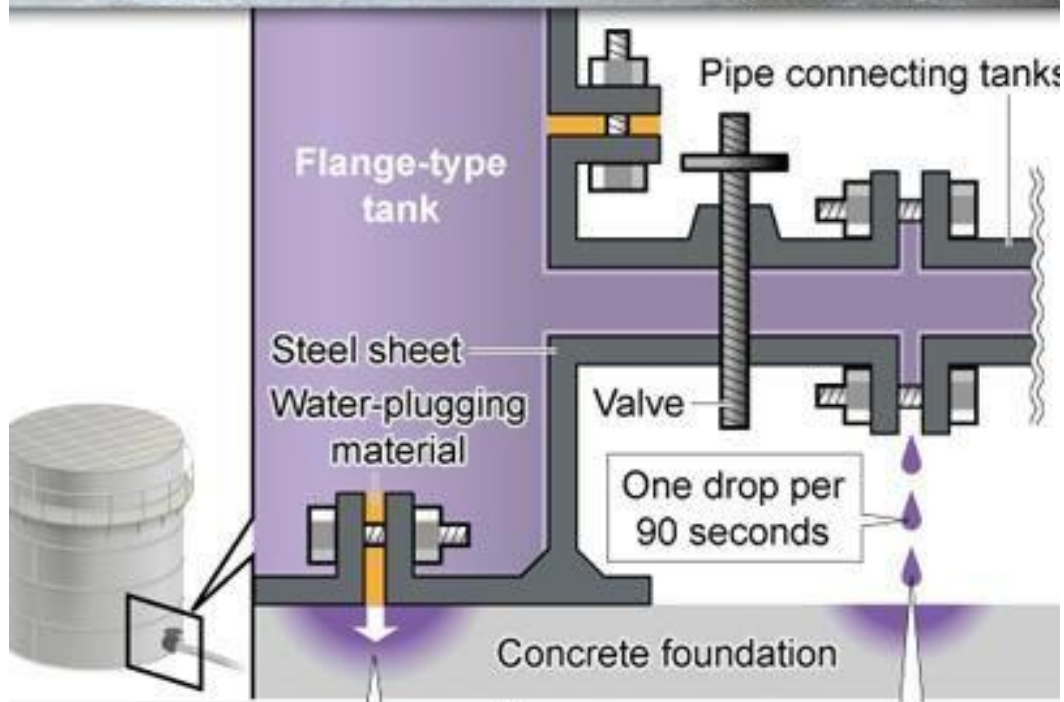
TEPCO says it found on Aug. 31 that one drop of water every 90 seconds was leaking from the connections between the tanks and pipes, leading the utility to close the tanks' valves.

## **More radiation, more leaks (2)**

### **Leaking pipe connecting tanks adds more woes at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309020069>

## Continued water leaks at Fukushima plant



Possible leakage of 300 tons of water found on Aug. 19

Leak from tank No. 5 in H5 area

A leaking pipe connecting storage tanks of radiation-contaminated water at the crippled Fukushima No. 1 nuclear power plant has been found, adding another source of concern for potential leaks along with the bolted sections of the steel plates of tanks.

Plant operator Tokyo Electric Power Co. announced on Sept. 1 that highly radioactive water had been found in a different section of tanks used to store the vast amounts of water used to cool the plant's crippled reactors. That leak raises fresh doubts about the network of piping on the site through which contaminated water is being transferred between tanks.

On Sept. 2, Prime Minister Shinzo Abe said the government will implement prompt, comprehensive measures to resolve the continuing water-leakage problems at the Fukushima No. 1 plant. During a liaison meeting between the government and his ruling Liberal Democratic Party, Abe vowed that the government will compile a basic policy to resolve the crisis as soon as possible.

“From now on, the government will be out front in initiatives to implement necessary measures, not leaving the situation in the hands of TEPCO,” the prime minister said. “We will also implement comprehensive measures; not the haphazard ones that have been taken so far.”

The government will convene the Nuclear Emergency Response Headquarters and announce a set of concrete policy measures as early as Sept. 3.

The latest leak was found in a section of tanks called the H5 area, which is situated about 100 meters southwest of the H4 area, where about 300 tons of contaminated water was found to have leaked on Aug. 19.

That came after a worker patrolling the H5 section on Aug. 31 pressed on insulation outside a pipe connecting two tanks and drops of water trickled out. Radiation levels on the floor were measured at about 230 millisieverts per hour. When the insulation was removed, workers found a drop of water leaking from the connecting section every 90 seconds or so.

Workers also measured radiation levels at a tank in the H3 area that reached 1,800 millisieverts per hour on Aug. 31. Readings at the same location were 1,100 millisieverts on Sept. 1, but radiation levels on the opposite side of the same tank were 1,700 millisieverts per hour.

An exposure of 1,800 millisieverts per hour for about four hours is considered fatal to a human being. But workers can be shielded from the deadly radiation with the proper protection because it is mostly beta rays, which have weak penetrating power.

TEPCO officials plan to move the contaminated water in the tank to another tank.

### **Increased patrols find more leaks**

The greater frequency at which leaks of radiation-contaminated water are being discovered at the Fukushima plant can be attributed to the increased manpower and patrols inspecting the tanks.

Conversely, it shows the shoddy and lackadaisical manner in which TEPCO had been monitoring the ever-increasing tonnage of contaminated water.

The utility will increase the number of workers patrolling the tanks from about 10 to 60 from Sept. 2. Until now, patrols were conducted twice a day by a team of two workers.

Each worker patrolled different areas. But because each would be responsible for about 500 tanks over a two-hour patrol period, a simple calculation showed a worker had only 15 seconds for each tank.

That meant the workers did not have time to thoroughly inspect their respective areas.

Radiation levels also were not measured unless a worker suspected something was wrong. Moreover, because rainwater easily collected at the concrete foundations where the tanks were lined up, workers rarely considered puddles around the tanks to be suspicious, and often radiation measurements were not taken.

The leaking of about 300 tons of contaminated water from a tank was announced by TEPCO on Aug. 19. But officials believe the water leaked slowly from around July, meaning the utility was unaware of the leak for about six weeks.

With the increased manpower to be used on patrols, the frequency of the patrols will be increased to four daily. On two of those patrols, workers will measure radiation levels while walking completely around a tank.

Patrols will also be conducted at night, and radiation levels will be measured whenever a puddle is discovered.

Because patrols will be strengthened, there will be a greater possibility that leaks overlooked until now will be found. Signs of potential leaks can also be uncovered with greater frequency.

The finding that leaks may have occurred at the pipes connecting the tanks represents another major headache for TEPCO.

Tanks that are welded together were believed to be less susceptible to leaks than the so-called flange-type tanks that have steel sheets connected by bolts.

However, both types of tanks use the same connecting structure of piping through which contaminated water is being transferred.

When members of the Nuclear Regulation Authority visited the Fukushima plant site on Aug. 23, Commissioner Toyoshi Fuketa suggested that not only the flange-type tanks but welded tanks as well be inspected.

Piping coming out of the welded tanks was laid on the ground and if leaks should occur at the connecting sections of those tanks, the contaminated water would immediately seep into the ground.

"While we hold very strong concerns about the flange-type tanks right now, that does not mean we can be confident about the welded tanks," Fuketa said. "There are many things we have to be concerned about."

Not only have leaks been found from connecting sections in the past, but because an extensive network of pipes is laid within the Fukushima plant site, there is the potential for contaminated water to leak from anywhere.

Meanwhile, mayors of municipalities in the vicinity of the Fukushima No. 1 plant raised concerns that the recent reports about leaking contaminated water will only further discourage residents who have evacuated.

"The desires of residents who want to return are gradually disappearing," said Tamotsu Baba, the mayor of Namie, Fukushima Prefecture.

He said the central government should take a more comprehensive approach and bring together experts on nuclear and civil engineering to evaluate the current situation and the problems that exist.

"The measures being taken now are haphazard," Baba said. "As the saying goes 'slow and steady wins the race,' so it would be preferable to calmly put together fundamental measures to deal with the problem."

## **How effective is ALPS?**



## **News Navigator: What is ALPS, and can it solve the radioactive water crisis?**

<http://mainichi.jp/english/english/perspectives/news/20130902p2a00m0na009000c.html>

The Mainichi answers some common questions readers may have about the Advanced Liquid Processing System (ALPS) for decontaminating radioactive water at the Fukushima No. 1 nuclear power plant.

Question: There's a big problem now at the Fukushima No. 1 nuclear plant with highly radioactively contaminated water leaking from an above-ground storage tank, right? So how was plant operator Tokyo Electric Power Co. (TEPCO) planning to deal with the water in the tanks in the first place?

Answer: The space on the plant grounds is limited, meaning TEPCO can't keep building storage tanks forever. The utility is considering running the toxic water through the Advanced Liquid Processing System (ALPS) before dumping it in the Pacific Ocean. Test operations of the ALPS equipment began at the end of March this year.

Q: How does ALPS purify the water?

A: In the case of ALPS, the toxic water is passed through seven special materials that absorb target radioactive substances. It's basically the same concept as cleaning molecules behind nasty smells out of the air with charcoal filters. A total of 63 radioactive contaminants including plutonium and strontium have been found in the water at the Fukushima plant. TEPCO has said the ALPS system can get concentrations of 62 of those substances -- tritium is the lone exception -- below the government maximum for dumping waste water into the environment, and do it at a rate of 500 metric tons a day.

In June, however, corroded parts and other problems were found in the ALPS equipment, and the system is now off-line for inspections. As such, TEPCO has been unable to move forward with water decontamination, and the water has built up in the tanks on-site. TEPCO is planning to restart its ALPS test run by the end of September.

Q: What does "Advanced Liquid Processing System" really mean?

A: Exactly what it says; it processes contaminated liquids, water in this case, quickly. We hope that ALPS gets repaired quickly, so this cutting-edge technology can be put to practical use.

Q: And what about the tritium?

A: The beta radiation emitted by tritium is so weak it cannot penetrate human skin, meaning it also cannot reach inside the body. Even if tritium is taken internally, it does not accumulate and passes out of the body in urine. The amount of the element in the body is reduced by half by the tenth day after ingesting it. Compared to strontium and plutonium, which builds up in the lungs and bones and can cause tumors, the health effects of tritium are thought to be minor.

If the concentration of radioactive materials in the treated water still exceeds the government standard of 60 becquerels per cubic centimeter after it's been passed through ALPS, TEPCO is considering adding more, clean water to bring down the concentration. (Answers by Tomoki Okuyama, Science & Environment News Department)

## **Gov't emergency measures disclosed on Tuesday (Sept.3)**

### **Govt. compiling measures to address Fukushima leak**

[http://www3.nhk.or.jp/nhkworld/english/news/20130902\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20130902_31.html)

The Japanese government will compile a basic plan on Tuesday to deal with a leak of radioactive water at the Fukushima Daiichi nuclear power plant.

Prime Minister Shinzo Abe said on Monday that the government would spearhead tackling the problem and not leaving it to the plant operator, Tokyo Electric Power Company. He said previous measures were taken on an ad hoc basis and that drastic steps are now needed. He was speaking at a meeting of the government and the governing parties.

Chief Cabinet Secretary Yoshihide Suga said the government will do all it can, including using reserve funds. He says the government plans to present a comprehensive package of measures on Tuesday at a meeting of its nuclear disaster task force, which includes all Cabinet members.

Contaminated water leaked from a storage tank and some of the water may have escaped into the ocean.

Tokyo Electric Power Company detected a radiation level of 1,800 millisieverts per hour near another tank on Saturday. This level could kill a person within 4 hours after exposure.

Sep. 2, 2013 - Updated 08:27 UTC

### **Gov't to show steps Tues. to address Fukushima toxic water**

<http://mainichi.jp/english/english/newsselect/news/20130902p2g00m0dm057000c.html>

TOKYO (Kyodo) -- The government will present Tuesday a set of emergency measures to deal with the huge volume of radioactive water accumulating at the crippled Fukushima Daiichi nuclear power plant, officials said Monday.

The measures to prevent a further buildup of contaminated water, possibly including steps financed by the state budget, will be presented at a ministerial meeting headed by Prime Minister Shinzo Abe.

"We will present a package of comprehensive countermeasures on Tuesday" at the meeting, Chief Cabinet Secretary Yoshihide Suga said during the talks between the government and the ruling coalition at the prime minister's office, according to one of the officials.

Suga also said the government is planning to set up another ministerial panel focusing on the issue, which has put Japan under the international spotlight over its handling of the nuclear crisis triggered by the March 2011 earthquake and tsunami.

In July, Tokyo Electric Power Co., the operator of the plant, admitted that contaminated groundwater was flowing from the nuclear complex into the area within breakwaters. TEPCO also later found that 300 tons of highly toxic water had escaped from a storage tank.

On Monday, Abe said at the meeting the government will play major roles in tackling the problem, not leaving it entirely to the company alone. He also said the government will compile Tuesday "basic principles" to handle the situation.

Abe was responding to requests from the New Komeito party, junior coalition partner for his Liberal Democratic Party.

The toxic water leakage is "very serious," New Komeito leader Natsuo Yamaguchi told Abe at the meeting. "I want the government to deal with the problem in a comprehensive manner."

LDP Secretary General Shigeru Ishiba, who also attended the meeting, said, "We must be responsible for explaining to the public how we respond" to the development.

## **TEPCO boosts efforts to monitor contaminated water**

### **TEPCO steps up monitoring of toxic water leaks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130902\\_38.html](http://www3.nhk.or.jp/nhkworld/english/news/20130902_38.html)

The operator of the disabled Fukushima Daiichi nuclear power plant has boosted efforts to monitor hundreds of storage tanks holding radioactive water.

Tokyo Electric Power Company has increased the number of inspectors from 10 to 90 and doubled the tank's monitoring activities to 4 times a day.

On August 19th, TEPCO workers found contaminated water leak from a storage tank in an area near the number 4 reactor.

Over the weekend, the operator detected extremely high levels of radiation in storage tanks in 2 other areas. More water leaks were also found.

The reading at one of the tanks was 18 hundred millisieverts per hour at the highest. Most of the contamination was caused by radiation called beta rays.

Beta rays can cause serious burns if a person comes in direct contact with them. Beta rays can also damage the eyes such as causing cataracts. The government sets the exposure limits for eye lens at 150 millisieverts per year. 18 hundred millisieverts are extremely high and can reach the limit level 5 minutes

after exposure.

TEPCO says all the storage tanks where the contaminated water leaks were found are not welded together. More contaminated water leaks from the tanks are possible.

The operator says it has about 300 such tanks and will monitor them 4 times a day. For 2 of the inspections, the inspectors will use radiation measuring equipment.

When high levels of radiation are detected, the workers will conduct further monitoring approaching closer to the tank.

NHK's reporter says there is a possibility that more contaminated water leaks will be found with the boosted monitoring. The reporter says TEPCO will have to ensure the safety of the workers and conduct strict monitoring to see the radioactive water is not seeping into the ocean.

September 3, 2013

## **New toxic leak feared**

### **New radiation spike found near Fukushima nuclear plant water tanks**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309030016>

THE ASAHI SHIMBUN AND WIRE REPORTS

Tokyo Electric Power Co., operator of the wrecked Fukushima No. 1 nuclear power plant, said Sept. 2 that a patrol of workers had found a new area of high radiation near tanks used to store contaminated water.

The latest revelation came a day before Japan's government was set to announce new steps to address deep-seated problems in controlling the spread of radiated water at Fukushima and criticism that the utility has bungled the response to the worst nuclear accident since Chernobyl.

TEPCO said it had found a radiation reading above 100 millisieverts per hour on the ground near a water storage tank.

The latest leak was found in an area called H6, which is situated south of an area called H4, where about 300 tons of contaminated water was found to have leaked on Aug. 19.

TEPCO said in a statement there was no sign of a water leak around the newly discovered area of high radiation. **The utility could not give a precise reading for the level of radiation since workers were using instruments that only recorded radiation up to 100 millisieverts.**

Japanese nuclear workers are limited to a cumulative exposure of 100 millisieverts over five years.

TEPCO officials cast doubt that contaminated water might have seeped through rivets and materials designed to absorb water at the tank.

The utility is investigating the leakage.

### **Radiation spike at Fukushima plant raises fears of new toxic water leak**

<http://mainichi.jp/english/english/newsselect/news/20130903p2a00m0na020000c.html>

Radiation levels of over 100 millisieverts per hour have been detected at the base of another storage tank at the Fukushima No. 1 nuclear plant, plant operator Tokyo Electric Power Co. (TEPCO) announced Sept. 2.

The high radiation level has raised fears of yet another radioactive water leak at the plant. There have been suspected leaks in four areas of the plant ground so far.

The new radiation spike was found at the base of a storage tank about 100 meters to the south of another tank that leaked some 300 metric tons of radioactively contaminated water earlier this year. The new radiation hotspot was discovered by a maintenance patrol on Sept. 2, though there was no sign of a leak at the base of the tank.

### **Beware of degrading resin**

## **TEPCO: Worn resin may be cause of high radiation**

[http://www3.nhk.or.jp/nhkworld/english/news/20130903\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20130903_13.html)

The operator of the Fukushima Daiichi nuclear plant says degrading resin may be to blame for extremely high radiation detected on the plant's storage tanks.

Tokyo Electric Power Company measured high radiation levels near the bottom of 3 tanks holding radioactive waste water, over the weekend. One of them had beta-ray radiation of up to 1,800 millisieverts per hour.

All the high measurements came from the joints of tanks built of steel plates that are bolted together. Workers found resin extruding from the joints. The resin is used inside the seams as a "water-stop" material because it expands when soaked with water.

TEPCO officials believe wear and tear caused the resin to extrude from the steel joints. They say there's no trace of water leakage from the joints, and no high levels of radiation have been measured on the ground beneath.

But they say they will look into the problem further, as degrading resin could result in leaks.

The company has been stepping up monitoring of tanks since a leakage of more than 300 tons of radioactive water was found from a single tank in mid-August.

But increased patrols have only led to more discoveries of hot spots. On Monday, beta-ray radiation of more than 100 millisieverts per hour was detected on another tank in a different area.

September 4, 2013

## **Taxpayer money pledged for new and unproven technologies**

### **Government banking on uncertain technologies to resolve Fukushima water crisis**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309040061>

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## Government measures to tackle radioactive water problem

 Time frame       Taxpayer money to be spent

### Develop high-performance purifier

 By end of 2014       15 billion yen

### Surround 4 reactors with frozen soil wall to block water

 2nd half of fiscal 2014       32 billion yen

### Remove radioactive water from pits on ocean side of reactors

 Started in August       None

### Improve ground on ocean side of reactors to block seaward leak

 Started in August       None

### Pump up groundwater before reaching reactors, release into sea

 Equipment ready, operation unscheduled       None

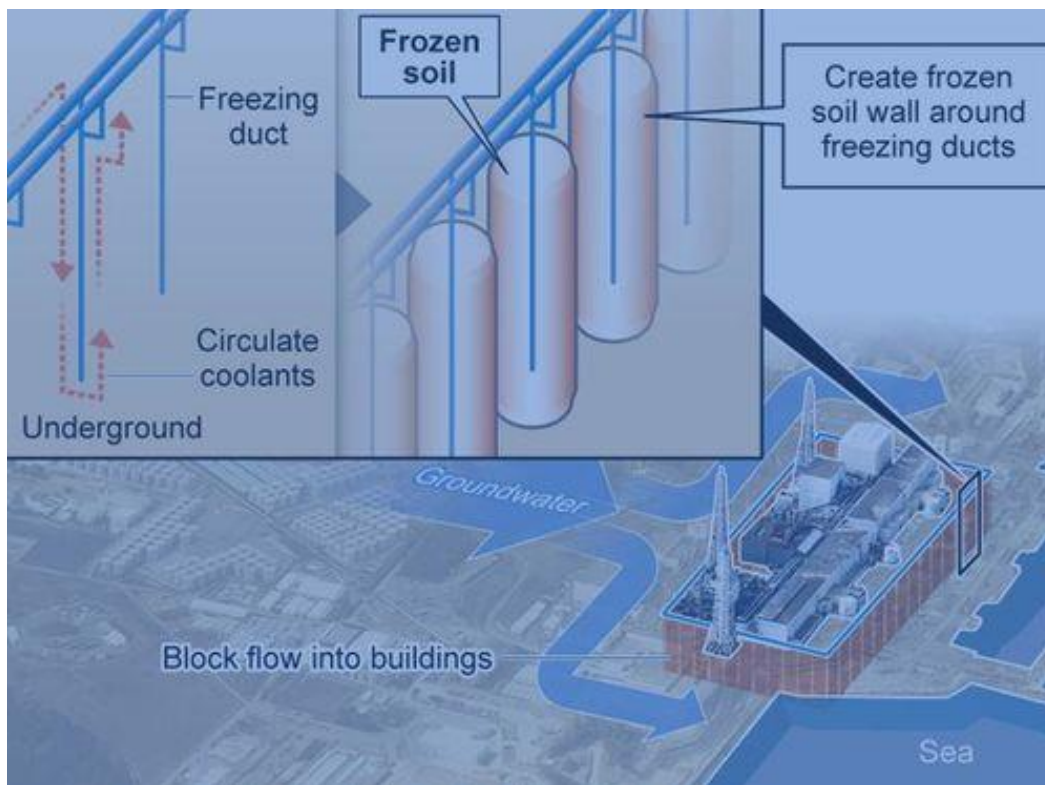
### Install wall to block water near levee off reactors

 Around September 2014       None

### Replace existing storage tanks

 Not clearly mentioned       None

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The government on Sept. 3 failed to allocate funding to resolve the immediate challenge of leaking radioactive water at the crippled Fukushima No. 1 nuclear power plant, although **it pledged taxpayer money on unproven technologies that will take a few years to implement.**

"The whole world is watching to see if we will be able to decommission the reactors at the Fukushima No. 1 nuclear power plant, including if we can cope with the problem of radioactive water there," Prime Minister Shinzo Abe told a meeting of the government's Nuclear Emergency Response Headquarters on Sept. 3. "My government will work as one to resolve the issue."

Despite the prime minister's enthusiasm, the government has set forth no plan to pay for replacing storage tanks of the flange type, which utilize steel sheets connected with bolts, for holding radioactive water on the grounds of the crippled plant.

One of those flange-type tanks, which account for approximately 350 of the 1,000 storage tanks on site, was found in mid-August to have leaked 300 tons of radioactive water.



"We will consider the matter in the future," was the only response given by an official of the Agency for Natural Resources and Energy to a question at a Sept. 3 news conference why no funds were being earmarked to immediately deal with the problem.

Tokyo Electric Power Co., the plant operator, said it will replace those tanks with storage tanks that have steel sheets welded together, which are believed to be more waterproof, and step up patrols inspecting the tanks.

However, 47 billion yen (\$472 million) in taxpayer money will be poured into longer-term measures based on new and unproven technologies.

Specifically, **the government plans to spend 32 billion yen to build a frozen soil wall to block out water, and an additional 15 billion yen to develop an upgraded version of the Alps water decontamination system**, a multi-nuclide removal equipment that has been halted during trial runs.

The water-blocking wall will comprise 1,400 meters of frozen earth that will surround and isolate the soil near the hobbled No. 1 to No. 4 reactors. The wall is intended to block the flow of groundwater into the reactor and turbine buildings, and thereby curb the increase in the growing tonnage of radioactive water at the plant.

TEPCO initially hoped to have the wall operational in the first half of 2015, but the government has moved that timetable up **to be completed by the end of fiscal 2014**.

Frozen soil wall technology has only been used on a temporary basis, including to block water gushing out at tunnel construction sites, but nowhere in the world has that been used on such a large scale and such a long term as envisaged at the Fukushima nuclear plant, sources said.

The initial plans would have a general contractor **conduct reduced-scale experiments and determine by year-end if full-scale construction could be started**.

Asked about the abrupt announcement to move that schedule forward, an official with the Agency for Natural Resources and Energy only said it represents the government's "willingness" to make that happen.

The government package also includes a plan to fund the development of a new purifier for removing radioactive substances from highly contaminated water.

The existing Alps system has yet to enter full operation. The equipment, designed to remove 62 types of radioactive materials, has been put on hold in the midst of trial runs after workers spotted corrosion holes in one of its storage tanks.

## Radiation near tank not abating

### Radiation near tanks hits highest level yet

Bloomberg

<http://www.japantimes.co.jp/news/2013/09/04/national/radiation-near-tanks-hits-highest-level-yet/#.Uieb339Sb9k>

Tokyo Electric Power Co. has detected the highest radiation levels found so far near tanks holding contaminated water used to cool reactors at its wrecked Fukushima No. 1 nuclear plant.

Readings of 2,200 millisieverts (2.2 sieverts) per hour were found Tuesday in an area where levels of 1,800 millisieverts had been detected Saturday, Tepco spokeswoman Mayumi Yoshida said Wednesday. The increase could be due to a slight difference in where the measurements were taken, she said. "It fluctuates when you move a little bit," so the higher reading doesn't necessarily indicate rising radioactivity levels, Yoshida said.

Tuesday's hourly reading is equivalent to the amount of radiation 44 plant workers may be exposed to in a full year under government guidelines.

A report on the weekend said exposure to 1.8 sieverts could prove fatal in around four hours.

The Tuesday reading was at one of four radiation hot spots near storage tanks reported by Tepco last weekend, one of which led crews to a leaking pipe that was fixed Sunday. Investigators will now deploy more advanced sensors to locate the source of Tuesday's reading, Yoshida said.

Tepco reported a 300-ton leak last month from a tank used to store radioactive water in what the Nuclear Regulation Authority designated the most severe level since the March 2011 earthquake and tsunami sparked a triple meltdown at the plant.

The utility has subsequently boosted the number of tank-inspection patrols from twice to four times a day and increased its inspection staff to 60 members from 10, it said.

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**For radiation doses equivalence, see also:**

[http://www.tepco.co.jp/en/announcements/2013/1230191\\_5502.html](http://www.tepco.co.jp/en/announcements/2013/1230191_5502.html)

<http://ex-skf.blogspot.fr/2013/09/ro-waste-water-leak-fukushima-i-nuke.html>

## Frozen soil wall test to begin at Fukushima plant

[http://www3.nhk.or.jp/nhkworld/english/news/20130905\\_04.html](http://www3.nhk.or.jp/nhkworld/english/news/20130905_04.html)

Japan's government is set to test a project to build a frozen artificial wall at the Fukushima Daiichi nuclear plant. Engineers hope the wall will stop groundwater from seeping into the contaminated compound.

Groundwater is flowing into the plant's reactor buildings from surrounding mountains at a rate of 400 tons per day. The inflow is adding to the problems of toxic wastewater onsite.

The government has pledged 32 billion yen, or about 320 million dollars, to build the underground wall.

**The feasibility test will start by mid-October at the earliest.** Engineers plan to drive steel pipes 30 meters deep into the soil near the Number-4 reactor building. The pipes will be used to surround a 10-by-10-meter plot on the mountain side of the building.

Liquid calcium chloride at minus 40 degrees Celsius will be pumped into the pipes to freeze the soil. The test will examine whether the wall stops the groundwater flow.

Officials will also check for any impact on the surrounding soil and groundwater, as well as how best to change pipes over the long-term.

**Japan's industry ministry hopes to finish the test by the end of next March and start operating the wall by March 2015. The government has earmarked 1.3 billion yen, or 13 million dollars, for the test.**

Tokyo Electric Power Company has for the first time released video footage of groundwater flowing into the compound. The video shows the water splashing into the Number-1 turbine building from an area near an underground cable tube.

September 5, 2013

## Underground water influx spotted

## **TEPCO locates groundwater inflow into reactor turbine building for first time**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309050051>

By SHUNSUKE KIMURA/ Staff Writer

The location of an underground water leak into a reactor turbine building of the crippled Fukushima No. 1 nuclear power plant has been spotted for the first time since the March 2011 earthquake and tsunami, plant operator Tokyo Electric Power Co. said.

TEPCO said Sept. 4 it confirmed groundwater is flowing into the first basement of the No. 1 reactor turbine building from the junction of the building and outside piping.

To locate underground water influx, TEPCO drilled a hole on the first floor of the No. 1 turbine building and lowered a video camera into the part connecting outlet pipes with the building. TEPCO said the video camera recorded images and sound of underground water flowing into the building basement.

The operator will decide what measures to take to stop groundwater inflow after assessing the current amount of water flowing into the building.

While an estimated 70,000 tons of radioactive water has already accumulated in the basements of the No. 1, No. 2, No. 3 and No. 4 reactor and turbine buildings at the plant, 400 tons of underground water is newly flowing into the basements on a daily basis.

It has been said that groundwater is coming from junctions of the buildings and outside piping, as well as other areas.

TEPCO has been adjusting water height in the reactor and turbine buildings to make underground water levels around them higher. The effort is intended to prevent additional radioactive water accumulated in the basements of the buildings from spilling into the soil surrounding them.

## **Leak may have reached groundwater**

### **Leaked water may have reached groundwater**

[http://www3.nhk.or.jp/nhkworld/english/news/20130905\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20130905_33.html)

The operator of the damaged Fukushima Daiichi nuclear power plant says radioactive water that leaked from a storage tank may have reached groundwater.

Tokyo Electric Power Company says it detected high levels of radioactive substances in water collected on Wednesday at a monitoring well about 10 meters from the tank.

It says the water contained 650 becquerels per liter of beta-ray emitting substances, including strontium. The water was taken from about 7 meters deep, where groundwater is flowing.

Last month, TEPCO discovered more than 300 tons of contaminated water had leaked from the tank. Company officials said some of the water may have reached the sea.

## Water tanks almost full

### **Tepco's data shows they're to run out of tanks in the 3rd week of November**

<http://fukushima-diary.com/2013/09/tepcos-data-shows-theyre-to-run-out-of-tanks-in-the-3rd-week-of-november/>

Following up this article..**Approx. 90% of contaminated water tank is already full** [URL]

On 9/4/2013, Tepco released the data of the balance of the tank capacity and the current volume of stocked contaminated water (Concentrated salty water).

The data shows the increasing rate of the stocked water will get slower around the 3rd week of this October. However, the reason is not announced.

On the assumption that the increasing rate doesn't get slower for the unknown reason, Tepco will run out of the tanks around the 3rd week of November.

On 8/5/2013, Fukushima Diary predicted Tepco may run out of the tanks 11/11/2013 ~ 11/17/2013. This is nearly the same time as what their own data shows.

↓ The blue line shows the volume of the stocked contaminated water (Concentrated salty water). The black line was added by Fukushima Diary to show the change in increasing trend. The red line indicates the tank capacity.

[http://www.tepco.co.jp/cc/press/betu13\\_j/images/130904j0101.pdf](http://www.tepco.co.jp/cc/press/betu13_j/images/130904j0101.pdf)

[http://www.tepco.co.jp/cc/press/2013/1230283\\_5117.html](http://www.tepco.co.jp/cc/press/2013/1230283_5117.html)

## **Leaked water may have reached groundwater**

[http://www3.nhk.or.jp/nhkworld/english/news/20130905\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20130905_33.html)

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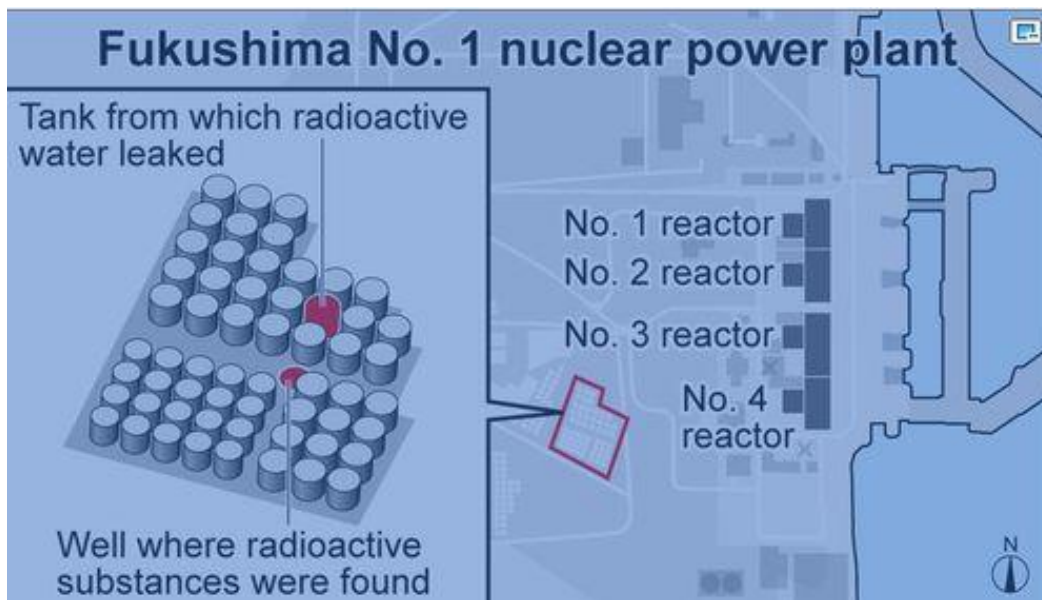
Last month, TEPCO discovered more than 300 tons of contaminated water had leaked from the tank. Company officials said some of the water may have reached the sea.

September 6, 2013

## **Groundwater contamination confirmed**

### **TEPCO confirms highly radioactive water spread underground**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309060053>



By SHUNSUKE KIMURA/ Staff Writer

Highly radioactive water that leaked from a storage tank and was not discovered until last month is spreading underground at the Fukushima No. 1 nuclear power plant, Tokyo Electric Power Co. said Sept. 5.

The utility said 650 becquerels per liter of radioactive materials, which emit beta rays such as radioactive strontium, were found in water samples from an observation well near the tank, from which an estimated 300 tons of highly radioactive water were found to have leaked.

Strontium is believed to accumulate in bones in humans and can cause bone cancer and leukemia. TEPCO first discovered the leak on Aug. 19, which is suspected to have started in July.

Although much of the contaminated water has apparently seeped into the soil and combined with groundwater, TEPCO's latest findings from the well are the first time the utility has confirmed that leaking water is spreading underground.

After the latest water leakage issue was exposed, TEPCO drilled the 7-meter-deep observation well one to two meters south of a site lined with tanks, including one where the water leak was discovered.

Near the observation well, there is a drain valve where 16 millisieverts per hour of beta rays were detected. Those levels are higher than those of surrounding areas. TEPCO believes the radioactive water leaked from the drain valve.

The tanks hold radioactive water generated in the process of cooling the crippled reactors. The contaminated water in the tanks has a concentration of 200 million becquerels of radioactive materials per liter.

The Nuclear Regulation Authority has rated the latest water leak accident at the plant as Level 3 (serious incident) on the eight-point International Nuclear and Radiological Event Scale.

TEPCO currently plans to pump groundwater from other wells on the plant site and release it into the sea before the underground water is contaminated by the leaked water. But those wells are located 130 meters on the seaward side of the observation well where groundwater contamination has been confirmed.

TEPCO said it will dig additional wells to investigate how far the radioactive water has spread underground.

### **Leaked toxic water at Fukushima plant may have mixed with groundwater**

<http://mainichi.jp/english/english/newsselect/news/20130906p2g00m0dm009000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Thursday it has detected 650 becquerels per liter of radioactive substances from groundwater near a leaky water storage tank at its crippled Fukushima Daiichi nuclear power plant.

The detection of radioactive substances emitting strontium and other beta rays shows the possibility that toxic water from the tank may have reached the groundwater, the plant operator known as TEPCO said. About 300 tons of highly toxic water had leaked from the tank.

The utility said it collected the groundwater Wednesday at a well dug more than a dozen meters south of the tank in the H4 area where the radioactive water had leaked.

The radiation level of the groundwater, which has been found to be lower than that of the toxic water in the tank, may have been diluted by rain water, according to TEPCO.

The utility believes that leaked toxic water mostly seeped into soil and partly flowed into the sea through a nearby drain ditch. The amount of flow into the sea is unknown.

The government plans to use wells to pump up groundwater before it flows into reactor buildings for discharge into the sea in a bid to reduce about 400 tons of groundwater now seeping into reactor buildings every day. The construction of an ice wall is also planned to block off groundwater flow.

With the latest detection of radioactive substances, however, the water in some of the wells is feared to be contaminated.



## Water gauges to be installed on all flange tanks

### Tepco plans to equip radioactive water tanks with level gauges

<http://www.japantimes.co.jp/news/2013/09/06/national/tepcos-plans-to-equip-radioactive-water-tanks-with-level-gauges/#.Uintjn9Sb9k>

by Kazuaki Nagata

Staff Writer

Tokyo Electric Power Co. said Friday that it will install water-level gauges on all flange-type tanks storing radioactive coolant water at the Fukushima No. 1 nuclear plant by the end of November to beef up monitoring.

Last month Tepco belatedly revealed that one of the tanks, which number in the hundreds and are made of steel plates bolted together, leaked some 300 tons of highly radioactive water, causing a domestic and international uproar over the contamination of the environment. Tepco admitted Thursday that the water probably seeped down and merged with tainted groundwater flowing into the Pacific.

**The new gauges can remotely monitor the levels of water in the tanks nonstop and sound an alarm if a drop in the level is detected,** the utility said.

**Currently, only 55 flange-type tanks out of 337 are equipped with gauges. The existing gauges are different from the ones that will be installed and cannot be remotely monitored.**

The flange-type tanks, which are considered temporary, are sealed with waterproof packing at their bolted-together seams. The tanks have experienced several leaks, including the recent one in which 300 tons of radioactive water escaped.

The Nuclear Regulation Authority deemed that leak a level 3 “serious incident” on the International Nuclear and Radiological Event Scale, or INES, to 7. The Fukushima No. 1 plant meltdown calamity stands at a level 7, just like the Chernobyl catastrophe.

The radioactive water problem has drawn keen international attention, in part because the International Olympics Committee will choose early Sunday Japan time whether Tokyo, Madrid or Istanbul will host the 2020 Olympics.

During a news conference held in Buenos Aires on Wednesday, where the IOC will announce the host city, many questions from foreign media focused on the Fukushima plant.

In an apparent effort to deflect the concerns, Tepco posted a video message by President Naomi Hirose on Thursday on its English-language website: "We recognize that bringing the contaminated water under control is the most urgent and serious problem that must be addressed. We are tackling this by implementing not only emergency measures, but also fundamental measures."

He also said the radiation monitoring shows that the impact has been contained within the small, now basically walled-in harbor at the power plant and that the wider ocean is safe.

Asked if the Olympic bid prompted the video message posting, a Tepco spokeswoman said that was not the motive, adding that the utility is simply trying to better inform the global community.

Tepco is making storage tanks nonstop, as it accumulates some 300-plus tons of highly radioactive water daily that first was circulated into its three reactors that suffered meltdowns, to keep their molten fuel inside submerged.

Water that leaks out of the reactor containment vessels into the buildings housing the crippled units combines with contaminated groundwater entering the basements on its way to the sea. That amount is also believed to be some 300 tons daily.

September 8, 2013

## Questions one shouldn't ask TEPCO

### **2 things Tepco never want us to ask – Direct leakage of coolant water and welling up contamination offshore**

<http://fukushima-diary.com/2013/09/column-2-things-tepco-never-want-us-to-ask-direct-leakage-of-coolant-water-and-welling-up-contamination-offshore/>

Japan takes advantage of their old image as “the trustworthy gentleman”, it’s concealing the most significant part of the facts. What we think is all is actually only a part of the entire situation, which they want us to see. Here are the two things that they never want to be asked about.

#### **1. Isn't the coolant water directly leaking out to the sea ?**

High level of contamination is measured from the groundwater. Normally, everyone would suspect it's from the reactor buildings and other related buildings. However they are taking ages to investigate trench and stuff -beating around the bush.

It's actually easy to identify where the coolant water goes. Just color it. If you see it in the sea, the coolant water, which directly touched molten nuclear fuel, is leaking to the sea. Tepco is given the right to define the causes to take forever to get to what really matters, and media is supporting Tepco by not asking why they don't investigate it.

#### **2. Some of the contaminated water can go underneath the plant port and directly well up offshore.**

Some parts of the groundwater in the plant area goes under the sea bottom of Fukushima plant port. It comes up to the sea far offshore.

The depth of the plant port is approx. only 5m. On the other hand, impermeable layer is 13m deep underground. Groundwater stream goes on the layer and can travel far like an underground river. There are some locations to have groundwater well up in the Pacific but Tepco hasn't investigated it, nor doesn't plan to do it. Japanese government doesn't even mention the presence of such points in the sea.

September 10, 2013

## New contamination of well discovered

### Leaked toxic water found at another site at Fukushima plant: TEPCO

<http://mainichi.jp/english/english/newsselect/news/20130910p2g00m0dm032000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Monday it has detected 3,200 becquerels per liter of radioactive substances in a well near a leaky water storage tank at its crippled Fukushima Daiichi nuclear power plant.

The radioactive substances emitting strontium and other beta rays were detected in samples taken Sunday from a well about 20 meters north of the water storage tank in the H4 area where toxic water had leaked. On Thursday, TEPCO said it had detected 650 becquerels per liter of such radioactive substances in another well located about 20 south of the storage tank.

The latest finding raises the possibility that leaked toxic water has reached groundwater at the power plant, which was devastated by the March 2011 earthquake and tsunami.

To prevent groundwater from being contaminated at the reactors, TEPCO plans to use wells to pump up the groundwater before it flows into the reactor buildings and is discharged into the sea.

But the latest finding could affect the utility's plan as the nearest well to be used to pump up groundwater is only 130 meters away from the monitoring well where highly radioactive contamination was found in samples on Sunday.

## More ground water contaminated

### Water highly irradiated near leaky tank

AFP-JIJI, Kyodo

<http://www.japantimes.co.jp/news/2013/09/10/national/water-highly-irradiated-near-leaky-tank/#.Ui9jwX9Sb9k>

Tokyo Electric Power Co. said groundwater at an observation well near the site of a leaky storage tank at the Fukushima No. 1 nuclear plant has shown high levels of radiation.

Tests found 3,200 becquerels per liter of beta ray-emitting materials, including strontium. As a result, it “now seems more likely” that radioactive water from leaking tanks at the crippled facility became mixed with groundwater in the area, Tepco said Monday.

**The level of contamination far exceeds the government limit of just 10 becquerels of strontium per liter in drinking water and 100 becquerels per kilogram for food.** If ingested, experts say, strontium accumulates in bones and can cause cancer.

Many of the tanks were used to cool molten fuel in the No. 1 plant’s three reactors that experienced core meltdowns from the March 2011 earthquake and tsunami.

Last week, the government unveiled a ¥47 billion plan to stem the leaks by creating a wall of ice under the plant. Tepco also plans to use wells to pump out groundwater before it seeps into the Pacific Ocean.

The latest findings could affect that plan, as the nearest pumping well is only 130 meters from the monitoring site where the highly irradiated water sample was taken.

### **Leaked toxic water found at another site at Fukushima plant: TEPCO**

<http://mainichi.jp/english/english/newsselect/news/20130910p2g00m0dm032000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Monday it has detected 3,200 becquerels per liter of radioactive substances in a well near a leaky water storage tank at its crippled Fukushima Daiichi nuclear power plant.

The radioactive substances emitting strontium and other beta rays were detected in samples taken Sunday from a well about 20 meters north of the water storage tank in the H4 area where toxic water had leaked. On Thursday, TEPCO said it had detected 650 becquerels per liter of such radioactive substances in another well located about 20 south of the storage tank.

The latest finding raises the possibility that leaked toxic water has reached groundwater at the power plant, which was devastated by the March 2011 earthquake and tsunami.

To prevent groundwater from being contaminated at the reactors, TEPCO plans to use wells to pump up the groundwater before it flows into the reactor buildings and is discharged into the sea.

But the latest finding could affect the utility's plan as the nearest well to be used to pump up groundwater is only 130 meters away from the monitoring well where highly radioactive contamination was found in samples on Sunday.

### **Leak from Fukushima tank contaminating groundwater**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309100048>

Tokyo Electric Power Co. has discovered radioactive materials from groundwater at the crippled Fukushima No. 1 nuclear power plant. It is the second such instance, which suggests contaminated water that leaked from a storage tank is spreading underground.

The utility said Sept. 9 that 3,200 becquerels of radioactive materials, such as strontium, were detected per liter of water taken from an observation well the previous day.

The well is located 20 meters north of the storage tank from which the company said on Aug. 20 that an estimated 300 tons of highly radioactive water leaked.

TEPCO will investigate how widely the leaked water has spread and check whether it will affect plans to intercept uncontaminated groundwater and release it into the ocean.

The utility is planning to pump water from a well 130 meters on the seaward side of the observation well before it flows into buildings and mixes with radioactive water generated from reactor cooling operations.

The company previously detected 650 becquerels of radioactive materials per liter of water taken Sept. 4 from an observation well 20 meters south of the storage tank.

### **Fukushima leaks contaminate more groundwater**

[http://www3.nhk.or.jp/nhkworld/english/news/20130910\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130910_03.html)

The operator of the Fukushima Daiichi nuclear power plant says it has recorded another spike in the level of radioactive substances in groundwater in the plant compound.

Tokyo Electric Power Company says it suspects contaminated water that leaked last month from a storage tank may be spreading.

TEPCO says it detected 3,200 becquerels of strontium and other radioactive substances per liter of water collected on Sunday from a new well. The well is about 20 meters north of the tank that leaked.

The reading was 5 times higher than in a sample taken from another well, to the south of the tank, last Wednesday.

TEPCO is planning to dig more wells to try to find out how the underground water is being contaminated.

In another development, TEPCO officials said they detected 80,000 becquerels of tritium per liter in a sample collected last Thursday from a well on the coastal side of the No.1 reactor building. The well has been there from before the nuclear accident.

That's higher than a reading taken from the well about a year ago.

## **First Cabinet discussion of leak**

### **Cabinet ministers discuss Fukushima leak**

[http://www3.nhk.or.jp/nhkworld/english/news/20130910\\_26.html](http://www3.nhk.or.jp/nhkworld/english/news/20130910_26.html)

Japan's Cabinet ministers have held their first meeting to tackle the leakage of radioactive water at the crippled Fukushima Daiichi nuclear power plant.

The launch of the ministerial panel was decided under the government's basic plan compiled earlier this month to deal with the contaminated water issue.

In Tuesday's meeting, Chief Cabinet Secretary Yoshihide Suga told the participants that he hopes to enlist experts both at home and abroad to solve the issue in a truly effective way.

He instructed relevant government agencies to coordinate views and accelerate countermeasures.

The panel decided to identify potential risk factors and compile necessary countermeasures before the end of this year.

The government has already decided to spend about 470 million dollars in taxpayers' money to deal with the contaminated water leakage issue.

One plan is to freeze the surrounding soil to create an underground wall in a bid to prevent groundwater from seeping through and becoming contaminated. Construction work for a feasibility study may start in mid-October at the earliest.

September 11, 2013

### **Tainted water may be leaking near No.2 reactor**

[http://www3.nhk.or.jp/nhkworld/english/news/20130912\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20130912_01.html)

A nuclear expert says radioactive groundwater at the crippled plant in Fukushima is likely still flowing into the sea.

Attempts by Operator Tokyo Electric Power Company to stop the water appear to have had little effect.

The utility admitted the leak in May after detecting high radioactivity at some of the wells between reactor facilities and the sea, as well as the plant port's water.

Head researcher at the Japan Atomic Energy Agency, Seiji Takeda, says levels of radioactive tritium in water samples from the wells and the nearby sea suggests the groundwater is to blame.

Takeda says tritium, which resembles hydrogen in character, moves with water and can be used to track water flow.

He noted that water samples taken in these wells at the sea side of the No. 2 reactor are showing higher levels of tritium compared to wells in surrounding areas. The wells are close to an underground tunnel also between the reactor facility and the sea.

From these reasons, he suggests the tunnel is one of the main sources of the contaminated water. He says the water is most likely flowing fairly quickly into the sea through pebbles inside the tunnel.

The operator has been solidifying the embankment to plug the leak. But it admitted on Wednesday that the measure is not working so far.

September 12, 2013

### **Tritium tainted groundwater expands at plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20130912\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20130912_02.html)



The operator of the crippled Fukushima Daiichi nuclear plant says it has found rising tritium levels at a monitoring well near a wastewater storage tank.

One of the storage tanks leaked more than 300 tons of highly radioactive water in August. The water is likely to have seeped into the soil.

Tokyo Electric Power Company has since increased the number of monitors to check radioactive materials in groundwater near the tank.

The company says the level of radioactive tritium at one of the wells rose to 64,000 becquerels per liter on Tuesday, more than twice the reading the previous day.

The well is located 20 meters north of the leaking tank. Engineers checked soil taken when the well was dug and found beta radiation of 0.1 millisieverts an hour.

Beta rays are kind of radiation emitted from tritium and other substances.

The operator suspects the leak is spreading but says it doesn't know why as the well is not located near to the groundwater flows. It says most of the contaminated soil around the tank has been removed.

The company initially planned to pump up clean groundwater and release it into the ocean before it passes through heavily contaminated reactors buildings. The finding that the groundwater is already tainted before its reaches the buildings may hamper that plan.

## **Tritium soars**

### **Groundwater tritium levels soar near Fukushima radioactive water leak site**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309120059>

Tritium levels sampled from a well near the Fukushima No. 1 nuclear power plant storage tank that leaked 300 tons of highly radioactive water by August exceeded the legal limit of 60,000 becquerels per liter, Tokyo Electric Power Co. said Sept. 11.

The samples, taken Sept. 10, registered 64,000 becquerels of tritium per liter and came from the well lying 20 meters north of the storage tank, according to TEPCO.

That is a significant spike compared to samples taken Sept. 9 that registered 29,000 becquerels per liter of water.

Tritium is a radioactive isotope of hydrogen.

Meanwhile, levels of radioactive strontium detected in the well dropped from 3,200 becquerels per liter of water sampled on Sept. 8 to 2,000 becquerels per liter two days later.

Strontium is believed to accumulate in bones and can cause bone cancer and leukemia.

TEPCO also released ground radiation level readings taken while it was drilling the test well. The utility said it detected beta ray levels of up to 0.09 millisievert per hour at depths of between 2.5 and nearly 4 meters from the surface.

TEPCO said it plans to dig more wells to gauge both the expanse and depth of the radioactive contamination.

September 13, 2013

## Contaminated drain into the sea?

### Contaminated water from cleanup after tank leak at Fukushima plant may have reached ocean

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309130069>

By SHUNSUKE KIMURA/ Staff Writer

Tokyo Electric Power Co. workers reported temporarily detecting high levels of radioactive strontium in parts of a drainage ditch close to the ocean at the crippled Fukushima No. 1 nuclear power plant.

"The possibility that some of the contaminated water may have reached the ocean cannot be denied," a TEPCO official said.

The drainage ditch is used to remove rainwater. The high level of strontium was detected at a point about 150 meters from the water's edge.

Samples taken from the ditch on Sept. 11 registered 220 becquerels of beta ray sources, including strontium, per liter of water. No radioactive materials were detected in water sampled from the same area of the ditch a day later.

TEPCO workers had been decontaminating areas of the ditch upstream from where the samples were taken until Sept. 11. Radioactive cesium was also detected at a level of 104 becquerels per liter of water.

The area upstream from the ditch contains the storage tank that was found in August to have leaked 300 tons of highly radioactive water. It was also discovered that some of the contaminated water from the tank flowed into the drainage ditch.

TEPCO workers used pressurized water to clear away mud that had accumulated in the ditch on Sept. 11. It is believed that may have caused some of the radioactive material to flow further downstream.

Despite the cleanup efforts, strontium levels of 2,400 becquerels were registered in other areas around the ditch.

TEPCO officials believe the radioactive material is residue that was overlooked during the cleaning process. They say they plan to collect the remaining radioactive contaminated materials in the near future.

## **Radioactive water in ditch may have reached sea**

[http://www3.nhk.or.jp/nhkworld/english/news/20130913\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130913_03.html)

The operator of the troubled Fukushima Daiichi nuclear plant says some of the water used to decontaminate a drainage ditch may have reached the sea near the plant.

Last month, more than 300 tons of highly radioactive water leaked from a storage tank. Tokyo Electric Power Company says some of the toxic water may have escaped into the sea through the ditch.

TEPCO is monitoring radiation levels at 8 spots in the ditch and the sea nearby to find out how the leaked water has spread.

The utility discovered 80 becquerels per liter of cesium-137 in water samples taken on Wednesday at a location 30 meters from the sea.

The density is close to the government-set threshold for radioactive water allowed to be discharged to the sea.

The company also found 220 becquerels per liter of beta-ray emitting radioactive substances, including strontium.

TEPCO says decontamination work is underway at an upstream ditch following the leak of radioactive water from storage tanks. The utility adds some of the tainted clean-up water may have flowed down the ditch and into the sea.

The power company says it had taken measures to remove the decontamination water to prevent it from leaking into the sea. But TEPCO admitted these steps were insufficient. It promised additional measures to remove clean-up water and beef up surveillance of the decontamination work.

## **Toxic drain water may have run into Pacific**

Kyodo

<http://www.japantimes.co.jp/news/2013/09/13/national/toxic-drain-water-may-have-run-into-pacific/#.UjMP-z95ivM>

Tokyo Electric Power Co. said it found radioactive substances in a drainage ditch that leads directly to the Pacific Ocean near the Fukushima No. 1 nuclear plant.

Substances radiating 220 becquerels per liter were found in samples taken Wednesday from a ditch about 150 meters from the sea. The beta rays given off by strontium, cesium and other substances were some 12 times greater than samples taken there Tuesday, Tepco said Thursday.

Workers have been trying to decontaminate an upstream ditch for several days, and Tepco suspects toxic water seeped through sandbags placed there.

The upstream ditch is near a water tank in the area known as H4 from which around 300 tons of highly toxic water was recently found to have leaked.

The latest finding could undermine Prime Minister Shinzo Abe's remarks during Tokyo's final presentation to the International Olympic Committee in Buenos Aires last weekend that the radioactive leakage has been "completely confined," before Tokyo won the 2020 Olympics.

Tepco said it has not taken measures to prevent the radioactive substances in the ditch from reaching the sea.

The utility maintains that no abnormalities have been detected in the radiation levels of the seawater, with its evaluation based on samples taken about 100 meters south of the drainage outlet.

The level of bone-cancer-linked strontium-90, which makes up about half of the beta ray-emitting substances detected in samples from the ditch, is believed beyond the threshold set by the government.

## Barrett in Fukushima

### US nuclear expert inspects Fukushima Daiichi

[http://www3.nhk.or.jp/nhkworld/english/news/20130912\\_45.html](http://www3.nhk.or.jp/nhkworld/english/news/20130912_45.html)

A US nuclear expert says problems at the Fukushima Daiichi plant are more complex than an accident on Three Mile Island in 1979.

Lake Barrett is a former official with the US Nuclear Regulatory Commission. He directed cleanup operations at the US plant for 4 years after the accident.

He visited the Fukushima plant on Thursday, after the Tokyo Electric Power Company invited him to provide advice to its water management task force.

Barrett inspected a storage tank from which about 300 tons of contaminated water leaked last month. He also visited a construction site for barriers to prevent radioactive water from seeping into the sea.

Barrett said TEPCO should have made the barriers around the storage tanks high enough to stop any leaks even if all the water escapes.

In a meeting with TEPCO president Naomi Hirose, Barrett said that in the Three Mile Island accident, contaminated water remained inside the reactor buildings. He said Fukushima is more complex and difficult as it involves groundwater.

Barrett is expected to take part in a meeting at the TEPCO headquarters in Tokyo on Friday to provide advice on water management.

Barrett also spoke about the increase of contaminated water in the storage tanks. He said radioactive substances must be lowered to a level below national and international limits.

He added that the volume of contaminated water is too large to be stored in tanks indefinitely. Barrett said public consent will be more important than technical issues if the water eventually needs to be dumped into the ocean.

The president of TEPCO said the utility expects Barrett to apply his expertise and experience from the Three Mile Island accident, to solve the problems in Fukushima.

### **US expert: TEPCO should say more on water leaks**

[http://www3.nhk.or.jp/nhkworld/english/news/20130913\\_18.html](http://www3.nhk.or.jp/nhkworld/english/news/20130913_18.html)

A US nuclear expert has urged the operator of the Fukushima Daiichi nuclear plant to do more to tell the world about leakage of radioactive water at the site.

Lake Barrett is a former official of the US Nuclear Regulatory Commission who led cleanup work for 4 years after the nuclear accident at Three Mile Island.

Barrett took part in a meeting at Tokyo Electric Power Company on Friday to address problems including leakage from wastewater storage tanks and contamination of massive amounts of groundwater.

Barrett, who inspected the site on the previous day, said measures taken there are helping to contain significant amounts of radioactivity.

He said there's no reason for concern about public health or safety concerning water at the plant.

**But he stressed that efforts for technical control of the water are insufficient. He urged TEPCO to improve its methods of communicating to the world so that people know what's going on at the plant.**

**Barrett said managing water in a situation like that of Fukushima Daiichi is a major challenge that's much larger than that of the Three Mile Island accident.**

But he said people have been traumatized and that any additional release of radioactivity is a great concern however low its risk.

TEPCO says it will continue to ask the US expert for advice.

## Ex-U.S. regulator says Fukushima cleanup complicated

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309130095>

THE ASSOCIATED PRESS

A former U.S. nuclear regulator says cleaning up Japan's wrecked Fukushima plant is a bigger challenge than the work he led at Three Mile Island and that ongoing radioactive water leaks are a minor part of that task.

Lake Barrett was appointed this month by plant operator Tokyo Electric Power Co. as an outside adviser for the decades-long decommissioning process.

He led the Three Mile Island accident cleanup for nearly a decade as part of the Nuclear Regulatory Commission.

He said that the meltdowns in three of the reactors, massive radiation leaks and the volume of contaminated water at the Fukushima No. 1 plant, on Japan's northeast coast, make it a more complicated clean-up.

"In comparison to Three Mile Island, Fukushima is much more challenging, much more complex a job," Barrett told a Tokyo news conference.

Compared to the magnitude of that task, the leakage problem is a "very low health impact and not a concern," he told The Associated Press in an exclusive interview later on Sept. 13.

The attention on the contaminated water leaks is "out of proportion," and is hurting the overall cleanup process by slowing things down, he said.

The 1979 core melt accident at the Three Mile Island nuclear plant in Pennsylvania involved one reactor. All the radioactivity was contained in one building, where 8,000 tons of contaminated water were trapped.

In Fukushima, the catastrophe was precipitated by a massive earthquake and tsunami, whose aftermath are further adding to the difficulties of containing and cleaning up after the meltdowns of the three reactors.

Moreover, buildings at the Japanese plant were destroyed or damaged by hydrogen explosions, which released massive radioactive elements into the air and sea.

Japanese officials have acknowledged that radioactive ground water has been leaking from the plant since soon after the nuclear disaster. Recent leaks from storage tanks holding radioactive water have added to the concerns.

But despite worries over the massive quantities of water needed to cool the melted reactors, the risk of radiation-contaminated water to public health is minimal, Barrett said.

Improved communication would help calm those fears, which likely persist since huge amounts of radiation-tainted water will have to be released into the Pacific after it is processed to bring it below legal limits.

TEPCO acknowledged on Sept. 12 that samples of underground water from near a tank where a major leak occurred last month showed high levels of radioactive tritium.

Massive amounts of contaminated water--a combination of water leaking from the three damaged reactors and inflows of underground water--have also accumulated inside reactor and turbine basements and threaten to leak into the Pacific Ocean.

The most toxic water gathers in the basements, Barrett said, but it is so far "adequately controlled."

The Nuclear Regulation Authority has estimated the amount of that water at a hefty 90,000 tons and urged TEPCO on Sept. 12 to quickly increase anti-leak measures to the basements to minimize the risk of the highly toxic water spreading.

Hours before the Sept. 7 vote by the International Olympic Committee awarded Tokyo the hosting rights for the 2020 games, Prime Minister Shinzo Abe emphatically declared that the leaks were under control.

The government has promised to become more directly involved in the plant's water management and to fund costly projects to contain the leaks, including an ice wall--using a system of pipes to freeze the earth so it forms a frozen wall--to surround the reactor and turbine buildings to block underground water flows, and an advanced water treatment apparatus designed to process tank water to make it safe enough for eventual release into the Pacific.

Dale Klein, a former NRC chairman who was also in Tokyo as a TEPCO adviser, said Sept. 13 that the contaminated water problem would last "for at least a decade" until planned removal of molten fuel that needs constant cooling begins.

"Water would be an issue that TEPCO would have to pay attention for a long time," he said.

September 14, 2013

## **Barrett: "A big nothing"**

### **INTERVIEW/ Lake Barrett: Japan must get ready to release Fukushima water into the sea**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309140076>

REUTERS

Japan should begin preparing to release a massive tide of water from the wrecked Fukushima nuclear plant into the Pacific Ocean, once it regains public trust and can confirm the water has only low levels of radiation, a U.S. adviser to the plant's operator said on Sept. 13.

Lake Barrett, a former head of the Department of Energy's Office of Civilian Nuclear Waste Management, spent nearly a decade at the U.S. Nuclear Regulatory Commission and led the clean-up operations after the 1979 partial meltdown at the Three Mile Island nuclear plant. He has been brought in by Tokyo Electric Power to advise it on the lengthy decommissioning process at Fukushima No. 1 nuclear power plant.

He said work should begin now to pump groundwater from the plant before it reaches wrecked reactors--a measure that has been stalled by local opposition.

"They should start pumping as soon as practical," said Barrett, adding that groundwater would have to be released into the sea along with water that had been treated to remove most radiation--by a system designed by Toshiba Corp.

"I believe in a matter of a few months ... early next year ... water will be cleaned up and be ready to be discharged," he said in an interview.

But Barrett, who has said he would feed his grandchildren fish caught off the Fukushima coast if the cleanup proceeds as planned, said TEPCO has lost its credibility to reassure a jittery public. "When TEPCO says: 'trust me, this water is safe,' that's not enough," he said.

Barrett toured the Fukushima plant on Sept. 12 and met TEPCO president Naomi Hirose, part of an effort by the utility and the central government to show they are following through on a pledge to take control of irradiated water leaks at Fukushima.

TEPCO has been battling to contain a tide of contaminated water at the plant, which suffered reactor meltdowns after the station was crippled by a massive 2011 earthquake and tsunami.

### **'Now is the time'**

The utility is pumping 400 tons of highly radioactive water out of the reactor buildings' wrecked basements every day, treating it to remove most radiation and storing the water in hundreds of makeshift tanks around the plant. Some 330,000 tons of contaminated water--enough to fill more than 130 Olympic swimming pools--has been pumped into storage pits and above-ground tanks at the facility.

TEPCO plans to more than double the storage capacity of tanks at Fukushima by 2016, but doesn't have a plan beyond that. At least one tank has sprung a leak.

TEPCO has tried to win local support for a "bypass" that would route groundwater around the plant and into the sea, reducing the amount of contaminated water that must be treated and stored. Local fishermen oppose the plan and have delayed its implementation.



Barrett said Japan's consensus-style of decision making risked delaying a practical step that would allow TEPCO to focus on more critical problems.

"My sense is that they're hesitant to do this because it's a burden for the Japanese people, a burden for the fishermen, so maybe we'll just continue with more tanks," he said. "But you're just delaying the problem. Now is the time to deal with it."

Barrett said he urged Hirose to make TEPCO more open to expertise from overseas. Foreign contractors and consultants have been largely excluded from the cleanup.

"I recommend they integrate foreign expertise within the Japanese system," he said. "It's something where they know they have to do better."

He said concerns raised by South Korea and China over the continued leaks of radiated water at Fukushima "political posturing."

"This is healthwise a big nothing," he said.

September 16, 2013

## **US offers help to stop leaks**

### **Fisheries official to ask Seoul to end food ban**

Kyodo <http://www.japantimes.co.jp/news/2013/09/16/national/fisheries-official-to-ask-seoul-to-end-food-ban/#.UjczLz95ivM>

[Japan asked South Korea on Monday .....]

### **U.S. offers to help stop Fukushima water leaks**

JIJI  
VIENNA

U.S. Energy Secretary Ernest Moniz said Sunday that Washington is ready to support Japan's effort to stop radioactive water from leaking into the sea at Tokyo Electric Power Co.'s crippled Fukushima No. 1 nuclear power plant.

Moniz made the offer at a meeting in Vienna with Ichita Yamamoto, after the minister in charge of science and technology said Tokyo is acting responsibly to fully contain the spread of radiation with a bunch of money — government funds amounting to ¥47 billion — announced last month more than two years after the crisis began.

The U.S. energy chief underscored the importance of transparency in disclosing the government's crisis response measures.

Yamamoto gave assurances Japan will provide the international community with accurate information. As for the decommissioning of the Fukushima reactors, Yamamoto called for international support for the complex and difficult task.

## **Storm - TEPCO taking "precautions"**

### **Crippled Fukushima plant braces for storm**

[http://www3.nhk.or.jp/nhkworld/english/news/20130916\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20130916_13.html)

The operator of the Fukushima Daiichi nuclear power plant is taking precautions to prevent contaminated water from overflowing, as a strong storm approaches.

Workers at the nuclear plant have placed weights on large cranes to stop them toppling over. The cranes are used to move debris around the reactor buildings.

They have also tied down outdoor pumps and piping, used to inject water into the reactors.

Tokyo Electric Power Company is strengthening patrols to stop rain from overflowing the basement of turbine buildings and the underground tunnel where highly contaminated water has accumulated.

Workers took water samples from behind the barrier surrounding the storage tank on the mountain side of the Number 4 reactor. More than 300 tons of contaminated water leaked from the tank last month.

They say they detected 170,000 becquerels of strontium and other radioactive substances per liter of water.

TEPCO says they will transfer the water behind the barrier, to a nearby tank and do the same for water in other areas where radioactivity is high.

On Sunday afternoon, workers found water overflowing around a separate tank.

They detected 37 becquerels of beta-ray emitting radioactive substances per liter of water.

TEPCO officials say that level is lower compared to the water in the tank, and that only rainwater brought by the storm accumulated and overflowed.

TEPCO says that for the day, they have cancelled the construction of new storage tanks and the building of steel walls along the embankment designed to prevent contaminated groundwater reaching the sea.

Sep. 16, 2013 - Updated 03:23 UTC

## They have dared!

### **Tepco discharges tainted rainwater from storage tank areas**

Kyodo <http://www.japantimes.co.jp/news/2013/09/16/national/tepc-discharges-tainted-rainwater-from-storage-tank-areas/#.Ujcy5T95ivM>

Tainted rainwater was discharged into the ocean Monday to prevent the damaged Fukushima No. 1 power plant from being flooded by the passage of Typhoon Man-yi, Tokyo Electric Power Co. said.

The radioactivity of the rainwater, which had accumulated within circular barriers around makeshift storage tanks holding water tainted by emergency cooling operations, was low enough to release into the sea, the beleaguered utility said.

Tepco said it decided to discharge the rainwater, tainted by strontium-90, because it was threatening to spill over into the rest of the complex. So it opened the barriers and released the water from the storage area, mainly through rainwater ditches, into the sea.

The barriers are designed to contain leaks from the more than 1,000 hastily built storage tanks at the plant, which suffered three core meltdowns after the March 11, 2011, earthquake and tsunami.

The utility said the rainwater was discharged from barriers at seven locations and contained strontium 90, which can cause bone cancer if ingested. The beta radiation given off by the strontium did not exceed the government's limit of 30 becquerels per liter, it said.

Tepco said the radiation level of the water overall, including strontium 90, which accounted for about half of the beta ray emissions, maxed out at 24 becquerels per liter.

In areas where water samples were highly toxic, however, Tepco took a different approach and transferred it elsewhere through makeshift pumps. One of those areas contained rainwater that was emitting 170,000 becquerels per liter, far higher than allowed.

September 17, 2013

## TEPCO's "emergency" measure

### TEPCO releases water deposited by typhoon at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309170057>

Tokyo Electric Power Co. said it released 1,130 tons of water left behind by powerful Typhoon No. 18 on Sept. 16 onto the soil of the crippled Fukushima No. 1 nuclear power plant after determining contamination levels were below safety standards.

The rainwater collected behind seven concrete barriers, each enclosing a group of storage tanks holding radioactive water on the grounds.

The utility said its workers took the "emergency measure" after confirming that the water in each area contained lower radioactive strontium levels than the legal limit.

TEPCO said it decided to drain the water because if another leak occurred in the storage tanks and went unnoticed, it could contaminate the rainwater accumulated inside the enclosure.

Each concrete barrier in the enclosure is about 30 centimeters high and is equipped with a drainage valve. The valves used to be kept permanently open until the discovery in August that 300 tons of highly radioactive water had leaked from a storage tank in an area called "H4."

TEPCO decided to keep the valves closed after the Nuclear Regulation Authority warned that any leaking water from a tank could flow outside the enclosure if the valves remained open.

The utility said Sept. 17 that the water was drained from seven areas, where rising water levels were flooding the concrete foundations of the storage tanks. It said workers opened valves on the barriers surrounding those areas to drain the water between about 12:40 p.m. and 4:30 p.m. on Sept. 16.

The water, which flowed onto the surrounding soil, may eventually find its way into the nearby ocean. Quick tests found between 3 and 24 becquerels of strontium and other beta-ray sources per liter of water in each of the seven areas. Those levels were lower than the legal limit of 30 becquerels of strontium per liter of water that can be released into the environment, TEPCO officials said.

Strontium is believed to accumulate in bones in humans and can cause bone cancer and leukemia.

TEPCO said its workers did not test radioactive cesium levels in the rainwater because the low strontium levels indicated there would be similarly low cesium levels present.

The utility said it did not release water from areas where high radioactive readings were registered.

TEPCO said its workers were collecting water from such areas and transferring it into storage tanks.

For example, 170,000 becquerels of radioactive strontium and other beta-ray sources were detected per liter of water in Area H4, where the 300-ton leak discovered in August occurred.

In a separate development, TEPCO said tritium levels remain elevated and fluctuating in groundwater samples from a test well near the tank that was the source of the leak in Area H4.

Samples taken on Sept. 14 from the well were found to contain **170,000 becquerels of tritium**, a radioactive isotope of hydrogen, per liter, the utility said Sept. 16.

That level was up from 130,000 becquerels per liter on Sept. 12 and 150,000 becquerels per liter on Sept. 13, but the reading dropped slightly to 140,000 becquerels per liter in samples taken on Sept. 15, TEPCO added.

### **TEPCO: 1,130 tons of water released onto ground**

[http://www3.nhk.or.jp/nhkworld/english/news/20130917\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20130917_25.html)

The operator of the Fukushima Daiichi nuclear plant has released more than 1,100 tons of rainwater that had pooled inside barriers around wastewater storage tanks.

Heavy rain lashed the plant on Sunday and Monday due to the effects of a severe tropical storm.

Officials of Tokyo Electric Power Company told reporters on Tuesday that workers discharged 1,130 tons of water from 7 sections onto nearby soil to prevent it from overflowing.

They said the level of radioactive substances in the water was below the government-set standard, so they judged it to be rainwater.

The government sets 30 becquerels per liter as the limit for discharging radioactive water into the ocean.

TEPCO officials say workers released the water onto the ground and not into drainage ditches that lead to the sea, so they cannot say how much may have leaked into the ocean.

The utility plans to study ways to prevent rainwater from accumulating within the storage tank barriers to prepare for future heavy rains.

Sep. 17, 2013 - Updated 04:12 UTC

September 18, 2013

## **The long road ahead**

## **ANALYSIS: The long road ahead in ending Fukushima water problem**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309180074>

*See extensive graphic of Fukushima plant situation here:*

[http://ajw.asahi.com/appendix/pdf\\_data/Fukushima\\_water\\_crisis.pdf](http://ajw.asahi.com/appendix/pdf_data/Fukushima_water_crisis.pdf)

Even geography is working against Tokyo Electric Power Co. and the government in their struggle to deal with the persistent problem of radiation-contaminated water at the Fukushima No. 1 nuclear plant.

The site receives so much groundwater that special equipment--rendered useless by the 2011 earthquake and tsunami--was set up to prevent the plant's buildings from floating on the continuous flow.

The most pressing problem is stopping the groundwater from entering the plant's reactor buildings, becoming contaminated and spilling into the sea. But it is far from the only obstacle in the roadmap to decommission the reactors at the stricken plant.

TEPCO still does not know all the details of how and where groundwater is entering the buildings. Also in the dark about the full extent of the problem, the central government has stepped in and is resorting to unprecedented measures with potential pitfalls.

An estimated 800 to 1,000 tons of groundwater flows daily in the direction of the Fukushima plant buildings, a volume much larger than those at other nuclear plants.

The original site of the Fukushima No. 1 plant was a cliff more than 30 meters high. But 20 meters was lopped off to create the foundation of the nuclear plant, putting the groundwater level only a few meters below the surface.

The plant itself was constructed on land containing gravel layers through which water can easily pass through. In the past, a brook trickled by the No. 4 reactor.

According to Atsunao Marui, who heads the Groundwater Research Group at the National Institute of Advanced Industrial Science and Technology, rain makes up most of the groundwater at the Fukushima plant. Water also flows in from the Abukuma Highlands.

“About 4 million tons of rain falls on the plant site over the course of a year,” Marui said. “Of that figure, it is believed that between 1 million and 1.5 million tons seep into the ground.”

Subdrains at depths of between 10 and 15 meters were constructed around the reactor buildings to pump up groundwater and send it out to sea. Without that pumping, the buildings faced the danger of being buoyed by rising groundwater.

The subdrains could pump up 850 to 1,200 tons of groundwater a day, enough to fill three to four 25-meter swimming pools.

But the subdrains were rendered inoperable after the Great East Japan Earthquake and tsunami knocked out power to the plant on March 11, 2011, leading to the meltdowns of three reactors.

Now, about 400 tons of groundwater flows daily into the buildings for the No. 1 to 4 reactors and mixes with water already contaminated by the melted nuclear fuel.

The growing volume of contaminated water continues to be stored in tanks installed on the plant site. As of Sept. 10, 435,000 tons of polluted water was held in building basements and tanks, an increase of 137,000 tons over the course of a year.

TEPCO officials have pinpointed only two locations, including the turbine building of the No. 1 reactor, where groundwater is entering the building basements. They believe there are many more breaches.

However, workers have been unable to confirm such locations and plug the holes because dangerous radiation levels make it difficult to approach the trouble spots.

Highly radioactive water in the building basements is also flowing into underground trenches that hold cables and other equipment. Some of that contaminated water is believed to be leaking into the ground, mixing with groundwater and heading toward the ocean.

Industry ministry officials estimate that 300 tons of such radioactive water flows into the ocean daily.

## **Two-phase approach**

Faced with the continuing water problems at the site, the central government decided to take a more active role in dealing with the situation.

The Nuclear Emergency Response Headquarters on Sept. 3 released a plan that includes a two-phase approach to deal with the contaminated water: emergency steps to be implemented immediately, and comprehensive measures that would be carried out over the next year or two.

The first emergency measure is removing about 20,000 tons of highly radioactive water accumulated in the underground trenches toward the ocean side of the reactor buildings to prevent it from flowing into the sea.

But the trenches are connected to the turbine buildings, so additional contaminated water would fill the trenches even if water is pumped up.

The government plans to stop water from entering or exiting the trenches by the end of the current fiscal year. To achieve that goal, one measure being considered is freezing the water in the connecting joints to the trenches. However, that work could be difficult considering the high water pressure involved.

Another emergency measure is establishing a groundwater bypass from wells toward the mountain side of the reactor buildings to divert the water to the ocean before it becomes contaminated. Construction on 12 of those wells as well as the piping was completed in March. Once the system begins operations, the volume of water flowing into the buildings could be reduced by about 100 tons daily.

However, local communities distrustful of TEPCO have still not given their consent to having the water dumped into the ocean.

“The only thing to do with water that is not dangerous is to release it,” said Osamu Tochiyama, a former professor of nuclear engineering at Tohoku University. “Rather than leave matters up to TEPCO, the central government should have shown that it was responding to the negative publicity that had arisen from the nuclear accident. It should have provided support to ensure that the problem was being dealt with in a more assuring manner.”

A key part of the government’s plan is building a 1,400-meter-long underground wall of frozen soil that would surround the area holding the No. 1 to 4 reactors. The central government plans to earmark 32



billion yen (\$322 million) in construction costs for the wall, and it is seeking to start the project in fiscal 2014.

According to the plan, the frozen wall would prevent groundwater from entering the buildings, allowing workers to remove the contaminated water there.

The frozen soil wall technology has been used in tunnel construction. But there is no precedent for the scale of what would be needed at the Fukushima plant.

Another comprehensive measure will be restarting the subdrains to lower the groundwater level, thereby reducing the volume of contaminated water within the buildings. The government is seeking to resume subdrain operations in September 2014.

The function of the frozen soil wall would end after groundwater no longer leaked into the buildings. According to the plan, contaminated water could then be removed and water circulated within the buildings to cool the melted fuel.

But it would still not represent an end to all the problems at the Fukushima nuclear plant.

For example, the tanks on the plant site would continue to hold huge amounts of contaminated water.

TEPCO is seeking an early start of operations of the Alps multi-nuclide removal equipment, which can eliminate 62 radioactive substances from contaminated water. Reducing the amount of such substances would reduce the risk in the event contaminated water leaked from the tanks.

However, that would still leave open the question of what to do about tritium, a radioactive isotope of hydrogen that cannot be removed by the Alps equipment.

(This article was written by Shunsuke Kimura, Ryuta Koike and Senior Staff Writer Hisashi Hattori.)

## **Can cracked vent pipe withstand earthquake?**

## Cracks found in vent pipe at Fukushima plant

[http://www3.nhk.or.jp/nhkworld/english/news/20130919\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130919_03.html)

The people in charge of the Fukushima Daiichi nuclear plant say they've found cracks in a steel framework that supports an unused ventilation pipe. They relied on the pipe for a period of time to release dangerous vapors created by the 2011 accident.

Officials at Tokyo Electric Power Company say workers on Wednesday discovered the **cracks and cuts at 8 places in the buttress about 66 meters above the ground.**

**The Nuclear Regulation Authority has ordered the company to assess the capacity of the pipe to withstand an earthquake as quickly as possible.**

**The 120-meter vertical pipe stands between the number-1 and number-2 reactor buildings.**

When they were handling the 2011 accident at the plant, TEPCO workers used it to discharge radioactive vapor and ease pressure in the containment vessels. They did this to prevent explosions.

TEPCO officials say they believe the 2011 earthquake damaged the steel framework. They say they have not observed any obvious damage in the pipe itself.

The officials say they are considering how to access the pipe to assess its strength. **The area around the pipe is contaminated with high levels of radiation measuring 10 sieverts per hour.**

## Japan Regulator Presents Fukushima-Daiichi Status Update

<http://www.nucnet.org/all-the-news/2013/09/18/japan-regulator-presents-fukushima-daiichi-status-update>

Molten cores in the reactor pressure vessels and primary containment vessels at the Fukushima-Daiichi nuclear plant have been successfully cooled and the concentration of hydrogen in the PCVs is “much lower than the flammability level”, Japan’s Nuclear Regulation Authority (NRA) has said in a status update on the situation at the facility.

Hiroshi Yamagata, director of the nuclear regulation division for boiling water reactors at the NRA, told the International Atomic Energy Agency that the temperature of water in the spent fuel pools at Units 1 to 4 ranges from 26 degrees Celsius to 36 degrees Celsius. The operational limit is 65 degrees Celsius.

Mr Yamagata said the removal of spent fuel from the Unit 4 spent fuel pool will begin next month. Debris from the Unit 3 spent fuel pool is being removed.

Units 5 and 6 at the plant, which was hit by an earthquake and tsunami in March 2011, are in cold shutdown.

Mr Yamagata said that around 400 cubic metres a day of groundwater is flowing through the reactor and turbine buildings, together with extra water from an injection tank. This extra water is treated and recirculated for injection into the RPVs for cooling. This gives rise to about 400 cubic metres a day of contaminated water, which is pumped into tanks for storage.

He said there is 11,000 cubic metres of highly contaminated water at the site in a seawater pipe trench. The level of radioactivity in this water is about one billion becquerels per litre (GBq/ℓ).

Most of the seawater sampled near the plant has been under the detection limits and there has been no change in this since leaks of contaminated water from a storage tank were discovered in August.

In the harbour that serves the plant, samples taken on 8 September showed levels of radioactivity over the legal limit. All-beta radiation was measured at 880 becquerels per litre (Bq/ℓ), caesium-137 at 97 Bq/ℓ, and tritium at 2,800 Bq/ℓ.

Mr Yamagata's presentation to the IAEA is online:

[www.iaea.org/newscenter/news/2013/fukushimaupdate160913.pdf](http://www.iaea.org/newscenter/news/2013/fukushimaupdate160913.pdf)

September 20, 2013

## Quake strikes Fukushima on Friday

### M5.3 earthquake rocks Fukushima

AFP-JJI

<http://www.japantimes.co.jp/news/2013/09/20/national/m5-3-earthquake-rocks-fukushima/#.Ujv0WINSb9k>

A magnitude 5.3 earthquake rocked Japan's Fukushima prefecture early Friday morning, U.S. seismologists said, but no tsunami warning was issued.

The epicenter of the earthquake was 22 km below the ground, according to the U.S. Geological Survey. It struck 20 km west of Iwaki, bordering the Pacific Ocean, at 2:25 a.m.

The epicenter was also about 50 km southwest of the damaged Fukushima No. 1 Nuclear Power Station, which was crippled by the major quake and tsunami in March, 2011.

The Japan Meteorological Agency, which put the quake at magnitude 5.8, said no tsunami warning had been issued.

The quake, which registered shindo 5 on the Japanese seismic scale for the Fukushima area, was felt in Tokyo, 175 km away.

It came just hours after Prime Minister Shinzo Abe toured the nuclear plant on Thursday, ordering its operator Tokyo Electric Power to fix radioactive water leaks there.

## **M5.9 quake strikes Fukushima, no reports of plant damage**

<http://mainichi.jp/english/english/newsselect/news/20130920p2g00m0dm001000c.html>

TOKYO (Kyodo) -- A magnitude 5.9 earthquake struck Fukushima in the northeast early Friday morning, the Japan Meteorological Agency said, but no abnormalities were observed at the region's nuclear power plants including the crippled Fukushima Daiichi, according to their operators.

The focus of the 2:25 a.m. quake was around 17 kilometers underground in Fukushima Prefecture's southern coastal region, the Japan Meteorological Agency said. No tsunami warning was issued.

Seismic intensity ranged from 1 to upper 5 on the scale of 7 in the Japanese measurement system from northeastern to central Japan.

The highest reading of upper 5 was recorded in Iwaki city in Fukushima Prefecture, while lower 5 was logged in other parts of Fukushima and Ibaraki prefectures. Tokyo and Narita city registered intensity 3.

A Japan Meteorological Agency official told a news conference that the quake was an aftershock of the magnitude 9 quake that devastated northeastern Japan in 2011 and warned that a temblor measuring up to 4 in intensity could occur within a week.

Iwaki firefighters said a 62-year-old woman suffered light shoulder injuries at her home in the city when she got out of bed in surprise following the quake.

A 32-year-old woman in Iwaki also sustained minor foot injuries from a shattered mirror, they added.

No new abnormalities were observed in measurement data from the nuclear reactors and other equipment at the Fukushima Daiichi Nuclear Power Station or from radioactivity monitoring posts there. Readings were also normal at the nearby Fukushima Daini plant, according to Tokyo Electric Power Co. The Daiichi plant was crippled by the massive quake and tsunami in 2011.

Japan Atomic Power Co. said no abnormalities were confirmed at the Tokai No. 2 nuclear power plant in Ibaraki Prefecture.

A few sections of highways in the region were closed to traffic, according to highway operators.

A quake measuring upper 5 on the Japanese scale hit Ishinomaki in northeastern Japan's Miyagi Prefecture on Aug. 4.

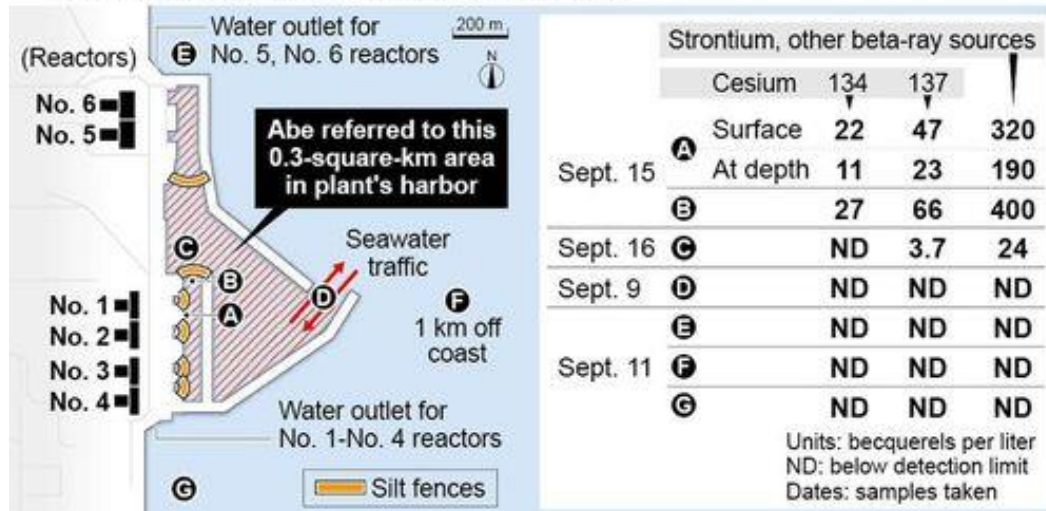
Japanese Prime Minister Shinzo Abe visited the Fukushima Daiichi on Thursday and urged TEPCO to scrap the remaining two reactors in addition to four other units the utility is taking steps to decommission.

## **Contaminated water still flowing out to Pacific**

## ANALYSIS: Contaminated water flowing into ocean despite Abe's claim

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309200053>

### Fukushima No. 1 nuclear plant: seaborne radioactive readings, measures to block leaks from harbor



Water contaminated with radiation is flowing out into the Pacific Ocean from a harbor at the Fukushima No. 1 nuclear plant despite assurances from Prime Minister Shinzo Abe that it has been "completely blocked."

Abe on Sept. 19 based his assertion on measurements taken in the outer ocean.

But experts said levels of seaborne radioactive substances stay mostly below detection limits in the outer ocean because the substances have simply become diluted.

The government has estimated that 300 tons of radioactive groundwater is leaking every day into the plant's harbor. The harbor has an opening to the outer ocean through which 20 percent of the seawater within is believed to be replaced by seawater from the outer ocean during one cycle of high and low tides.

Michio Aoyama, a senior researcher of marine chemistry at the Japan Meteorological Agency's Meteorological Research Institute, estimated that 30 billion becquerels of radioactive cesium and another 30 billion becquerels of radioactive strontium continue to leak into the outer ocean every day.

Radioactive materials decay with time at fixed rates, but available monitoring data have shown no decline in their levels.

A daily input of 60 billion becquerels is required to make that happen, Aoyama said.

Radioactive cesium and strontium continue to be detected within the harbor. They are believed to derive from the highly radioactive water that leaked through underground pits in April and May 2011 after the water was used to cool melted nuclear fuel during the early stages of the nuclear accident that began in March 2011.

To deal with the situation, Tokyo Electric Power Co. installed 0.5-millimeter-thick polyester barriers, which it calls "silt fences," in the harbor in April 2011 to suppress seawater traffic. But the barriers cannot totally block the movement of radioactive substances because water and fine mud particles can penetrate the silt fences through grids of minuscule holes, each 0.02 to 0.03 millimeter in size.

TEPCO, the Fukushima prefectural government, the Environment Ministry, the Nuclear Regulation Authority and other organizations have been monitoring radioactivity levels in seawater and the seabed at 200 to 300 sites, most of them within a 20-kilometer radius of the crippled nuclear plant. But the methods of those measurements have been called into question.

Experts pointed out a lack of consistency in the sampling and analysis methods during a Sept. 13 meeting of an NRA panel tasked with ocean monitoring.

"Measurements could vary tenfold at the same site," one expert said.

"The analysis methods are outdated," said another.

NRA Commissioner Kayoko Nakamura said she will take measures to improve the situation.

"Data should be taken accurately and reliably," Nakamura said.

The NRA plans to begin monitoring seabed soil in an area that stretches 20 km east of the nuclear plant and 50 km from north to south. The plan will make use of equipment developed by University of Tokyo researchers that is attached to a wire and lowered from a ship onto the seabed to measure radioactive cesium levels in soil as the ship moves along.

The NRA plans to monitor 600,000 sites at 1-meter intervals and put together the results before the current fiscal year ends in March.

(This article was written by Shunsuke Kimura and Toshio Kawada.)

## Of the advantages of scrapping reactors 5 & 6

### Motegi: Scrapping 2 reactors helps

[http://www3.nhk.or.jp/nhkworld/english/news/20130920\\_22.html](http://www3.nhk.or.jp/nhkworld/english/news/20130920_22.html)

Japan's industry minister says decommissioning 2 undamaged reactors at the troubled Fukushima Daiichi plant would help accelerate scrapping of the facility's damaged reactors.

Toshimitsu Motegi was speaking on Friday a day after Prime Minister Shinzo Abe asked the plant's operator to decommission the Number 5 and 6 reactors.

The 2 reactors, unlike the plant's other 4, remained intact after the 2011 massive quake and tsunami. But local municipalities have been demanding that Tokyo Electric Power Company scrap them.

Motegi said decommissioning the 2 would create space to build more tanks to store contaminated wastewater.

He added that during the scrapping process, the operator could use the 2 reactors' facilities to train its engineers. He said such training is impossible at the damaged No. 1 to 4 reactors due to high radiation.

Referring to a massive buildup of contaminated water at the plant, Motegi said the government will allocate state funds to install a high-performance water treatment device there.

He said the government and the company will do their best to complete work to purify the water by the end of March 2015, without sticking to a schedule.

## TEPCO needs a credible plan

### TEPCO's water purification plan faces difficulties

[http://www3.nhk.or.jp/nhkworld/english/news/20130920\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20130920_25.html)

The operator of the damaged Fukushima Daiichi nuclear plant says it will purify all the radioactive water at the site by March 2015.

But observers say that won't be easy.

Tokyo Electric Power Company said Thursday there's a total of 440,000 tons of contaminated water in the basement of the turbine buildings and in storage tanks. The utility says there's another 15,000 tons in tunnels under the compound.

Containing the radioactive water was the main issue Prime Minister Shinzo Abe discussed with TEPCO on Thursday during his visit to the plant.

The utility plans to install 2 more water treatment devices in addition to one now in place. But its trial run is currently on hold because of damage caused by corrosion.

One of the two additional devices is a high performance model. TEPCO hopes the three devices will enable it to treat 1,500 tons of water a day. That's 3 times the present rate.

But the water-treatment devices cannot remove tritium, a radioactive isotope of hydrogen.

TEPCO also has a plan to release clean groundwater into the ocean before it is contaminated by the facilities area. It will do that by forming a bypass around the plant.

But there are growing fears that a leak of 300 tons of tainted water from a storage tank could be affecting the groundwater before it reaches the facility.

Local fishermen are worried this could further hurt Fukushima's image and delay the restart of the local fishery.

Observers say TEPCO needs to come up with a credible plan to deal with these problems.

## **Can TEPCO keep to contamination deadline?**

### **TEPCO sets decontamination deadline**

<http://www3.nhk.or.jp/nhkworld/newsline/201309201705.html>

Tentative deadline (March 2015) has been but engineers will face major hurdles to meet their goals.



Repeated problems with ALPS

September 21, 2013

## Loose bolts at bottom of tank

**TEPCO finds loose bolts on bottom of leaky radioactive water storage tank**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309210043>

By DAISUKE SUDO/ Staff Writer

# Loose bolts found in Fukushima storage tank that leaked radioactive water

Radioactive water leaked from tank—being dismantled Sept. 14 (Provided by TEPCO)



Loose bolts



Five loose bolts discovered on the bottom of a storage tank are believed to be the cause of the leak of 300 tons of radioactive water at the Fukushima No. 1 nuclear power plant, Tokyo Electric Power Co. said Sept. 20.

TEPCO is currently disassembling the leaky storage tank to inspect its interior. The plant operator said the loose bolts were from bottom panels near the eastern edge of the storage tank.

The bolts are designed to be fastened to set an impermeable rubber seal that blocks an opening along a juncture of steel panels. A loose bolt can leave such an opening unblocked.

"The leak likely took place there, but we will study the matter further," said Masayuki Ono, acting general manager of TEPCO's Nuclear Power and Plant Siting Division.

TEPCO said **sealing sections to block openings along junctions were found bulging in eight areas. Packing sections below the sealants were also protruding in several areas. The utility said it will study if those problems arose because the tank was disassembled and relocated before the radioactive water leak occurred.**

TEPCO also said it monitored radiation levels in earth samples taken from a hole drilled beside the tank and measured a maximum beta-ray level of 1.7 millisieverts per hour at a depth of 30 centimeters below the ground surface.

Radioactive water may have penetrated the soil through cracks formed in the concrete-covered ground surface. TEPCO said it will investigate once the tank dismantlement is completed.

### **Loose bolts may cause radioactive water leakage**

[http://www3.nhk.or.jp/nhkworld/english/news/20130921\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130921_03.html)

The operator of the damaged Fukushima Daiichi nuclear plant says radioactive water may have leaked from a storage tank whose pivot bolts used for the joints of steel sheets had become loose.

In August, more than 300 tons of highly radioactive water was found leaking from one of the storage

tanks. But one month later the cause of the leakage is still unknown.

In order to find the cause of the problem, the plant operator on Tuesday began work to dismantle the tank.

TEPCO officials say 5 of the pivot bolts used to fix joints of steel sheets at the bottom of the tank were found loose. They say it is highly probable that this caused the leakage.

But officials say they will also check deformed resins and rust on the sides of the sheets for ruptures.

Fukushima Daiichi has more than 300 similar tanks that store radioactive water. It is feared the same problem could be found at the bottom of those tanks.

But TEPCO officials say it is impossible to directly check or reinforce them, or to replace all the tanks at the same time.

They say they will do more to monitor the leakages.

## Turn F.Daiichi into a "decommissioning center" ?

### **Fukushima No. 1 nuclear power plant to become training center**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309210055>

Tokyo Electric Power Co., resigned to never restarting its Fukushima No. 1 nuclear power plant as concerns grow over radioactive leaks, will turn the facility into a training base for decommissioning reactors.

The plant operator has begun considering turning the 42-year-old plant into what would be called a "decommissioning center," sources said Sept. 20. The new role for the plant will be included in the utility's rebuilding plan that is to be revised before the end of the year.

The move comes a day after TEPCO agreed to a request from Prime Minister Shinzo Abe to decommission the No. 5 and 6 reactors at the Fukushima plant that were not damaged by the 2011 Great East Japan Earthquake and tsunami.

Abe told reporters that he made the request to decommission the two remaining reactors because he wanted to place priority on dealing with the nuclear accident and the problem of radiation-contaminated water.

The decision to decommission means TEPCO will no longer need the manpower to maintain the equipment that would be used if the reactors were to resume power generation sometime in the future. By switching the plant site from a power generation facility to one handling decommissioning, TEPCO will also be able to demonstrate that it is concentrating its resources on the contaminated water issue as a means of bringing the accident under control.

The No. 1 reactor at the Fukushima No. 1 plant began commercial operations in 1971. The newer No. 5 and 6 reactors went into operation in 1978 and 1979, respectively. After the nuclear accident in 2011, the No. 1 to 4 reactors ended their roles as power generators officially in April 2012.

Even after the formal decision is made to decommission the No. 5 and 6 reactors, the utility will not immediately begin decommissioning work. TEPCO officials intend to maintain the major facilities, such as the reactor buildings, as is.

A major reason is that those two reactors, which are similar in structure to the No. 1 to 4 reactors, could be used as training centers. Workers who would decommission the No. 1 to 4 reactors would train in the No. 5 and 6 reactors. Since melted nuclear fuel sits in the No. 1 to 3 reactors, new decommissioning techniques will have to be developed. The No. 5 and 6 reactors would also be used for that development process.

Once the two reactors are retrofitted, they could be used to conduct experiments and training using remote-controlled robots that would remove melted fuel from the reactor cores. The reactors could also be used for training exercises to repair core containment vessels and check on the situation within the core.

The area in the vicinity of the No. 5 and 6 reactors could also be used to hold storage tanks for the contaminated water that continues to increase in volume as well as to store the equipment and materials that would be needed for decommissioning work.

At a Sept. 20 news conference, Toshimitsu Motegi, the economy, trade and industry minister, said about the No. 5 and 6 reactors, "We will consider various possibilities for the future."

He indicated those two reactors would be utilized to proceed with the decommissioning of the No. 1 to 4 reactors.

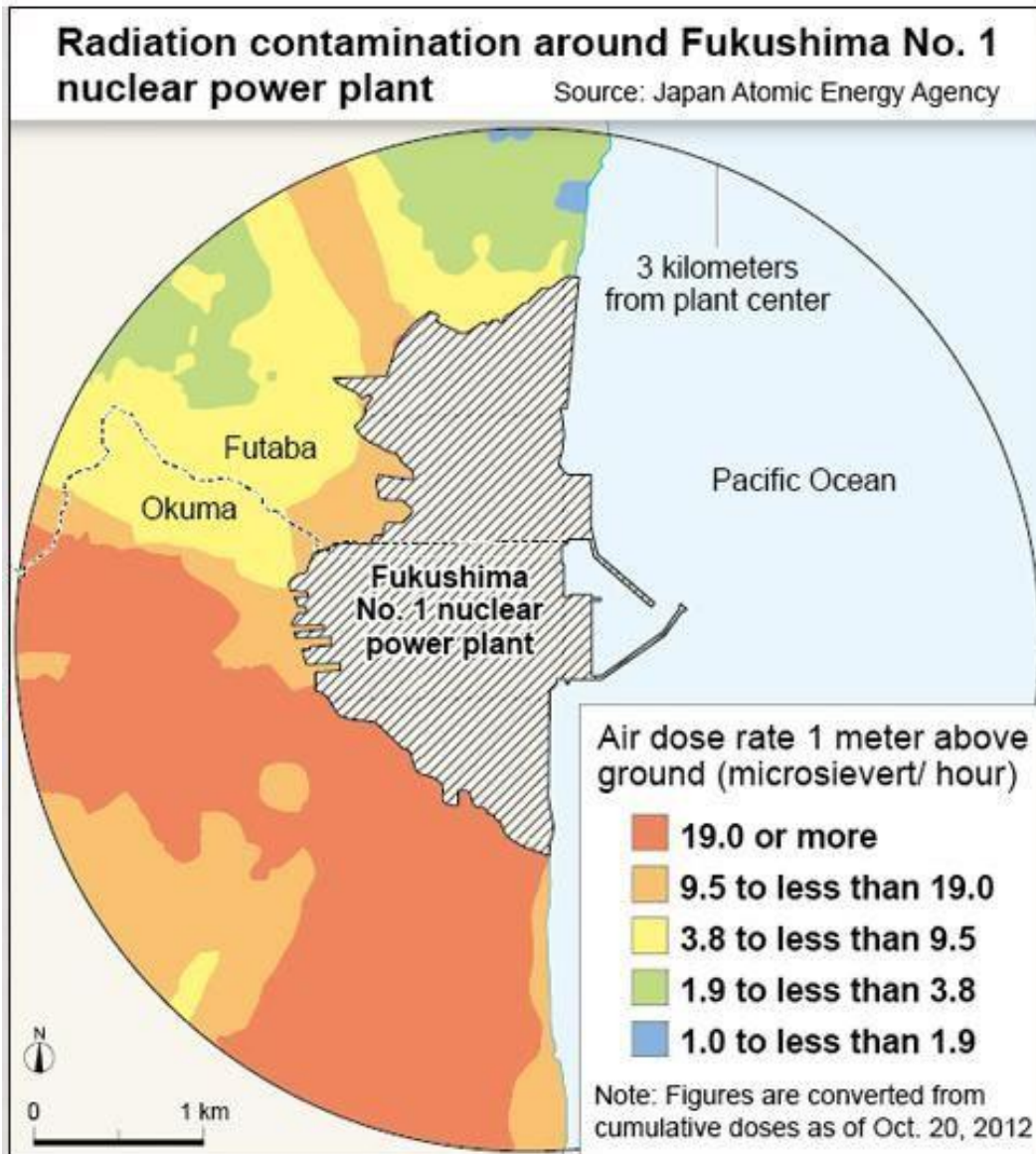
(This article was written by Yuriko Suzuki and Takashi Ebuchi.)

September 24, 2013

## **First map of radiation in 3-km radius around Fukushima Daiichi**

### **JAEA finally tracks contamination in immediate vicinity of Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309240008>



By HISASHI HATTORI/ Senior Staff Writer

The Japan Atomic Energy Agency used an unmanned helicopter to crack a missing piece of the puzzle regarding radiation contamination close to the wrecked Fukushima No. 1 nuclear power plant.

It has finally come up with the first detailed study of radiation levels within a 3-kilometer radius of the center of the plant. The zone has been inaccessible to scientists because of the three reactor meltdowns triggered by the 2011 earthquake and tsunami disaster.

The JAEA measured radiation levels within 3 km of the stricken plant between August and October last year, and detected **readings of more than 19 microsieverts per hour south and west of the nuclear plant.**

The government-affiliated research body said radiation levels remained **relatively high northwest of the facility as well.**

It also investigated radiation levels above ground within an 80-km radius of the plant, and found that the extent of contamination has fallen 36 percent from a previous survey.

The agency regularly compiled contamination maps inside an 80-km radius of the plant based on cumulative doses at 10,000 locations.

As of last December, cumulative doses in the area had declined by 36 percent from June 2011. This was largely due to a sharp decrease in levels of cesium-134, which has a half-life of two years, according to the JAEA.

The research institute said 29 percentage points of the observed 36-percent fall in cumulative doses was due to the decrease in cesium-134 levels, while cumulative doses declined a further 8 points because rain washed away radioactive substances on the ground and helped them seep into the soil.

However, annual radiation levels of 1 millisievert or more were detected in 60 percent of the area.

Cumulative doses on streets among houses and other buildings decreased to 35 percent of the previous measurement, although cumulative doses on roads in forest areas fell to 44 percent of the previous survey. That is apparently because decontamination work has been more intensively carried out in residential areas than in woodland regions.

September 25, 2013

## **Scientists Weigh in on Leaks (NHK video)**



## Nuclear Watch

<http://www3.nhk.or.jp/nhkworld/newsline/201309251314.html>

- TEPCO's data not much good, difficult to understand
- Enormous distrust of TEPCO and Japanese Gov't
- A partnership for international cleanup effort is needed

## Gaps around bolts?



## Tepeco finds chinks around two bolts in leaky tank

[http://www.japantimes.co.jp/news/2013/09/25/national/tepeco-finds-chinks-around-two-bolts-in-leaky-tank/#.UkQrAlM0\\_9k](http://www.japantimes.co.jp/news/2013/09/25/national/tepeco-finds-chinks-around-two-bolts-in-leaky-tank/#.UkQrAlM0_9k)

by Kazuaki Nagata  
Staff Writer



Tokyo Electric Power Co. said Wednesday night that it found chinks in a storage tank from which 300 tons of highly radioactive water escaped with barely a trace last month.

It is highly possible the small openings are what caused the massive leak, but more testing of the flange-type storage tank is required to confirm that, said Akira Ono, chief of the Fukushima No. 1 power plant, during a news conference at the plant streamed live over the Internet.

The water is thought to have entered the ground or made its way into the sea.

Tepco made the discovery Wednesday by conducting a vacuum test on the bottom of the tank after coating the bolts inside with foam. When the vacuuming caused some of the foam inside to disappear, it revealed chinks around two bolts.

Ono said it is not yet known how the chinks formed because the two bolts are usually not loosened.

“The fact that the bubbles were vacuumed means there are spaces, and it is highly likely that they caused the leakage. But we will eventually need to disassemble the tank and examine it to be thorough,” said Ono.

The tank in question is one of the plant’s 300 or so flange-type tanks, which consists of steel plates bolted together and sealed with waterproof packing at the seams. They are not as sturdy or watertight as welded tanks.

Last month, Tepco announced that 300 tons of tainted water had vanished from the tank in about a month without anyone noticing, an incident the Nuclear Regulatory Authority classified as level 3 on the International Nuclear and Radiological Event Scale, which tops out at 7.

Bumbling Tepco had been unable to locate any leaks in the tank until Wednesday.

There are about 300 flange-type tanks storing radioactive water that was used to cool the reactors’ melted fuel. Although the water is processed to remove most of the cesium, it still contains other hazardous radioactive materials, including strontium, which can cause bone cancer.

The utility is planning to transfer the tainted water in the flange-type tanks to the welded ones.

## **TEPCO finds gap between plates of leaked tank**

[http://www3.nhk.or.jp/nhkworld/english/news/20130926\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20130926_03.html)

The operator of the Fukushima Daiichi nuclear plant says it may have identified the cause of a highly radioactive water leak from a storage tank in August.

TEPCO workers have found a gap between steel plates at the bottom of the tank.

The workers put foam on the joints between the plates and managed to suck it through to the other side.

TEPCO says the massive weight of stored water might have widened the gap and allowed the water to leak.

TEPCO earlier found that some bolts used to fix joints in the lower part of the tank had come loose.

The utility says it will further investigate.

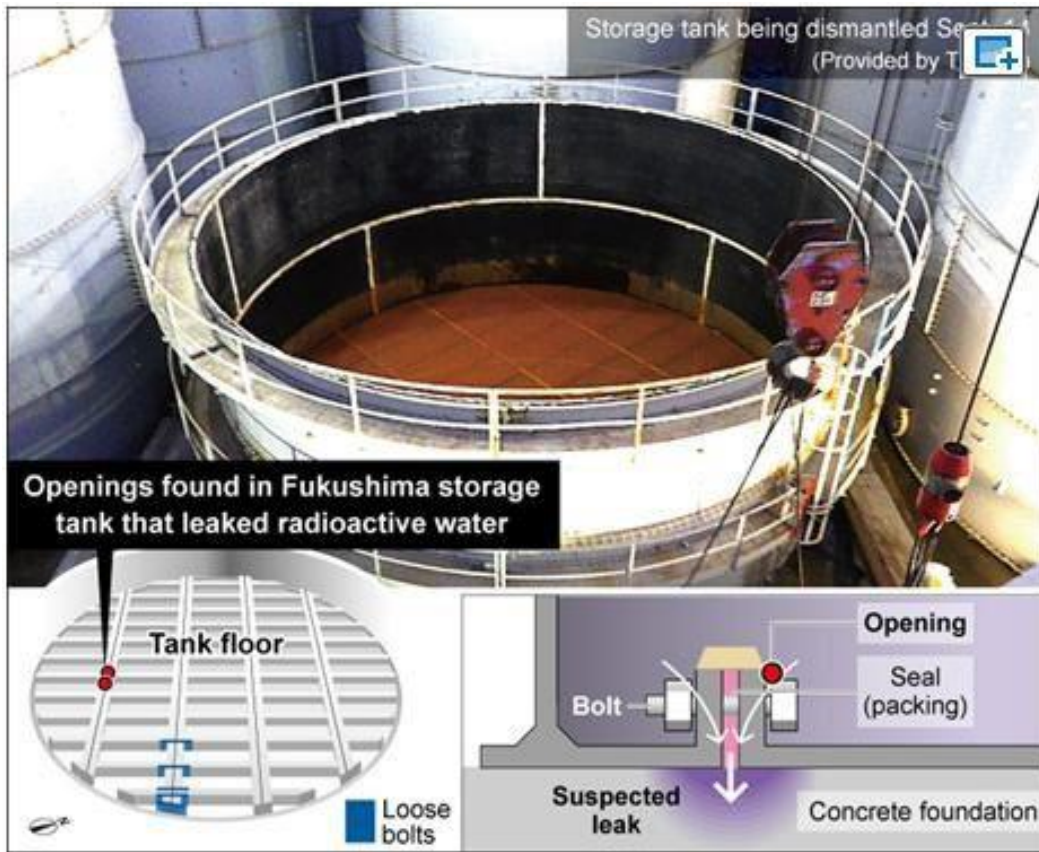
The company has about 300 similar tanks installed at the plant site. It is being called on to resolve the problem as quickly as possible.

September 26, 2013

## **Breaches in leaky tanks**

### **TEPCO pinpoints breaches in leaky water storage tank**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309260047>



By SHUNSUKE KIMURA/ Staff Writer

Engineers found two openings along a joint in the storage tank at the crippled Fukushima No. 1 nuclear power plant that leaked 300 tons of highly radioactive water, Tokyo Electric Power Co. said.

TEPCO, the operator of the plant, said Sept. 25 it conducted a vacuum test the same day whereby it applied foam to the bottom of the tank to see where it was compromised. Foam near a pair of adjacent bolts that fasten steel panels on the south side of the structure disappeared, indicating openings were present, the utility said.

Earlier checks discovered five loose bolts on the east side of the tank floor. The foam near those bolts remained undisturbed during the vacuum tests, according to TEPCO.

But the pressure inside the tank, particularly along the bottom, is greater when it is full. TEPCO said it will investigate to see how and if the loose bolts and the openings were involved in the 300-ton leak discovered in mid-August.

TEPCO has been disassembling the tank to try to locate the source of that leak. The utility believes the leak occurred on the bottom of the structure after finding no traces of water on its sidewalls.

### **Fukushima Daiichi underwater fences breached**

[http://www3.nhk.or.jp/nhkworld/english/news/20130926\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20130926_25.html)

The operator of the crippled Fukushima Daiichi nuclear plant says underwater barriers in the facility's port have been breached. The so-called silt fences are intended to prevent the spread of radioactive materials.

Tokyo Electric Power Company officials said on Thursday they found damage in the curtain-like barriers near the intake canals of the No. 5 and 6 reactors.

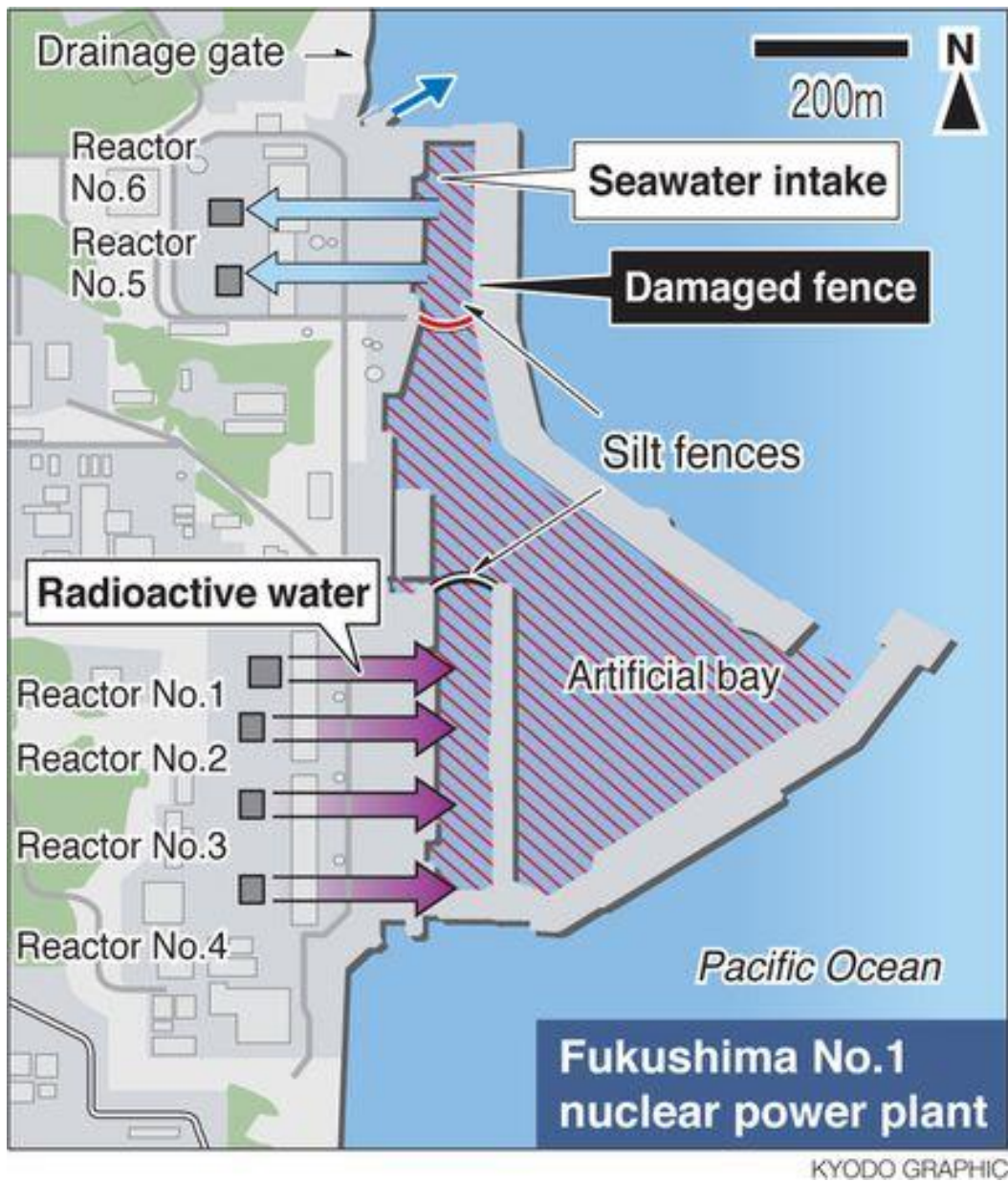
The silt fences are to stop contaminated sea-bed soil from near the damaged No. 1, 2, 3 and 4 reactors polluting water near the still-intact No. 5 and 6 reactors.

TEPCO is investigating the accident's cause. It plans to repair the fences once high waves triggered by an approaching typhoon subside.

The Nuclear Regulation Authority instructed the power company to measure radiation levels in the sea near the No. 5 and 6 reactors.

The underwater barriers were also damaged in April. TEPCO officials attributed the cause to high waves.  
Sep. 26, 2013 - Updated 06:03 UTC

### **Silt fence damaged by bad weather**



### Bad weather damages silt fence at No. 1 plant

[http://www.japantimes.co.jp/news/2013/09/26/national/bad-weather-damages-silt-fence-at-no-1-plant/#.UkQqIVM0\\_9l](http://www.japantimes.co.jp/news/2013/09/26/national/bad-weather-damages-silt-fence-at-no-1-plant/#.UkQqIVM0_9l)

by Reiji Yoshida  
Staff Writer

Bad weather has damaged a silt fence erected to contain radioactive material escaping from the crippled reactors at the Fukushima No. 1 nuclear plant, Tokyo Electric Power Co. said Thursday, raising fears that more tainted water might flow into the Pacific Ocean.

The breach was found at 10:40 a.m. Thursday near intact reactors 5 and 6, which take in core-cooling seawater that is later pumped back into the ocean.

Unfavorable weather has prevented a thorough examination of the fence, a Tepco spokesman in Tokyo said Thursday afternoon. Repair work will start as soon as the sea calms.

The fence is meant to keep earth and sand out of seawater intakes for units 5 and 6. It is also designed to block radioactive material coming from damaged units 1, 2, 3 and 4, where another silt fence is set up.

The fences are suspended from floats and anchored with weights on the seafloor. But it is thought that large amounts of radioactive materials have already drifted into the Pacific anyway.

However, the density of radioactive substances outside the artificial bay remains well within legal limits, probably because it is being diluted by seawater.

The Nuclear Regulation Authority has ordered Tepco to take seawater samples and monitor the density of radioactive materials. In April, the same fence near units 5 and 6 was damaged by rough waves and bad weather.

### **Fukushima plant's undersea radiation curtain ripped: TEPCO**

<http://mainichi.jp/english/english/newsselect/news/20130926p2g00m0dm100000c.html>

TOKYO (Kyodo) -- Damage was found Thursday on one of the undersea curtains installed near the crippled Fukushima Daiichi nuclear power plant to help contain radiation contamination, plant operator Tokyo Electric Power Co. said.

The curtain, called a "silt fence," is placed around an adjoining pair of water intakes of the plant's Nos. 5 and 6 reactors, which did not suffer meltdowns during the 2011 Fukushima nuclear disaster.

A worker found a cut in the fence at about 10:40 a.m., TEPCO said without elaborating, adding it is studying the damage and its impact. A cut had also been found in April.

As waves are high due to a typhoon moving near the Japanese archipelago, the utility said it plans to repair the barrier after the weather becomes calm.

The silt fence consists of cloth hung from buoys in the sea with weights and is installed around a set of intakes of the Nos. 1 to 4 units, which suffered critical damage during the nuclear crisis, as well as another set of intakes of the Nos. 5 and 6 reactors.

The seawater in front of the Nos. 1 to 4 units is more contaminated than that in front of the Nos. 5 and 6 units. The silt fence for the Nos. 5 and 6 units is intended to prevent the water enclosed there from becoming further contaminated by getting mixed with more toxic water.

The seawater in front of the Nos. 5 and 6 intakes is discharged into the Pacific Ocean after cooling the two reactors.

## **New underwater robot for Fukushima**

### **Underwater robot developed for work at Fukushima nuclear plant**

<http://ajw.asahi.com/article/economy/technology/AJ201309260055>





stairs pose no problems for Sakura No. 2 at the Chiba Institute of Technology  
Ibarashi, Chiba Prefecture, on Sept. 25. (Takeshi Owada)

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By TAKESHI OWADA/ Staff Writer

A robot capable of operating underwater and lifting heavy objects is expected to work in areas of the Fukushima No. 1 nuclear plant that are still too dangerous for humans to enter.

The robot, Sakura No. 2, was developed and produced by Mitsubishi Heavy Industries Ltd. (MHI) and the Chiba Institute of Technology (CIT) under a cooperation agreement announced on Sept. 25.

Sakura No. 2 is 51 centimeters wide, 18 cm high and 104 cm long. It weighs about 48 kilograms, can carry equipment up to 50 kilograms, and its battery life is eight hours.



“(This is) the world’s one and only robot that can move freely in a nuclear reactor building and even work in water,” Takayuki Furuta, director of the CIT’s Future Robotics Technology Center, said.

Although no schedule has been announced, Furuta said Sakura No. 2 will likely be used in places of the wrecked nuclear reactor buildings at the Fukushima plant that are inaccessible to workers due to water leaks and high radiation levels.

CIT independently developed the robot. Under the agreement, MHI manufactures and markets Sakura No. 2.

The institute has provided unmanned robots, including Sakura, Rosemary and Quince No. 1 to 3, for reconstruction work since nuclear disaster started in March 2011.

The earlier models were capable of going up and down stairs, and their cameras helped plant operator Tokyo Electric Power Co. learn what was happening inside a five-story nuclear reactor building.

However, TEPCO also asked CIT if it could develop a robot that can be used in water and carry a heavy measuring device. The developer spent about a year to create Sakura No. 2.

## Part of ALPS system running again

### TEPCO resumes wastewater decontamination

[http://www3.nhk.or.jp/nhkworld/english/news/20130927\\_05.html](http://www3.nhk.or.jp/nhkworld/english/news/20130927_05.html)

The operator of the crippled Fukushima Daiichi nuclear plant has resumed test-runs of its filtration equipment to decontaminate radioactive wastewater.

Tokyo Electric Power Company planned to fully operate the Advanced Liquid Processing System in August. It is designed to remove most radioactive substances from contaminated water. But in June pre-treatment water leaked from a storage tank and forced TEPCO to halt test-runs of the system.

The firm suspects the leak was caused by chemical-induced corrosion. It took countermeasures, including putting an anti-corrosion cover inside tanks.

TEPCO has finished those steps on one of the 3 purification systems. This allowed the utility to restart test-runs on Friday.

TEPCO officials say they plan to resume test-runs of the remaining 2 systems by mid-November. When all 3 systems are online the filtration equipment will be able to treat about 500 tons of contaminated water a day.

However, the equipment cannot filter out the radioactive material tritium, leaving open the question of how to dispose of the tritium-contaminated water.

September 27, 2013

## New contamination discovered

### High levels of radiation discovered in new well at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309270056>

Highly radioactive water accumulating in underground tunnels at the Fukushima No. 1 nuclear power plant is spreading to the surrounding soil, according to new data.

Radioactive substances of 400,000 becquerels per liter were found in water samples from a well at the wrecked nuclear power plant, the plant operator, Tokyo Electric Power Co., said on Sept. 27.

TEPCO said it detected radioactive materials that emit beta rays, including strontium, from a new observation well on the seaward side of the reactor complex earlier that day. Strontium is believed to accumulate in bones and cause bone cancer and leukemia.

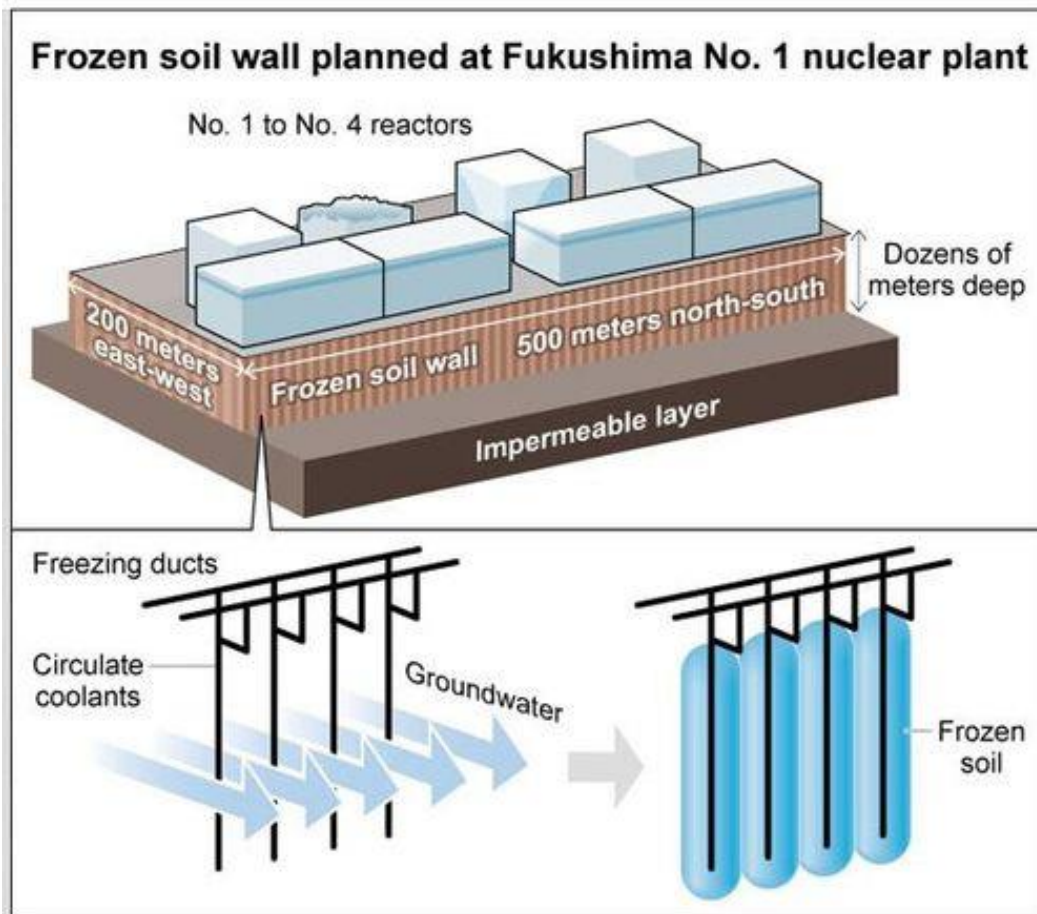
According to TEPCO, the unusually high radioactivity levels were discovered in water sampled from a well it had recently dug on the seaward side between the No. 1 and No. 2 reactor buildings. It was the first time that the operator has measured levels of radioactive substances in the well, TEPCO said.

On July 5, a record reading of 900,000 becquerels was found in another well between the No. 2 reactor building and the sea, to which the newly dug well is closely located.

## Frozen wall faces so many hurdles

### INSIGHT: Frozen soil wall at Fukushima plant riddled with uncertainties

<http://ajw.asahi.com/article/0311disaster/analysis/AJ201309270063>



By TAKASHI KAMIGURI/ Staff Writer

An ambitious plan to create a frozen underground soil wall at the crippled Fukushima No. 1 nuclear power plant to contain contaminated groundwater is facing hurdles, most notably its **durability and cost**. An estimated 400 tons of groundwater is flowing into the four reactor buildings daily, where it is mixing with water already contaminated with radioactive materials from melted nuclear fuel.

The Nuclear Energy Response Headquarters on Sept. 3 decided to surround the reactor and turbine buildings with the underground wall of frozen soil to prevent groundwater from flowing into and out of the structures.

The government plans to spend 32 billion yen (\$320 million) on construction of the wall, which it hopes to complete by March 2015.

The proposal calls for installing rows of underground ducts at 1-meter intervals where coolants will circulate, freezing the soil. The wall will reach down to an impermeable layer dozens of meters below the surface and run 500 meters north to south and 200 meters east to west.

A major challenge is whether the frozen wall can be maintained over an extended period.

The same technology has been used in tunneling and other civil construction projects in locations where groundwater is abundant.

But at a meeting of the industry ministry's committee working on the disposal of contaminated water, members said previous walls were only in place for a maximum of 18 months or so.

Pipes, pumps and other equipment may eventually require replacement due to the **corrosion caused by the coolants**. The 32-billion-yen budget does not include operating and maintenance costs for the cooling system.

Some members noted the possibility that groundwater may still end up seeping even deeper when the flow of water is blocked.

The wall may also experience breaches in locations where groundwater currents are strong.

Areas near concrete water conduits and pipes are considered vulnerable because soil around some objects does not freeze as easily.

At a meeting of the industry ministry panel in April, general contractors proposed a number of methods to prevent groundwater from flowing into the buildings, such as erecting underground concrete barriers and using chemical agents.

The frozen soil wall technique was proposed by general contractor Kajima Corp. A Kajima subsidiary is one of only two Japanese companies that possess the expertise to build the frozen wall.

In terms of cost, the technology was the least competitive because the wall must be maintained by the use of a cooling system. One advantage cited by members was that the wall can be restored quickly if a major earthquake causes a breach.

Kajima and the industry ministry plan to build a working model of the wall to identify potential problems and eventually solutions before primary construction begins.

Masafumi Yokemoto, a professor of environmental policy at Osaka City University, said the government taking the lead in dealing with contaminated water at the nuclear plant is one thing, but public funds being used to implement countermeasures is another.

"If taxpayers money is kept pouring into something when no one knows how much it will cost, it becomes ambiguous who should bear responsibility," he said.

## 400 tons a day but not all of it radioactive, says TEPCO

### Tepco raises toxic water estimate to 400 tons a day

[http://www.japantimes.co.jp/news/2013/09/27/national/tepcu-raises-toxic-water-estimate-to-400-tons-a-day/#at\\_pco=tcb-1.0&at\\_tot=8&at\\_ab=-&at\\_pos=6](http://www.japantimes.co.jp/news/2013/09/27/national/tepcu-raises-toxic-water-estimate-to-400-tons-a-day/#at_pco=tcb-1.0&at_tot=8&at_ab=-&at_pos=6)

by Reiji Yoshida  
Staff Writer

Tokyo Electric Power Co. on Friday formally revised its groundwater flow simulation and now believes up to 400 tons of contaminated water is seeping into the Pacific every day from the damaged Fukushima No. 1 nuclear plant.

The previous estimate was about 300 tons per day.

According to Tepco President Naomi Hirose, who was invited to appear as an unsworn witness at a special Diet committee session, the utility now believes 800 tons of groundwater are flowing each day into the compound and damaged reactors 1, 2, 3 and 4.

Of that, **400 tons is getting into the underground floors of the four reactor buildings while the other 400 tons is reaching the Pacific**, according to a Tepco analysis based on the new simulation. Hirose stressed that **Tepco does not believe all 400 tons of the water entering the sea is contaminated with radioactive materials.**

Even so, he said, the company has adopted a conservative scenario assuming that up to 400 tons is contaminated.

In its previous simulation, Tepco estimated that 1,000 tons of groundwater was entering the compound and 300 tons was eventually reaching the sea.

Hirose was speaking at a special session of the Lower House Economy And Industry Committee called to address the water problems at Fukushima No. 1. The committee is planning to meet again Monday.

Hirose repeated his apologies for the recent leaks of toxic water and a number of other troubles at the wrecked power station.

Meanwhile, Sumio Mabuchi, once an advisor to former Prime Minister Naoto Kan of the Democratic Party of Japan, claimed that the DPJ-led administration was considering back in 2011 to build a wall around the damaged reactors to keep groundwater from seeping in.

According to Mabuchi, **Tepco persuaded the Kan administration to cancel the announcement of the ¥100 billion plan because the utility was worried about its financial situation.**

September 28, 2013

## Some risks more urgent than others - Substitute plan needed

### Gov't panel sorts risks associated with radioactive water

<http://mainichi.jp/english/english/newsselect/news/20130928p2g00m0dm005000c.html>

TOKYO (Kyodo) -- A government panel on Friday sorted risks associated with the increasing radioactive water at the crippled Fukushima Daiichi nuclear complex, hoping to draw a broader picture of how to deal with the issue by the end of the year.

The risks were categorized into those to be tackled by plant operator Tokyo Electric Power Co. and those that need to be dealt with in the future, such as toxic water leaks caused by huge tsunami waves or damage to water storage tanks due to natural disasters.

The government plans to take "preventive and multi-layered countermeasures" on the issue, but prospects of their being implemented are unclear because -- as the panel acknowledged -- new technology must be developed.

According to a document listing the risks, the panel also referred to the need to prepare a substitute plan if TEPCO fails in its attempt to block groundwater from seeping into the basement of the reactor buildings by freezing the soil around them.

The planned huge underground ice wall is seen as a key step to prevent the amount of contaminated water from increasing through groundwater finding its way into the buildings containing reactors in meltdown.

But an alternative method would need to be devised if the first approach failed, according to the document compiled by the panel headed by Yuzo Onishi, professor emeritus of civil engineering at Kyoto University.

A massive amount of radioactive water is already accumulating at the Fukushima plant as a result of the continuing injection of water into the three severely damaged reactors to cool them.

TEPCO is storing the toxic liquid in huge tanks set up at the site, but concerns have grown over its handling of the water especially after 300 tons of water was found to have escaped from one of the tanks in August.

## **Tepco really struggling**

### **TEPCO faces high hurdles in controlling contaminated water at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20130928p2a00m0na006000c.html>

Tokyo Electric Power Co. (TEPCO) on Sept. 27 resumed testing of an advanced liquid processing system (ALPS) to treat radiation-tainted water at its crippled Fukushima No. 1 Nuclear Power Plant. The government also listed further problems that could occur at the tsunami-hit plant and proposed

countermeasures. However, the feasibility of some proposals remains doubtful and government screening of the contaminated water issue has led to suggestions that the problem exceeds TEPCO's capacity as a single company.

Yoji Ueda, an official in the Ministry of Economy, Trade and Industry's Agency for Natural Resources and Energy who is in charge of measures to counter radioactively contaminated water, has stressed the government will adopt a proactive stance to handling future problems at the plant.

"Up until now, we've thought of responses after the problem has appeared. From now on we'll make preparations," he said in announcing risks at the plant.

The government's Committee on Countermeasures for Contaminated Water Treatment has shed light on underlying risks. The total amount of radioactively contaminated water has been increasing as an estimated 400 tons of groundwater flows into the damaged reactor buildings at the plant each day and comes into contact with melted nuclear fuel. The committee pointed out that highly contaminated water from the reactor buildings posed the biggest risk at the plant.

A major issue in this situation is the structure of the current circulating water cooling system designed to cool the nuclear reactor cores. The system's pipes extend for four kilometers, creating a high risk of them leaking. As a countermeasure, the committee has proposed creating a small circulation loop in which purification equipment is linked directly to the reactor buildings, so that contaminated water can be treated while cooling the reactor cores. It has also proposed waterproofing the buildings.

Additionally, the committee proposes developing technology to remove radioactive materials from the huge amount of seawater in the harbor around the plant, and to store water contaminated with radioactive tritium, which the ALPS cannot process, underground.

However, with the bulk of these measures, officials are merely at the stage of acquiring knowledge from home and abroad, and it is unclear whether the measures can actually be carried out. For example, creating the proposed "small circulation loop" would require work within the reactor buildings, but the extremely high radiation levels within these structures that prevent people from entering them make this a difficult prospect. Furthermore, when waterproofing the buildings, officials would not be able to accurately ascertain which parts have been damaged.

Ueda himself admitted, "These are not things we have actually decided to go ahead with."

In a committee meeting held behind closed doors on Sept. 27, an official remarked that clear goals needed to be laid out. A reason the committee ending up presenting proposals whose feasibility remains in doubt was that international skepticism had been directed at Japanese technicians following the discovery this summer that contaminated water from the Fukushima plant was leaking into the sea, and officials were desperate to rectify the situation. One official at the committee meeting said, "If we cannot solve the problem, it will be shameful for technicians."

ALPS, meanwhile, has been held as a trump card in lowering the risk of contaminated water leaking from storage tanks on the grounds of the Fukushima nuclear plant. The government intends to inject about 15 billion yen into building a high-performance ALPS that TEPCO plans to introduce by September 2014.

However, it took about 10 months for construction of the ALPS whose trial operations resumed on Sept. 27 to begin following a technical proposal by its developer, Toshiba. The construction work took another six months, and over a year was spent before tests with ordinary water and contaminated water began. It is unclear whether the high-performance ALPS that TEPCO plans to introduce can be up and running within the proposed time frame.

Plans have also been put forward to create a groundwater bypass system in which groundwater is pumped into the sea before it reaches the reactor buildings, but it is unclear whether residents will support the move.

Speaking at a meeting of the House of Representatives Committee on Economy, Trade and Industry, on Sept. 27, TEPCO President Naomi Hirose apologized over continuing problems at the plant. He admitted that the company was struggling to handle some parts of the work, likening the situation to a game of "whack-a-mole." He said the company was grateful to have the government take an active stance in the issue.

## **ALPS already suspended**

### **Tepco halts trial of water treatment system at Fukushima No. 1 plant**

Kyodo

[http://www.japantimes.co.jp/news/2013/09/28/national/tepc-halts-trial-of-water-treatment-system-at-fukushima-no-1-plant/#.UkgSWFM0\\_9k](http://www.japantimes.co.jp/news/2013/09/28/national/tepc-halts-trial-of-water-treatment-system-at-fukushima-no-1-plant/#.UkgSWFM0_9k)

Tokyo Electric Power Co. said Saturday it has halted a trial run of its much-vaunted water treatment system at the Fukushima No. 1 plant just a day after it resumed operations.



At around 10:40 p.m. Friday, Tepco detected technical problems with line C of the advanced liquid processing system (ALPS), which was restarted after midnight Thursday and had processed around 100 tons of toxic water before its suspension. Tepco is investigating the cause.

ALPS extracts most radioactive materials from contaminated water and is seen as crucial in the utility's efforts to process the vast amount of toxic water that continues to accumulate at the crippled No. 1 nuclear plant. The system operates via three separate lines.

While Tepco's existing water treatment facility at Fukushima No. 1 can only remove cesium, ALPS can extract 62 different types of radioactive materials, with the exception of tritium.

Tepco and the government had trumpeted the ability of ALPS to process tainted water faster than it builds up at the wrecked complex, which suffered three meltdowns in March 2011. They planned to expand the system and to enhance its performance in the future.

The utility initially started a trial run of lines A and B in March, but halted all operations in June after the tank of line A was found to be leaking water because of internal corrosion. While Tepco worked to repair the tank and investigate the problem, it sped up efforts on line C, which at the time was still waiting to be tried out.

**See also :**

### **TEPCO halts test operation of Fukushima water treatment system**

<http://mainichi.jp/english/english/newsselect/news/20130928p2g00m0dm082000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Saturday it has halted trial operation of its water treatment system at the Fukushima Daiichi nuclear power station a day after resuming it [....]

### **Waste water decontamination suspended**

[http://www3.nhk.or.jp/nhkworld/english/news/20130928\\_26.html](http://www3.nhk.or.jp/nhkworld/english/news/20130928_26.html)

The operator of the Fukushima Daiichi nuclear plant says it has suspended the process of decontaminating radioactive wastewater with a new filtration system. The move came less than one day after it resumed a test-run.

Tokyo Electric Power Company says it detected a decline in the flow of radioactive wastewater in a pipe that carries the water to a storage tank at about 10:30 PM on Friday.

TEPCO officials say they are checking what caused the problem. They say they do not know when the decontaminating operation will resume.

It was the first time TEPCO had tried testing the new equipment in one and a half months.

The equipment is designed to eliminate almost all of the radioactive materials in the accumulating wastewater at the plant.

September 29, 2013

## Workers

### Rubber mat in tank may have shut down ALPS

Kyodo, Jiji

[http://www.japantimes.co.jp/news/2013/09/29/national/rubber-mat-in-tank-may-have-shut-down-alps/#.UkgSh1M0\\_9k](http://www.japantimes.co.jp/news/2013/09/29/national/rubber-mat-in-tank-may-have-shut-down-alps/#.UkgSh1M0_9k)

The shutdown of the ALPS water treatment system at the Fukushima No. 1 plant may have been caused by a rubber mat left in its water tank, Tokyo Electric Power Co. said Sunday.

Just a day after resuming trial runs of the advanced liquid processing system, Tepco detected technical problems with line C of the high-tech radiation-filtering machine at around 10:40 p.m. Friday.

On Sunday, the utility said it had found that **a rubber mat used to keep ladders from slipping had been left inside an ALPS tank by workers.**

The utility said it was still investigating whether the sheet was the cause of Friday's shutdown.

ALPS was restarted on a trial basis after midnight Thursday and had processed around 100 tons of toxic water before its suspension.

ALPS extracts most radioactive materials from contaminated water and is seen as crucial in the utility's efforts to process the vast amount of toxic water that continues to accumulate at the crippled No. 1 nuclear plant. The system operates via three separate lines.

While Tepco's existing water treatment facility at Fukushima No. 1 can only remove cesium, ALPS can extract 62 different types of radioactive materials, with the exception of tritium.

Tepco and the government had trumpeted the ability of ALPS to process tainted water faster than it builds up at the wrecked complex, which suffered three meltdowns in March 2011. They planned to expand the system and enhance its performance in the future.

Initially, Tepco started a trial run of lines A and B in March, but halted all operations in June after the tank of line A was found leaking because of internal corrosion. While Tepco commenced repairs and investigated the problem, it sped up efforts on line C, which at the time was still waiting to be tried out.

Industry minister Toshimitsu Motegi said Sunday he believes Tepco will soon decide to decommission aging reactors 5 and 6 as well.

Prime Minister Shinzo Abe, during his second visit to the plant on Sept. 19, strongly urged Tepco to decommission the two undamaged units but did not explain why. He also sought a deadline for filtering the stored radioactive water.

## Life is a struggle

### **TEPCO flounders as leaks of contaminated water, problems with ALPS continue**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309290110>

Tokyo Electric Power Co. on Sept. 28 confirmed that low-level radioactive water had leaked from another storage tank at its stricken Fukushima No. 1 nuclear power plant, the latest in a series of leaks of contaminated water.

The embattled utility said a worker discovered the leak in a storage tank near the No. 6 reactor around 10:45 p.m. on Sept. 28. The unit stores seawater that flowed into the basements of the Nos 5-6 reactors

after a 15-meter tsunami inundated the plant in the March 2011 disaster triggered by the Great East Japan Earthquake. The two reactors were offline when the quake and tsunami struck.

The tank in question is the so-called flange type, in which the steel panels are fastened with bolts rather than welded, the same design of one near the No. 4 reactor that was discovered in August to have leaked 300 tons of highly radioactive water.

Meanwhile, the utility said the same day that an ALPS (advanced liquid processing system) water treatment device, which can eliminate 62 radioactive substances from contaminated water, including strontium, remained suspended.

The multi-nuclide removal equipment was taken out of operation about 22 hours after it was put back online for a trial run after midnight on Sept. 27. Failure to remove mud generated in the process of treating water interfered with the ALPS system, TEPCO said.

Three ALPS devices have been installed at the plant to treat the increasing volume of contaminated water used to cool the crippled reactors and render it less hazardous for storage.

Trial runs of the two other units were suspended after problems surfaced earlier this year.

September 30, 2013

## **ALPS system started again**

### **Tepeco resumes water filtration at Fukushima nuke plant**

Kyodo

[http://www.japantimes.co.jp/news/2013/09/30/national/rubber-mat-in-tank-may-have-shut-down-alps/#.UkkpylM0\\_9k](http://www.japantimes.co.jp/news/2013/09/30/national/rubber-mat-in-tank-may-have-shut-down-alps/#.UkkpylM0_9k)

Tokyo Electric Power Co. said Monday it has resumed test operations of the new high-tech water treatment system at the Fukushima No. 1 nuclear plant, following its suspension late last week.

The advanced liquid processing system, known as ALPS, was suspended Friday after the utility detected a problem in one of the machines. The system has three lines, A, B and C. The C line is the one that developed the latest glitch.

Tepco determined Sunday that a rubber sheet left in a water tank near the system was obstructing the drain outlet.

ALPS is intended to remove most radioactive materials from contaminated water and is expected to play a crucial role in the utility's fight against the toxic water continuing to accumulate at the crippled nuclear plant.

ALPS was restarted on a trial basis after midnight Thursday and had processed around 100 tons of toxic water before the suspension.

The current water treatment facility at Fukushima No. 1 can only remove cesium, while ALPS can extract 62 different types of radioactive materials, with the exception of tritium.

Initially, Tepco started a trial run of lines A and B in March, but halted all operations in June after the tank for line A was found leaking because of internal corrosion. While Tepco commenced repairs and investigated the problem, it sped up efforts on line C, which at the time was still waiting to be tried out.

### **TEPCO resumes ALPS operation following problem**

<http://mainichi.jp/english/english/newsselect/news/20130930p2g00m0dm045000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said early Monday it has resumed operation of its water treatment system at the crippled Fukushima Daiichi nuclear power plant, following its suspension late last week.

The three-line advanced liquid processing system, known as ALPS, was suspended Friday after the utility detected a problem.

TEPCO determined Sunday a rubber sheet left in a water tank near the system obstructed the drain outlet and caused the problem.

ALPS is intended to remove most radioactive materials from contaminated water and is expected to play a crucial role in the utility's fight against the toxic water continuing to accumulate at the crippled nuclear plant.

September 30, 2013(Mainichi Japan)

## **TEPCO resumes water decontamination at Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20130930\\_16.html](http://www3.nhk.or.jp/nhkworld/english/news/20130930_16.html)

The operator of the Fukushima Daiichi nuclear plant resumed decontamination of waste water early Monday.

On Friday, Tokyo Electric Power Company resumed a test run of its Advanced Liquid Processing System, or ALPS system, designed to remove radioactive materials from the contaminated water.

But it suspended the operation in less than 24 hours after it detected the flow of radioactive wastewater had declined in a pipe which sent the water into a storage tank.

The utility says a rubber mat which had been left by workers in a tank after an inspection clogged the drain outlet.

It says the mat had been placed under a ladder.

The utility says workers were supposed to remove the mat as soon as they finished the inspection, but forgot.

The ALPS system has experienced a number of troubles, including a water leak caused by corrosion in June.

Sep. 30, 2013 - Updated 04:01 UTC

## **Rubber pad left in tank shuts ALPS**

### **Forgotten rubber pad shuts down radioactive-water purifier at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201309300017>

An uncollected rubber pad halted operations of a radioactive-water purifier that is considered a key piece of equipment in dealing with the crisis at the Fukushima No. 1 nuclear plant, the plant's operator said.

The ALPS multi-nuclide removal equipment stopped running slightly over 22 hours after it resumed a trial run at the crippled nuclear plant in the early hours of Sept. 27.

Tokyo Electric Power Co. said Sept. 29 that two rubber pads, each 400 square centimeters, had been used to fix the feet of a ladder temporarily installed inside a treatment tank.

Camera inspections found that one of the square rubber pads had come off the bottom of the tank and ended up blocking an outlet for discharging mud, forcing a shutdown of ALPS, TEPCO officials said.

Workers should have collected the rubber pads after use, the officials added.

Work at the nuclear plant has been hampered by continuing leaks of radioactive water and the accumulation of contaminated water at the site.

The ALPS equipment, which can remove 62 radioactive substances from contaminated water, is part of plans to reduce the volume of polluted water at the site.

TEPCO officials said inspections found that no other rubber pads had been displaced in other tanks. ALPS resumed treating radioactive water on Sept. 30.

### **Rubber sheet left inside water tank halted TEPCO's water treatment system**

<http://mainichi.jp/english/english/newsselect/news/20130930p2a00m0na003000c.html>

Tokyo Electric Power Co. (TEPCO), operator of the crippled Fukushima No. 1 Nuclear Power Plant, disclosed Sept. 29 that a technical problem during test operations of its water treatment system was caused by a rubber sheet left inside a water tank.

According to TEPCO, two rubber sheets -- 20 centimeters square and 3 millimeters thick -- were taped inside the tank to stabilize a temporary ladder. They were supposed to be removed before the test run on Sept. 27, but workers thought they didn't need to collect the sheets and left them inside the tank.

TEPCO suspects that one of the two rubber sheets came off and obstructed a drain. The company planned to investigate other tanks to see if any other objects had been left inside them.

The utility's three-line advanced liquid processing system, known as ALPS, is intended to remove 62 types of radioactive materials from contaminated water. While it is expected to play a crucial role in the utility's fight against toxic water that continues to accumulate at the crippled nuclear plant, the system has gone through a series of problems.

TEPCO began test operation of ALPS in March, but suspended the system five months later as water was found to be leaking from a tank. The company resumed the test run on Sept. 27, but operation of ALPS had to be stopped 22 1/2 hours later as a result of the technical problem.

TEPCO subsequently announced that it removed the rubber sheets from the tank and restarted the test run at 2:38 a.m. on Sept. 30.

October 1, 2013

## Radioactive rainwater again

### Tainted rainwater overflows at Fukushima Daiichi

[http://www3.nhk.or.jp/nhkworld/english/news/20131001\\_46.html](http://www3.nhk.or.jp/nhkworld/english/news/20131001_46.html)

Workers at the Fukushima Daiichi nuclear plant face another challenge.

Tokyo Electric Power Company says 4 tons of radioactive rainwater has seeped into the ground after overflowing from a storage container.

The spill occurred on Tuesday when workers were pumping into the container rainwater that had collected around wastewater storage tanks. Officials of the firm say the overflow occurred because the workers transferred the water to the wrong container.

A tropical storm in September and subsequent rain led to the buildup of tainted rainwater in barriers surrounding the tanks.

The officials say the level of radioactive substances in the water just after the storm was 160 becquerels per liter. That's five times the government limit for releasing water into the ocean.

The operator is checking radioactivity levels of the overflowed water.

## New criteria for discharging contaminated rainwater

### TEPCO proposes rainwater drainage rules

[http://www3.nhk.or.jp/nhkworld/english/news/20131001\\_39.html](http://www3.nhk.or.jp/nhkworld/english/news/20131001_39.html)



The operator of the damaged Fukushima Daiichi nuclear plant has compiled criteria for discharging rainwater accumulated inside the barriers around storage tanks containing radioactive water.

Until now, Tokyo Electric Power Company had no such criteria. Last month, when a tropical storm hit the area, workers measured the radioactivity of the accumulated rainwater. They moved highly radioactive water into tanks, and released low-level waters into gutters.

Under the new criteria the utility submitted to the Nuclear Regulation Authority on Monday, rainwater will be transferred to a specific tank, where workers will measure its radioactivity levels.

The utility will discharge rainwater if the level of beta-ray-emitting substances is below 10 becquerels per liter.

The standard is one third the limit of strontium-90 levels at which the government allows discharging into the sea.

TEPCO also places the radioactive cesium level at one third of the government's limit.

The Nuclear Regulation Authority will study what to do with tritium levels, since it takes time to measure the substance.

The NRA asked the utility to accelerate its investigation into an accident at a storage tank that resulted in the leakage of 300 tons of radioactive water. The regulators demanded that TEPCO remove the bottom of the tank and examine its concrete foundation, to determine the cause of the accident.

October 2, 2013

## More contaminated water problems

### **4 tons of contaminated rainwater leaks at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310020020>

REUTERS

Four tons of rainwater contaminated with low levels of radiation leaked at the crippled Fukushima nuclear plant during an operation to transfer the water between tank holding areas, the operator said Oct. 1.

Tokyo Electric Power Co. has been trying to contain contaminated water at the Fukushima site after it found 300 tons of radioactive water had leaked from a tank at the plant.

Fukushima suffered triple nuclear meltdowns and hydrogen explosions after a March 2011 earthquake and tsunami.

Heavy rain during a recent typhoon flooded one of the tank holding areas where TEPCO stores excess water flushed over damaged reactors to keep them cool, a spokesman said.

After tests last month showed the rainwater contained 160 becquerels of radiation per liter, a relatively low level, TEPCO officials decided to transfer the water to another holding area for tanks, the spokesman said.

During the transfer, a worker found the leak, which the company estimated to be 4 tons and was absorbed into the ground, the spokesman said.

The company faces the prospect of more heavy rain in the next few days as another storm approaches Japan from the south.

TEPCO has been pumping hundreds of tons of water a day over the Fukushima reactors to keep them cool and storing the radioactive wastewater in tanks above ground. In August, the utility said at least one of those hastily built tanks was leaking.

It has also found high levels of radiation just above the ground near other tanks, suggesting widespread structural problems with the tanks.

TEPCO' stock, which was up in the morning, fell after the utility announced the latest problem with water storage, closing down 4.1 percent.

Earlier on Oct. 1, TEPCO said one of three units for injecting nitrogen into the damaged reactors shut down due to a worker mishandling the equipment, but was restarted later.

TEPCO injects nitrogen into the reactors to prevent explosions similar to those that rocked the site in the early days of the disaster.

## **High radiation levels in rainwater overflow**

[http://www3.nhk.or.jp/nhkworld/english/news/20131002\\_14.html](http://www3.nhk.or.jp/nhkworld/english/news/20131002_14.html)

The operator of the Fukushima Daiichi nuclear plant says it has detected high levels of radioactive substances in water that overflowed from a storage container on Tuesday.

The spill occurred when workers were pumping rainwater into the container. A tropical storm last month led to it accumulating in dikes surrounding wastewater storage tanks.

4 tons of the tainted water seeped into the ground before workers halted pumping.

Tokyo Electric Power Company says it found 390 becquerels per liter of beta-ray emitting substances, believed to be mostly strontium, in water inside the container.

The level is much higher than the government limit for releasing strontium-tainted water into the ocean, which is set at 30 becquerels per liter.

The level is also higher than the 160-becquerels-per-liter detected in rainwater around the wastewater storage tanks just after the storm.

TEPCO officials say they will look into why the radiation level increased.

The officials explain the overflows occurred because the rainwater was transferred into the wrong container. They plan to investigate the pipe system layout, and other factors, to find out why there was a container mix up.

### **Radioactive water found overflowing from tank at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20131002p2a00m0na004000c.html>

Some four tons of water containing radioactive materials overflowed from a storage tank at the Fukushima No. 1 Nuclear Power Plant due to human error, the Tokyo Electric Power Co. (TEPCO) has revealed.

At around 11:50 a.m. on Oct. 1, a worker patrolling around storage tanks located southwest of the plant's No. 4 reactor building noticed that water was overflowing from the lid of a temporary water storage tank. A hose was feeding rainwater to the tank from a walled off area around other water tanks. The water flow was stopped around 20 minutes later.

According to the secretariat of the Nuclear Regulation Authority, the water was supposed to have been transferred to another walled off area, but the hose was accidentally connected to the water tank instead. The secretariat is continuing to investigate the issue.

The concentration of beta ray-emitting radioactive substances like strontium in the water was 390 becquerels per liter. National regulations state that radioactive liquid leakages must be kept at under 30 becquerels per liter.

## **Miscommunication ?**

### **Miscommunication caused tainted water overflow**

[http://www3.nhk.or.jp/nhkworld/english/news/20131003\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20131003_03.html)

The operator of the Fukushima Daiichi nuclear power plant says miscommunication with a subcontractor resulted in tainted rainwater accidentally escaping from a storage container.

Tokyo Electric Power Company says the incident occurred as workers were transferring rainwater from inside one of the barriers that have been set up around the contaminated water tanks. The rainwater was found to be radioactive.

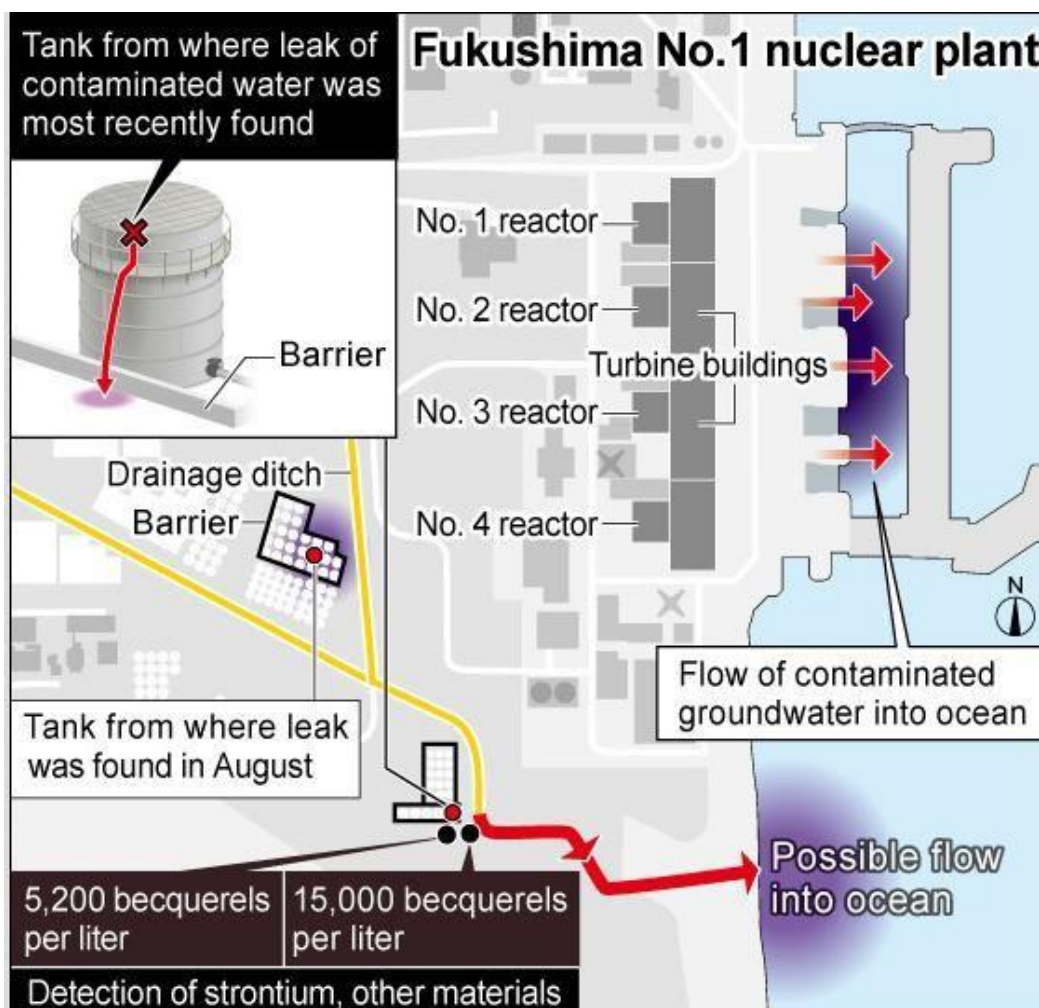
The workers sent the water to a small tank by mistake. About 5 tons of the radioactive water overflowed and seeped into the ground.

October 3, 2013

## Leak from another tank

### Radioactive water leaks from another tank at Fukushima plant, flows into ocean

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310030067>



Radioactive water leaked from another tank at the Fukushima No. 1 nuclear plant and spilled into the ocean following bungled work to prepare for a typhoon, Tokyo Electric Power Co. said Oct. 3. (With video)

The utility estimated that about 430 liters breached the barrier surrounding the leaking tank in the B-South area and entered a drainage ditch leading to the sea.

“We believe (contaminated water) flowed into the ocean,” Masayuki Ono, acting general manager of TEPCO’s Nuclear Power and Plant Siting Division, said at an Oct. 3 news conference.

The leak occurred because the utility had pumped too much rainwater into the tank. TEPCO officials said the water likely spilled from a section connecting the top and side of the tank.

Water within the barrier surrounding the tank had levels of beta rays, including radioactive strontium, of 200,000 becquerels per liter.

The Nuclear Regulation Authority ordered TEPCO to collect the soil where the contaminated water leaked and to check the effects on the seawater.

The Fukushima prefectural government, increasingly frustrated over the lack of progress in dealing with the radioactive water problem at the nuclear plant, held an emergency meeting of high-ranking officials on the morning of Oct. 3.

“TEPCO has said it would place priority (on dealing with the contaminated water problem) and that it would inject corporate resources to deal with it, but I doubt their actions match what they have said,” Governor Yuhei Sato said.

TEPCO is struggling to bring the contaminated water problem under control. Storage space for radioactive water used to cool the reactors has long been a concern. And groundwater continues to enter reactor buildings where it mixes with the polluted water.

In August, workers discovered that about 300 tons of highly radioactive water had leaked from another tank in the H4 area of the site. Some of that water is believed to have reached the ocean as well.

The flange-type tank where the latest leak was found is one of five connected by pipes in the B-South area. The metal sheets on these tanks are secured by bolts. Each tank has a capacity of 450 tons and stores water that has been processed through purifying equipment after cooling a reactor core.

According to TEPCO officials, a large volume of rainwater had accumulated within the barrier in the B-South area on Oct. 2. Workers that day pumped the water into the tanks from 8:30 a.m. until shortly after noon to make room for additional rainwater from the approaching typhoon.

At 8:05 p.m., a worker discovered water dripping from the top part of a tank.

The tanks were filled to about 98.6 percent of capacity, leaving very little space between the top of the water and the ceiling of the tank.

Normally, water is stored at a much lower level because the sections of tank are connected only by bolts.

The B-South area is also on an incline, meaning that the tanks are tilted. Workers checked the water gauge at the tank at the highest location. Officials believe the water leaked from the tank at the lowest location.

## **New radioactive water leak found at Fukushima No. 1: Tepco**

Kyodo

[http://www.japantimes.co.jp/news/2013/10/03/national/new-radioactive-water-leak-found-at-fukushima-no-1-tepco/#.Uk0\\_UFM0\\_9k](http://www.japantimes.co.jp/news/2013/10/03/national/new-radioactive-water-leak-found-at-fukushima-no-1-tepco/#.Uk0_UFM0_9k)

Tokyo Electric Power Co. says it has found that an unspecified amount of water contaminated with a highly concentrated radioactive substance escaped from another storage tank at the Fukushima No. 1 nuclear plant and some may have reached the Pacific Ocean.

Tepco said Wednesday it detected 200,000 becquerels per liter of beta ray-emitting radioactive substances, including strontium-90, far above the legal limit of 30 becquerels per liter, as well as cesium-134 and -137, both within their legal limits.

A ditch adjacent to the tank is linked to a drainage channel reaching the ocean. "Contaminated water may well have flowed into the sea," Tepco said.

At a news conference held early Thursday at the Fukushima Prefectural Government office, a Tepco official apologized for "causing anxiety."

The latest leak was found at one of the tanks in the B South cluster, separate from the H4 cluster where in August around 300 tons of water tainted with 80 million becquerels per liter of strontium and other beta-ray substances was discovered to have leaked. Some of that water is also believed to have reached the sea. The August leak was assessed as a "serious incident" on the international scale of nuclear accidents.

For the latest leak, a worker found water overflowing from the top panel of the tank in the B South area at around 8:05 p.m.

The tank was tilted, but it was "within a permissible range," Tepco said.

The company said it gave a statutory notice to the central government about the leak and is checking the volume of water leaked.

The Nuclear Regulatory Authority has ordered Tepco to take steps to stem the flow of tainted water into the sea and remove contaminated soil.

The tank in question is a flange type made of steel sheets joined by bolts for storing contaminated water moved from cesium removal and desalination facilities. Tepco has said it is planning to replace these tanks with more watertight welded tanks.

Concerns have grown over Tepco's handling of water in its fields of storage tanks at Fukushima No. 1.

## Lack of caution, typhoons and slopes

### TEPCO: Leak caused by lack of caution

[http://www3.nhk.or.jp/nhkworld/english/news/20131003\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20131003_33.html)

The operator of the Fukushima Daiichi nuclear plant says the latest radioactive water leak from one of the facility's storage tanks resulted from lack of caution.

About 430 liters of highly radioactive wastewater leaked from the top of the tank on Wednesday. The water was found to have 200,000 becquerels of beta ray-emitting radioactive materials per liter. The government limit for releasing such water into the ocean is 30 per liter.

Officials of Tokyo Electric Power Company, or TEPCO, said the leak occurred at one of the 5 tanks connected by pipes.

The tanks were built along a slope. Only the one at the highest position was equipped with a water gauge.

Workers believed that if they kept the water level in the tank at 98 percent, or 50 centimeters from the top, no water would spill, even from the lowest tank.

The workers kept pouring into the tanks contaminated rainwater that had pooled nearby. The spill occurred at the lowest tank.

TEPCO officials say their estimation was incorrect, and that the water likely drained into the sea about 200 meters away.

TEPCO faces an increasing workload as the firm must not only build more tanks but also cope with an increase in contaminated rain and groundwater and repeated leaks.

### New spill at No. 1 laid to typhoon miscalculation

[http://www.japantimes.co.jp/news/2013/10/03/national/new-spill-at-no-1-laid-to-typhoon-miscalculation/#.Uk1hUVM0\\_9k](http://www.japantimes.co.jp/news/2013/10/03/national/new-spill-at-no-1-laid-to-typhoon-miscalculation/#.Uk1hUVM0_9k)

by Reiji Yoshida  
Staff Writer

An apparent miscalculation amid a typhoon caused a storage tank to overflow at the wrecked Fukushima No. 1 power plant, releasing about 430 liters of radioactive water into the Pacific Ocean, Tokyo Electric Power Co. said Thursday.

Authorities are still groping for a solution to the water crisis at the crippled nuclear plant, which is rapidly running out of storage space and facing a growing risk of flooding from typhoons.

Around 8 p.m. Wednesday, plant workers checking a group of five flange-type tanks in a storage sector called B-South discovered water leaking from the cover of a tank that had apparently been overfilled. Because the group of interconnected tanks was built on a slope, the water was coming out of the one farthest downhill — and landing outside the flood containment barrier encircling it.

From there, it apparently drained into the rainwater diversion ditch that leads to the sea.

The water contained strontium and tritium and was emitting beta-ray radiation of 580,000 becquerels per liter, according to Tepco, which was apparently trying to drain rainwater from the flood containment area into the tanks during the typhoon.

Tepco usually releases rainwater that accumulates in the flood containment areas after confirming radiation levels are within the government-set limits. But the typhoon did not give Tepco much time to conduct radiation surveys, prompting it to use the five tanks as a temporary storage measure.

The five tanks, all connected with pipes, were built along a moderate slope. Tepco pumped rainwater into the tanks until the water gauge of the high tank read 98.6 percent full. Tepco said it thought there was enough room left in the low tank to account for the slope's effect on its water level but miscalculated.

During the previous typhoon in September, about 1,400 tons of rainwater accumulated within the flood-prevention fences guarding the more than 1,000 tanks at the plant.

The tank that leaked this time has a capacity of about 450 tons but doesn't have a watertight lid.



## **430 liters of toxic water leak from Fukushima plant, some into ocean**

<http://mainichi.jp/english/english/newsselect/news/20131003p2g00m0dm039000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Thursday that about 430 liters of highly radioactive water leaked from one of the tanks at the crippled Fukushima Daiichi nuclear complex the previous day, some of which flowed into the Pacific Ocean.

While it was not clear exactly how much contaminated water had leaked into the sea, Chief Cabinet Secretary Yoshihide Suga maintained the government's view that the situation is "under control as a whole" during a regular press conference held in the morning.

The leak was observed from the top panel of the 450-ton tank after TEPCO tried to fill it with as much water as possible due to fears the utility may run out of containers for storing the massive amount of radioactive water that is increasing daily at the nuclear complex.

The tank is one of five standing on a slight slope. TEPCO had to take the tilt into account when transferring water, but failed to secure enough space to prevent a spill from the top panel, which is not water-tight, TEPCO spokesman Masayuki Ono told a separate press conference.

Some of the leaked water is believed to have fallen inside a water barrier set up around the five tanks so that contamination will not spread further outside when leaks occur.

But about 430 liters of radioactive water is estimated to have leaked outside the barrier by moving along the foothold attached to the tank and found its way into a nearby side ditch, which is connected to a drainage channel.

The water in the tank contains 580,000 becquerels per liter of beta ray-emitting radioactive substances including strontium 90. The legal limit of strontium 90 is 30 Bq per liter.

TEPCO is storing over 300,000 tons of radioactive water in tanks as a result of continuing water injections into the three reactors that suffered meltdowns in the wake of the 2011 earthquake and tsunami disaster.

The utility has also recently started storing rainwater that has accumulated inside the water barriers around the tanks if the radiation level exceeds the legal criteria.

TEPCO was transferring water inside the barriers to the tank when the leak occurred Wednesday. It was raining due to a typhoon and TEPCO wanted to avoid having the rainwater flow over the 30-centimeter-high barrier, Ono said.

In August, TEPCO said 300 tons of highly radioactive water escaped from a tank located in a different area at the site, some of which is also believed to have flowed into the ocean. The liquid was tainted with 80 million Bq per liter of radioactive material emitting beta rays.

Facing growing concerns over the plant operator's lax handling of toxic water, Prime Minister Shinzo Abe told the international community in September that the situation is "under control" and that the influence of toxic water "is completely restricted to within the 0.3-square-kilometer area of the plant's port."  
October 03, 2013(Mainichi Japan)

### **Leak traced to overflowing of tank built on slope**

[http://www3.nhk.or.jp/nhkworld/english/news/20131003\\_18.html](http://www3.nhk.or.jp/nhkworld/english/news/20131003_18.html)

The operator of the Fukushima Daiichi nuclear plant says the latest leak of radioactive wastewater has been traced to the overflowing of a storage tank built on a slope.

Tokyo Electric Power Company officials apologized at a news conference on Thursday for the leaks that surface on an almost daily basis.

The tank is on the mountain side of the plant's No.4 reactor. The TEPCO officials said the tank was built on ground that slopes toward the ocean, and the leak occurred on the side that faces the sea.

They estimate that 430 liters of wastewater seeped outside the barrier around the tank and say some of this water may have flowed into the sea, about 200 meters away.

Workers had been careful not to fill the tank to the top. But on Wednesday, they put in too much rainwater that had pooled nearby.

Shortly after 8:00 PM on Wednesday, workers found wastewater leaking from the upper part of the tank.

They detected 200,000 becquerels per liter of beta ray-emitting radioactive substances in water pooled inside the barrier around the tank. The safety limit is 30 becquerels per liter.

In August, TEPCO officials discovered that more than 300 tons of radioactive wastewater had leaked from a storage tank in a different area of the Fukushima plant.

Japan's top government spokesman says the government will make every effort to stop the leaks of radioactive water from storage tanks at the crippled Fukushima Daiichi nuclear power plant.

Referring on Thursday to the latest contaminated water leak, found the previous night, Chief Cabinet Secretary Yoshihide Suga told reporters that increased patrols had speeded up detection of the leakage.

But he added that adequate countermeasures are needed to deal with such leaks.

Asked about Prime Minister Shinzo Abe's remark that the situation at the plant is under control, Suga said he basically holds the same view.

Noting that a tropical storm is partially to blame for the latest leaks, Suga stressed that steps should be taken to cope with rough weather.

He stressed that the government will work closely with the plant's operator, Tokyo Electric Power Company, to prevent similar incidents.

### **NHK video: Rain leads to more leaks**

<http://www3.nhk.or.jp/nhkworld/newslines/201310031806.html>

**TEPCO doesn't have the ability to handle the contaminated water when it rains.**

October 4, 2013

## **ALPS halted again**

### **TEPCO stops ALPS operation at Fukushima plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20131004\\_18.html](http://www3.nhk.or.jp/nhkworld/english/news/20131004_18.html)

Tokyo Electric Power Company says it has halted operation of a new wastewater treatment system at the damaged Fukushima Daiichi nuclear plant.

The system is designed to eliminate almost all radioactive substances from wastewater.

TEPCO says an alarm sounded to indicate abnormalities in its Advanced Liquid Processing System, or ALPS, shortly before 7AM on Friday. Workers at the utility are looking into the cause of the alarm.

The utility resumed its test-runs of the new system on Friday of last week following a month-and-a-half suspension. But it had to shut down the system less than 24 hours later due to technical problems, and resumed operations last Monday.

### **Suga: No leaks from ALPS at Fukushima Daiichi**

[http://www3.nhk.or.jp/nhkworld/english/news/20131004\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20131004_25.html)

Japan's top government spokesman says a new wastewater treatment system is being investigated at the damaged Fukushima Daiichi nuclear power plant following reports of abnormalities.

Yoshihide Suga told reporters on Friday morning that no abnormalities, including leaks of contaminated water, have yet been found.

Tokyo Electric Power Company halted test-runs of its Advanced Liquid Processing System, or ALPS, after an alarm sounded to indicate abnormalities earlier on Friday. The system is designed to eliminate almost all radioactive substances from wastewater.

Suga said he was told that the water treatment process was suspended after the alarm.

## **ALPS out of action**

### **TEPCO's water decontamination system out of action again**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310040062>

By SHUNSUKE KIMURA/ Staff Writer

The trouble-plagued ALPS water decontamination system at the Fukushima No. 1 nuclear power plant has once again shut down, this time due to an unknown problem, Tokyo Electric Power Co. said on Oct. 4.

According to TEPCO officials, the equipment automatically stopped operations after an alarm went off at around 6:45 a.m. on Oct. 4. Officials said no leak had been found, and they were working to find the cause of the latest problem, which resulted in the third such stoppage since June.

The equipment is designed to remove 62 radioactive contaminants from the water, including strontium.

The ALPS (advanced liquid processing system) unit has three channels, called A, B and C, and each has the daily capacity to process 250 tons of water.

Plans had called for using the equipment to process the huge volume of contaminated water that is stored in tanks at the plant. Some of the tanks have leaked, adding to the urgency for a system to remove radioactive materials to reduce the dangers posed by the water.

The ALPS system began a trial run starting in late March, but leaks were discovered in the system's tanks in June, leading to the first stoppage. The trial run resumed on Sept. 27 in channel C, but operations were halted once again, just 22 hours later, when the equipment developed problems in discharging mud. TEPCO officials believe the cause of that problem was due to a failure to remove a rubber pad from the tank, leading to a blockage in the system.

### **TEPCO: System failure stopped ALPS**

[http://www3.nhk.or.jp/nhkworld/english/news/20131004\\_54.html](http://www3.nhk.or.jp/nhkworld/english/news/20131004_54.html)

Tokyo Electric Power Company has resumed operation of a new wastewater treatment system at the crippled Fukushima Daiichi nuclear power plant after a half-day suspension.

The Advanced Liquid Processing System, or ALPS, automatically stopped on Friday morning after an alarm sounded to indicate abnormalities.

The system is described as a pillar to remove radioactive materials from contaminated water.

Workers found the system halted because 2 contradictory signals were sent at the same time to a tank that temporarily stores contaminated water.

One signal was to refuse to receive external water to add chemical agents. But when workers stirred the agents and water inside, water levels lowered and another signal that allows receiving water was sent.

TEPCO's officials say this malfunction can happen during test-run operations and that they will have to improve the system.

Operation was resumed in the evening, but the utility plans to stop the system for 3 days from Saturday for maintenance.

TEPCO resumed its test-runs of the ALPS on Friday of last week after a month-and-a-half suspension. But it had to shut down the system less than 24 hours later due to a careless mistake by a worker. They resumed operations Monday.

## **Liquid processing system at Fukushima Daiichi suspended again**

<http://mainichi.jp/english/english/newsselect/news/20131004p2g00m0dm043000c.html>

FUKUSHIMA, Japan (Kyodo) -- Tokyo Electric Power Co. said Friday the water treatment system at its crippled Fukushima Daiichi nuclear power plant has been suspended again after an alarm was triggered at around 6:40 a.m.

Leakage of contaminated water has not been detected so far, according to the utility.

Following the previous suspension on Sept. 27 due to a problem, TEPCO resumed operation of the advanced liquid processing system, known as ALPS, on Monday after determining that a rubber sheet left in a water tank near the system obstructed the drain outlet and caused the problem.

ALPS is intended to remove most radioactive materials from contaminated water and is expected to play a crucial role in the utility's fight against the toxic water continuing to accumulate at the crippled nuclear plant.

## **NHK video on water treatment**

### **Expert view on water Treatment**

<http://www3.nhk.or.jp/nhkworld/newsline/201310050209.html>

“Trying to keep pace... race against time”

no perfect solution

aim: reduce the risks associated with radiation

October 5, 2013

## **Floating windfarm in Fukushima**

## **Floating Fukushima wind farm to energize region's hopes and households**

[http://ajw.asahi.com/article/behind\\_news/social\\_affairs/AJ201310050044](http://ajw.asahi.com/article/behind_news/social_affairs/AJ201310050044)

By TAKASHI KAMIGURI/ Staff Writer

NARAHA, Fukushima Prefecture--Within sight of the crippled Fukushima No. 1 nuclear power plant, a high-tech wind farm that will eventually bring clean energy to thousands of homes is now under construction.

The farm is 20 kilometers off the coast of Fukushima Prefecture.

Fukushima Mirai, a wind turbine on a floating rig foundation, measures 80 meters across and rises 106 meters from the sea surface to the tip of a blade at its highest position. Mirai means future in Japanese.

The turbine, being built by Marubeni Corp. and other entities under consignment from the industry ministry, has an output capacity of 2 megawatts and is scheduled to enter trial runs as soon as next week. Mitsubishi Heavy Industries Ltd. will install two more turbines, among the largest in the world with a diameter of 167 meters each, within two years. The three turbines, when completed, are expected to cover the power demand of more than 10,000 households.

The wind farm is considered a world first because its substation also floats along with the turbines.

A floating substation will not only reduce losses in transmission by allowing power to be transmitted to land at high voltages, but will also enable additional turbines to be installed simply by connecting them to the substation with cables.

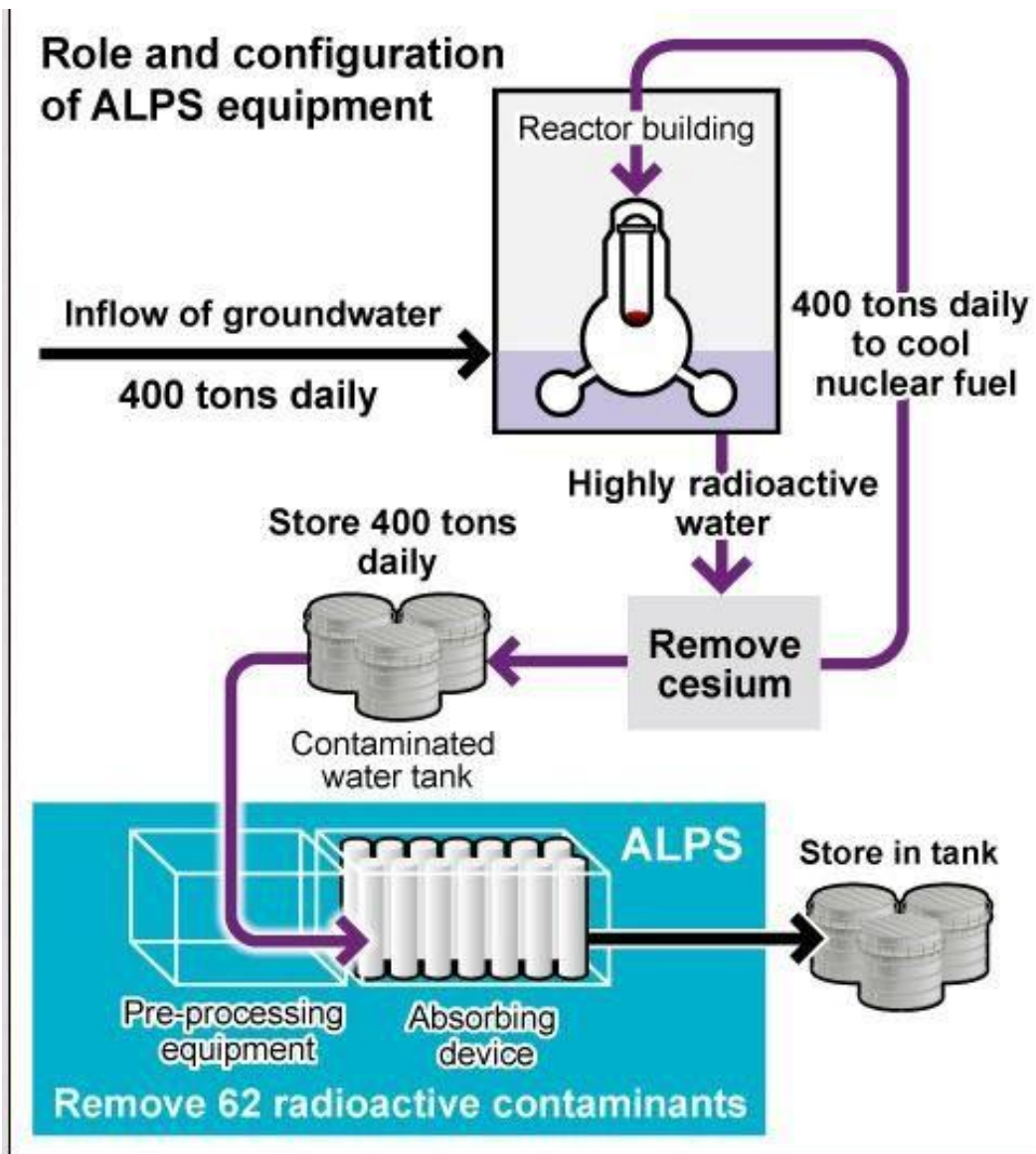
Manufactured by Hamanaka Chain Mfg. Co., the steel chains for fastening the turbines and the substation to the seabed are the thickest used in Japan. Some sections are as thick as 13.2 centimeters and can withstand a maximum load of 1,070 tons.

The power transmission cables were also developed anew by Furukawa Electric Co. so they can withstand strong tide currents.

## **Conflicting signals - ALPS restarted**

### **Water decontamination equipment at Fukushima restarts after 12-hour stoppage**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310050049>



The water decontamination system at the crippled Fukushima No. 1 nuclear power plant resumed operations on Oct. 4, after a warning sounded and automatically shut down the equipment earlier in the day.

The ALPS (advanced liquid processing system), which removes radioactive materials from contaminated water stored at the plant site, was out of action for 12 hours.

Officials of plant operator Tokyo Electric Power Co. said **no water leaked from the ALPS equipment**. The system has been plagued with problems. Operations were temporarily suspended in August after a leak was discovered and again in late September due to a blockage.



TEPCO officials said the warning sounded around 6:45 a.m. At that time, work had begun in a tank within the pre-processing equipment that is designed to remove heavy metals and other materials from the contaminated water. A signal was sent to close the valve at the entrance to the equipment, but another signal was sent simultaneously to open the valve so contaminated water could be pumped in from another tank.

A TEPCO official said, "The reason the warning sounded was **because conflicting signals were sent at the same time instructing that water be flushed out but also not allowing other water to enter.**"

After an inspection of the equipment, processing resumed around 6:30 p.m.

In order to cool melted nuclear fuel in the reactors at the Fukushima No. 1 plant, 400 tons of water is circulated into the reactors daily. However, because groundwater also seeps into the reactor buildings at a pace of 400 tons daily, the overflowing contaminated water is being moved to and stored in tanks on the plant site.

As of Oct. 1, about 294,000 tons of highly radioactive water awaited processing.

The ALPS equipment is designed to absorb and remove 62 radioactive contaminants from the water, including strontium. The aim of removing the contaminants is to lower the danger should a leak occur. The ALPS unit has three channels, called A, B and C, and each has a daily capacity to process 250 tons of water.

If the contaminated water cannot be processed, there will be no reduction in the volume of highly radioactive water that is stored in the tanks. However, the ALPS system cannot remove all radioactive elements. For example, tritium, a radioactive isotope of hydrogen, remains in the water after processing so the water must continue to be stored on the plant site.

A trial run began in late March on Channel A. Soon after a trial run began on Channel B in June, contaminated water was found leaking from a tank within the Channel A equipment.

The trial runs were eventually stopped to look into the cause of the leak as well as to repair the equipment.

The trial run on Channel C finally began on Sept. 27, but that had to be stopped the same day because it could not discharge mud. The cause of that problem was the failure to remove a rubber pad from the tank, leading to a blockage in the system.

(This article was written by Shunsuke Kimura and Daisuke Sudo.)

October 7, 2013

## Cooling halted for a while

### Water injection pump for damaged Fukushima reactor halts

<http://mainichi.jp/english/english/newsselect/news/20131007p2g00m0dm052000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said that a pump to inject water into one of the severely damaged reactors at the Fukushima Daiichi nuclear power plant halted Monday, possibly due to a problem at a power switchboard.

The halt occurred at around 9:47 a.m. But cooling of the No. 1 reactor immediately resumed through a backup pump, the utility known as TEPCO said.

The Nuclear Regulation Authority separately said in a press release that the incident may have occurred because a worker wrongly pushed the stop button on a switchboard during an equipment checkup.

At the Fukushima plant in northeastern Japan, the Nos. 1 to 3 reactors suffered meltdowns in March 2011 because quake-triggered tsunami waves that hit the plant flooded electrical equipment and led to the loss of reactor cooling systems.

### Power failure briefly halts cooling at Fukushima

[http://www3.nhk.or.jp/nhkworld/english/news/20131007\\_21.html](http://www3.nhk.or.jp/nhkworld/english/news/20131007_21.html)

A partial power failure at the Fukushima Daiichi nuclear plant on Monday briefly halted the injection of cooling water into one of the reactors. The plant operator believes human error to be the cause of the blackout.

Tokyo Electric Power Company says an alarm indicating falling voltage sounded at a power switchboard at the No.1 turbine building on Monday morning.

TEPCO says a pump that injects water to cool nuclear fuel inside the No.1 reactor had stopped. But a backup pump quickly kicked in. It says the reactor's temperature remained unchanged.

The operator says the blackout also halted systems that decontaminate radioactive gases in the No.1 and 2 containment vessels. But backup systems there also took over.

TEPCO believes the power failure occurred when a worker mistakenly pushed the switchboard's stop button during an inspection.

In March, a rat entered a makeshift outdoor power distribution board at the plant, causing a short circuit. Systems to cool a pool in which spent fuel rods are stored were down for as long as 29 hours.

Four months later, the No.6 reactor's cooling machinery was suspended for about 2 hours due to worker's mistake.

October 8, 2013

## TEPCO's explanations of yesterday's power failure

### Water injection for damaged Fukushima reactor accidentally halted

Kyodo

[http://www.japantimes.co.jp/news/2013/10/08/national/water-injection-for-damaged-fukushima-reactor-accidentally-halted/#.UlPRyVM0\\_9k](http://www.japantimes.co.jp/news/2013/10/08/national/water-injection-for-damaged-fukushima-reactor-accidentally-halted/#.UlPRyVM0_9k)

A pump to inject water into one of the severely damaged reactors at the Fukushima No.1 nuclear complex halted Monday after a worker accidentally triggered a power failure, Tokyo Electric Power Co. said.

The halt occurred at around 9:47 a.m. but cooling of the No. 1 reactor **immediately resumed through a backup pump**, Tepco said.

The utility said the power failure occurred when one of two employees conducting routine checks of electricity equipment wrongly pushed a “stop” button on a switchboard, cutting power supply.

The utility does not have a procedure manual detailing how to manage the equipment and the worker had not previously conducted such checks, according to the utility. The other worker, who knew the proper procedure, was checking another switchboard and did not notice the mistake.

At the Fukushima plant in northeastern Japan, reactors 1 to 3 suffered meltdowns in March 2011 when tsunami hit the plant, flooding electrical equipment and triggering the failure of the reactor cooling system.

A power outage was also triggered last March when a rat touched a makeshift switchboard. The incident disabled the cooling system for the spent fuel pools of the reactors 1, 3 and 4 units and it took 29 hours to fully restore the system.

The reactors 1 to 3 are currently being kept cool by pouring around 400 tons of water into them every day. But the total amount of toxic water is increasing daily as groundwater is seeping into reactor buildings and mixing with water that passes through the reactors.

The government has decided to finance some measures to address the situation, such as the construction of a huge underground ice wall around reactor buildings to block the entry of groundwater.

Economy, Trade and Industry Minister Toshimitsu Motegi told a Diet committee Monday that the government may consider providing additional funds for a backup plan to be prepared in case the current planned measures fail to deal with the contaminated water.

“The government will play a proactive role on issues that involve technical difficulties,” he said.

The government has said it will spend ¥47 billion on construction of the ice wall, in which up to 1.4 kilometers of soil around the reactors 1 to 4 will be frozen.

An official at the Economy, Trade and Industry Ministry said that the annual operational cost of the system is expected to amount to several billion yen.

October 9, 2013

## Six workers sprayed with contaminated water

### Fukushima plant workers exposed to radiation

[http://www3.nhk.or.jp/nhkworld/english/news/20131009\\_23.html](http://www3.nhk.or.jp/nhkworld/english/news/20131009_23.html)

Workers at the crippled Fukushima Daiichi nuclear power plant have caused a fresh leak of contaminated water by **mistakenly detaching a pipe**.

The plant's operator, Tokyo Electric Power Company, says **6 workers were sprayed with the contaminated water and are being checked for radiation exposure**.

TEPCO says the workers mistakenly detached a water pipe from a joint near a desalination device on Wednesday morning.

**The accident caused about 7 tons of contaminated water to leak for about 50 minutes**. TEPCO says the water is contained inside a 60-meter-long, 12-meter-wide barrier that surrounds the device.

The water is highly radioactive, containing 34 million becquerels of beta ray-emitting material per liter.

Worker errors have been occurring frequently at the Fukushima Daiichi plant, as TEPCO struggles to keep the facility under control.

### 6 workers at crippled Fukushima nuclear plant exposed to radioactive water

<http://mainichi.jp/english/english/newsselect/news/20131009p2a00m0na012000c.html>

Six workers at the tsunami-ravaged Fukushima No. 1 Nuclear Power Plant were exposed to highly radioactive water that leaked from pipes on the morning of Oct. 9, its operator said.

The water leak stopped about five hours later. Officials of the plant operator, Tokyo Electric Power Co. (TEPCO), said it remains unclear how much water had leaked, but denied that the contaminated water leaked into the sea.

The utility is examining how much radiation the workers were exposed to in the accident.

At around 10 a.m., a worker reported to plant managers that water had begun to leak from piping in a device to desalt radioactive contaminated water. TEPCO officials said that as of Aug. 13, the water contained 37 million becquerels of radioactive substances per liter that emit beta rays. The water that leaked was to be sent to the desalting device after removing radioactive cesium.

The utility attributes the accident to the fact that a worker at a subcontractor erroneously disconnected the pipes.

Nine workers had been working at the facility at the time of the accident, but two others joined them after the radioactive water leak. The workers were wearing rain jackets over their protective suits, but radioactive substances were later detected on the bodies of six of the workers.

### **Workers at Fukushima splashed by toxic water**

AFP-JIJI, AP, Kyodo

[http://www.japantimes.co.jp/news/2013/10/09/national/workers-at-fukushima-splashed-by-toxic-water/#.UJZKQ1M0\\_9k](http://www.japantimes.co.jp/news/2013/10/09/national/workers-at-fukushima-splashed-by-toxic-water/#.UJZKQ1M0_9k)

Six workers at the Fukushima No. 1 nuclear plant were doused Wednesday with radioactive water from a desalination system, Tepco said.

The fluid splashed onto the men when they accidentally removed a pipe connected to the system, officials from Tokyo Electric Power Co. said.

The highly toxic water spilled out in the incident, covering the desalination facility's entire floor, Tepco said.

About 10 tons of water may have leaked, the utility said, noting the pipe in a reading in August contained some 37 million becquerels per liter of radioactive substances that emit beta rays such as strontium-90, against the legal limit of 30 becquerels for strontium-90.

The mishap is the latest in a spate of leaks and problems caused by human error that have added to public criticism of Tepco's handling of the crisis.

"The water did not come into contact with their faces so there is little possibility that the workers ingested" any of the water, a Tepco spokeswoman said, adding there were five other workers present at the time.

The pipe was reconnected and the leak stopped within an hour of the initial incident, the utility said in a statement.

The system is designed to desalinate contaminated water once it has been treated to reduce its cesium content. It is then stored in tanks on the site.

Wednesday's incident will do little to improve the commonly held view that Tepco is making a mess of handling the crisis.

Earlier this week it was revealed a worker had accidentally switched off power to pumps keeping broken reactors at a steady temperature.

Tepco workers have been pouring thousands of tons of water onto the reactors to keep them cool.

The radioactive water is being stored in around 1,000 tanks, which have recently been the source of leaks. Tepco has so far revealed no clear plan for the water stored on the site, but experts have said that ultimately it will have to be dumped in the Pacific once it has been scoured of the worst of its radioactive load. But this suggestion faces opposition from fishermen, environmental groups and neighboring countries.

### **Toxic water splash 6 in Japan nuke plant mishap**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310090053>

THE ASSOCIATED PRESS

The operator of Japan's crippled nuclear power plant says six workers have been exposed to highly radioactive water that poured out of a treatment unit when they removed a wrong pipe.

Tokyo Electric Power Co. said Oct. 9 that exposure to the workers, who were wearing face masks and protective gear, is believed minor but still under investigation.

Tons of highly toxic water spilled out in the incident, covering the facility's entire floor, TEPCO said.

The mishap is the latest in a spate of recent leaks and problems caused by human error that have added to public criticism of TEPCO's handling of the crisis.

Last week, workers overfilled a tank without fully checking water levels, causing a leak, possibly to the sea.

### **Fukushima plant workers exposed to radiation**

[http://www3.nhk.or.jp/nhkworld/english/news/20131009\\_45.html](http://www3.nhk.or.jp/nhkworld/english/news/20131009_45.html)

The operator of the Fukushima Daiichi nuclear power plant says 6 of its workers were exposed to radiation on Wednesday morning due to a contaminated water leak caused by human error.

Tokyo Electric Power Company said on Wednesday evening that the workers had been decontaminated and that it will step up efforts to prevent a recurrence.

It says the workers mistakenly detached a water pipe from a joint near a desalination device at around 9:30 AM.

The accident caused about 7 tons of contaminated water to leak for about an hour. TEPCO says the water is contained inside a 60-meter-long, 12-meter-wide barrier that surrounds the device.

The water is highly radioactive, containing 34 million becquerels of beta ray-emitting material per liter.

Six of 11 workers at the site were sprayed with the radioactive water.

TEPCO says the affected workers were decontaminated and that the maximum level of their exposure to beta rays was 1.2 millisieverts. The government sets the exposure limit for skin at 500 millisieverts per year.

Company officials say alertness among workers may be decreasing due to an increased burden of preventing further leaks. They add they will redouble efforts to prevent accidents.

Worker error has occurred frequently at the Fukushima Daiichi plant, as TEPCO struggles to keep the facility under control.

October 10, 2013

## Highly radioactive water splashes over workers

### Workers covered in toxic water as pipe disconnected at Fukushima plant

<http://mainichi.jp/english/english/newsselect/news/20131010p2g00m0dm038000c.html>

TOKYO (Kyodo) -- Highly radioactive water leaked from a desalination facility at the severely damaged Fukushima Daiichi nuclear power plant on Wednesday morning when workers wrongly disconnected a pipe, plant operator Tokyo Electric Power Co. said.

A total of 7 tons of water flowed out from the pipe for over an hour, but it remained inside leak-protection barriers set up around the facility. Six of the 11 workers were covered in the toxic water but unlikely to have suffered internal exposure, the utility said.

Nuclear Regulation Authority Chairman Shunichi Tanaka told a press conference that the leak seemed to be another accident triggered by "carelessness" at the plant.

**TEPCO said the water, which leaked from about 9:35 a.m., contained around 34 million becquerels per liter of radioactive substances that emit beta rays such as strontium-90.** Beta particles can penetrate the skin but can be blocked with a thin sheet of metal, such as aluminum.

**Dosimeters showed that subcontract workers were exposed to up to 1.2 millisieverts of beta rays and up to 0.42 millisievert of gamma rays,** which are emitted from radioactive substances like cesium and have a greater ability to penetrate other materials.

TEPCO spokesman Masayuki Ono told a press conference later in the day that the levels of exposure were unlikely to result in health problems for the workers.

The workers were supposed to replace an empty pipe connected to the facility but wrongly chose the pipe containing toxic water. The leak was finally stopped at around 10:50 a.m. because the workers had difficulties reconnecting the pipe.

The six workers were wearing waterproof jackets in addition to protective gear. Full-face masks also protected them from splashes.



TEPCO continues to face difficulties in managing the massive quantity of toxic water created as a result of continuing water injections into the three reactors that experienced meltdowns during the nuclear crisis that erupted in 2011.

Water used to cool the reactors passes through facilities that reduce radioactive cesium and remove salt before it is stored in tanks. The water that leaked had undergone the cesium-reduction process but still contained about 1,690 becquerels of cesium per liter and was due to be desalinated.

The incident occurred after nuclear regulators ordered TEPCO last Friday to improve its management of the contaminated water following a series of problems caused by human error.

Last week, TEPCO said about 430 liters of radioactive water leaked from the lid of one of the tanks because it failed to appropriately take into account the inclination of the ground where the container was set up.

Although some of the water is believed to have flowed into the Pacific Ocean, the NRA said Wednesday it had not found any rise in radiation in the sea and determined it was an accident with "no safety significance."

Visiting International Atomic Energy Agency chief Yukiya Amano and Economy, Trade and Industry Minister Toshimitsu Motegi agreed during a meeting in Tokyo the same day to cooperate in disseminating information over the radioactive water issue and radiation monitoring, Japanese officials said.

## Radiation in sea hits two-year high

### Radiation levels near damaged Fukushima reactor hit two-year high

REUTERS

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310090079>

Radiation levels in seawater just outside one of the damaged Fukushima reactors spiked this week to the highest level in two years, the operator of the crippled nuclear plant said on Oct. 10.

Radiation levels on Oct. 9, the day six workers were exposed to highly radioactive water, jumped 13 times the previous day's reading, the highest levels since late 2011.

A massive quake and tsunami hit the power station, operated by Tokyo Electric Power Co., also known as TEPCO, in March 2011, causing three reactor meltdowns and hydrogen explosions.

TEPCO, which is pouring hundreds of tons of water to keep reactors cool, has struggled to contain the buildup of radioactive water at the plant.

In the latest incident, a worker on Oct. 9 mistakenly detached a pipe connected to a treatment system, releasing seven tons of highly radioactive water.

The accidents at the Fukushima No. 1 nuclear power plant, 220 km (130 miles) north of Tokyo, are adding to the crisis and stirring doubt over TEPCO's abilities to carry out a complex cleanup widely expected to take decades.

TEPCO said combined Cesium-134 and Cesium-137 readings just outside the damaged No. 2 reactor spiked to 1,200 becquerels per liter on Oct. 9, more than 13 times the level on Oct. 8.

Cesium-134 readings were 370 becquerels per liter while Cesium-137 was 830/liter within a silt fence right outside the reactor building. Regulatory limits for Cesium, which emits a strong gamma radiation and is harmful to the human body, is 90 becquerels/liter for Cesium-137 and 60 becquerels/liter for Cesium-134.

A TEPCO spokesman said the sudden spike in radiation was caused by construction work near the No. 2 building.

Workers are injecting chemicals to harden the ground on the seaside of the Fukushima reactor buildings to prevent contaminated water from flowing out to the ocean. The pressure from pumping chemicals into the ground pushed some contaminated soil out into the port area, the spokesman said.

TEPCO also said Cesium-137 readings just outside the silt fence next to the No.2 reactor rose to 160 becquerels/liter, also above the regulatory limit and almost double the previous day's level.

The readings were taken right next to the Fukushima plant but hundreds of meters from the port entrance that connects to the Pacific Ocean.

Radiation from water leaking from the facility is mostly confined to the harbor around the plant, officials have said.

Last week, TEPCO said 430 liters (113 gallons) of contaminated water had spilled out of a storage tank at Fukushima and probably flowed to the ocean.

Cesium readings further out in the Pacific Ocean remain non-detectable and officials say there is no environmental threat to other countries as radiation will be diluted by the sea.

In September, Prime Minister Shinzo Abe promised the International Olympic Committee that radioactive water problems at Fukushima were "under control" and any contamination is limited to the harbor next to the Fukushima plant.

Nuclear Regulation Authority last week ordered TEPCO to draft in additional workers and report within a week on its measures to tackle the hazardous clean-up.

October 11, 2013

## Cesium in sea water (away from plant)

### **Radioactive cesium detected in waters off Fukushima nuclear plant**

<http://mainichi.jp/english/english/newsselect/news/20131011p2g00m0dm031000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co., operator of the crippled Fukushima Daiichi nuclear plant, said Thursday that 1.4 becquerels per liter of radioactive cesium-137 had been detected in a seawater sample recently taken around 1 kilometer from the power plant.

Although nuclear plant operators are allowed to discharge 90 becquerels per liter into the sea, the reading suggests that toxic water leaks at the Daiichi plant have not been contained within a small area near the facility.

The utility, known as TEPCO, said it had immediately filed a report with the central government, adding that no radioactive cesium was detected in a sample taken Thursday.

In a speech at the International Olympic Committee's general meeting in Buenos Aires in early September, Japanese Prime Minister Shinzo Abe said the impact of radioactive water leaks at the Daiichi plant had been "completely blocked" within a zone of 0.3 square kilometers in the plant's port area.

Tokyo beat Istanbul and Madrid to win the right to host the 2020 Olympics.

TEPCO began surveying seawater off the plant site in August and no radioactive cesium was previously detected.

Cesium-137, which has a half-life of around 30 years, can cause cancer and experts said it can accumulate in fish.

### **Radioactive cesium detected in seawater**

[http://www3.nhk.or.jp/nhkworld/english/news/20131011\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20131011_01.html)

Radioactive cesium has been detected in seawater outside the port of the damaged Fukushima Daiichi nuclear power plant.

The plant's operator, Tokyo Electric Power Company, says it took a seawater sample on Tuesday outside a breakwater about one kilometer off the coast.

The company began monitoring at that spot in August, after it acknowledged in July that contaminated groundwater had been seeping into the ocean.

One-point-four becquerels per liter of cesium-137 was found in the sample. This is the first time that the radioactive material has been detected in seawater taken at that spot.

TEPCO officials say the radiation level is lower than the safety standard for drinking water set by the World Health Organization, which is 10 becquerels per liter.

They say a seawater sample taken from the spot on Thursday did not contain a detectable level of cesium.

They will continue to monitor seawater to find out whether contaminated groundwater is affecting the seawater outside the plant's port.

## High radiation in same area as in September

### High radiation reported near tanks

JJI

[http://www.japantimes.co.jp/news/2013/10/11/national/high-radiation-reported-near-tanks/#.UlfYFM0\\_9k](http://www.japantimes.co.jp/news/2013/10/11/national/high-radiation-reported-near-tanks/#.UlfYFM0_9k)

FUKUSHIMA – Tokyo Electric Power Co. said Friday that high radiation levels have been detected **near three water storage tanks** at the Fukushima No. 1 nuclear plant.

The highest reading was 69.9 millisieverts per hour near one of the three tanks holding radioactive water to the west of the building housing reactor 1.

**It is the same area where high radiation levels were detected in early September.** The highest reading at that time was 2,200 millisieverts per hour.

No leak of radioactive water has been confirmed, and there has been no change in water levels in the three tanks, Tepco officials said.

The utility found the high doses **during a routine inspection Thursday.** The highest radiation levels near the other two tanks were 19.95 millisieverts and 39.95 millisieverts.

Radiation checks were conducted about 5 cm from the tanks near their base. One of the three was among the tanks around which high radiation levels were found in early September

October 12, 2013

## Radiation monitoring in port reinforced

## TEPCO to reinforce monitoring activities at Fukushima plant's port

<http://mainichi.jp/english/english/newsselect/news/20131012p2g00m0dm002000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Friday that it will reinforce radiation monitoring inside the plant's port where the concentration of radioactive cesium is rising.

For a week from Friday, Tokyo Electric Power Co. plans to check every day the radiation level of the sea water at five points, including at the entrance to the port, TEPCO officials said.

The utility has detected that the concentration of cesium is rising near the water intake of the plant's No. 2 reactor, one of three units that suffered meltdowns during the 2011 nuclear crisis. An undersea curtain called a "silt fence" is placed around the intake to prevent the spread of contamination.

Seawater samples taken from inside the curtain area Tuesday contained 90 becquerels of cesium per liter, while samples taken Wednesday and Thursday contained 1,200 becquerels and 970 becquerels of cesium respectively.

Radiation levels outside the curtain have also been rising.

TEPCO believes the change in radiation levels is related to the soil improvement work the utility is conducting at the coastal site, which is likely to have affected the flow of groundwater passing through the plant premises.

The utility also said on Friday that highly radioactive water that leaked from the plant's desalination facility on Wednesday totaled 11 tons, not 7 tons as announced earlier.

The water remained inside leak-protection barriers set up around the facility, meaning none leaked into the sea.

In that incident, six workers were soaked by toxic water when they wrongly disconnected a pipe that was not empty. They were able to wipe off the contamination and did not have to receive medical treatment.

The desalination facility is used in the water circulation process to keep the three crippled reactors cool.

October 13, 2013

## Cesium contamination increasing in port

### Cesium contamination increasing in water at port of Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310130062>

Tokyo Electric Power Co. announced Oct. 12 that it has detected a rising level of radioactive cesium in seawater sampled from the mouth of the harbor of the devastated Fukushima No. 1 nuclear power plant, measuring a combined 10 becquerels of cesium-134 and cesium-137 per liter.

The level is the highest since the plant operator began sampling water in June at the mouth of the port, which marks the boundary between the harbor around the plant and the ocean.

At the plant, a vast amount of contaminated water that includes radioactive substances has been discharging into the sea since the nuclear disaster following the Great East Japan Earthquake and tsunami on March 11, 2011.

On Oct. 11, TEPCO said that it recorded 2.7 becquerels of cesium-134 and 7.3 becquerels of cesium-137 per liter at the port mouth. Samples taken a day earlier were below the measurable limits of 1.1 becquerels of cesium-134 and 0.9 becquerel of cesium-137 per liter, the company said.

The previous record amount of radioactive cesium detected at the mouth of the harbor was 1.6 becquerels of cesium-134 and 4.7 becquerels of cesium-137 per liter in water sampled on Aug. 19.

World Health Organization guidelines advise the maximum level of radioactivity in drinking water to be 10 becquerels per liter or less. But TEPCO officials said that the environmental impact of the level of cesium detected on Oct. 11 is negligible.

On Oct. 8, the company also detected 1.4 becquerels of cesium-137 from seawater sampled 1 kilometer off the mouth of the port.

Meanwhile, TEPCO measured 320,000 becquerels of tritium, a radioactive isotope of hydrogen, per liter from water sampled from an observation well on Oct. 10 located near a storage tank, from which the leakage of 300 tons of highly contaminated water was discovered in August.

About 1,000 storage tanks are holding the ever-increasing volume of highly toxic water left after being used to cool the reactors.

It marked the first time that water containing 300,000 or more becquerels of tritium per liter was detected from groundwater sampled from the compound of the Fukushima No. 1 plant.

It is more than five times the legally allowed maximum level of tritium contamination--60,000 becquerels per liter--that could be released into the ocean.

October 14, 2013

## **Weeklong IAEA mission**

### **IAEA team begins weeklong mission to help with nuclear waste control**

Kyodo

[http://www.japantimes.co.jp/news/2013/10/14/national/iaea-team-begins-weeklong-mission-to-help-with-nuclear-waste-control/#.Ulwi9lM0\\_9k](http://www.japantimes.co.jp/news/2013/10/14/national/iaea-team-begins-weeklong-mission-to-help-with-nuclear-waste-control/#.Ulwi9lM0_9k)

A 16-member team from the International Atomic Energy Agency began a weeklong mission in Japan on Monday to assist in efforts to manage toxic waste caused by the radiation-leaking Fukushima Daiichi nuclear power plant.

The team, headed by **Juan Carlos Lentijo**, will remain until next Monday and present a set of proposals to the Japanese government at the end of its mission on issues that need to be addressed and how to make further progress in the decontamination work after inspecting decontamination sites.

**It is the second time for an IAEA team to visit Japan since October 2011**, several months after the Fukushima plant was crippled by the March 11 earthquake and tsunami.

Speaking at a news conference in Tokyo a day after the team arrived in Japan, Lentijo — an expert on nuclear fuel cycles and waste technology — expressed hope it can provide advice on how to control nuclear-contaminated waste.

The team's trip to Japan, made at the request of the Japanese government, comes at a time the central and local governments are trying to make headway in plans to construct temporary storage facilities for such waste in Fukushima Prefecture, where the Fukushima Daiichi plant is located.

October 16, 2013

## 80 more workers at Fukushima Daiichi

### TEPCO to add 80 more to workforce to improve toxic water management

<http://mainichi.jp/english/english/newsselect/news/20131016p2g00m0dm035000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. on Tuesday told nuclear regulators that it is assigning an addition 80 workers to manage a massive amount of radioactive water accumulating at its crippled Fukushima Daiichi nuclear power plant in order to improve its efforts to deal with the problem.

The additional workforce will include **20 employees from the Kashiwazaki-Kariwa nuclear complex** in Niigata Prefecture, which TEPCO is seeking to restart to improve its business situation as the utility's business situation has worsened following the 2011 nuclear crisis.

The plan was included in a report the company compiled at the request of the Nuclear Regulation Authority following a series of water leak incidents at the Fukushima plant.

The report said that a lack of information-sharing was seen behind one of the incidents, in which about 430 liters of toxic water spilled from a tank after workers tried to inject more water into the nearly full container set up on uneven ground.

**According to TEPCO, the number of people it has added to the workforce for water management from mid-September will total about 200.**



Radioactive water is increasing daily at the Fukushima plant, hit by a huge earthquake and tsunami in March 2011, because groundwater is seeping into reactor buildings and mixing with water that is used to cool the three crippled reactors.

Such contaminated water is kept in some 1,000 tanks set up at the site, and TEPCO is struggling to prevent leaks from the storage tanks.

## Loose waterproof packing the culprit

### **Loose packing responsible for leak of radiation-tainted water from tank: TEPCO**

<http://mainichi.jp/english/english/newsselect/news/20131016p2a00m0na023000c.html>

Some 300 tons of radioactively contaminated water leaked from a storage tank on the grounds of the crippled Fukushima No. 1 Nuclear Power Plant because waterproof packing between steel sheets in the tank was pushed out of alignment, the plant's operator, Tokyo Electric Power Co. (TEPCO), has announced.

TEPCO reported the cause of the leak at a Nuclear Regulation Authority (NRA) task force meeting on Oct. 15.

Officials suspect that metal on the bottom of the tank expanded and contracted due to temperature changes, and that water pressure forced some of the packing down outside the tank, creating a gap through which water was able to leak out.

There are a total of 956 similarly designed tanks on the power plant grounds, and TEPCO is poised to take measures to prevent further leaks, such as covering the bottom of the tanks with a waterproof coating.

The leak occurred in a cylindrical tank whose bolted seams were filled with resin-based packing to prevent water from leaking. When workers took apart the tank to inspect it, they found that some of the packing had been pushed down outside the tank, and that two bolts in this part of the tank were loose, apparently leaving the spot vulnerable to water pressure.

Toyoshi Fuketa, one of the NRA's commissioners, said measures needed to be taken to prevent leaks from the hundreds of other similar tanks at the power plant.

**"It's appropriate to take measures on the possibility that any of these tanks will leak sooner or later,"** he said.

TEPCO announced it plans to gradually replace the tanks with welded tanks, which are said to be less susceptible to leaking, placing priority on the tanks that hold higher concentrations of radioactive materials.

## **TEPCO releases rainwater from typhoon...again**

### **TEPCO forced to drain water overflow from typhoon at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310160060>

Heavy rain from Typhoon No. 26 forced Tokyo Electric Power Co. to discharge rainwater Oct. 16 that was threatening to swamp the barriers that surround the radioactive water storage tanks at the devastated Fukushima No. 1 nuclear power plant.

TEPCO said all the water released was well within safety standards approved the previous day by the Nuclear Regulation Authority.

According to the utility, workers drained about 40 tons of water from within barriers in areas called C-West and C-East at around 5:40 a.m. The water was transferred to a temporary storage tank to check its radiation levels before it was released, TEPCO officials said.

But water levels continued to rise inside the barriers, threatening to spill over. Plant workers were eventually forced to open drainage valves on a total of nine storage areas starting around 7 a.m. to allow the water to escape, according to officials.

Earlier, TEPCO had said it would discharge water that accumulated behind the barriers only after transferring it to a temporary storage tank where it would confirm it complied with safety standards. TEPCO officials said circumstances forced it to take "emergency measures" because the water rose at a faster rate than it could transfer to the holding tank.

TEPCO presented a draft of its safety measures to the NRA on Oct. 15. The utility reviewed and modified the draft after NRA officials pointed out flaws in the measures.

The provisional measures, which the NRA approved late on Oct. 15, stipulated cesium-134, cesium-137 and strontium-90 levels should be lower than 15, 25 and 10 becquerels per liter, respectively, before water could be discharged. It also said the combined levels of those and other radioactive substances must, as a whole, be lower than the legal limit before being released into the environment.

Water exceeding the limit levels must be stored in empty tanks. TEPCO said it has secured 4,000 tons of tank capacity to store rainwater.

### **TEPCO releases rainwater from typhoon**

[http://www3.nhk.or.jp/nhkworld/english/news/20131016\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20131016_31.html)

The operator of the damaged Fukushima Daiichi nuclear plant has released rainwater that had accumulated in the compound from typhoon Wipha. The water has reportedly cleared tests for radioactivity.

Tokyo Electric Power Company says the rainwater had accumulated inside barriers surrounding tanks used to store radioactive wastewater. It began releasing the water from 9 locations on Wednesday morning.

The rainwater underwent 5 checks for radioactivity on Tuesday, including tests for cesium and strontium-90.

TEPCO says the levels met standards set by the Nuclear Regulation Authority for radioactive wastewater normally released into the sea.

The level of tritium, which takes longer to measure, is also likely to be safe.

In a separate move, TEPCO made an emergency transfer of highly radioactive water that had pooled at 2 other locations. The water was transferred to an adjacent underground storage pool.

TEPCO had not stored water underground since a leak in April. But because rainwater from the typhoon was rising fast, the utility decided to store the radioactive water temporarily in an underground pool that had not leaked. It will then transfer it to a tank for wastewater.

TEPCO has built additional storage tanks and increased personnel and patrols to control contaminated water after a storm earlier this month. Radioactive water flowed over barriers at that time, and seeped out of an overfilled tank.

The Nuclear Regulation Authority says it was notified on Wednesday morning of TEPCO's decision to transfer the water to an underground pool.

The authority gave the go-ahead after judging that the risk of a leak was minimal.

It said the tank to which the water was transferred had not been used since passing a safety inspection, and that the tank would only be used temporarily.

The authority asked TEPCO to tighten monitoring for possible leaks.

October 17, 2013

## Another one

### TEPCO reports another tank leak

[http://www3.nhk.or.jp/nhkworld/english/news/20131017\\_21.html](http://www3.nhk.or.jp/nhkworld/english/news/20131017_21.html)

The operator of the Fukushima Daiichi nuclear plant says radioactive water has overflowed from a tank storing pumped-up groundwater.

Tokyo Electric Power Company says an employee found water spilling from the top of the tank Thursday morning.

TEPCO says it has stopped drawing up groundwater. The leakage has been contained within a barrier set up around the tank.

The utility says it is investigating how much water spilled from the tank and why. It says a pump used to send the water from the tank to its storage place in the reactor building may not have been working.

The tank is located on the embankment facing the ocean and near the badly damaged reactors No. 1 and 2.

TEPCO began pumping up groundwater near the reactors in August to reduce the amount of contaminated water flowing into the sea. The groundwater is flowing from the mountains and gets tainted as it passes through the plant premises.

## High levels of radiation in ditch

## High radioactivity in Fukushima Daiichi ditch

[http://www3.nhk.or.jp/nhkworld/english/news/20131017\\_11.html](http://www3.nhk.or.jp/nhkworld/english/news/20131017_11.html)

The operator of the damaged Fukushima Daiichi nuclear power plant says it has detected high levels of radioactivity in a ditch leading to the sea, after Typhoon Wipha brought heavy rain.

Workers at the plant are conducting daily radioactivity checks of water in the ditch. The measure is to examine the effects of contaminated water leaks from storage tanks.

Officials at the Tokyo Electric Power Company say they detected 1,400 becquerels per liter of beta ray-emitting radioactive material at a measuring point 150 meters from the sea on Wednesday.

The figure was more than 70 times higher than readings taken on Tuesday. It's also the highest since monitoring of the ditch water was started in August.

Officials say rain from the typhoon caused contaminated soil to flow into the ditch and created the high radioactivity.

They say they will begin a cleanup operation.

Officials also say they will assess the effects on the surrounding sea.

## Very high levels of contamination in well

### High radioactivity found in Fukushima Daiichi well

[http://www3.nhk.or.jp/nhkworld/english/news/20131018\\_09.html](http://www3.nhk.or.jp/nhkworld/english/news/20131018_09.html)

The operator of the Fukushima Daiichi nuclear power plant says that it has detected a sharp rise in radioactivity in a well near a storage tank.

The tank leaked more than 300 tons of contaminated water in August. Some of it is believed to have poured into the sea via a ditch.

Officials of the Tokyo Electric Power Company say that they detected **400,000 becquerels per liter of beta ray-emitting radioactive substances, including strontium, at the well on Thursday.**

The level is 6500 times higher than the readings on the previous day.

The well was dug to monitor the impact of the leakage and is located at about 10 meters from the tank. High levels of radioactive tritium, which tends to be transferred easily in water, had been already detected.

TEPCO officials believe Thursday's findings show that radioactive substances such as strontium, which are transferred relatively slowly, have reached the ground water.

There is another well about 100 meters from the tank near the seaside. It's for pumping up groundwater before it seeps into the reactor building and vicinity so as to contain the increase of contaminated water.

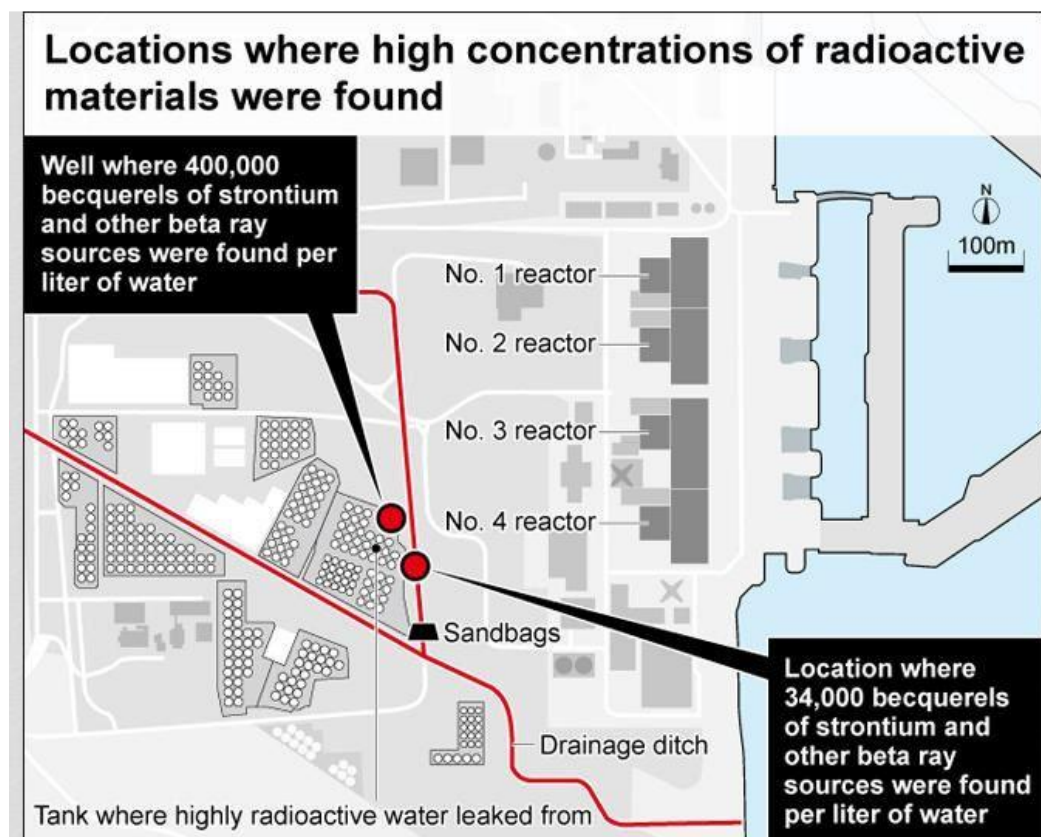
TEPCO will remove the contaminated soil around the tank and continue to closely watch radioactivity levels of the groundwater at the monitoring well.

October 18, 2013

## High levels of radiation in well (2)

### Radioactivity level in well water soars near leaky Fukushima tank

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310180088>



A record level of radioactivity was found in a well near a storage tank from which 300 tons of highly radioactive water leaked in the summer at the devastated Fukushima No. 1 nuclear power plant.

On Oct. 18, Tokyo Electric Power Co. said 400,000 becquerels of beta ray sources, including radioactive strontium, were detected per liter of water taken on Oct. 17, about 6,500 times more than the 61 becquerels recorded the previous morning.

The observation well is about 10 meters north of the tank where the leak was discovered in August. The tank was holding radioactive water with concentrations of 200 million becquerels, which was contaminated by the ongoing operation to cool the reactors.

High levels of tritium, a radioactive isotope of hydrogen, have been detected in this well, but not strontium, which moves more slowly than tritium. Strontium, which tends to accumulate in human bones, is believed to cause cancer and leukemia.

“There is a possibility that radioactive materials contained in the leaked contaminated water has reached the well,” a TEPCO official said. “We will examine details to find out why the radioactivity level rose sharply.”

The company said it has found no trace of additional leakage around the tank.

TEPCO also said Oct. 18 a record level of radioactivity was found in a drainage ditch, also near the tank in question.

The water taken on Oct. 17 contained 28,000 to 34,000 becquerels of beta ray sources, such as radioactive strontium, per liter, about 10 times higher than the previous day.

The levels apparently rose because radioactive materials on the ground flowed into the ditch during Typhoon No. 26 on Oct. 16, when swelling rainwater threatened to overflow barrier walls that surround storage tanks. The leak found in August is also suspected as a cause.

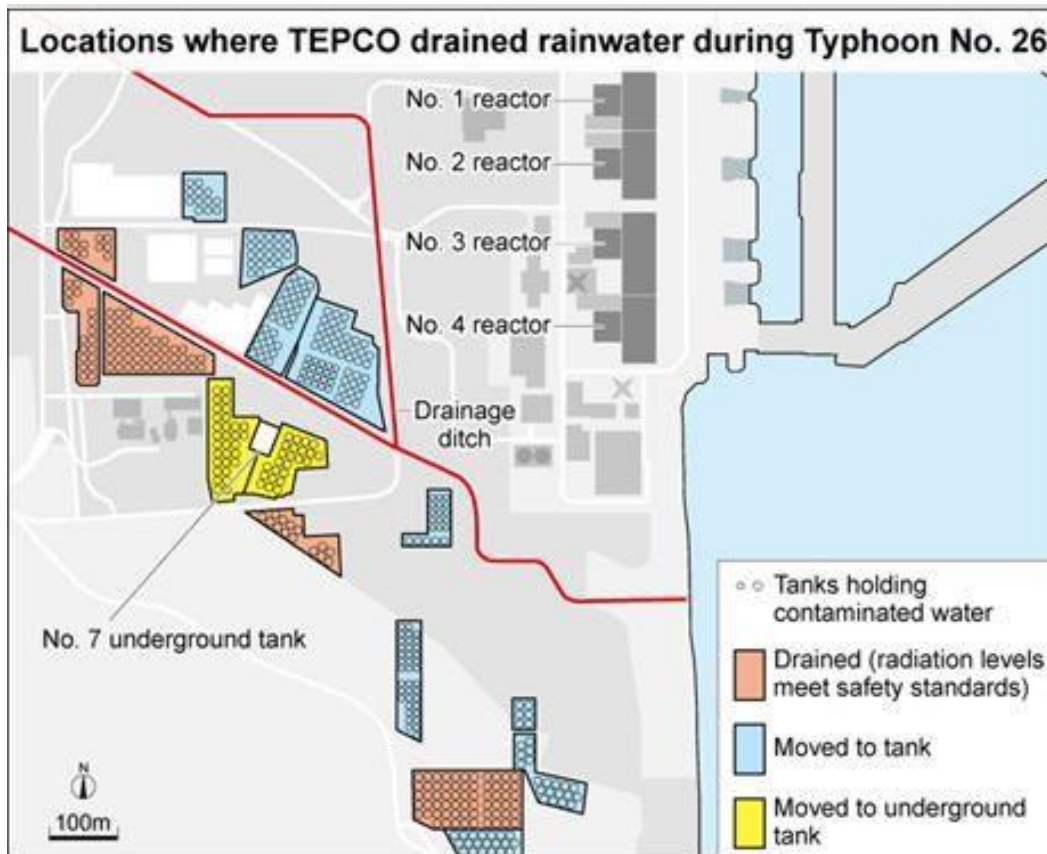
The location is 700 meters from the ocean. Water tends to accumulate because sandbags are placed immediately downstream.

TEPCO on Oct. 17 said 1,400 becquerels of beta ray sources were found per liter of water taken the previous day in a different part of a drainage ditch that leads directly to the ocean. The location is 150 meters from the ocean.

## **Protocol abandoned - new barriers not ready until end of year**

### **TEPCO skips protocol in draining typhoon rainwater at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310180083>



By SHUNSUKE KIMURA/ Correspondent

Heavy rainfall from Typhoon No. 26 forced Tokyo Electric Power Co. to abandon protocol to prevent rainwater from overflowing near tanks holding contaminated water at the Fukushima No. 1 nuclear power plant.

TEPCO skipped newly introduced procedures when it discharged rainwater that was accumulating within the barrier walls that surround the storage tanks on Oct. 16.

The company said the radiation levels of the rainwater discharged from nine locations were all within provisional safety standards approved by the Nuclear Regulation Authority late on Oct. 15.

TEPCO originally told the NRA it would transfer accumulating rainwater to a temporary storage tank in order to determine radiation levels before releasing it to the outside.



However, the rainfall from the typhoon was too great, leaving workers no choice but to abandon protocol and discharge the water onto the surrounding ground.

Radiation levels were measured directly in the water accumulating behind the barriers before it was released.

“Rainwater was about to overflow from the barriers,” a TEPCO official said. “We checked (radiation levels) after mixing water taken at several locations.”

TEPCO said the water that exceeded safety standards was directed to holding tanks, including a previously shuttered underground tank. The company stopped using underground facilities after radioactive water escaped from some in April.

But workers resorted to the stopgap measure because they had no time to transfer all of the rainwater to a farther 4,000-ton tank.

TEPCO collected 1,400 tons of contaminated rainwater during Typhoon No. 18 on Sept. 15. The amount of contaminated water is expected to increase further with each heavy rainfall.

TEPCO plans to install a new gutter system to prevent rainwater from accumulating behind the barriers. The utility will also erect concrete barriers measuring 60 to 130 centimeters high around the tanks in addition to the existing 30-cm-high barriers. **But the new barriers will not be completed until the end of the year.**

## High levels of radiation (3)

### Water radiation soars at Fukushima No. 1

Jiji, AFP-Jiji

<http://www.japantimes.co.jp/news/2013/10/18/national/water-radiation-soars-at-fukushima-no-1/>

FUKUSHIMA – Radiation levels in groundwater under Tokyo Electric Power Co.’s Fukushima No. 1 nuclear plant are soaring, Tepco said Friday after taking samples from an observation well.

Tepco said 400,000 becquerels per liter of beta ray-emitting substances such as strontium were detected in water sampled Thursday from the well located some 15 meters from a storage tank that leaked about 300 tons of highly radioactive water in August.

The level of becquerels, a record high for water in that well, was up 6,500-fold from the 61 becquerels found Wednesday.

Tepco was planning to pump groundwater up from different wells about 100 meters from the leaky tank for release into the Pacific before the water flows into the damaged reactor buildings and becomes heavily contaminated with radioactive materials.

But that plan appears in jeopardy because the sharp increase in the levels of radioactive materials in the observation well suggest the radioactive groundwater is spreading.

By law, water containing beta particle-emitting substances exceeding certain levels cannot be released into the sea. The upper limit is set at 30 becquerels per liter for strontium-90 and 60 becquerels for cesium-134.

Tepco also said water collected Thursday from a drainage ditch near the leaky tank contained 34,000 becquerels of beta particle-emitting substances per liter, compared with 2,300 becquerels the day before. Water contaminated with radioactive materials flowed into the ditch when Typhoon Wipha hit the area this week, but then much of the water evaporated, leading to the surge in the density of beta particle-emitting materials there, Tepco officials explained.

It is believed some 400 tons of radioactive groundwater is flowing into the Pacific daily.

Officials said Thursday they will solicit proposals from both domestic and overseas nuclear experts and firms on how best to scrap the ruined reactors at Fukushima No. 1.

The International Research Institute for Nuclear Decommissioning will publicly seek ideas as early as this month, an institute official said.

While the body is not putting the entire decommissioning process out to tender, the move will be welcomed by the international community, which has long called for Japan to make better use of available expertise around the globe.

The institute, formed by nuclear-related firms and government-backed bodies in August to dismantle the crippled reactors, will screen decommissioning proposals and take the results to the government, the official said.

"We will set up a website in both Japanese and English to notify interested parties at home and abroad of our calls for decommissioning ideas so that we can offer more useful and practical proposals to the government," the official said.

## **High levels of radiation detected in well at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20131018p2a00m0na004000c.html>

Highly radioactive materials measuring 400,000 becquerels per liter of water were detected in water taken from a well at the Fukushima No. 1 Nuclear Power Plant, plant operator Tokyo Electric Power Co. (TEPCO) has announced.

TEPCO said the high concentrations of radioactive substances -- including strontium 90 -- were detected in the water taken on Oct. 17 from a 7-meter-deep groundwater observation well near an aboveground storage tank, where some 300 metric tons of highly contaminated water had leaked earlier. The concentrations of strontium 90 in the well water are way beyond the government-set emission standard of 30 becquerels or less per liter, and are 125 times the maximum amount observed in the well in the past. The well is one of eight observation wells that were dug in early September. Because the well is located 15 meters away from the storage tank that leaked 300 tons of contaminated water, the water in the well holds higher concentrations of radioactive materials than that in the other wells. The previous maximum concentration was 3,200 becquerels per liter detected in the well's water on Sept. 8.

"We don't know the reason (for the increased concentration)," TEPCO said. However, since the well is covered with a lid, the utility surmised that "the effect of highly contaminated water leaked (from the nearby tank) is one possibility."

Because the well is located upstream of another well as part of a bypass plan, in which groundwater will be pumped up to be released into the ocean before making its way into nuclear reactor buildings, the latest finding could affect the viability of the plan.

Meanwhile, TEPCO said a record 34,000 becquerels per liter of radioactive substances were detected in water taken on Oct. 17. from a drain ditch nearby, which leads to the outer sea. The figure amounts to 15 times the concentrations announced the day before after TEPCO detected up to 2,300 becquerels per liter of radioactive substances in water in the ditch.

"It is likely that contaminated soil surrounding the area made its way into the ditch along with rainwater brought by Typhoon No. 26," TEPCO said. It added, however, that "the concentrations (of radioactive materials) had never spiked this sharply after previous typhoons."

TEPCO denied the possibility of the contaminated water in the ditch having leaked into the outer ocean on the grounds that the water is blocked by sandbags.

## **Underground water: TEPCO promises additional measures**

### **TEPCO to contain tainted underground water**

[http://www3.nhk.or.jp/nhkworld/english/news/20131019\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20131019_02.html)

The operator of the crippled Fukushima Daiichi nuclear power plant says it plans to take additional measures to contain the spread of contaminated water that leaked from a storage tank.

Tokyo Electric Power Company managers on Wednesday announced they had detected 400,000 becquerels per liter of beta ray-emitting radioactive substances in water collected from a monitoring well.

They said the figure is more than 6,000 times higher than the level recorded the day before.

They also said the level of radioactive strontium also tripled to the highest-ever figure of 790,000 becquerels per liter.

The well is some 10 meters from a storage tank that holds radioactive water. More than 300 tons of the water leaked from the tank in August. Some of it is believed to have seeped into nearby soil and also reached the ocean through a ditch.

TEPCO officials have been containing the problem by retrieving contaminated soil near the tank. But their efforts to completely remove the tainted soil are being hindered by the presence of pipes and other fixtures in the area.

TEPCO plans to collect the soil under the pipes and also wants to set up a new well to pump up the tainted water.

It has also announced that some 2,400 tons of water had been released from floodgates when heavy rainfall brought on by Typhoon Wipha caused water levels to rise on Wednesday.

**The operator maintains that radioactivity levels have stayed below the government set standard and isn't having a negative impact on the environment.**

## **Pr.Masaki Shimoji and anti-nuke repression in Japan**

[http://www.youtube.com/watch?v=YKRvT3Ku\\_H0](http://www.youtube.com/watch?v=YKRvT3Ku_H0)

**Osaka Professor Masaki Shimoji who is the president of the Hannan University Teachers Union discusses the fight against the burning of nuclear rubble from Fukushima ordered by the Japanese government and the jailing of him and others for providing educational material about the growing dangers of radiation and contamination from the meltdowns at the Fukushima nuclear reactors.**

Professor Shimoji was jailed for 20 days in Osaka along with other anti-nuclear activists and he discusses the continuing repression by the Japanese government in order to prevent the Japanese people from learning about the continuing dangers from the Fukushima nuclear power plant catastrophe.

Professor Shimoji spoke in Berkeley, California on October 17, 2013

The criminal charges against Shimoji have been dropped but the repression continues.

The interpretation was done by Umi Hagitani of the No Nukes Action Committee.

For more information on his case go to:

<http://monmojimoji.jimdo.com/論説-エッセイ/address-to-my-students/>

<http://www.jfissures.org/2013/01/20/o...>

<http://ex-skf.blogspot.jp/2012/12/arr...>

<http://fukushimavoices-eng.blogspot.co...> For more information from the No Nukes Action Committee go to:

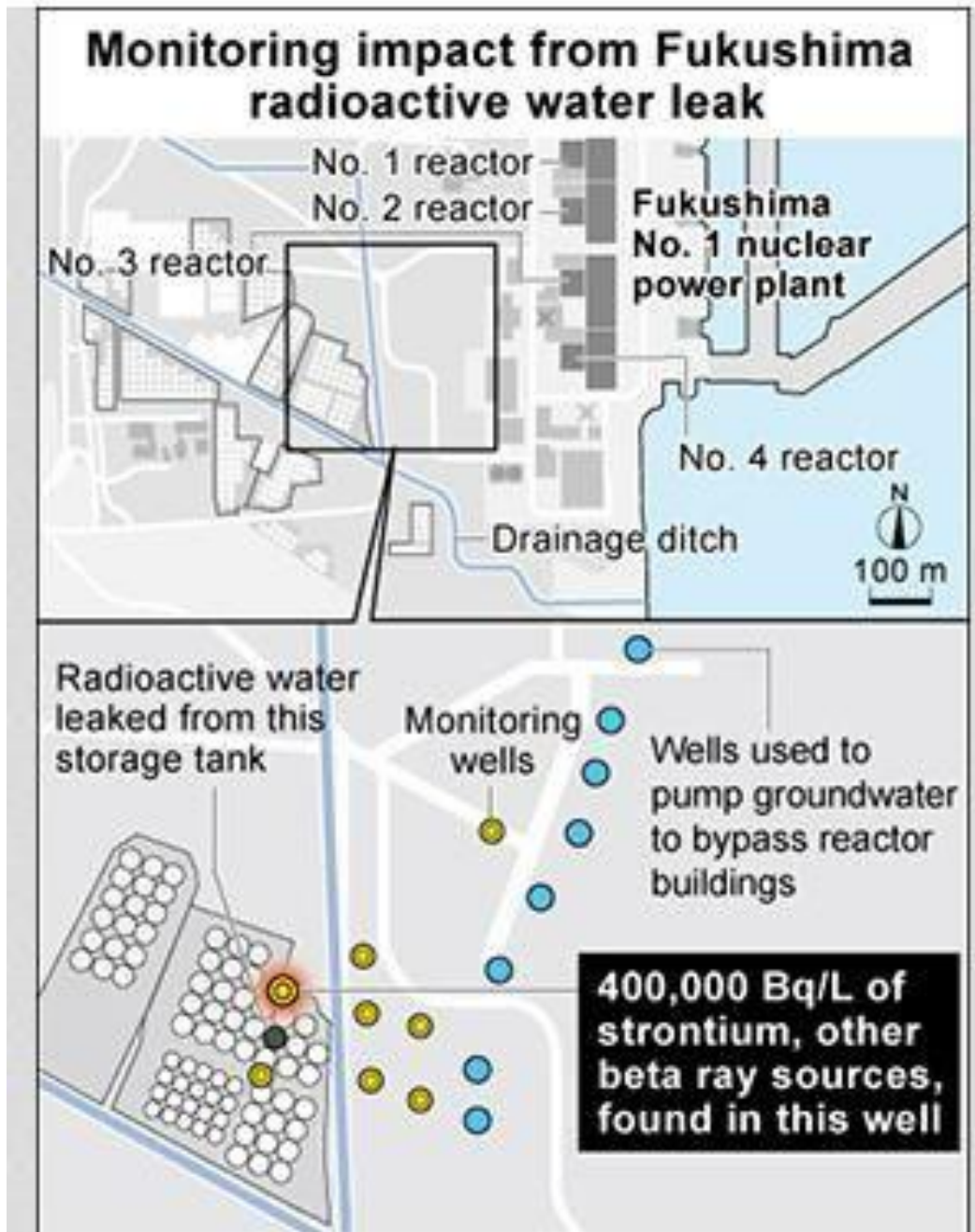
<http://nonukesaction.wordpress.com/> Production of Labor Video Project [www.laborvideo.org](http://www.laborvideo.org)

October 19, 2013

## **Probably took two months - But what does it mean?**

## FUKUSHIMA WATER CRISIS: Fukushima radioactive water took 2 months to reach monitoring well

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310190046>



It likely took highly radioactive water two months to travel just over 10 meters to reach a monitoring well that is at the forefront of the crippled Fukushima No. 1 nuclear power plant's latest leak scare, according to Tokyo Electric Power Co.

The plant operator said Oct. 18 that 400,000 becquerels of strontium and other beta-ray sources per liter of water were detected a day earlier in the well located near the storage tank from where 300 tons of highly radioactive water leaked during the summer. The spike is about 6,500 times more than the 61 becquerels recorded in the well on Oct. 16. In addition, a record 790,000 becquerels of tritium per liter of water were also detected, more than three times the previous reading.

"Radioactive water that escaped the tank probably seeped into the soil around pumping equipment adjacent to the well and migrated into the well itself," Masayuki Ono, acting general director of the Nuclear Power and Plant Siting Division at TEPCO, said Oct. 18.

The utility is considering collecting the radioactive soil near the well and pumping out the contaminated groundwater, Ono added.

Strontium is believed to accumulate in bones and can cause bone cancer and leukemia. Tritium is a radioactive isotope of hydrogen.

The legal limit for release into the environment is 30 becquerels per liter for strontium and 60,000 becquerels per liter for tritium. They both emit beta rays, which are more easily shielded than the gamma rays emitted by cesium and other radioactive substances.

TEPCO began sampling groundwater from the well in question on Sept. 8 to gauge the spread of radioactive contamination. The levels of tritium, which easily spreads with groundwater, reached 320,000 becquerels per liter on Oct. 10. Strontium, on the other hand, sticks to soil and spreads more slowly. While 3,200 becquerels of strontium were found per liter of water when the monitoring began, its levels hovered between 60 and 90 becquerels per liter just days earlier.

As a precautionary measure, TEPCO dug an array of "bypass" wells where groundwater is intercepted before reaching the contaminated areas around the reactor and turbine buildings. If necessary, the groundwater will be rerouted to the ocean directly. There would be no risk of the water becoming contaminated. Those wells are located about 130 meters on the sea side of the well in question.

TEPCO officials said they will now take additional measures to prevent water in the bypass wells from becoming contaminated, adding that detection wells that are located between the storage tank where the leak occurred and the bypass wells **so far** have shown no increased radiation levels.

The utility also said Oct. 18 that it had collected 2,400 tons of rainwater that had accumulated behind barrier walls that surround storage tanks that hold radioactive water as a result of Typhoon No. 26.

It did so after determining radiation levels exceeded provisional safety standards. The utility said it will store the contaminated water in the basement of the turbine building for the No. 2 reactor.

TEPCO added it had discharged another 2,400 tons of rainwater from behind the barriers after confirming radiation levels met safety standards. Workers did so by opening up drainage valves on the barriers to let the water run into surrounding soil and along a drainage ditch to eventually reach the ocean.

## **Record tritium contamination in well water**

### **High level of radioactive tritium found in Fukushima groundwater**

<http://mainichi.jp/english/english/newsselect/news/20131019p2a00m0na007000c.html>

A record 790,000 becquerels of radioactive tritium per liter of well water has been detected near a tank on the premises of the crippled nuclear plant in Fukushima Prefecture from which about 300 tons of highly radioactive water has leaked, its operators said.

The amount is 2.5 times the radioactivity detected on Oct. 10, which measured 320,000 becquerels, according to Tokyo Electric Power Co. (TEPCO), the operator of the tsunami-hit Fukushima No. 1 Nuclear Power Plant.

Furthermore, a record 400,000 becquerels per liter of other radioactive substances that emit beta rays, such as radioactive strontium-90, have been detected in water from the observation well. TEPCO made the finding after analyzing samples taken from the well on Oct. 17.

The well is one of eight that were drilled in early September to check whether underground water on the premises of the power station is contaminated with radioactive substances, and is only 20 meters north of the tank from which highly radioactive water leaked.

TEPCO officials said workers were unable to completely remove soil contaminated with radioactive water because piping and other pump equipment lies north of the well. The well was covered with a lid.

An advanced liquid processing system (ALPS) installed at the plant does not have the capability to remove tritium from radioactively contaminated water.

As to the reason for a sharp rise in the concentration of radioactive substances, TEPCO pointed to the possibility that such substances flowed in as a result of rain brought by Typhoon Wipha, contaminating the underground water. The power company is considering removing contaminated soil and pumping up tainted underground water.

October 21, 2013

## Beware of rain (1)

### **Rainwater flows over tank barriers at Fukushima No. 1**

JJI

[http://www.japantimes.co.jp/news/2013/10/21/national/rainwater-flows-over-tank-barriers-at-fukushima-no-1/#.UmTOl1M0\\_9k](http://www.japantimes.co.jp/news/2013/10/21/national/rainwater-flows-over-tank-barriers-at-fukushima-no-1/#.UmTOl1M0_9k)

Simultaneous overflows had not previously taken place at so many tank areas at the plant.

The possibility cannot be ruled out that overflowed water has leaked into the sea, according to Tepco.

Tepco also discovered water leaks from a concrete joint of a barrier at another tank area where above-limit radioactive substances have been found in the past.

As a result, contaminated water inside such barriers has leaked from more than half of the plant's 23 tank areas.

In the past, radioactive materials in excess of the provisional limits set by Tepco have been detected in water inside some tank-surrounding barriers.

The overflows and leaks are the latest in a series of radioactive water problems at the plant.

On Sunday, the utility started draining water from inside the barriers at six tank areas, including five of the 11 overflow areas, after confirming that radiation levels have fallen below the provisional limits.

At two other tank areas, Tepco transferred barrier area water to sunken reservoirs. Although the utility stopped using the reservoirs after the discovery of radioactive water leaks from some of them in April, it took the emergency step this time, as it did in preparation for heavy rain caused by Typhoon Wipha last week.

The total amount of water that overflowed and leaked Sunday is not known, the company said.



In one location among the 11 tank areas, a maximum of 29,000 becquerels per liter of strontium and other radioactive materials emitting beta-ray particles were detected in the past.

Tepco's provisional limit on radiation is 10 becquerels per liter for strontium-90, a substance that is believed to account for about half of beta ray-emitting radioactive materials.

Airborne radioactive materials have fallen inside the tank-surrounding barriers at the plant, while contaminated water is thought to have leaked into some of the areas. Therefore, rainwater inside the barriers contains a certain amount of radioactive substances.

After plant workers patrolling tank areas discovered the overflows late Sunday afternoon, Tepco started pumping water from inside the barriers to storage facilities, including tanks.

Rainwater flowed over the barriers around storage tanks containing radioactive water in 11 tank areas of the stricken Fukushima No. 1 nuclear power plant Sunday, Tokyo Electric Power Co. said.

### **TEPCO: Strontium tops safety standards in 6 spots**

[http://www3.nhk.or.jp/nhkworld/english/news/20131021\\_16.html](http://www3.nhk.or.jp/nhkworld/english/news/20131021_16.html)

The operator of the Fukushima Daiichi nuclear power plant says radioactive strontium in 6 barriers, around tanks storing contaminated water, exceeded the government safety limit.

Workers found on Sunday that heavy downpours caused water to flow over 11 of the barriers.

Tokyo Electric Power Company says levels of radioactive strontium in 6 of them were above the government-approved limit for releasing the substance.

The highest reading was 71 times the set standard of 10 becquerels per liter.

### **TEPCO says the water that overflowed may have reached the ocean.**

Pumps could not keep up with the rising water levels in the barriers after last week's typhoon and Sunday's downpours. The barriers are 30 centimeters high.

**TEPCO plans to double the number of pumps as another typhoon is expected to approach Japan this week.**

## Rain causes radioactive water to overflow (2)

### Spilt rainwater at Fukushima plant contains high levels of radiation

<http://mainichi.jp/english/english/newsselect/news/20131021p2a00m0na020000c.html>

High levels of radiation have been detected in the rainwater that overflowed from concrete barriers around storage tanks holding contaminated water at the Fukushima No. 1 Nuclear Power Plant in six of 23 zones on the premises, plant operator Tokyo Electric Power Co. (TEPCO) has announced.

TEPCO said on Oct. 21 that the rainwater from the previous day spilt over from 30-centimeter-tall concrete barriers around storage tanks in 11 zones, among which spilt rainwater contained radioactive materials in excess of TEPCO's voluntary emission standards in six zones. The utility is investigating the total amount of spilt rainwater and its effects on the environment.

Rainfall from Oct. 20 brought TEPCO's insufficient management of rainwater containing radioactive materials to the surface, and the utility is hastily arranging additional measures against looming Typhoon No. 27, such as supplying 30 more pumps as well as hoses to transfer the rainwater.

According to the rainwater emission criteria that TEPCO voluntarily laid out, the utility allows itself to discharge less than 15 becquerels of radioactive cesium 134 per liter of water, less than 25 becquerels of cesium 137 per liter of water, and less than 10 becquerels of strontium 90 per liter of water. The emission criteria also require no gamma ray-emitting radioactive materials except for cesium to be detected in discharged rainwater.

When TEPCO analyzed the rainwater that spilled from the concrete barriers, 10 to 710 becquerels of strontium 90 per liter of water were detected in six zones -- exceeding the self-set emission criteria. The maximum of 710 becquerels was detected in the "H2 south area," to the west of a zone where some 300 metric tons of radiation-contaminated water had leaked in August. The levels of cesium detected in the spilled rainwater either fell below measureable limits or the voluntary emission criteria.

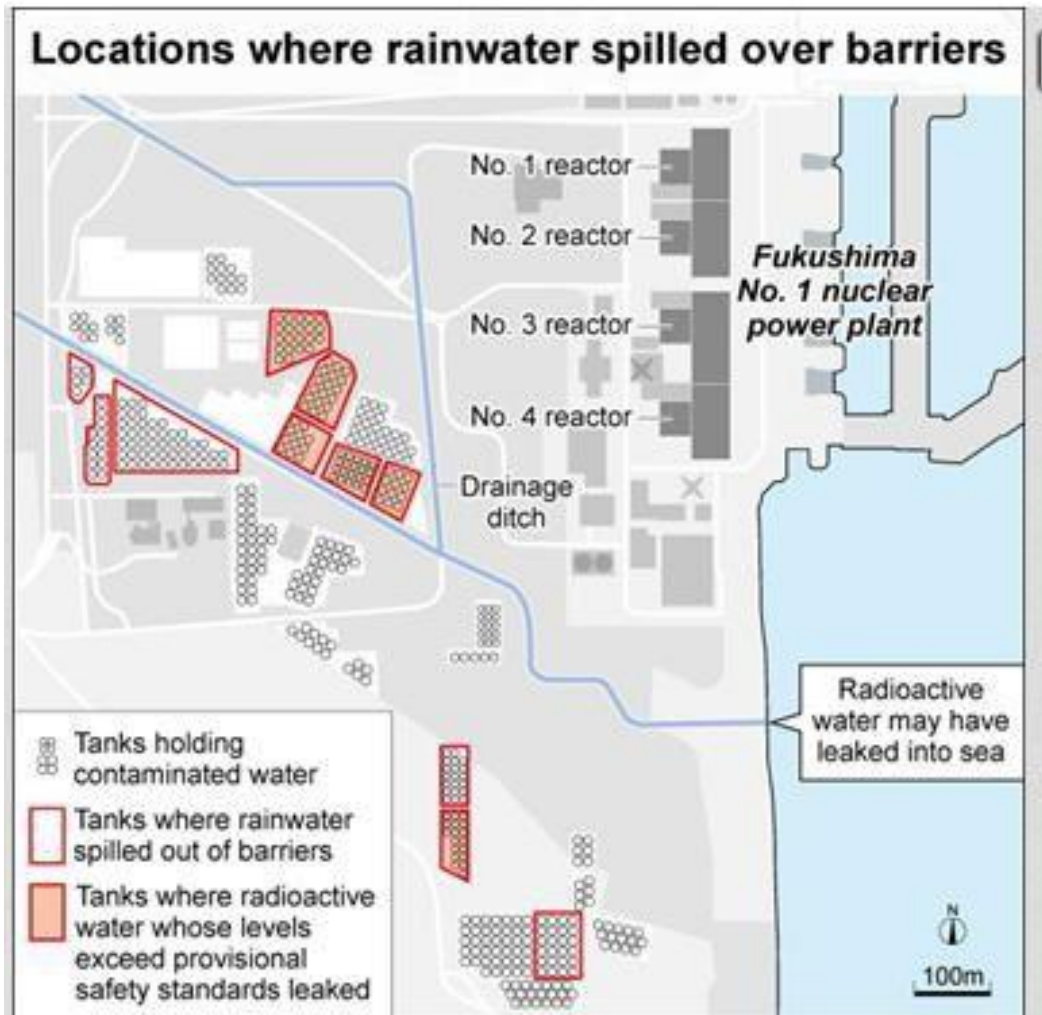
"It is difficult to retrieve the spilled rainwater (in the six zones)," TEPCO said.

The flooding of rainwater from the concrete barriers was first found on the evening of Oct. 20, and continued until the rain stopped late at night. While TEPCO first announced on the night of Oct. 20 that

rainwater had spilt from the barriers in 12 zones, it later revised the figure, saying that a subsequent survey found no such flooding in the "H1 east area."

### FUKUSHIMA WATER CRISIS: Heavy rain causes radioactive water spills at 11 spots

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310210087>



By RYUTA KOIKE/ Staff Writer

Radioactive water exceeding safety standards spilled over storage-tank barriers at the Fukushima No. 1 nuclear plant and likely reached the ocean during a heavy rainfall on Oct. 20, the plant's operator said.

The latest contaminated water leaks at the stricken plant came after workers were slow in removing water brought on earlier by Typhoon No. 26, Tokyo Electric Power Co. officials said Oct. 21.

Contaminated water breached the barriers at 11 locations during the Oct. 20 downpour, TEPCO said. The barriers surround large storage tanks filled with highly radioactive water.

Levels of strontium-90 exceeding provisional safety standards were detected at six of those sites. The highest reading in the spilled water was 710 becquerels per liter, 71 times the safety standard approved by the Nuclear Regulation Authority, according to the TEPCO officials.

The TEPCO officials said radioactive substances that had accumulated on the ground's surface likely mixed with the rainwater, leading to the high strontium reading.

At all 11 locations, cesium-134 was below detectable levels, TEPCO said. At one site, the company recorded 12 becquerels of cesium-137 per liter, well within the safety standard of 25 becquerels.

The officials said the radioactive water possibly leaked into the sea via a drainage ditch.

As Typhoon No. 26 hit the plant on Oct. 16, the utility discharged the accumulating rainwater that was threatening to spill over the barriers. They measured radioactivity levels in the water within the barriers, and judged that the water was well within the provisional safety standards, according to TEPCO.

But according to a new protocol, the workers should have transferred the rainwater to small temporary storage tanks to determine radioactivity levels before the discharge.

After the typhoon passed the facility, TEPCO workers started pumping the rainwater within the 30-centimeter-high barriers into storage tanks.

However, due to a shortage of pumps, radioactive water exceeding 20 cm remained within some of the barriers when the downpour hit on Oct. 20, the officials said.

TEPCO measured radioactivity levels in water within the barrier walls, and it again opened valves to discharge the water when the readings were well under the safety standards.

But the rainwater breached the barriers at the 11 locations before the workers could transfer it to the small storage tanks or measure the radioactivity levels.

TEPCO plans to assess the impact on the sea of the latest water leaks.

The company said it intends to erect new barriers that are 60 to 130 cm high around the tanks to back up the existing 30-cm ones. But the higher barriers will not be completed until the end of the year.

Typhoon No. 27 is now approaching Japan. The utility on Oct. 21 started adding more pumps and pipes to quickly transfer the radioactive water within the barriers to temporary storage tanks.

## Rain & overflow (3)

### Radiation in rainwater overflow spikes at No. 1\*\*

Kyodo, Jiji

[http://www.japantimes.co.jp/news/2013/10/21/national/rainwater-flows-over-tank-barriers-at-fukushima-no-1/#.UmZr9lM0\\_9k](http://www.japantimes.co.jp/news/2013/10/21/national/rainwater-flows-over-tank-barriers-at-fukushima-no-1/#.UmZr9lM0_9k)

Rainwater that overflowed Sunday from the concrete-ringed enclosures around the water storage tanks at the Fukushima No. 1 nuclear plant had excessively high radiation readings, Tokyo Electric Power Co. disclosed Monday.

Strontium-90 in the rainwater, which had accumulated from recent downpours, was above the limit of 10 becquerels per liter near six tank clusters, with the reading in one area reaching 710 becquerels, Tepco said.

It said some of the radioactive water has seeped into the ground, but noted that most of the affected surface water probably didn't flow to the Pacific Ocean because barrier mounds have been built outside the flood enclosures to prevent water from entering the drainage channels that lead to the sea.

Yet Tepco couldn't totally rule out that surface water had reached the sea.

The concrete flood fences, about 30 cm high, were built to keep water from spreading if a tank leaks. There are 23 enclosed tank clusters. The tanks store highly radioactive water that was used to cool the melted cores of the three crippled reactors.

When rainwater accumulates in an enclosure, Tepco transfers it to other containers and checks the radiation level before discharging it. But Sunday's rainfall was so heavy that it overflowed.

The rainwater that day overflowed the fences of 11 of the tank enclosures, Tepco said.

Simultaneous overflows had never taken place at so many clusters before.

Tepco also found water leaks from a concrete joint in a barrier at another tank cluster where excessively radioactive substances were found in the past. As a result, tainted water in such barriers has leaked from over half of the plant's 23 tank enclosures.

In the past, radioactive materials in excess of the provisional limits set by Tepco have been detected in water in some of the tank cluster enclosures.

The overflows and leaks are the latest in a series of the Japanese government's water problems at the plant.

On Sunday, the utility started draining water from inside the barriers at six tank areas, including five of the 11 overflowed areas, after confirming that radiation levels had fallen below the provisional limits.

At two other tank areas, Tepco transferred the enclosure water to sunken reservoirs. Although the utility stopped using the reservoirs to store the highly radioactive coolant after discovering in April that they were leaking, it took the emergency step this time because of the looming rainfall threat when Typhoon Wipha approached last week.

The total amount of water that overflowed and leaked Sunday is not known, the company said.

In one location among the 11 tank areas, a maximum of 29,000 becquerels per liter of strontium and other radioactive materials emitting beta-ray particles were detected in the past.

Tepco's provisional limit on radiation is 10 becquerels per liter for strontium-90, a substance linked to bone cancer that is also believed to account for about half of beta ray-emitting radioactive materials.

Airborne radioactive materials have fallen into the enclosures, while tainted tank water is thought to have leaked into some of the areas.

## **Rainwater flows over tank barriers at Fukushima No. 1**

JJI

[http://www.japantimes.co.jp/news/2013/10/21/national/rainwater-flows-over-tank-barriers-at-fukushima-no-1/#.UmTO1M0\\_9k](http://www.japantimes.co.jp/news/2013/10/21/national/rainwater-flows-over-tank-barriers-at-fukushima-no-1/#.UmTO1M0_9k)

Simultaneous overflows had not previously taken place at so many tank areas at the plant.

The possibility cannot be ruled out that overflowed water has leaked into the sea, according to Tepco. Tepco also discovered water leaks from a concrete joint of a barrier at another tank area where above-limit radioactive substances have been found in the past.

As a result, contaminated water inside such barriers has leaked from more than half of the plant's 23 tank areas.

In the past, radioactive materials in excess of the provisional limits set by Tepco have been detected in water inside some tank-surrounding barriers.

The overflows and leaks are the latest in a series of radioactive water problems at the plant.

On Sunday, the utility started draining water from inside the barriers at six tank areas, including five of the 11 overflow areas, after confirming that radiation levels have fallen below the provisional limits.

At two other tank areas, Tepco transferred barrier area water to sunken reservoirs. Although the utility stopped using the reservoirs after the discovery of radioactive water leaks from some of them in April, it took the emergency step this time, as it did in preparation for heavy rain caused by Typhoon Wipha last week.

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Rainwater flowed over the barriers around storage tanks containing radioactive water in 11 tank areas of the stricken Fukushima No. 1 nuclear power plant Sunday, Tokyo Electric Power Co. said.

## Next typhoon may hit Fukushima

### **Typhoon, severe tropical storm may hit Japan**

[http://www3.nhk.or.jp/nhkworld/english/news/20131021\\_32.html](http://www3.nhk.or.jp/nhkworld/english/news/20131021_32.html)

Weather officials say another typhoon and a severe tropical storm are heading in a northerly direction toward Japan's southern islands.

The Meteorological Agency says typhoon Francisco was moving north-north-west at a speed of 10 kilometers per hour as of 6 PM on Monday.

It had a central atmospheric pressure of 940 hectopascals, and was packing winds of up to 162 kilometers per hour near its center.

The typhoon is expected to approach Okinawa's main island and the remote islands of the Amami region on Wednesday.

It may then take an easterly route and come close to the Pacific coast of western and eastern Japan later this week.

Meanwhile, severe tropical storm Lekima developed near the Pacific nation of the Marshall Islands early Monday.

The storm was heading north at a speed of 15 kilometers per hour as of 6 PM on Monday.

Its central pressure has been measured at 990 hectopascals. Maximum wind speed near its center is 90 kilometers per hour.

Lekima is expected to come closer to the Ogasawara Islands, about 1,000 kilometers south of Tokyo, later this week.

October 22, 2013

## Rain (4)

### **TEPCO struggles with rainwater contamination**

[http://www3.nhk.or.jp/nhkworld/english/news/20131022\\_11.html](http://www3.nhk.or.jp/nhkworld/english/news/20131022_11.html)

The operator of the Fukushima Daiichi nuclear plant is bracing for more downpours by adding additional pumps to cope with radiation-contaminated rainwater.

A weekend storm caused accumulation of rainwater inside tank barriers that are meant to contain radiation leaks. The tainted water overflowed 11 barriers on Sunday.

At 6 of them, the spilled rainwater contained radioactive strontium above the government-approved release limit of 10 becquerels per liter. Levels at the most contaminated site were at 71 times that limit.

Tokyo Electric Power Company said that pumps installed to drain rainwater from the barriers didn't have enough capacity to keep up with the rising water levels.

TEPCO says it will add 19 more pumps that can drain up 60 tons of water per hour. This will boost the system's pumping capacity to about 4 times the current level.

The utility also plans to use larger draining hoses to speed up the transfer of water from the barriers.

The operator says it will measure radiation levels of water in the barriers before removing it to containers. This is to ascertain its toxicity before it is diluted by added rainwater.

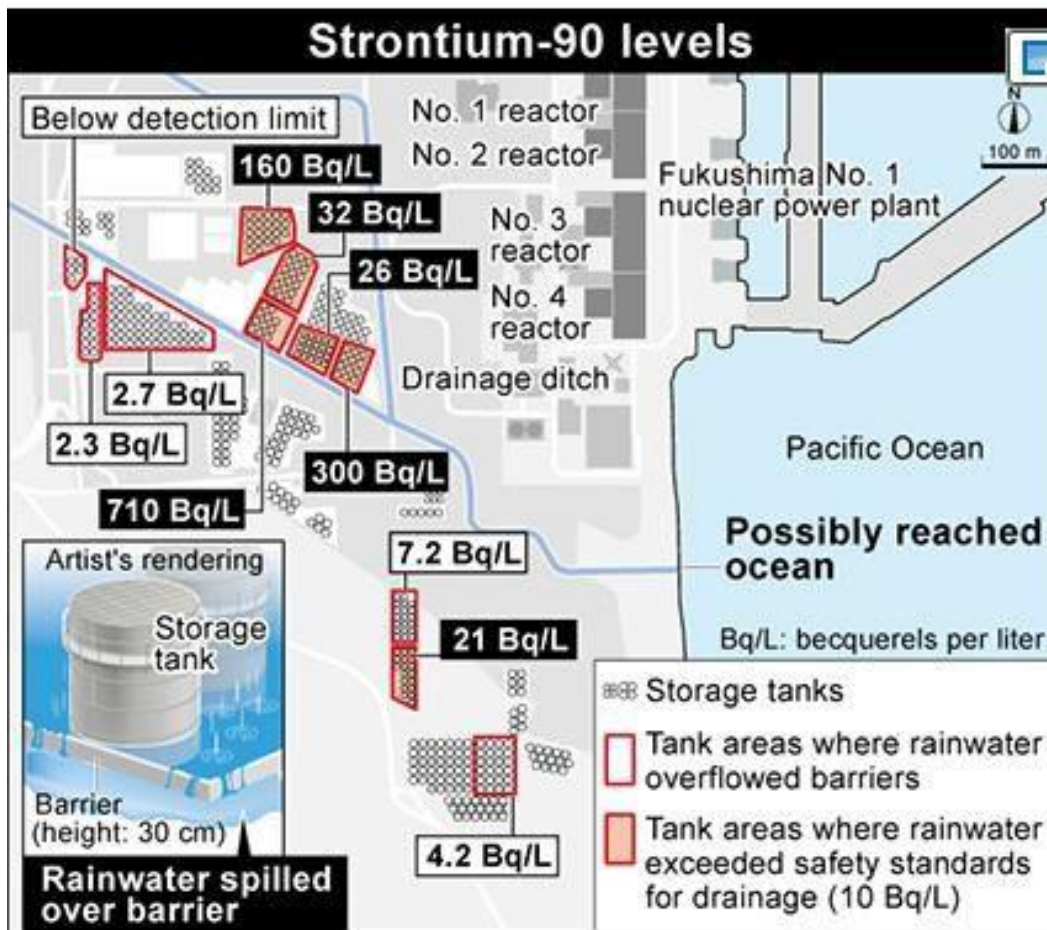
A TEPCO official admitted that the company underestimated the amount of possible rainfall. The official said TEPCO will bring in more workers if necessary

### **TEPCO far from ready for next typhoon**

### **FUKUSHIMA WATER CRISIS: TEPCO still looking for solutions as typhoon approaches**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310220072>





Tokyo Electric Power Co., a company struggling with water problems, even messed up its rain forecast.

The latest spillage of radioactive rainwater over barriers surrounding storage tanks during the downpour on Oct. 20 is yet another sign that TEPCO is far from in control of the growing volume of contaminated water at the Fukushima No. 1 nuclear power plant.

Equipment is inadequate, human error is a continuing problem, and Mother Nature refuses to cooperate in efforts to remove the radioactive water at the site. Even the storage tanks holding highly contaminated water have leaked.

“The water transfer operations are complicated,” Noriyuki Imaizumi, acting general director of TEPCO’s Nuclear Power & Plant Siting Division, told a news conference on Oct. 21. “Water could not be pumped out fast enough during the precipitous rainfall.”

TEPCO had forecast between 30 and 40 millimeters of rain over the entire day of Oct. 20. The company's prediction was way off.

More than 120 mm poured down on the Fukushima No. 1 plant site that day, filling the enclosures around the tanks and forcing water with radioactive content exceeding safety standards to breach the barriers.

The barriers were already filled with a previous accumulation of rainwater, but the available pumping capacity was too poor to quickly remove the liquid.

TEPCO faces another immediate challenge; Typhoon No. 27 is expected to hit the Japanese islands next weekend.

The company said it will install additional pumps so that as much water as possible can be transferred from the barriers to storage tanks and elsewhere before the storm hits.

But Imaizumi said he expected a "tough situation" if the rainfall from the typhoon is similar in scale to the Oct. 20 downpour.

TEPCO said the storage tank areas have a total of 67 pumps, but they have relatively modest pumping capacity--7.2 tons per hour for 35 of the devices, 12 tons per hour for 31, and 36 tons per hour for the remaining one.

The utility said it will install 19 more pumps, each with a capacity of 60 tons per hour, starting on Oct. 22, and hopes to eventually equip the plant with 11 additional pumps.

TEPCO also plans to build 60- to 130-cm-tall concrete walls outside the existing 30-cm-high barriers to surround the tank areas, but they will only be completed by the end of this year.

In the latest incident, TEPCO said rainwater overflowed the barriers in 11 locations. The water seeped into surrounding soil, and part of it likely ran along a drainage ditch and reached the ocean.

In six of the 11 storage tank areas, the rainwater contained radioactive substances exceeding provisional safety standards for drainage. The highest strontium-90 reading was 710 becquerels per liter, about 70 times the safety standards.

Contaminated water that had escaped the storage tanks, as well as radioactive fallout from the hydrogen explosions in March 2011, likely mixed with the rainwater.

According to TEPCO's operational protocol, water accumulating within a barrier should be transferred to temporary storage for testing. The water can only be discharged after its radioactivity level is confirmed below the safety standards.

Water exceeding the safety standards should be collected and stored in designated areas, including a 4,000-ton storage tank, the protocol says.

But the water within the barrier walls rose too fast during the heavy rainfall from Typhoon No. 26 on Oct. 16, leaving workers no time to transfer the water into temporary storage. The workers instead tested the water directly behind the barriers and let it flow out if it showed levels below the safety standards.

But during the downpour on Oct. 20, rainwater exceeding the safety standards overflowed the barrier walls before the workers could test it.

TEPCO at that time was working to remove water within the barriers following Typhoon No. 26, with a priority on areas where high levels of radioactive substances had been detected in the past.

With poor pumping capacity, however, the utility could only lower the water levels by several centimeters a day.

Large pools of water from Typhoon No. 26 remained in seven of the 11 overflow areas. When the rainfall intensified at 3 p.m. on Oct. 20, the water was more than 20 cm high and on the verge of flowing over the 30-cm-high barriers that surround five of the storage tank areas.

Until August, rainwater accumulating within the barriers was allowed to run freely outside. After the discovery that month of 300 tons of highly radioactive water that escaped a storage tank, protocols were modified to keep drainage valves on the barriers shut to prevent water from running outside.

It then became mandatory to test and process rainwater every time it rained.

(This article was written by Ryuta Koike and Shunsuke Kimura.)

## **Cesium detected one km away from No.1**

## **Tiny amount of cesium detected off Fukushima plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20131022\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20131022_31.html)

Tokyo Electric Power Company says a very small amount of radioactive cesium has been detected about one kilometer off the damaged Fukushima Daiichi nuclear plant it operates.

TEPCO has been analyzing seawater taken at 5 locations outside the plant's harbor. This is to monitor the spread of radioactive substances in wastewater that's believed to be seeping out with groundwater.

A sample taken last Friday about one kilometer offshore was found to contain 1.6 becquerels of cesium-137 per liter.

The level is far below the 90 becquerels-per-liter limit for releasing cesium-137 into the sea. But it is the second time the substance has been detected at this location since monitoring began in August. The previous finding was on October 8th.

TEPCO says it does not know why cesium has been found at that specific spot. But the company says it poses no environmental risk as the level is near the minimum detection threshold. It adds that hardly any cesium is being found elsewhere in the sea outside of the port.

Oct. 22, 2013 - Updated 08:38 UTC

## **Freezing contaminated water**

### **TEPCO test to freeze contaminated water**

[http://www3.nhk.or.jp/nhkworld/english/news/20131022\\_32.html](http://www3.nhk.or.jp/nhkworld/english/news/20131022_32.html)

The operator of the damaged Fukushima Daiichi nuclear power plant is conducting an unusual test to freeze radioactive water.

The test is part of a project involving the removal of radioactive water from an underground tunnel to prevent contaminated groundwater from flowing into the sea. TEPCO regards the water in the tunnel as the main source of contamination.

The utility believes the groundwater becomes contaminated as it passes through the plant's compound and mixes with radioactive water seeping from a tunnel connected to a turbine building.

**The firm plans to freeze the contaminated water, creating an ice wall that would stop the flow of water from the turbine building to the tunnel.**

TEPCO engineers started the test in August using a mockup of the tunnel. They installed coolant pipes between the turbine building and the tunnel. They say an ice wall 2 meters high and 2 meters wide was formed in about a month and a half, and they successfully removed water from the mock tunnel.

But the engineers say the test also revealed additional problems. They had to install extra pipes in some places in the tunnel in order to freeze the water uniformly.

**A senior TEPCO official says it will not be easy to install coolant pipes evenly in the real tunnel, given radiation levels and other conditions.**

The utility plans to start the work to freeze contaminated water early next year. It will start removing about 10,000 tons of radioactive water from the tunnel in the next fiscal year.

October 23, 2013

## **New typhoon threatens Fukushima**

### **Fukushima plant struggles with typhoon threat**

[http://www3.nhk.or.jp/nhkworld/english/news/20131024\\_08.html](http://www3.nhk.or.jp/nhkworld/english/news/20131024_08.html)

The operator of the crippled Fukushima Daiichi nuclear plant is racing to secure storage space for tainted rainwater as another powerful typhoon approaches.

Tokyo Electric Power Company has begun moving the rainwater into underground pools once deemed too leaky. The water is the result of typhoons and downpours that have filled barriers around radioactive waste water tanks.

TEPCO has been storing the most contaminated rainwater in tanks and in the basement of a turbine building. But with Typhoon Francisco set to hit Japan's mainland over the weekend, the tanks are full.

Japan's nuclear regulator has approved moving the tainted water to 3 underground pools. The pools have a total capacity of about 9,000 tons.

TEPCO stopped using the pools after similar models leaked in April. The utility now says it has no other option but to use them.

The utility also says it found 140,000 becquerels per liter of Beta-ray emitting radioactivity in an onsite

ditch on Wednesday. The radioactivity has doubled since the previous day. TEPCO says it is transferring the contaminated water to a tank.

October 24, 2013

## Water transferred to underground storage

### TEPCO resumes use of Fukushima underground tanks to deal with heavy rain

[http://ajw.asahi.com/article/0311disaster/fukushim](http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310240074)



A Tokyo Electric Power Co. official briefs members of Fukushima Prefecture's nuclear reactor decommissioning safety monitoring council outside a barrier

Tokyo Electric Power Co. said Oct. 24 it has started transferring pools of rainwater at the Fukushima No. 1 nuclear plant to underground storage tanks that it had previously stopped using over fears of leaks.

The three underground storage tanks that TEPCO plans to fill have not leaked, according to the utility. But radioactive water escaped the No. 2 underground tank in April, and the company decided to no longer use the seven underground water storage tanks available at the site.

However, recent typhoons and heavy rains in the area have flooded enclosures around storage tanks holding radioactive water. Contaminated rainwater has spilled over the barriers and is believed to have reached the ocean.

The Nuclear Regulation Authority said TEPCO can use the underground storage tanks at its own discretion. But local government officials have called for the water to be transferred from the underground tanks to other storage tanks as soon as possible, TEPCO said.

Rainwater will be transferred from six storage tank areas where waterborne radioactivity levels exceed provisional safety standards. The readings of radioactive strontium and other beta-ray sources range between 29 and 970 becquerels per liter of water in the six areas, according to TEPCO officials.

The operations are intended to lower water levels in the enclosures to 10 cm or less ahead of possible downpours from Typhoon No. 27, which is threatening to hit the Kanto region this weekend. The barriers of the enclosures are 30 centimeters tall.

The utility said workers began transferring the water early on Oct. 24 into the No. 4 underground storage tank, which has a capacity of 4,000 tons.

On Oct. 16, TEPCO used the No. 7 underground storage tank in an emergency operation to deal with the heavy rains from Typhoon No. 26. It also transferred water from the barriers to the No. 7 tank during another downpour on Oct. 20.

In addition, TEPCO said it will temporarily simplify the protocol for testing radioactivity levels in rainwater within the barriers to help prevent the escape of contaminated water.

Currently, TEPCO is supposed to move the rainwater from within the barriers to temporary storage tanks for testing to eliminate errors caused by different readings from sampling point to sampling point.

TEPCO said that during heavy rainfalls, workers will now sample water directly from within the barriers for pre-drainage tests in areas that have shown low levels of radioactive contamination.

“It is not in our intention to change the protocol, but we are talking (to the NRA) about what to do during heavy rains,” said Noriyuki Imaizumi, acting general director of TEPCO's Nuclear Power and Plant Siting Division.

NRA Chairman Shunichi Tanaka said Oct. 23 that the protocol should be heeded in principle.

“Highly radioactive water in a tank may have dripped into the water pool behind a barrier,” Tanaka said. “Basically, it should be stored somewhere else before being released, if it can be released.”

TEPCO also presented a summary of the downpour on Oct. 20.

It said 2,400 tons of radioactive rainwater was collected in storage tanks, while an additional 3,000 tons of water that met the safety standards was discharged from the barriers.

The amount of water that overflowed is still not known, TEPCO added.

### **HIGH LEVEL OF RADIATION IN POOLING WATER**

TEPCO also said Oct. 23 that 510,000 becquerels of radioactive strontium and other beta-ray sources were found per liter of water pooling behind a barrier surrounding an area where 300 tons of highly radioactive water escaped from a storage tank during the summer.

The company said the high readings have had no impact on the outside environment because no water has overflowed the barrier.

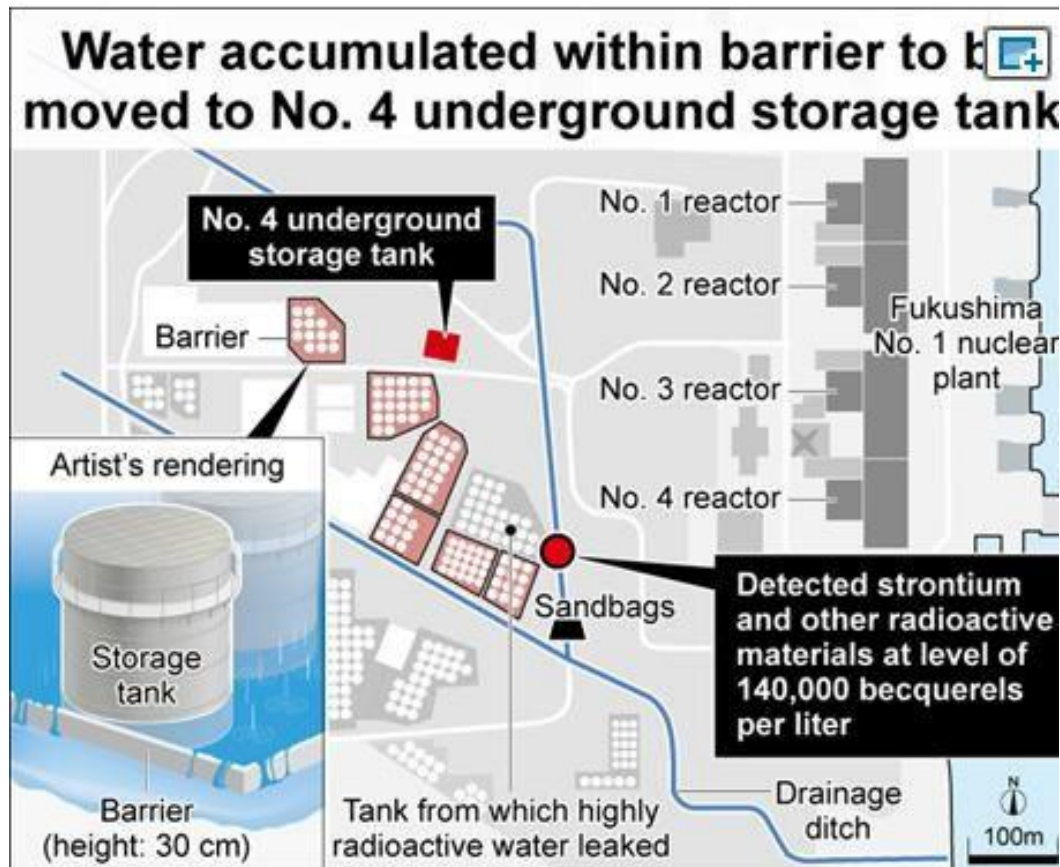
No new leaks have occurred from other tanks in the area, the utility added.

## **Sandbags to prevent highly contaminated water from reaching ocean**



## Highest radiation level detected in water found in drainage ditch at Fukushima nuclear plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201310240061>



The Asahi Shimbun

Tokyo Electric Power Co. said it has found the highest radiation levels recorded since it began checking water in drainage ditches in August at its crippled Fukushima No. 1 nuclear plant.

The utility announced Oct. 24 that it had detected radioactive strontium and other beta ray emitting substances measuring **140,000 becquerels per liter** in water sampled in one of the facility's drainage ditches.

The legal standard for strontium emissions is 30 becquerels per liter.

TEPCO officials said the high radiation level was detected in water collected on Oct. 23. The levels in water taken on Oct. 22 were 59,000 becquerels per liter.

"We believe it stems from the effects of rain that has fallen until now that has flushed out radioactive materials from the surrounding areas into the drainage ditch," a TEPCO official said.

**No specific leak that can be linked to the contaminated water has yet been discovered.**

The ditch where the high radiation levels were detected is near the tank that was discovered in August to have leaked about 300 tons of radioactive water. The location of the recent find was just 700 meters from where the drainage ditch empties into the ocean.

**TEPCO workers have placed sandbags further along the ditch in an attempt to prevent radioactive material from reaching the ocean.**

## **NHK video on lack of storage space**

### **Limited Space for Tainted Water**

<http://www3.nhk.or.jp/nhkworld/newsline/201310242006.html>

## **Fukushima to host summit in 2015**

### **Fukushima likely to host Pacific Islands summit**

[http://www3.nhk.or.jp/nhkworld/english/news/20131024\\_15.html](http://www3.nhk.or.jp/nhkworld/english/news/20131024_15.html)

The Japanese government is considering disaster-ravaged Fukushima Prefecture as the host site of the Pacific islands summit in 2015.

A government official said on Wednesday that final arrangements are under way to pick Fukushima as the venue for the summit.

Japan hosts the Pacific Islands Leaders Meeting once every 3 years to discuss regional development and environment issues with leaders of the Pacific island countries.

Officials say they believe that hosting a summit-level international conference will help Fukushima's efforts to rebuild from the 2011 disaster.

The host site will be formally decided at a ministerial-level meeting due to be held on Saturday in Tokyo.

The 2015 gathering will be the 7th since the 1997 inauguration of the regional summit. The latest one was held in Okinawa last year.

## **Radiation in ditch hits new record**

### **Radiation doubles to new high in No. 1 plant water ditch**

[http://www.japantimes.co.jp/news/2013/10/24/national/radiation-doubles-to-new-high-in-no-1-plant-water-ditch/#.Uml0xlM0\\_9k](http://www.japantimes.co.jp/news/2013/10/24/national/radiation-doubles-to-new-high-in-no-1-plant-water-ditch/#.Uml0xlM0_9k)

JJI

Tokyo Electric Power Co. said Thursday that radiation rose to a new record in water collected from a drainage ditch at its stricken Fukushima No. 1 nuclear plant.

Tepco said it detected a maximum of 140,000 becquerels per liter of beta ray-emitting substances, including strontium, from a water sample collected Wednesday from the ditch, which extends to the sea beyond the plant's port.

The figure is 2.3 times higher than the previous record of 59,000 becquerels detected in water sampled at the same location Tuesday, and was more than 11 times the previous day's reading.

The measurement location is about 600 meters from the open ocean and close to the storage tank that leaked some 300 tons of radioactive water in August.

Tepco said rainwater may have carried radioactive materials in surrounding areas into the drainage ditch.

Sandbags were placed downstream, but heavy rain may have caused the water in the ditch to overflow them and enter the ocean.

Also on Thursday, Tepco started transferring radioactive water that has built up inside the tanks' flood enclosures to a covered reservoir ahead of heavy rain expected from fresh typhoons approaching Japan.

### **Drain water radiation level more than doubles at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20131024p2g00m0dm081000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear plant said Thursday the radiation level of water from a drainage channel near the tank that leaked 300 tons of highly toxic water in August has more than doubled.

The water, extracted Wednesday, indicated a record high 140,000 becquerels per liter of beta radiation emitted by radioactive materials such as strontium-90, Tokyo Electric Power Co. said. The previous day's reading was 59,000 becquerels.

TEPCO said the spike in the radiation level may be attributable to the recent heavy rain that has caused soil contaminated with radioactive substances to enter the drainage channel.

The channel is located near a cluster of tanks that hold highly radioactive water produced as a result of continuing water injections into the three reactors that suffered meltdowns during the March 2011 nuclear disaster.

TEPCO is struggling more than ever during the current typhoon season to prevent leaks as rainwater accumulates inside the leak-protection barriers around the tanks.

With another typhoon approaching Japan's mainland, the company said Thursday that it has started pumping out water from the 30-centimeter-high barriers to underground tanks.

TEPCO stopped using the seven underground tanks at the plant after three were found to have leaked water in April.

But it has been forced to reopen three tanks confirmed leak-free as temporary storage facilities.

The water that is being pumped out contains a maximum 970 becquerels per liter of strontium-90, TEPCO said.

The legal limit for the release of strontium-90 into the sea outside the nuclear power plant is set at 30 becquerels per liter. Strontium tends to accumulate in bones and is thought to cause bone cancer and leukemia.

October 25, 2013

## Rushing to keep ahead of storm

### TEPCO rushes to transfer contaminated water

[http://www3.nhk.or.jp/nhkworld/english/news/20131025\\_40.html](http://www3.nhk.or.jp/nhkworld/english/news/20131025_40.html)

The operator of the Fukushima Daiichi nuclear plant is rushing to take measures to prevent radioactive water in outdoor barriers from overflowing as a severe tropical storm approaches.

Water in barriers around tanks has been accumulating after a series of heavy rains since mid-September. The water is contaminated with radioactive substances.

The tainted water overflowed 11 barriers on Sunday.

At 6 of them, the spilled rainwater contained radioactive strontium above the government-approved release limit.

Tokyo Electric Power Company is transferring water from barriers to other tanks capable of holding a total of 4,000 tons.

TEPCO also plans to move the tainted water to underground pools. Some of those pools leaked radioactive water in April.

The utility has added 19 additional pumps, each of which can deal with 60 tons per hour, as well as 12 vehicles such as fire engines and water tank trucks.

But as of 4PM on Friday, the company did not finish the transfer work at some barriers.

On Thursday, Japan's Nuclear Regulation Authority allowed TEPCO to simplify its procedure to release water from barriers by eliminating the step of temporarily transferring it to other tanks.

But the measure will be taken only if contamination levels in barriers are below the NRA-set standard.

Oct. 25, 2013 - Updated 10:46 UTC

October 26, 2013

## **M7.1 off coast of Fukushima**

### **M7.1 quake strikes off the coast of Fukushima, minor tsunami observed**

<http://mainichi.jp/english/english/newsselect/news/20131026p2g00m0dm001000c.html>

TOKYO (Kyodo) -- An earthquake registering a preliminary magnitude 7.1 struck off the coast of Fukushima Prefecture early Saturday morning and the Japan Meteorological Agency issued an alert for tsunami of 1 meter high for Japan's northeastern Pacific coast but lifted it about two hours later.

The agency urged people to stay away from waterfront areas after the 2:10 a.m. quake. The tsunami alert covered Iwate, Miyagi, Fukushima, Ibaraki and Chiba prefectures. It was lifted at 4:05 a.m.

A woman in her 60s in Miyako, Iwate Prefecture, fell from her bed and hit her head and back, according to firefighters. She sustained minor injuries and was transported to a hospital.

No abnormality was reported at the Fukushima Daiichi nuclear power plant, which was crippled by the magnitude 9.0 quake in March 2011, according to Tokyo Electric Power Co. Workers, however, were ordered to evacuate from waterfront.

Tohoku Electric Power Co. said no abnormality has been confirmed at its Onagawa nuclear power plant. Evacuation advisory was issued for coastal residents in Higashimatsushima, Miyagi Prefecture, Ofunato, Kamaishi, Rikuzentakata and Iwaizumi in Iwate Prefecture.

The agency said 40 centimeter high waves were observed in Kuji Port, Iwate Prefecture and Soma, Fukushima Prefecture. It also reported 30 cm waves in Ishinomaki, Miyagi Prefecture, and 20 cm waves in Ofunato in Iwate.

The focus was roughly 10 kilometers underground in the Pacific Ocean around 290 kilometers east-southeast of Oshika Peninsula, the agency said.

The quake registered a moderate intensity of 4 on the Japanese seismic scale of 7 in Fukushima, Miyagi, Ibaraki and Tochigi prefectures. Tokyo marked intensity 3.

The agency revised the magnitude to 7.1 from 6.8. It said the latest quake is an aftershock of the 2011 quake, which triggered massive tsunami and caused nuclear meltdowns at the Fukushima Daiichi plant. October 26, 2013(Mainichi Japan)

See also:

### **M7.1 earthquake shakes Tohoku coast, tsunami advisory issued**

KYODO

[http://www.japantimes.co.jp/news/2013/10/26/national/m7-earthquake-shakes-tohoku-coast/#.UmuVYIM0\\_9k](http://www.japantimes.co.jp/news/2013/10/26/national/m7-earthquake-shakes-tohoku-coast/#.UmuVYIM0_9k)

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The agency urged people to stay away from waterfront areas after the 2:10 a.m. quake. The tsunami alert covered Iwate, Miyagi, Fukushima, Ibaraki and Chiba prefectures. It was lifted at 4:05 a.m.

No injuries have been reported in Iwate, Miyagi and Fukushima prefectures after the 2:10 a.m. quake, according to police.

No abnormality was reported at the Fukushima No. 1 nuclear power plant, which was crippled by the magnitude 9.0 quake in March 2011, according to Tokyo Electric Power Co. Workers, however, were ordered to evacuate from waterfront areas.

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## **Tsunami alert lifted**

### **Tsunami advisory lifted after M7.1 quake**

[http://www3.nhk.or.jp/nhkworld/english/news/20131026\\_06.html](http://www3.nhk.or.jp/nhkworld/english/news/20131026_06.html)

Japan's Meteorological Agency has lifted its tsunami advisory following an earthquake.

A magnitude 7 point 1 quake struck around 2:10 AM local time off the coast of Fukushima Prefecture.

Agency officials issued the warning for the coastlines of five prefectures. They withdrew it 2 hours later.

The officials noted a tsunami reached the country's northeastern coast just before 3:00 AM. But they said the sea's fluctuation gradually diminished.

Tohoku Electric Power Company officials said they measured a 55-centimeter tsunami at a port at Miyagi Prefecture's Onagawa nuclear plant.

## TEPCO & overflow

### TEPCO works to prevent radioactive water overflow

[http://www3.nhk.or.jp/nhkworld/english/news/20131026\\_16.html](http://www3.nhk.or.jp/nhkworld/english/news/20131026_16.html)

The operator of the damaged Fukushima nuclear power plant is working to prevent radioactive water being held back by outdoor barriers from overflowing.

Water from heavy rainfall over the past few weeks has accumulated inside barriers around tanks containing radioactive water.

Tokyo Electric Power Company has been transferring water from the barriers to tanks and underground pools.

TEPCO is storing rainwater inside barriers around the holding tanks in order to check it for radioactivity. However, as the rainwater in 2 of the barriers was thought to be on the verge of overflowing, the water was released into the compound after it was checked for radioactivity.

## 7.3 aftershock strikes Tohoku

### 7.3 'aftershock' rattles Tohoku

[http://www.japantimes.co.jp/news/2013/10/26/national/m7-earthquake-shakes-tohoku-coast/#.Umv1XlM0\\_9k](http://www.japantimes.co.jp/news/2013/10/26/national/m7-earthquake-shakes-tohoku-coast/#.Umv1XlM0_9k)

*Small tsunami hit coastline but no damage reported*

A magnitude 7.3 earthquake struck in the Pacific off the crippled Fukushima No. 1 nuclear complex early Saturday, triggering small tsunami but causing no damage.

An official with the Meteorological Agency said that the powerful temblor was an aftershock of the 9.0-magnitude earthquake and tsunami that struck the same area of the seabed on March 11, 2011, killing or leaving missing around 19,000 people and causing three core meltdowns at Fukushima No. 1.



There was no damage and only one minor injury was reported from the quake, which occurred at 2:10 a.m., according to the Fire and Disaster Management Agency of the internal affairs ministry.

Tsunami of up to 40 cm affected four areas along the coast, but a tsunami advisory was lifted less than two hours after the quake.

The epicenter of the temblor was around 290 km off Fukushima Prefecture, and it was felt some 480 km away in Tokyo.

“It was fairly big and rattled quite a bit, but nothing fell to the floor or broke. We’ve had quakes of this magnitude before,” said Satoshi Mizuno, an official with the Fukushima Prefectural Government’s disaster management department. “Luckily, the quake’s center was very far off the coast.”

Tokyo Electric Power Co. reported finding no damage or abnormalities at its destroyed Fukushima No. 1 atomic plant, Mizuno said.

The Meteorological Agency issued a 1-meter tsunami advisory for a long stretch of the northeastern coast. It put the quake’s magnitude at 7.1, while the U.S. Geological Survey estimated it as magnitude 7.3. The U.S. Pacific Tsunami Warning Center did not post any regional alerts.

The agency reported tsunami of 40 cm in the city of Kuji, Iwate prefecture, and in the city of Soma in Fukushima, as well as 30-cm tsunami at Ishinomaki in Miyagi Prefecture and 20-cm tsunami at the city of Ofunato, Iwate Prefecture.

All of Japan’s 50 commercial nuclear reactors remain offline while the government decides whether they meet more stringent requirements enacted after the 2011 quake-tsunami disaster, which triggered the Fukushima meltdowns and the discharge of massive leaks of radioactive materials.

The Fukushima No. 1 plant lies about 250 km northeast of Tokyo.

A string of mishaps this year at the crippled plant has raised international concerns about the ability of Tepco and the government to tackle the continuing crisis.

Nuclear Regulation Authority Chairman Shunichi Tanaka has scheduled a Monday meeting with Tepco President Naomi Hirose to seek solutions to what he says appear to be fundamental problems with the current situation at Fukushima No. 1.

October 28, 2013

## ALPS (partially) running again

### ALPS partially restarted in Fukushima plant

[http://www3.nhk.or.jp/nhkworld/english/news/20131028\\_28.html](http://www3.nhk.or.jp/nhkworld/english/news/20131028_28.html)

The operator of the damaged Fukushima Daiichi nuclear power plant has resumed its trial run of a key water decontamination system. It was shut down due to malfunctions.

Tokyo Electric Power Company on Monday began test-running one of 3 channels of the Advanced Liquid Processing unit, or ALPS. ALPS is capable of removing 62 different kinds of radioactive substances, excluding tritium.

Operation of the channel was suspended in June following leaks of unprocessed radioactive water.

TEPCO engineers discovered holes in the tank storing the contaminated water. Corrosion is apparently to blame. Work to prevent corrosion has been ongoing in all 3 channels of the ALPS system.

A test-run of another ALPS channel began about a month ago. The remaining channel is scheduled for a trial-run mid November.

Repeated suspensions of the unit have delayed the start of full-fledged operation till next year. Full operation was due to begin this autumn.

TEPCO plans to build 3 more ALPS channels next year. They also plan to set up a facility with higher water processing capabilities with government aid.

The utility hopes to complete decontaminating all its stored wastewater by March 2015.

But the question remains whether the trouble-marred ALPS system is capable of functioning over long periods.

October 29, 2013

## Use reactors 5 & 6 to store contaminated water?

Unscathed: Reactors 5 (upper left) and 6 at the Fukushima No. 1 nuclear plant are shown in an undated photo | KYODO



National

### **Tepco may use undamaged reactor buildings for water storage**

JJI

[http://www.japantimes.co.jp/news/2013/10/29/national/tepco-may-use-undamaged-reactor-buildings-for-water-storage/#.Um\\_0aVOwT9k](http://www.japantimes.co.jp/news/2013/10/29/national/tepco-may-use-undamaged-reactor-buildings-for-water-storage/#.Um_0aVOwT9k)

FUKUSHIMA – Tokyo Electric Power Co. may use the buildings housing the two undamaged reactors at the Fukushima No. 1 nuclear plant as temporary storage for rainwater, Tepco Executive Vice President Yoshiyuki Ishizaki said.

Tepco is looking at whether the basements under reactors 5 and 6 can be used to temporarily store contaminated rainwater, Ishizaki, head of the company's Fukushima Revitalization Headquarters, said Tuesday.

Prime Minister Shinzo Abe asked Tepco in September to decommission the two reactors in addition to the four reactors that were heavily damaged in March 2011.

Tepco will decide on the fate of reactors 5 and 6 by the end of the year. The two reactors managed to avoid the meltdowns and hydrogen explosions that marked the beginning of the catastrophe.

The site has been hit by a series of leaks and spills of radioactive water since September due to heavy rain.

To prevent such accidents, Tepco is transferring contaminated rainwater from inside barriers surrounding storage tanks to the basements of the No. 2 and No. 3 reactor buildings.

Water levels in the basements have risen considerably and Tepco needs to find new places to store the radioactive water.

October 30, 2013

## **NHK Video: New Water Treatment System**

### **Newswatch**

<http://www3.nhk.or.jp/nhkworld/newsline/201310300500.html>

400 tonnes groundwater seep every day into the reactors

440.000 tonnes of contaminated water stored on the site in tanks (and in the basements of the buildings)  
+ 15.000 tonnes in underground tunnels

The ALPS system has so far been plagued with problems due to:

- malfunctions
- human errors (often due to poor communication)

It is behind schedule.

The radioactive substances removed by ALPS will be stored on site.

Two big question marks :

- 1. No solution to remove tritium**
- 2. A final disposal site still has to be chosen**

## **TEPCO will pump up more underground water**

### **New measure to contain tainted underground water**

[http://www3.nhk.or.jp/nhkworld/english/news/20131031\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20131031_03.html)

The operator of the crippled Fukushima Daiichi nuclear power plant says it will pump up underground water at additional sites near a storage tank to prevent further spread of contaminated water.

More than 300 tons of contaminated water leaked from the number 4 tank set up on a hillside in August. In response, Tokyo Electric Power Company dug monitoring wells to check the scale of the leak.

The company said it had detected **220,000 becquerels per liter of beta ray-emitting radioactive substances on Monday in water collected from a well situated 10 meters north from the tank.**

To prevent further spread, TEPCO has decided to dig 5 more wells near the tank in addition to the ones they have dug near the ocean. TEPCO will start pumping up the water in early November.

**The utility will pump up about 10 tons per day and will store it in a specially-made tank.** TEPCO is currently removing highly radioactive soil and collecting it around the tank. It is planning to expand that area as well.

More than 2 months have passed since the leak was found in the tank. It is still unclear how big an impact the leak might have had on underground water.

November 2, 2013

## **IAEA to send experts team to Fukushima soon**

### **IAEA to send Fukushima probe team in end of Nov.**

[http://www3.nhk.or.jp/nhkworld/english/news/20131102\\_17.html](http://www3.nhk.or.jp/nhkworld/english/news/20131102_17.html)

The head of the international nuclear watchdog says he **will soon send a team of experts to Fukushima to investigate the contaminated water leaks at the crippled nuclear plant.**

Director-General of the International Atomic Energy Agency, Yukiya Amano, met reporters in Washington on Friday.

Amano said he will dispatch the team at the end of November. He said it will look into the water issue as well as the progress of the decommissioning work at the Fukushima Daiichi plant.

Amano says **Japan needs to cooperate with international organizations in addressing the nuclear plant's problems in order to regain the trust of the global community.**

He said the team will include **sea water analysts**. He said he believes the visit may ease concerns of Japan's neighbors and other countries about the dangers of the radioactive water leaks.

### **IAEA team to visit Fukushima in November over radioactive water**

<http://mainichi.jp/english/english/newsselect/news/20131102p2g00m0dm010000c.html>

WASHINGTON (Kyodo) -- The head of the International Atomic Energy Agency said Friday its mission will visit the crippled nuclear plant in Japan's Fukushima for fact-finding on problems including radioactive water leakage.

"We're planning to send our peer-review mission in autumn, perhaps toward the end (of November)," Yukiya Amano, director general of the IAEA, told reporters in Washington.

That will be an IAEA mission on decommissioning of the Fukushima Daiichi plant and "it covers the contaminated water issues," Amano said.

The IAEA sent a similar team of experts to the Fukushima plant in April to conduct an on-site survey related to work toward scrap of four of its six reactors which were devastated by the March 2011 mega earthquake and tsunami.

The IAEA mission at that time warned the operator Tokyo Electric Power Co. properly manage a massive amount of waste water that was contaminated with radioactive substances used to cool nuclear fuel in the waterfront plant.

A series of leakages of contaminated water in the premises were reported even after the visit by the IAEA team, some of which could have flowed into the Pacific Ocean, fueling overseas concerns about sea water safety.

## **See a IAEA team to probe Fukushima plant's water woes**

Kyodo

<http://www.japantimes.co.jp/news/2013/11/02/national/iaea-team-to-probe-fukushima-plants-water-woes/#.UnVONFOwT9k>

WASHINGTON – The head of the International Atomic Energy Agency said its mission will visit the crippled Fukushima No. 1 plant for fact-finding on problems including leakages of radioactive water. “We’re planning to send our peer review mission in autumn, perhaps toward the end (of November),” Yukiya Amano, director general of the IAEA, told reporters in Washington on Friday. That will be a mission on decommissioning Fukushima No. 1 and “it covers the contaminated water issues” as well, Amano said.

The IAEA sent a similar team of experts to the No. 1 plant in April to conduct an on-site survey of preparatory work for dismantling the complex, which was devastated by the 3/11 quake-tsunami disasters. That mission at the time warned plant operator Tokyo Electric Power Co. to properly manage the massive buildup of water contaminated with radioactive substances after being used to cool nuclear fuel.

A series of on-site leaks of contaminated water were reported even after the IAEA team’s visit. Some of the water flowed into the Pacific, fueling concerns about tainted seawater and marine produce.

## **US can help with tritium**

### **Moniz: US can help remove tritium from waste water**

[http://www3.nhk.or.jp/nhkworld/english/news/20131102\\_19.html](http://www3.nhk.or.jp/nhkworld/english/news/20131102_19.html)

The US Energy Secretary says his government and US companies could help Japan in removing hard-to-filter radioactive tritium from waste water at the country's crippled nuclear plant.

Ernest Moniz spoke to NHK on Saturday in Tokyo, one day after visiting the Fukushima Daiichi plant.

Moniz said he was shocked to see the scale of the damage that remains more than 2 and half years after the tsunami disaster and the nuclear accident.

He said he also sensed **how difficult work at the plant is with workers required to wear full face masks and other protective gear.**

In particular, he referred to the issue of processing radioactive waste water.

Tokyo Electric Power Company has been able to remove most of the radioactive materials from the processed water. The one exception is tritium, which emits beta rays with comparatively weaker energy.

Moniz said removal of tritium is a challenge. But he stressed that his department and US firms have experience in processing the material when they dealt with nuclear waste water in the past.

November 4, 2013

## **TEPCO delays fuel removal by up to two weeks**

### **TEPCO to conduct test for Fukushima No. 4 unit fuel removal**

<http://www.globalpost.com/dispatch/news/kyodo-news-international/131104/tepcoco-conduct-test-fukushima-no-4-unit-fuel-removal>

Tokyo Electric Power Co. will conduct a test for nuclear fuel removal at the No. 4 reactor building at the stricken Fukushima Daiichi power plant, delaying the start of the actual fuel removal operation by up to two weeks, sources close to the matter said Monday.

The operator of the plant, crippled in the March 2011 quake and tsunami disaster, planned to start removing nuclear fuel from a cooling pool at the reactor building as early as next Friday.

The decision comes after a government-affiliated nuclear safety agency called for an initial test operation, including transporting a protective fuel cask from the storage pool to another pool in a different building about 100 meters away for more stable conditions for cooling spent fuel, the sources said.

The administrative agency, the Japan Nuclear Energy Safety Organization, has already inspected equipment to be used in the fuel removal work on behalf of the Nuclear Regulation Authority.

It also urged TEPCO to have the planned work evaluated by a group of Japanese and overseas experts formed by the International Research Institute for Nuclear Decommissioning, a Tokyo-based organization founded by Japanese government agencies, nuclear facility manufacturers and electric power companies.



Of the four Fukushima plant reactors in use at the time of the 2011 disaster, only the No. 4 unit did not experience a reactor meltdown, with all of the fuel stored in the spent fuel pool for maintenance work.

The building housing the No. 4 reactor and the storage pool suffered a hydrogen explosion at the time as loss of power disrupted the pool's cooling function. Over 1,300 spent fuel assemblies and more than 200 unused ones still sit in the pool.

A crane has been installed to carry a protective cask into and out of the pool. The spent fuel will be placed inside the cask and moved to the nearby storage pool by trailer.

The work at the No. 4 unit will mark a new stage in the decommissioning of the Nos. 1 to 4 reactors damaged in the crisis.

Efforts continue to contain leaks of a massive amount of highly radioactive water accumulating at the plant as a result of water injections into the crippled Nos. 1 to 3 reactors. Underground water into the plant's premises has been compounding the problem and leaky water storage tanks have added to fears of seawater contamination.

==Kyodo

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<http://www.globalpost.com/dispatch/news/kyodo-news-international/131104/tepcoco-conduct-test-fukushima-no-4-unit-fuel-removal>

November 5, 2013

## TEPCO to delay fuel removal (2)

## **TEPCO to conduct test for Fukushima No. 4 unit fuel removal**

<http://mainichi.jp/english/english/newsselect/news/20131105p2g00m0dm035000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. will conduct a test for nuclear fuel removal at the No. 4 reactor building at the stricken Fukushima Daiichi power plant, delaying the start of the actual fuel removal operation by up to two weeks, sources close to the matter said Monday.[...]

### **See also:**

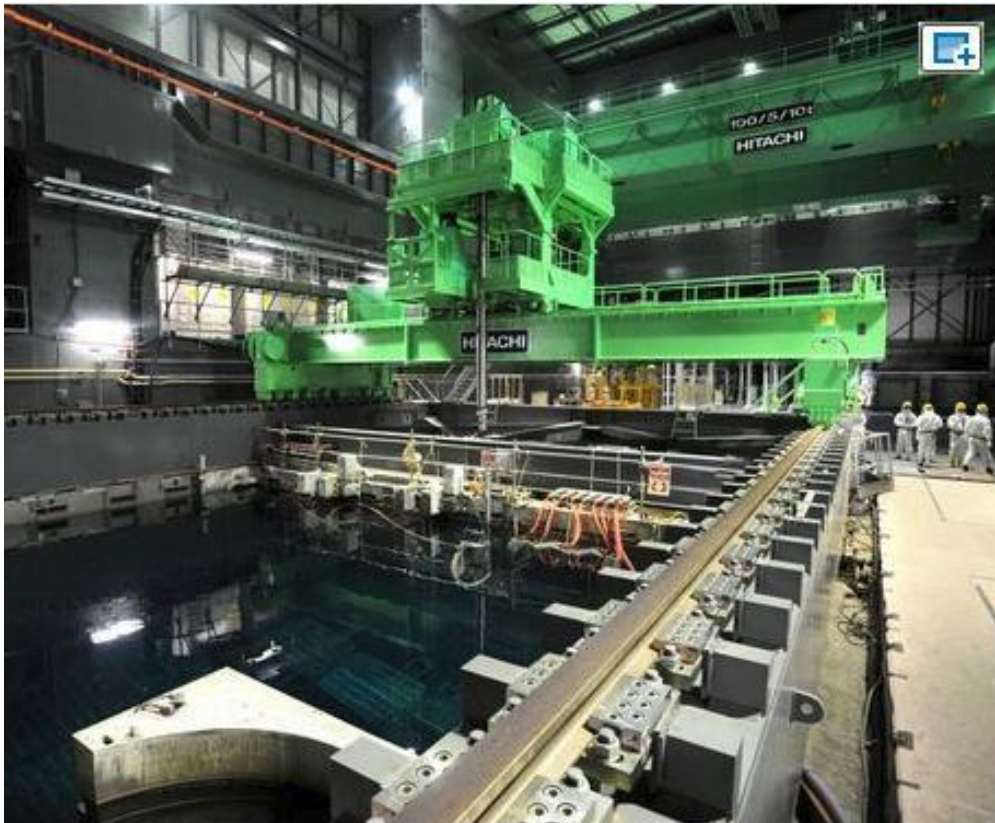
<http://www.reuters.com/article/2013/11/01/us-japan-nuclear-moniz-idUSBRE9A00TS20131101>

November 7, 2013

## **Ready to start?**

### **TEPCO prepares to remove nuclear fuel at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201311070083>



A fuel hoist has been installed to remove nuclear fuel from a storage pool in the No. 4 reactor building at the Fukushima No. 1 nuclear power plant. (Soichiro Yamamoto)

By TOSHIO KAWADA/ Staff Writer

OKUMA, Fukushima Prefecture--The 1,533 nuclear fuel assemblies were lined up in neat rows in the storage pool of the No. 4 reactor building amid new equipment and a clean environment.

But in stark contrast was the scene around the No. 4 reactor building at the Fukushima No. 1 nuclear power plant.

Concrete walls were still missing from the third and fourth floors of the No. 4 reactor building, raising questions among onlookers if the structure could withstand a huge earthquake.

On the sea side of the building, a piping system and metal rods were exposed behind collapsed walls of a former boiler building.

A truck swept up by the 2011 tsunami remained upside down by the side of the turbine building.

Amid these surroundings, Tokyo Electric Power Co. plans to start removing the nuclear fuel assemblies from the No. 4 storage pool as early as next week. The work would represent a new stage in the overall plan to end the nuclear crisis that started 32 months ago.

“It is a big step in the process to decommission the reactor,” Nuclear Regulation Authority Commissioner Toyoshi Fuketa said.

**The entire decommissioning plan for the plant is expected to take 30 to 40 years to complete, and the strategy could change at any moment.**

Workers still do not know the location of melted nuclear fuel in the No. 1, No. 2 and No. 3 reactors. High radiation levels are preventing entry to some areas. And contaminated water leaks continue to plague the site.

And removing the nuclear fuel from the No. 4 pool will require delicate procedures, considering the state of the building and the dangers involved.

NRA Chairman Shunichi Tanaka told TEPCO President Naomi Hirose to use extreme caution in removing the assemblies.

“The process involves **a very large risk potential**,” Tanaka told Hirose. “In a sense, it is more risky than the radioactive water crisis.”

TEPCO on Nov. 6 allowed reporters to see the spent fuel storage pool of the No. 4 reactor building and other areas of the stricken nuclear plant.

An elevator took the reporters to the top floor of the five-story building. **A steel frame had been assembled near the pool, and a new fuel hoist and a new crane had been installed.**

The No. 4 reactor building itself was covered by a canopy to replace the roof that was blown off in an explosion on March 15, 2011.

TEPCO plans to transfer the 1,533 nuclear fuel assemblies to a “storage pool for common use” 100 meters west of the No. 4 reactor.

The removal and transfer is expected to be completed at the end of next year.

The assemblies contain both spent and unused fuel. Some bundles were moved to the pool from the reactor core because the No. 4 reactor was undergoing a regular safety check when the Great East Japan Earthquake and tsunami struck the plant on March 11, 2011.

The disaster knocked out the cooling system for the storage pool, sparking fears that it would dry up, leaving the fuel exposed and allowing huge amounts of radioactive substances to spew into the air.

That didn't happen. However, the explosion four days after the tsunami left large chunks of debris in the storage pool.

Those chunks have been cleared, but a number of smaller pieces remain in the storage pool.

The fuel removal process will use **a cask receptacle that is 5.5 meters long, weighs 91 tons and can hold 22 fuel assemblies. It will be submerged in the pool and receive one fuel assembly at a time to prevent a nuclear reaction from occurring.**

A crane will lower the receptacle to the ground, where a vehicle will pick it up and take it to the common-use storage pool.

TEPCO plans to use two receptacles to speed up the transfer process and finish removing all the fuel in just over a year.

In addition to uranium, spent nuclear fuel contains highly toxic plutonium and other radioactive substances, which could be released if the fuel assemblies are damaged during the removal or transfer process.

**TEPCO has taken measures to check for deformed fuel assemblies and to prevent the remaining debris from causing damage when the fuel is pulled out.**

The company has also decided to use **double wires to ensure the receptacles are not dropped by mistake.**

The canopy covering the No. 4 reactor building is designed to contain radioactive materials in the event of an accident. The bottom of the storage pool has also been strengthened with concrete and other materials.

The reinforced storage pool could withstand shaking as strong as the magnitude-9.0 Great East Japan Earthquake, TEPCO officials said.

### **MYSTERIES REMAIN AT NO. 1 TO NO. 3 REACTORS**

The government and TEPCO announced the three-stage road map for decommissioning the Fukushima reactors in December 2011.

The first stage involves preparatory work, such as clearing debris, followed by the second-stage program that includes the removal of nuclear fuel from the pool in the No. 4 reactor building.

According to the road map, work to remove spent nuclear fuel from the pool in the No. 3 reactor building should start in the first half of fiscal 2015. But high radiation levels have prevented workers from approaching the No. 3 reactor, meaning that remote-control equipment will be needed to assess the situation.

The road map does not specify when the removal work will be completed there.

Removing the melted nuclear fuel from the No. 1 to No. 3 reactors is part of the third stage, and it is expected to start in fiscal 2020 at the earliest.

Engineers will first study methods to deal with the melted fuel, followed by the installation of equipment for the task. Currently, remote-control robots are being developed to study the situation and reduce workers' exposure to radiation.

The locations and the condition of the melted fuel for these reactors remain a mystery. It apparently dropped to the containment vessels through the inner pressure vessels housing the reactor cores.

In addition, TEPCO has not determined the extent of damage to the pressure and containment vessels.

TEPCO plans to insert a small remote-control device equipped with a camera into the suppression pool in the bottom part of the containment vessel of the No. 1 reactor on Nov. 13 at the earliest to get an idea of the internal situation.

The road map for decommissioning work could drastically change depending on the conditions of the melted nuclear fuel and the damage to the containment vessels.

## **ONGOING CONTAMINATED WATER PROBLEM**

One obstacle in the decommissioning plan is the continuous leaks of water contaminated with radioactive materials.

The Alps system that can remove 62 types of radioactive materials, including strontium, from water is scheduled to be put into full operation within this month.

It is considered a key piece of equipment to cut down the workers' risk of exposure to radiation.

On Nov. 6, the Alps system was still not operational.

Under a tent the size of a gymnasium, where the Alps equipment is stored, workers were inspecting tanks and piping while using cranes hanging from ceilings to relocate containers.

Test runs of Alps started in March. But the operations were suspended in June after water was found leaking from some of the tanks in the system.

On Sept. 27, Alps operations were restarted, only to be shut down the same day due to a different problem.

Contaminated water is increasing by about 400 tons every day at the plant due to the continuing cooling of the reactors and groundwater entering cracks in the buildings and mixing with radioactive water.

TEPCO has removed only cesium from about 380,000 tons of contaminated water so far. And since even the Alps system cannot remove tritium, TEPCO has no choice but to store the radioactive water at the site.

In April, radioactive water was found to have leaked from an underground storage tank. In August, 300 tons of highly contaminated water had spilled from a tank and likely reached the ocean.

Other leaks have also taken place, spreading soil contamination in the plant's compound.

Workers on Nov. 6 were seen heightening barriers and embankments to prevent radioactive water from spilling over the encasements surrounding tanks holding contaminated water.

About 200 workers have been assigned to monitor the tanks for possible leaks.

"The division to deal with contaminated water is different from the one to remove nuclear fuel. So we will be able to sufficiently carry out work for the two issues," said Akira Ono, director of the Fukushima No. 1 nuclear power plant.

However, TEPCO Vice President Zengo Aizawa was not so optimistic.

**"From the mid- and long-term perspective, I have concerns,"** Aizawa said.

By TOSHIO KAWADA/ Staff Writ

## **"Just a temporary measure" but no solution in sight**

### **TEPCO struggling with disposal of stored contaminated rainwater**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201311070079>

By SHUNSUKE KIMURA/ Staff Writer

Tokyo Electric Power Co. has yet to figure out what to do with 2,700 tons of radioactive rainwater now stored in two underground tanks at its crippled Fukushima No. 1 nuclear power plant.

The Fukushima prefectural government has accused TEPCO of dragging its feet on the issue and requested the plant operator to quickly transfer the rainwater elsewhere.



“It remains unknown why radioactive water (previously) leaked from some of the underground tanks, and no measures have been taken so far,” said a prefectural government official. “We have been demanding that (TEPCO) transfer (the contaminated rainwater) as soon as possible.”

When two typhoons pounded the plant in October, radioactive water accumulating within barriers surrounding aboveground storage tanks threatened to spill over.

TEPCO lowered the water levels by releasing the rainwater behind barriers where radioactivity levels were confirmed to be well below provisional safety standards.

Where readings were found to be higher than the safety standards, the utility transferred the water to the two underground tanks. TEPCO had stopped using its underground storage tanks after water had been found leaking from some in April, but the utility said heavy rainstorms forced it to bring the underground tanks in which no leaks were detected back in use.

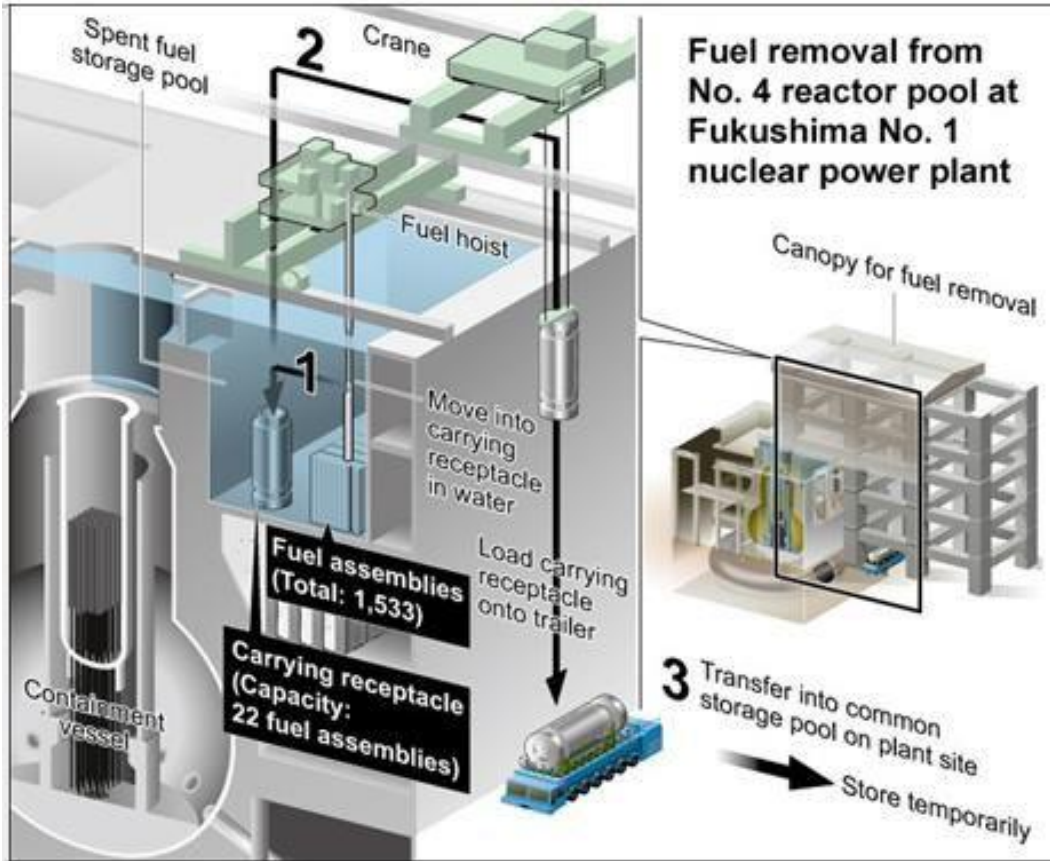
TEPCO had said that reusing the underground storage tanks is just a temporary measure as it intended to transfer the contaminated rainwater to the basements of the No. 2 and No. 3 reactor turbine buildings, where some radioactive water had already accumulated, as quickly as possible.

But it remains unclear how soon that will happen as large amounts of groundwater have been flowing into the basements each day--as well as rainwater transferred there from other locations--filling the sites and making it impossible to store additional radioactive water there.

More recently, TEPCO said it will have to continue to make use of the underground storage tanks until it is able to process the contaminated water and remove the radioactive substances.

#### **More photos of pool no.4**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201311070083>





Nuclear fuel assemblies are stored in a pool in the No. 4 reactor building of the Fukushima No. 1 nuclear power plant. (Soichiro Yamamoto)

## TEPCO ready to start

### For Tepco, 'real work' starts now

<http://www.japantimes.co.jp/news/2013/11/07/national/for-tepco-real-work-starts-now/#.UnzCkCewT9k>

JJI

FUKUSHIMA – Signaling “the start of decommissioning in a real sense,” Tokyo Electric Power Co. says it is ready to begin removing nuclear fuel assemblies from the spent fuel pool of the reactor 4 building at its crippled Fukushima No. 1 nuclear plant in mid-November.

By the end of 2014, 1,533 nuclear fuel assemblies stored in the pool in the reactor building, partly destroyed by a hydrogen explosion amid the March 2011 meltdowns, will be transferred to a pool in common use at another building at the plant.

The reactor 4 building has the most fuel assemblies in its fuel pool: 1,331 spent and 202 unused.

On Wednesday, Tepco showed media the cranes and other equipment that will be used to transfer the fuel assemblies.

“Decommissioning work starts with fuel removal,” plant head Akira Ono said, adding that the fuel removal marks “the start of decommissioning in a real sense.”

Work to remove fuel from storage pools is scheduled to start in the second half of fiscal 2017 at reactors 1 and 2 and in the first half of fiscal 2015 at reactor 3, at the earliest.

Tepco aims to start removing melted fuel, whose location has yet to be pinpointed, from reactors in 2020. Technologies to locate the fuel are still in development.

In a process that will be repeated for about a year, 22 fuel assemblies will be placed in a container in the reactor 4 building pool and then carried to the common-use pool about 100 meters away after radioactive decontamination.

Tepco has covered the top of the reactor building to prevent the release of radioactive substances.

A Jiji Press reporter saw new fuel removal equipment installed over the pool on the fifth floor of the building. Debris around the pool has been cleared away.

At the time of the March 2011 mega-quake and tsunami impact, reactor 4 was offline for a regular check, with its fuel stored in the pool.

Unlike reactors 1, 2 and 3, unit 4 did not melt down. Many people, however, have voiced concern about the massive quantity of fuel stored in the damaged building.

IAEA observes testing  
Kyodo

Two International Atomic Energy Agency experts began observing marine radiation monitoring activities Thursday off the coast of Fukushima Prefecture.

According to the IAEA, the experts are laying the groundwork for another IAEA mission later this month to review the process toward decommissioning the four severely damaged reactors at the Fukushima No. 1 nuclear complex.

With countries in the region concerned about the impact of radiation leaks from the crippled plant, the involvement of the U.N. nuclear watchdog in monitoring is expected to boost the credibility of the data Japan is releasing.

Hundreds of tanks have been set up at the plant to store the massive amounts of radioactive water produced as a result of continuing efforts to keep three of the damaged reactors cool.

But leaks have occurred frequently.

Groundwater flowing under the plant toward the ocean is also believed to be contaminated.

David Osborn, director of the IAEA Environment Laboratories in Monaco, and Hartmut Nies, head of the IAEA Radiometrics Laboratory, left Onahama port in the city of Iwaki at around 5:40 a.m. aboard the ship being used for water sampling by Tokyo Electric Power Co.

The ship is expected to take water samples at more than 10 points within 15 km of the Fukushima plant. After observing the seawater sampling activity Thursday, the experts on Friday will visit a building at the power plant where water is analyzed.

November 8, 2013

## Maintain morale among workers

### Fukushima No. 1 workers to get raise, perks

<http://www.japantimes.co.jp/news/2013/11/08/national/fukushima-no-1-workers-to-get-raise-perks/#.Un0z1iewT9k>

by Kazuaki Nagata

Staff Writer

Aiming to boost the morale of workers at the crippled Fukushima No. 1 plant, Tokyo Electric Power Co. said Friday it will raise wages and construct two new office buildings, an eight-story “rest station” and a food service center in the facility’s compound.

Tepco will double the extra pay for dangerous work at the Fukushima plant to ¥20,000 per day. The money, however, will first go to Tepco’s contractors and not the workers themselves.

Concerns have recently been raised over bad working conditions at the nuclear plant, which has seen a number of leaks of contaminated water into the nearby sea and soil.

Ahead of the announcement, Tepco President Naomi Hirose met with Nuclear Regulation Authority Chairman Shunichi Tanaka on Oct. 28, who urged him to **maintain morale** at the dangerous plant.

“We have come up with measures to maintain worker motivation and improve their working environment,” Hirose told reporters at Tepco headquarters.

The “rest station,” to be built next to the plant’s main gate, will accommodate as many as 1,200 people, while the food service center will have capacity to provide meals for 3,000 people.

Both will be built by the end of fiscal 2014, the utility said.

Currently, most Tepco workers are based in an office building at the Fukushima No. 2 plant, about 10 km from No. 1.

One of the two new office buildings will be built by next June within the No. 1 plant’s compound. It will eliminate the need for Tepco employees to make the trip between the two plants, the utility said.

Tepco said it will also provide more buses for commuting as well as other amenities and additional medical supplies.

Whether these measures will actually benefit all of the workers remains an open question.

Many manual laborers are hired through multiple layers of subcontractors, which reportedly often exploit site workers by charging commissions at each stage of the multiple subcontracts.

By implementing these measures, “we are expecting that the decommissioning work will proceed more smoothly,” Hirose said.

He also said the utility will work on better measures for handling the radioactive water stored in the hundreds of tanks at the plant.

For instance, recent heavy rain caused radioactive rainwater to overflow the concrete-fenced enclosures around the storage tanks, so now Tepco will make the walls higher, he said.

Also, to prevent tank spills, the utility will be putting more caulking compounds and sealant materials on the bottoms and bolts of the flange-type tanks, of which one suffered a leak of 300 tons of contaminated water.

More than 1,000 tanks have been set up within the plant's compound to contain radioactive water. Of them, 350 are of the flange-type.

November 9, 2013

## **320 workers assigned to dealing with contaminated water**

### **TEPCO to triple Fukushima work force for radioactive water**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201311090059>

Tokyo Electric Power Co. on Nov. 8 announced "emergency measures" to increase the work force, raise wages and improve labor conditions at the stricken Fukushima No. 1 nuclear power plant.

The Nuclear Regulation Authority had called on the utility to take action following a recent series of human errors that led to radioactive water leaks and other incidents at the nuclear plant.

According to TEPCO, 100 workers had been assigned to deal with radioactive water at the plant, such as monitoring storage tanks and replacing vulnerable tanks with more watertight models. In August, 300 tons of highly radioactive water was found to have escaped from one tank.

The utility said it will **increase the work force to 320.**

TEPCO said it will build a large rest station that can accommodate 1,200 workers, as well as a facility near the plant by the end of fiscal 2014 that can provide up to 3,000 meals.

The utility will also include expected wage hikes in its order prices for the assembly of radioactive water storage tanks and other tasks, company officials added.

## New leak near No.4

### Tainted water leaks again at Fukushima Daiichi

[http://www3.nhk.or.jp/nhkworld/english/news/20131110\\_06.html](http://www3.nhk.or.jp/nhkworld/english/news/20131110_06.html)

Workers at the Fukushima Daiichi nuclear power plant have discovered a new leak of contaminated water, this time **through a barrier that surrounds wastewater storage tanks.**

The workers were inspecting tanks on Saturday when they found tainted water had leaked out of the barrier near the No.4 reactor. **They tried to contain it with sandbags.**

They reported finding a puddle of water 80 centimeters long and 100 centimeters wide beyond the barrier. Plant operator Tokyo Electric Power Company detected 140 becquerels per liter of radioactive strontium.

The utility says the leak occurred near the valve used to drain the water. But it says the valve was closed, so it was unlikely to be the cause.

TEPCO officials say no contaminated water reached the ocean.

Engineers at the plant are still investigating. They say faulty joints in the body of the barrier may be to blame. The barrier is made up of concrete blocks bound by metal boards that are fitted either by welding or with bolts.

## Working conditions to be improved

### Work environment improvements planned for Fukushima plant

<http://mainichi.jp/english/english/newsselect/news/20131109p2a00m0na006000c.html>

Tokyo Electric Power Co. (TEPCO)'s headquarters in charge of handling contaminated water and contaminated water storage tanks at the Fukushima No. 1 Nuclear Power Plant announced safety



measures on Nov. 8 that include improvements to the working environment at the crippled plant to raise worker morale.

The chairman of the Nuclear Regulation Authority (NRA), Shunichi Tanaka, had sought fundamental improvements at the plant in a meeting with TEPCO President Naomi Hirose after repeated leaks of contaminated water occurred at the facility in October due to human error.

Motivation for the improvements came from the NRA halting safety inspections on the No. 6 and 7 reactors at TEPCO's Kashiwazaki-Kariwa Nuclear Power Plant -- which are necessary if those reactors are to be restarted -- because of insufficient measures at the Fukushima plant to prevent radioactive water leaks. Reactivation of the Kashiwazaki-Kariwa plant is a top priority for TEPCO for it to rebuild its finances.

The company plans to seek loans from financial institutions at the end of December. To secure the loans it is required to give an estimate of when the plant will be reactivated, as funds from the Kashiwazaki-Kariwa plant are required to improve its finances. If the safety evaluations of the plant's reactors remain suspended, financial institutions may not be willing to grant TEPCO the loans.

"If we do not quickly come out with some convincing measures (to stop water leaks), the reactivation (of the Kashiwazaki-Kariwa plant) will be pushed further back," said Hirose.

According to the announcement of the new safety measures, the areas people can work in without needing to wear a full-face mask to protect against radiation will be doubled from their current amount to cover two-thirds of the plant's premises by decontaminating the plant. By fiscal 2014 or 2015, TEPCO plans to expand these areas to cover everywhere except around the No. 1 through 4 reactors.

TEPCO will also make a new, eight-story rest area capable of accommodating around 1,200 people, according to the measures, as the current rest area located on the premises is too small. Construction on the new rest area is to start as early as December next year. To improve the food available to workers at the plant, a meal preparation center that can provide 3,000 meals a day is to be completed by the end of fiscal 2014.

Currently, the planning of work at the plant is done at the Fukushima No. 2 Nuclear Power Plant around 10 kilometers south, as there is no room at the Fukushima No. 1 plant for desk work. The new measures would provide a new building for such work within the Fukushima No. 1 plant grounds and aim for better efficiency. Additionally, 220 more workers are to be added to manage contaminated water and contaminated water storage tanks, with the extra manpower coming from locations such as the Kashiwazaki-Kariwa plant and thermal power plants.

Decommissioning of the Fukushima No. 1 reactors is expected to take 30 to 40 years, and to accommodate this, a central supervisory room will be made to combine what are currently divided, supervisory functions. Temporary-use generators set up as backup power sources will be replaced with more permanent ones.

To prevent radioactive rain water from flowing out over barriers set up around contaminated water storage tanks, as happened in October, the barriers will be made higher. To reduce the danger of the contaminated water in case it leaks, TEPCO will aim to speed up the start of full-scale operation of the plant's Advanced Liquid Processing System, which can remove 62 types of radioactive material from water, as well as make the system more reliable.

### **TEPCO fleshes out steps to improve Fukushima plant working conditions**

<http://mainichi.jp/english/english/newsselect/news/20131109p2a00m0na001000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. on Friday fleshed out a set of measures to improve the tough working environment at the crippled Fukushima Daiichi nuclear complex, hoping to raise the morale of people involved in the plant's decommissioning process.

The measures include plans to build an additional temporary office space to house 1,000 employees in June, a facility near the plant to produce warm meals for workers by the end of March 2015 and an eight-story building as a rest station. TEPCO will also take steps that could lead to increased wages for contract workers.

At a press conference in Tokyo, TEPCO President Naomi Hirose also vowed to ensure the safety of the upcoming process to remove fuel from the spent fuel pool of the severely damaged No. 4 unit. The work is expected to start in mid-November.

"This decommissioning work will continue for 30 to 40 years and it is the company's highest priority to improve labor conditions and to enable workers to maintain their sense of responsibility," Hirose said.

To reinforce its management of the radioactive water buildup at the Fukushima plant, Hirose said TEPCO is on the path to increasing the number of staff in charge of the matter to a total of 320 from the initial 100.

Following a string of radiation leaks and other problems, the Nuclear Regulation Authority recently urged TEPCO to take "drastic" steps to improve the situation, including the working environment that remains poor even though more than two years have passed since the nuclear crisis began in March 2011.

TEPCO is apparently eager to show the NRA that it can properly manage the Fukushima plant at a time when the utility is seeking to restart an idled nuclear power plant in Niigata Prefecture to turn around its struggling business.

A senior NRA official told reporters earlier that it will decide whether to go ahead with the safety assessment of the Kashiwazaki-Kariwa plant by seeing how the situation at the Fukushima plant improves.

The safety of reactors has to be confirmed by the NRA before they can be restarted.

Meanwhile, sources close to the matter said Friday that TEPCO plans to shift to a holding company system in fiscal 2016 at the earliest to ensure its survival when competition increases under planned drastic electricity sector reform in Japan.

In April this year, TEPCO installed in-house firms respectively in charge of thermal power generation, power grid and retail businesses. The in-house companies are likely to become subsidiaries under the holding company.

TEPCO may create more subsidiaries, including one in charge of decommissioning the Fukushima plant.

The government is pushing for a plan to separate regional utilities' power generation and transmission businesses as part of the power system reform expected to start from 2015.

TEPCO also plans to scrap all of its 10 branch offices and assign around 1,000 of the employees who have been working at the offices for reconstruction activities in Fukushima Prefecture, according to the sources.

## **Development of offshore wind power**

## **Winds of energy independence**

[http://www.japantimes.co.jp/opinion/2013/11/09/editorials/winds-of-energy-independence/#.Un\\_wMSewT9k](http://www.japantimes.co.jp/opinion/2013/11/09/editorials/winds-of-energy-independence/#.Un_wMSewT9k)

Despite Prime Minister Shinzo Abe's continued push to sell nuclear technology abroad and restart nuclear power plants at home, the Ministry of the Environment together with several leading companies and universities has been quietly developing Japan's capacity for wind power.

The first deep-water offshore wind turbine started generating power last month off the Goto Islands, Nagasaki Prefecture, and another floating turbine off the coast of Fukushima is set to start operations later this month. Each turbine has an output of 2,000 kilowatts.

That is a good start to a new and better energy policy that deserves to be expanded. It will be expanded as other offshore wind projects move into development. These initiatives, tentative as they may be, are important steps toward improving Japan's energy condition and recover from the meltdowns at the Fukushima nuclear power plant. Wind power should become a top priority for Japan.

While many renewable sources of energy have been explored in Japan, and should continue to be, what is unique with the offshore wind power turbines is the potential for expansion with few negative environmental consequences. Unlike traditional wind turbines, which must be located in shallow waters because they are anchored to the seabed, floating stations can be placed in much deeper waters so the potential locations for offshore wind farms are far more numerous.

The potential of offshore wind is huge, since Japan has one of the longest coastlines of any country in the world, ranking variously from fifth to 10th, depending on how coastlines are scientifically measured. In the ocean, winds are strong and stable, and there are no nearby residents for the turbines to bother.

The Environment Ministry estimates that wind energy could amount to 1.6 billion kilowatts, nearly eight times the current capacity of Japan's power companies. That makes sense to corporations such as Marubeni, Toda, Fuji Heavy Metal and Hitachi, which have been working with researchers at Kyoto University and Kyushu University to develop materials, designs and implementation.

The degree of cooperation between all the participants also makes the future of wind power promising.

Though initial construction costs for the turbines, cables, platforms and equipment are high, they are no more so than for a nuclear power plant. Concerns about the impact of offshore wind turbines on ecosystems are also important to consider. However, flotation devices have been designed to minimize interference with the environment, and companies are working together with fishing cooperatives.

Materials must also be made light and strong and the problems of undersea cables and maintenance on offshore platforms are being solved quickly. Fresh designs, such as the wind lens, developed at Kyushu University, are ensuring that turbine shapes funnel wind efficiently.

Japanese engineers have also moved ahead in many aspects of production and installation, solving problems related to such issues as the steel chains anchoring platforms to the seabed, turbine parts and other essential electronic and material components.

Japan seems to be seizing the initiative here, rousing itself from the innovation slumber that seemed to grip the nation as a result of the economic downturn and the March 2011 earthquake, tsunami and nuclear meltdowns. Japanese technology has a chance here to focus on producing a new industry that is safe, cutting edge and future-minded.

Though most of the world's floating wind power structures — 60 percent — are located in Europe, 23 percent are now in Japan. The new installations in Fukushima will generate enough electricity to power 1,700 homes at first. That may seem modest, but the added 140 working turbines planned by 2020 will increase that number considerably. Japan gets only a fraction of its energy from renewable sources at present, but wind power's potential has become clearly evident.

Japan's solar power industry should not be disregarded. Being particularly suitable for home and urban applications, solar energy will continue to fill different needs. But wind power far has more power-generating potential for Japan. According to the Environment Ministry, the amount of offshore wind energy that can be potentially generated is 10 times that of solar power.

As always, naysayers will contend that wind power is not realistic; however, imagining nuclear power plants will function safely is a more unrealistic point of view. Wind power has the huge advantage of providing Japan with a greater degree of energy independence, one that doesn't depend on potentially dangerous technology or expensive imports. After the Fukushima nuclear meltdowns, the jump in oil and gas imports reminded the country how important domestic innovation connects to energy independence.

Offshore wind power should become a larger part of the short- and long-term goals of the country's energy policy. The government budget supporting wind power initiatives should be considered a practical and sensible investment in the future, and wisely expanded.

The ministries, universities and companies should continue to work together on wind power, as productive cooperation has long been considered one of Japan's central virtues.

If wind power continues to develop, maybe one day Fukushima, where the turbines start up later this month, may be better remembered as the site of the first viable wind farm instead of as the symbol of Japan's misguided energy policies of the past.

November 11, 2013

## Wind farm off Fukushima

### Japan starts up offshore wind farm near Fukushima

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201311110054>



The Fukushima Mirai wind turbine floats 20 kilometers off the coast of Fukushima Prefecture in early October. In the background is the crippled Fukushima No. 1 nuclear power plant. (Asahi Shimbun file photo)

## THE ASSOCIATED PRESS

IWAKI, Fukushima Prefecture--Japan switched on the first turbine at a wind farm 20 kilometers off the coast of Fukushima on Nov. 11, feeding electricity to the grid tethered to the tsunami-crippled nuclear plant onshore.

The wind farm near the Fukushima No. 1 nuclear power plant is to eventually have a generation capacity of 1 gigawatt from 143 turbines, though its significance is not limited to the energy it will produce.

Symbolically, the turbines will help restore the role of energy supplier to a region decimated by the multiple meltdowns that followed the March 2011 earthquake and tsunami.

It also highlights Japan's aspirations to utilize its advanced energy technology from cleaner versions of conventional coal, oil and gas-burning thermal power plants to renewables and also nuclear power.

All of Japan's 50 viable nuclear reactors are offline for safety checks under new regulatory guidelines drawn up after the Fukushima disaster.

Utility companies have applied to restart at least 14 reactors under those new guidelines, which include more stringent requirements for earthquake and tsunami protections, among other precautions.

"We are moving ahead one step at a time. This wind farm is a symbol of our future," said Yuhei Sato, the governor of Fukushima Prefecture who has lobbied hard for support following the 2011 disasters.

Trading houses such as Marubeni Corp., which is leading the consortium building the offshore wind farm, are investing aggressively in renewable energy as well as conventional sources, helped by government policies aimed at nurturing favored industries.

In Japan, the push to tap more renewable sources to help offset lost power capacity and reduce costs for imported natural gas and oil also got a boost last year with the implementation of a higher wholesale tariff for energy generated from non-conventional sources.

Japan, whose coast is mostly ringed by deep waters, is pioneering floating wind turbine construction, required for seabed depths greater than 50 meters. The 2 megawatt downwind floating turbine that began operation Monday is tethered to a seabed 120 meters deep.

The turbine is linked to a 66 kilovolt floating power substation, the world's first according to the project operators, and an extra-high voltage undersea cable.

As the government and Tokyo Electric Power Co. struggle to clean up from the nuclear disaster and begin the decades-long task of decommissioning the Fukushima plant, Japan's energy industry is in the midst of a transition whose outcome remains uncertain.

Most leading members of Japan's ruling Liberal Democratic Party and the powerful business lobbies such as Keidanren, and many experts, argue that wind and other renewables alone simply cannot make up for the steady and huge baseload power produced by nuclear plants.

"I favor renewables. But it would be irresponsible to create a pie-in-the-sky claim that renewables alone are the answer," said Paul Scalise, a fellow at Tokyo University and expert on Japan's energy industry. "There is no such thing as a perfect power source."

He cites figures showing wind power's average generating capacity at 2 watts per square meter versus 20 watts per square meter for solar power--and 1,000 watts per square meter for nuclear.

Eventually there could be dozens of wind turbines off Fukushima's scenic but deserted coast.

The project is meant to demonstrate the feasibility of locating these towering turbines in offshore regions where the winds are more reliable and there are fewer "not in my backyard" concerns--bigger turbines that might create noise problems onshore are not an issue so far offshore.

In theory, Japan has the potential for 1,600 gigawatts of wind power, most of it offshore. About a dozen projects are already in the works, from Kyushu in the south to Hokkaido in the north.

THE ASSOCIATED PRESS

## **Material for future disaster prevention**

### **Geological records of Tohoku tsunami discovered in sand layers**

<http://ajw.asahi.com/article/0311disaster/analysis/AJ201311110068>





Geographical layers show signs of tsunami in three different periods in the Shimonogo district of Iwanuma, Miyagi Prefecture, on Nov. 10. (Hideaki Ishibashi)

By HIDEAKI ISHIBASHI/ Staff Writer

IWANUMA, Miyagi Prefecture--Sand layers near an archaeological site in northern Japan provide clear evidence of three tsunami, one dating back more than 1,000 years.

According to researchers, the tsunami deposits close to the Takaose remains in the Shimonogo district here are the first geological sample showing three natural disasters that devastated the region in different periods.

The most recent layer was put down by the Great East Japan Earthquake and tsunami that struck in 2011. The other two tsunami were believed caused by the magnitude-8.1 Keicho Sanriku earthquake in 1611 and the Jogan earthquake in 869, which had an estimated magnitude of between 8.3 and 8.4.

City officials are considering whether the geological layers can be preserved and exhibited as teaching materials about the power of tsunami.

The deposits, which opened for public viewing on Nov. 10, are located about one kilometer inland. The area is where water-rice cultivation was carried out until it was submerged by several meters of seawater during the tsunami of March 11, 2011.

The excavation and research work was done on this area, which is close to the Takaose remains of the Heian Period (794-1185), as part of the city's reconstruction projects.

According to a member of the research team, the top layer is about 20 centimeters thick with sand and mud brought by the 2011 tsunami. The boundary with the lower layer can be clearly defined as the tsunami abraded the soil and made it uneven.

Twenty-five centimeters below the first layer, a fourth layer of sand five centimeters deep was discovered. Radiocarbon dating of the orange-like layer showed the sediment was likely deposited by tsunami around 1600.

The researchers also pointed out a sixth layer of whitish volcanic ash deposited by the eruptions in the 10th century that formed Lake Towadako, located along a border between Aomori and Akita prefectures, more than 200 kilometers away from here.

Finally, a blue-like eighth layer, which is 0.8 to 1 meter below the surface, shows the tsunami deposits made between the 8th and 9th centuries, the researchers said.

Ryoichi Shiratori, a lecturer of archaeology studies at Shokei Gakuin University in Miyagi Prefecture who carried out the research, insisted that the record is precious.

Shiratori said, "The geographical layers show that tidal tsunami swept over this area three times." He added, "They will be precious materials for future education of disaster prevention," much like the Nojima Fault Preservation Museum in Awaji, Hyogo Prefecture.

That facility preserves an exposed fault line in the Great Hanshin Earthquake that struck the Kansai region at 5:46 a.m. on Jan. 17, 1995, to give people an opportunity to learn from the disaster.

November 12, 2013

## **New drainage channel to drain into harbour**

### **Tepco plans new draining ditch to divert any spills into No. 1 harbor**

Kyodo

<http://www.japantimes.co.jp/news/2013/11/12/national/tepco-plans-new-draining-ditch-to-divert-any-spills-into-no-1-harbor/#.UoHkdSewT9k>

FUKUSHIMA – Tokyo Electric Power Co. will build a new drainage channel at its crippled Fukushima No. 1 nuclear plant as part of efforts to prevent radioactive water from directly flowing into the Pacific when there is a storage tank spill, officials said.

The current channel drains into the sea outside the plant's man-made harbor, which is protected by breakwaters and its water has been partially enclosed to contain radioactive discharges. The new channel, to be completed by the end of March, will drain into the harbor, Tepco said Monday.

Tepco decided on the move after 300 tons of highly radioactive water leaked in August from one of the tanks, some of which is believed to have flowed into the Pacific via the drainage channels.

Under the plan, workers will build a new ditch that diverts from a main one that currently empties directly into the ocean. When there is a spill, Tepco will dam the existing ditch so the toxic water will flow instead into the harbor.

At the Fukushima plant, hundreds of tanks have been set up to store radioactive water created as a result of continuing water injections into the three crippled reactors that suffered meltdowns during the 2011 nuclear crisis.

It is also believed, however, that some 400 tons of radioactive groundwater is flowing into the sea daily after passing under the stricken reactor buildings.

## Govt., TEPCO target Fukushima water leaks

[http://www3.nhk.or.jp/nhkworld/english/news/20131112\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20131112_01.html)

Officials from the Japanese government and the operator of the damaged Fukushima Daiichi nuclear power plant have agreed on measures to protect the plant from heavy rainfall. They are hoping to limit leaks of radioactive water.

Senior Vice Industry Minister Kazuyoshi Akaba said an unusually large number of typhoons and storms over the past month caused radioactive rainwater leaks. Part of the water may have seeped outside of the facility and possibly into the sea.

Representatives of the government and TEPCO discussed the issue at a meeting in Fukushima Prefecture on Monday.

They decided to install drainage pipes on the plant's storage tanks by the end of March 2014. The pipes are expected to prevent about 60 percent of rainwater from flowing into barriers surrounding the tanks. Previously, rainfall caused contaminated water to buildup behind the barriers and overflow into the grounds of the plant.

They also agreed to double the height of all the barriers to 60 centimeters by the end of this year and raise some sections to 1.3 meters by the end of March 2014, if necessary.

The inside of barriers already contaminated with radiation will also be repainted.

A team of 22 people, including members of a government committee to manage contaminated water, conducted geological inspections at the Fukushima plant on Monday.

## Record radioactivity at plant well

### Record radioactivity level found at Fukushima plant well

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201311120055>

A record high level of 710,000 becquerels of beta-ray sources, such as radioactive strontium, was detected per liter of water in an observation well at the crippled Fukushima No. 1 nuclear plant.

Tokyo Electric Power Co. said Nov. 12 the water was taken Nov. 10 **at the well 10 meters north of a tank that leaked 300 tons of highly contaminated water before the problem was discovered in August.**

The previous high reading of 550,000 becquerels per liter was found in water sampled Nov. 9 at the same well.

TEPCO said a new leak from the tank has not been confirmed. It said leaked radioactive water that has remained in the soil likely spread to the well.

TEPCO detected 400,000 becquerels per liter at the same well on Oct. 17. The level once fell but has been rising in recent days.

## Removing fuel at No.4: Almost ready

### **NRA finishes checks before fuel removal**

[http://www3.nhk.or.jp/nhkworld/english/news/20131112\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20131112_33.html)

Japan's nuclear watchdog has finished facility checks before the removal of nuclear fuel from a badly damaged reactor at the Fukushima Daiichi power plant.

Removing the fuel units is the first milestone in a decommissioning project that's estimated to take about 40 years. The plant's operator, Tokyo Electric Power Company, plans to decommission 4 damaged reactors.

The firm is preparing to remove 1,533 fuel units from a storage pool in the plant's No.4 reactor, which stores the most fuel units among the 4.

On Tuesday, officials from the Nuclear Regulation Authority told the utility that they found no problems with a crane, the building's cover, and various facilities. The regulators had been checking since September.

The NRA plans to start checking work procedures on Wednesday to make sure that debris in the pool will not damage fuel units, most of which are highly radioactive spent rods.

If the agency finds no problem with the procedures, Tokyo Electric is to start removing the fuel in mid-November.

November 13, 2013

## "We will be very careful" (NHK video)

### **Nuclear Watch: TEPCO Says Fuel Removal Ready**

<http://www3.nhk.or.jp/nhkworld/newslines/201311131815.html>

TEPCO makes it sound like a routine operation performed many times before but a crippled reactor is another story.

- Given the high level of radioactivity at the plant, workers will need special equipment (gloves, overalls etc) which might make their work more difficult.
- one of the big worries is the presence of debris inside the pool
- the workers must be protected (their exposure limit should not be exceeded)

And that is only the beginning (of the decommissioning process).

## **Water gushing out of containment vessel of No.1 reactor**

### **Robot pinpoints leaks on Fukushima reactor**

[http://www3.nhk.or.jp/nhkworld/english/news/20131113\\_40.html](http://www3.nhk.or.jp/nhkworld/english/news/20131113_40.html)

A robot at the damaged Fukushima Daiichi nuclear plant has for the first time identified exactly where highly radioactive water is leaking from a reactor.

Plant operator Tokyo Electric Power Company, or TEPCO, on Wednesday succeeded in sending a remote-controlled robot close to the lower part of the No.1 reactor's containment vessel.

The lower section is filled with contaminated water injected to cool molten nuclear fuel. Extremely high radiation levels have hampered efforts to probe that section.

A camera on the robot captured images of water leaking from 2 holes in the containment vessel into the building housing the reactor.

TEPCO engineers say they're not sure how much water is leaking. But they say one of the leaks looks as if tap water is gushing out.

**Radiation levels in the area were extremely high at 0.9 to 1.8 sieverts an hour.**

Engineers suspect that damage to containment vessels at the No. 2 and 3 reactors is also causing similar

leaks of highly radioactive water.

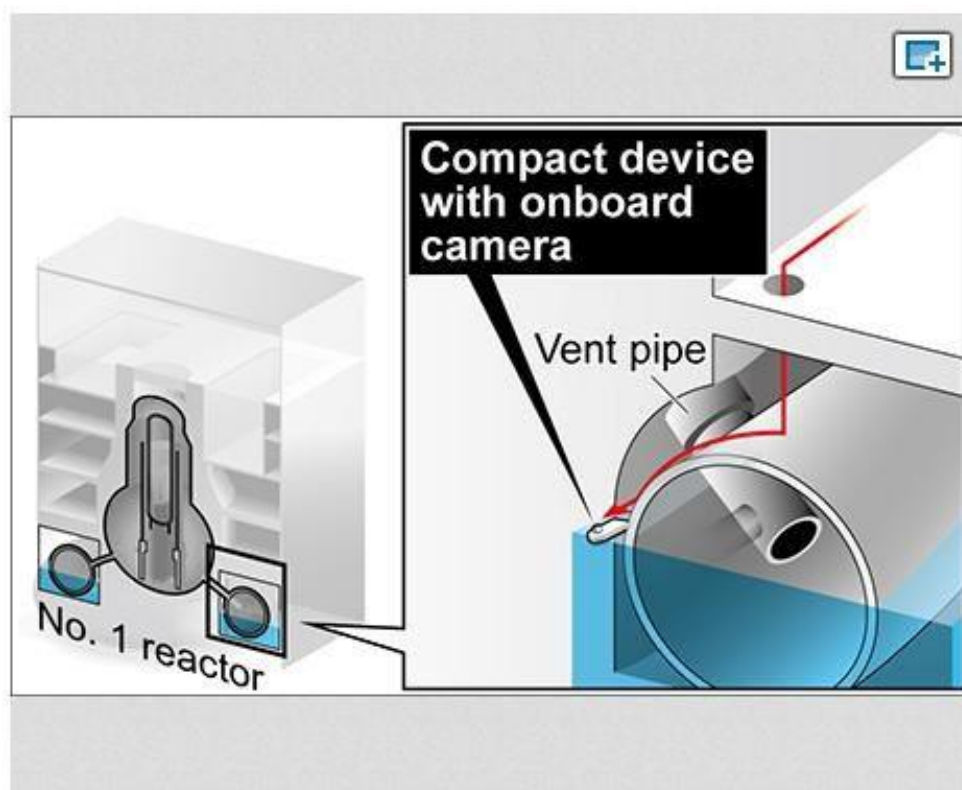
They say Wednesday's finding is important not only in solving water contamination problems but also in carrying out decommissioning. TEPCO will continue to use robots to look for other leaks.

November 14, 2013

## Evidence of leak

### Photo confirms water leaks from Fukushima reactor containment vessel

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201311140046>







A camera captures an image of water leaking on Nov. 13 from a snapped vinyl chloride pipe that extends from the bottom part of the Fukushima No. 1 nuclear power plant's No. 1 reactor containment vessel. (Provided by Tokyo Electric Power Co.)

A camera installed on a remote-controlled device captured the first direct evidence that water is leaking from a containment vessel at the Fukushima No. 1 nuclear power plant.

Tokyo Electric Power Co., the plant operator, said Nov. 13 that the water was leaking from an unidentified source, possibly a broken part in the suppression chamber or elsewhere in the containment vessel that houses one of the three reactors that went into meltdowns as a result of the 2011 earthquake and tsunami disaster.

TEPCO used the compact floating device earlier in the day to survey conditions near the No. 1 reactor's suppression chamber that lies beneath the containment vessel.



The suppression chamber, connected via vent pipes to the containment vessel, is designed to regulate pressure in the reactor in the event of an accident. Radiation levels in the area measured between 0.9 and 1.8 sieverts per hour.

Water was also found leaking from a snapped vinyl chloride pipe that extends from the bottom part of the containment vessel and is designed to collect water droplets that form on the containment vessel, TEPCO added.

TEPCO said it would continue the investigations on Nov. 14 with the remote-control device. It will try to locate the source of the leaks as part of efforts to decommission the crippled reactor, the utility said.

## But where exactly is it coming from?

### TEPCO yet to pinpoint reactor vessel damage

[http://www3.nhk.or.jp/nhkworld/english/news/20131114\\_16.html](http://www3.nhk.or.jp/nhkworld/english/news/20131114_16.html)

The operator of the damaged Fukushima Daiichi nuclear plant has yet to determine from what parts of the No.1 reactor containment vessel water is leaking.

Tokyo Electric Power Company, TEPCO, on Wednesday sent a camera-equipped remote-controlled robot close to the lower part of the No.1 reactor containment vessel. The camera captured 2 locations where water was leaking onto the floor of the building housing the reactor.

In one location, water was trickling down the surface of the suppression chamber and pooling on the floor. The doughnut-shape suppression chamber is a part of the containment vessel.

In another, water was flowing out of the tip of a broken pipe. The pipe had been installed to collect dew condensation.

TEPCO believes the water is coming from damaged parts of the containment vessel.

It is the first time that possible leak sites have been confirmed in the No.1 to No.3 reactor containment vessels.

If the damage is pinpointed, it may be possible to draw up measures to suppress the accumulation of wastewater.

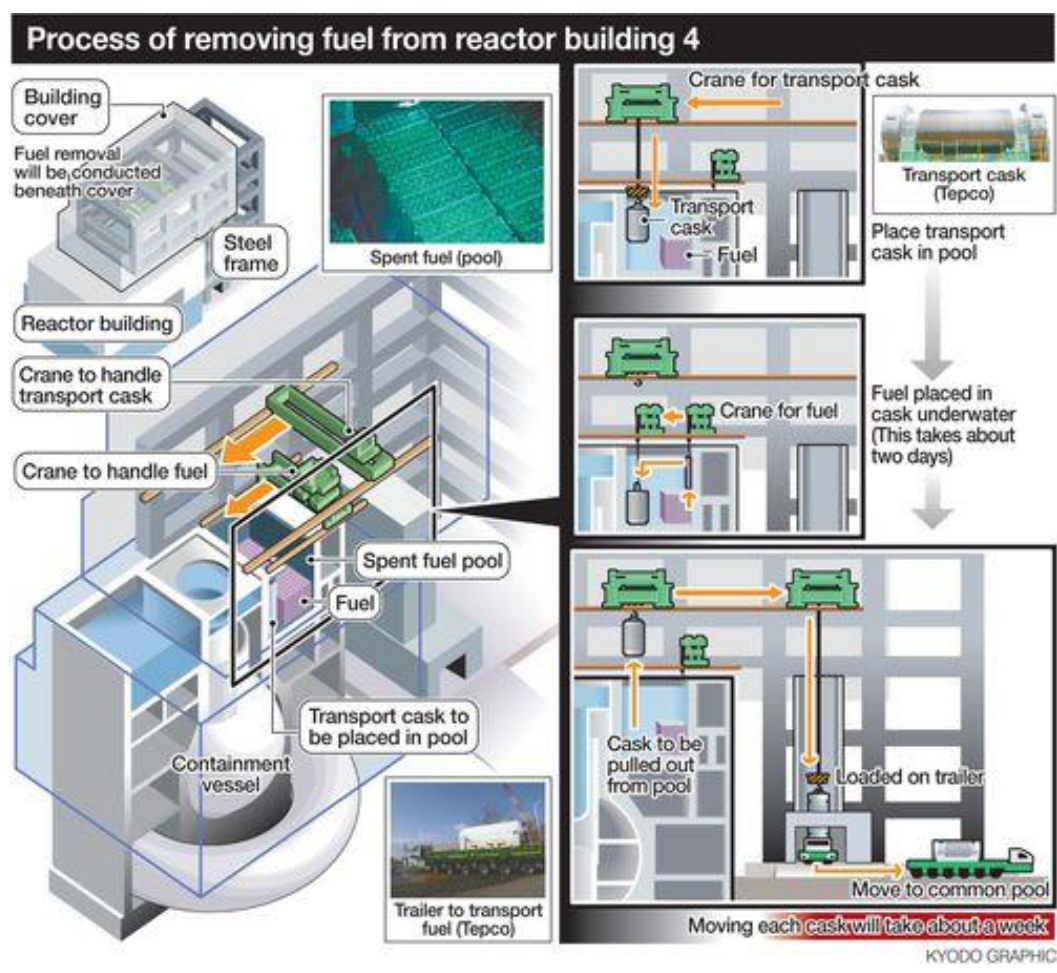
It could also help speed up the process of decommissioning the reactor by allowing the filling of the containment vessel with water to extract melted nuclear fuel.

However, high radiation levels and wastewater in the area are likely to hamper efforts to find the damaged parts and take effective measures.

## "Risky" or "safe" fuel removal?

### Risky fuel removal about to start

<http://www.japantimes.co.jp/news/2013/11/14/national/risky-fuel-removal-about-to-start/#.UoUbtiewT9k>



by Kazuaki Nagata  
Staff Writer

The decades-long decommissioning process at the crippled Fukushima No. 1 plant is about to take what Tokyo Electric Power Co. says is “an important step,” as the utility starts removing fuel rod assemblies from the spent fuel pool high up in reactor building 4 sometime this month.

Moving the massive amount of radioactive fuel assemblies out of the shattered building is significant because it will allow Tepco to monitor the fuel much more easily at another pool in an undamaged facility, experts say.

Meanwhile, they stress the task must be handled very carefully to avoid dropping and damaging the assemblies.

“Usually, spent fuel rods are safely stored in sturdy reactor buildings, but reactor building 4 experienced a hydrogen explosion, so it has lost its full containment capability,” said Kiyoshi Takasaka, an adviser on nuclear issues to Fukushima Prefecture.

The hydrogen blast occurred March 15, 2011, four days after the earthquake and tsunami, blowing the roof off the building and showering debris into the pool.

The pool has 1,533 fuel rod assemblies, 202 of which are unused. Once removed from the pool, the assemblies will be stored in a common pool in a different building.

Each assembly, a zirconium alloy box, is about 4.5 meters long and contains 60 to 80 fuel rods.

A fuel handling machine, which is like a hoist, set up over the pool will lift the assemblies one by one and place them into special transport casks. The casks will be put into the pool ahead of time, so that this work is done underwater to prevent gamma radiation from spilling to the outside environment.

Each cask can store 22 assemblies. A crane installed above the fuel handling machine will load them onto a trailer for transport to the common pool.

If all goes well, removing all of the assemblies will take about a year. Tepco said it is using nearly the same removal equipment used for regular nuclear operations.

Lake Barrett, a special adviser to Tepco who was in charge of the cleanup work after the Three Mile Island nuclear accident in the U.S., said he visited the plant Wednesday and was impressed with Tepco’s preparations.

Building 4 has been reinforced with steel frames and a cover, the equipment is in place and the workers have been trained well for the operation, Barrett said.

“Now I feel confident that they can complete this job properly,” he said, adding that the level of Tepco’s preparations will make the operation almost like a normal fuel removal.

Still, it will be different than performing this operation in an undamaged building, and extra caution is a must.

For instance, engineers normally program coordinates into the fuel handling hoist and let it run automatically, but they will manually control it for this operation.

Takasaka said it is essential that the people in charge of the task have enough training in handling the manual operations.

He added that although Tepco has been picking debris out of the pool, there are still small pieces that could fall between the assemblies and racks that contain the assemblies, possibly making it harder to lift them or even breaking them.

Barrett, who saw the pool for himself, said the water clarity is good but it is true that the assemblies could get jammed by small debris.

Tepco said it is ready for such eventualities. For instance, it plans to use underwater vacuum cleaners as much as possible.

Also, if the hoist detects extra weight when removing the assemblies, it will stop moving to avoid forcing the assemblies.

Another risk is dropping the assemblies and damaging them.

“It is imperative not to drop the assemblies when removing and after removing them from the racks,” said Hisashi Ninokata, a nuclear expert and professor at Polytechnic University of Milan in Italy.

"In the worst-case scenario, dropping a cask is conceivable. To avoid that, it is important to come up with multiple layers of measures," said Masayuki Ono, a Tepco spokesman.

For instance, the crane's control wires have been doubled, and it is designed not to drop the assemblies if the power is cut off, Tepco says.

And if an assembly is dropped and gets damaged enough to release radioactive materials, the radiation level outside Fukushima No. 1 will still not exceed the legal limit, the utility claims. This estimation is based on a scenario in which one assembly falls and strikes others, resulting in damage to all of the fuel rods contained in two assemblies.

Earlier this week, Tepco found three damaged assemblies that will be difficult to remove, but officials said the damage appeared to have occurred before the March 11 disasters.

Ninokata feels that as long as Tepco is sufficiently prepared and proceeds carefully, it is hard to imagine that any assemblies will get damaged, but if this does happen, he agrees with the utility that harmful amounts of radioactive materials won't escape into the environment.

Asked if it's possible for the spent fuel to achieve recriticality, Zengo Aizawa, vice president of Tepco overseeing the Fukushima crisis, said this is highly improbable since the removal process basically deals with one assembly at a time, and the utility has confirmed that one assembly alone cannot cause a nuclear chain reaction.

### **TEPCO ready for fuel removal from No. 4 spent fuel pool: U.S. expert**

<http://mainichi.jp/english/english/newsselect/news/20131114p2g00m0dm040000c.html>

TOKYO (Kyodo) -- U.S. nuclear expert Lake Barrett said Wednesday that Tokyo Electric Power Co. is "ready to start the safe removal" of fuel inside the spent fuel pool of the No. 4 unit at the crippled Fukushima Daiichi nuclear power plant, as he visited the site and talked to workers involved.

"I was very impressed with the preparations," Barrett, who has dealt with the 1979 Three Mile Island nuclear plant accident as an official of the U.S. Nuclear Regulatory Commission, said at a press conference, while warning that workers should not become "complacent" during the operation that will continue until the end of next year.

Barrett also said he expects the Fukushima plant's decommissioning process will take a few decades but added that creating a concrete sarcophagus to cover damaged reactors as seen in the 1986 Chernobyl disaster "is not a good idea" in Fukushima's case.

"Chernobyl and Fukushima are very different places, very different accidents. And the Japanese society is not the society of the Soviet Union of Chernobyl times," he said.

TEPCO is close to starting the mission to take out fuel from the pool of the No. 4 reactor building, a process that will mark the actual beginning of the plant's decommissioning.

Due to a quake-triggered tsunami that flooded power sources and disabled key cooling functions in March 2011, the Nos. 1 to 3 reactors suffered meltdowns.

The No. 4 unit, with all of the reactor fuel stored in the spent fuel pool during maintenance work, avoided a meltdown, but the building housing the reactor was damaged by a hydrogen explosion.

Barrett, however, said he thinks the planned operation at the No. 4 unit will not have much difference from spent fuel handling at normal nuclear power plants, due to a new building that has been built as a cover for the damaged reactor building.

Referring to a massive amount of radioactive water accumulating at the plant as a result of water injections into the three crippled reactors, the expert acknowledged that the issue remains a "significant challenge" for the utility to address.

In particular, Barrett called for a more "integrated" water management program, given that water with various radiation levels exists at the site and that different contractors work at the site.

TEPCO officials said the same day it has confirmed for the first time that water injected into the No. 1 reactor was actually leaking from the bottom of the container.

The utility found the leaks when studying areas near the doughnut-shaped suppression pool at the bottom of the reactor's primary containment vessel. The pool and the containment vessel are connected with pipes.

TEPCO wants to plug the leaks of the containment vessel, because it has to fill it with water to prepare for the removal of the melted fuel inside.

## **TEPCO confirms water leak at bottom of containment vessel (No.1)**

### **Leaks seen under reactor 1 containment vessel**

<http://www.japantimes.co.jp/news/2013/11/14/national/leaks-seen-under-reactor-1-containment-vessel/#.UoUbjiewT9k>

by Kazuaki Nagata  
Staff Writer

Tokyo Electric Power Co. says it has found water leaks around the bottom of the containment vessel in the reactor 1 building at the Fukushima No. 1 nuclear plant, the first time leaks have been detected near or possibly in any of the three containment vessels that experienced a meltdown in March 2011.

Tepco said Wednesday it was using a camera-equipped remote-controlled boat to check conditions when it found the two leaks.

One leak came from a rupture in a sand-cushioned drain pipe installed at the bottom of the containment vessel. The pipe is not directly connected to the containment vessel and is used to drain condensation that forms on the vessel's surface.

Another leak was confirmed just above the suppression chamber, which is a huge donut-shaped chamber connected to the containment vessel, and one of eight vent pipes.

The suppression chamber contains water and is used to reduce pressure inside the containment vessel through vent pipes.

Akira Ono, chief of the Fukushima No. 1 plant, said of the second leak that there is another pipe above the suppression chamber and the vent pipe, and it appears that the water is leaking from around that pipe.

But Ono said it is still unknown where exactly the leak is located, and that it is conceivable the water is coming from the containment vessel.

Still, "these are significant findings to help" find the precise locations of the leaks, he said.

The remote-controlled boat was in tainted water inside the torus room that contains the suppression chamber. Radiation levels inside the torus room are running between 0.9 to 1.8 sieverts per hour, dangerously high for human exposure.

The fuel cores of reactors 1, 2 and 3 suffered meltdowns at the start of the crisis, and Tepco believes they penetrated the pressure vessels, which are inside the containment vessels, and fell to the bottoms of the containment vessels, which also apparently have cracks or holes.

The melted fuel cores are being cooled by massive injections of water, but since the containment vessels have leaks, the coolant water that has been in contact with the radioactive fuel rods is leaking into the basement of the reactor buildings to increase the amount of tainted water.

As a result, finding and plugging the leaks are crucial to solving the vexing toxic water problem.

### **TEPCO confirms water leaks around Fukushima reactor for first time**

<http://mainichi.jp/english/english/newsselect/news/20131114p2a00m0na002000c.html>

Tokyo Electric Power Co. (TEPCO) has confirmed two water leaks from piping in the No. 1 reactor building at the Fukushima No. 1 Nuclear Power Plant, company officials said.

This is the first time the utility has located water leaks around the plant's damaged reactors since hydrogen explosions occurred at the plant in March 2011.

TEPCO has found that used reactor coolant water was leaking into the No. 1 reactor building's "Torus Room," which holds the reactor's pressure suppression chamber, after observing the room with a remote-controlled, camera-equipped floating device. The instrument measured high radiation levels in the areas, at between 0.9 and 1.8 sieverts per hour.

In order to proceed with reactor decommissioning, these leaks will have to be stopped and the reactor immersed in water to reduce radiation emissions.

## **Large-scale damage suspected at No.1**

### **Expert suspects large damage in Fukushima reactor**

[http://www3.nhk.or.jp/nhkworld/english/news/20131114\\_40.html](http://www3.nhk.or.jp/nhkworld/english/news/20131114_40.html)

A nuclear expert says reactor No.1 at the Fukushima Daiichi plant may have suffered relatively large-scale damage, causing large leaks of radioactive water.

Tokyo Electric Power Company on Thursday released video footage taken by a robot that identified the source of highly radioactive water leaks from the reactor.

The previous day, the remote-controlled robot got close to the lower part of the reactor's containment vessel, where its camera captured 2 leaks.

The video shows water from the first leak flowing down the surface of the suppression chamber and pooling on the floor of the building. The doughnut-shaped chamber is a part of the containment vessel.

In another, water poured out from a broken pipe as if it was running from a tap faucet. The size of the leak is considered unusual because the pipe was installed to collect dew condensation on the containment vessel.

Hosei University visiting professor Hiroshi Miyano says the volume of water suggests large damage to parts, such as a joint between the containment vessel and the suppression chamber.

He says the assembled part may have been dislodged by the impact of a hydrogen explosion that shattered the reactor building in March 2011.

November 15, 2013

## **TEPCO to start removing spent fuel on Monday (Nov.18)**

### **Tepco to start fuel removal from Fukushima reactor 4 pool Monday**

Kyodo

[http://www.japantimes.co.jp/news/2013/11/15/national/tepc-to-start-fuel-removal-from-fukushima-reactor-4-pool-monday/#at\\_pco=tcb-1.0&at\\_tot=8&at\\_ab=-&at\\_pos=0](http://www.japantimes.co.jp/news/2013/11/15/national/tepc-to-start-fuel-removal-from-fukushima-reactor-4-pool-monday/#at_pco=tcb-1.0&at_tot=8&at_ab=-&at_pos=0)

Tokyo Electric Power Co. said Friday it will start removing nuclear fuel from the spent fuel pool of the reactor 4 building at the crippled Fukushima No. 1 plant from Monday.

“Full-scale removal (from the accident-stricken unit) is a very important process in moving ahead with the plant’s decommissioning,” Tepco spokesman Masayuki Ono told a press conference, adding that the experience will be useful in dealing with the three other units that were damaged in the 2011 nuclear crisis.



The unit 4 spent fuel pool contains 1,331 spent fuel assemblies and 202 unused ones. Workers will begin with the removal of unused fuel assemblies, which are easier to handle.

The work Monday will begin with the placement of a transportation container inside the spent fuel pool. Workers will then use a crane to take each fuel assembly out of the storage rack and put it into the container.

Once the container is filled with 22 fuel assemblies, it will be put on a trailer and taken to another pool in a different building about 100 meters away, which is expected to provide more stable conditions for keeping the fuel cool.

It is expected to take about two days to fill the container with fuel assemblies, and about a week until the container is transported to the other pool, Ono said.

Reactor 4 avoided a reactor meltdown, unlike the units 1 to 3, as all of its fuel was stored in the spent fuel pool due to the reactor undergoing periodic maintenance work at that time.

But the building housing the reactor was severely damaged by a hydrogen explosion, raising concern about the continued storage of the more than 1,000 fuel assemblies in the spent fuel tank.

Tepco plans to finish the fuel removal work at unit 4 by the end of next year.

November 18, 2013

## **Removal of fuel starts at No.4**

### **TEPCO begins removing nuclear fuel at Fukushima plant**

Tokyo Electric Power Co. started removing nuclear fuel from a damaged reactor building at the Fukushima No. 1 nuclear plant for the first time, marking a new stage in the decades-long decommissioning process.

The operation to empty the storage pool in the No. 4 reactor building, which holds 1,533 nuclear fuel assemblies, began at 3:18 p.m. on Nov. 18.

Special equipment will lift the fuel assemblies, one at a time, and place them in a cask that can hold 22 units. The container will then be transported by vehicle to a common pool on the plant compound.

The No. 4 reactor had been shut down for regular inspections when the March 2011 earthquake and tsunami struck, and all its fuel was in the storage pool.

All fuel assemblies are expected to be removed by December 2014.

But the overall decommissioning work at the stricken nuclear plant is expected to take 30 to 40 years to complete.

High radioactivity levels have prevented workers from entering areas of the No. 1 to No. 3 reactors, which suffered meltdowns.

Removal of spent nuclear fuel in those three reactor buildings is expected to begin in 2015, at the earliest.

TEPCO hopes to start removing the melted fuel from the No. 1 to No. 3 reactors in fiscal 2020.

## **Removal of nuclear fuel begins at Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20131118\\_30.html](http://www3.nhk.or.jp/nhkworld/english/news/20131118_30.html)

The operator of the Fukushima Daiichi nuclear power plant has begun removing nuclear fuel from a storage pool at a damaged reactor building.

Workers placed a special fuel transport container in the storage pool of the Number 4 reactor building.

The pool holds 1,533 units of nuclear fuel, of which 1,331 are highly radioactive spent fuel. The rest are unused.

At around 3PM on Monday, the workers started to hoist the unused fuel units into the steel container, which can store 22 units of fuel. The utility decided to remove these units first as they do not release high levels of radiation and heat.

The first 22 units will be transferred into the container through Monday night.

Workers will then use a crane to lift the container out, and they will then move it to another storage pool 100 meters away.

But bits of debris in the pool of the Number 4 reactor building could obstruct the work. The building was damaged by a hydrogen explosion in March, 2011. Workers may also find undetected damage to the fuel units.

The removal work requires extreme caution, as any damage to the units could release high-level radiation.

The start of the work is the first step in an unprecedented decommissioning process that is expected to take 40 years.

Tokyo Electric Power Company plans to finish removing all nuclear fuel from the Number 4 reactor building by the end of next year.

## **Nuclear fuel removal procedure**

[http://www3.nhk.or.jp/nhkworld/english/news/20131118\\_26.html](http://www3.nhk.or.jp/nhkworld/english/news/20131118_26.html)

The removal of nuclear fuel units from the storage pool of the No.4 reactor building is expected to be completed by the end of next year if all goes well.

The pool contains 1,533 units. Nearly 90 percent of them are spent fuel rods, which continue to emit high levels of radiation and heat.

Spent fuel contains about one percent plutonium by weight.

The spent fuel units at the No.4 reactor building have been in the storage pool for at least 3 years. Each is said to have up to 7,500 trillion becquerels of radioactivity. Because of this, the units are stored in water that can block radiation.

When the units are taken out of the pool, they are put in a special steel container called a "cask," which is capable of blocking the radiation and heat.

A cask can hold up to 22 units. Workers will seal the filled cask and lift it out of the pool with a large crane. The work to remove one cask will take about 12 hours over a 2-day period.

Workers will then ensure that no radioactive substances are leaking and transport the fuel to another storage pool about 100 meters away. The utility officials say this process takes 8 to 10 days.

The first cask will transport unused fuel units. The officials say that if the work goes well, they will consider removing spent fuel units starting with the second one.

## No.4 pool fuel removal begins

### Reactor 4 pool fuel removal begins

<http://www.japantimes.co.jp/news/2013/11/18/national/reactor-4-pool-fuel-removal-begins/#.UopkwyewT9k>

Yearlong effort aims to lower potent rods to safer storage



*by Kazuaki Nagata*

Staff Writer

Tokyo Electric Power Co. started a yearlong operation Monday to remove hundreds of nuclear fuel assemblies stored atop reactor 4 at the Fukushima No. 1 power plant to prevent the rods from causing another radiation catastrophe.

The building housing reactor 4 was hit by a hydrogen explosion in the early stages of the triple meltdown triggered by the March 11, 2011, Great East Japan Earthquake and giant tsunami it spawned.

The explosion blew off the roof, exposing the spent-fuel pool on the fifth floor to the sky and falling debris. Tepco has since built a steel-framed cover to protect it from the elements, but getting the fuel out of the damaged building will allow the utility to monitor and safeguard it more easily and safely.

The pool contains 1,533 fuel rod assemblies, 202 of which are fresh. The utility plans to remove the fresh ones first.

The 4.5-meter-long assemblies will be lifted out of their racks individually by using a fuel handling machine similar to a hoist. They will then be placed into special transport casks waiting inside.

“Today we reached an important milestone in our work at the Fukushima No. 1 plant,” Tepco President Naomi Hirose said in a video message on the utility’s website.

Hirose said this would be one of the biggest tasks in the plant’s decades-long decommissioning process. “The success of the extraction process therefore represents the beginning of a new and important chapter,” he said.

Tepco said it did some preparation work in the morning and began extracting the fuel at 3:18 p.m. The first one entered the transport cask at 3:57 p.m., and a total of four had been inserted by 6:45 p.m.

Hirose said that although the beleaguered utility has performed more than 1,000 fuel assembly removals in the past, it is well aware that special care must be taken this time.

One transport cask can hold 22 assemblies. Once full, it will be loaded onto a trailer to be moved to an undamaged building where a common pool will keep them secure.

Experts have warned that the removal task should be handled very carefully to avoid dropping and damaging the fuel, which might cause a release of radioactive materials, although it would be below the legal limit.

The pool still contains small amounts of debris from the explosion that might get entangled with the assemblies and racks, causing the hoist to jam.

Tepco says it has taken several precautions. For instance, the wires for the fuel handling machine and the crane for raising the transport casks have been doubled. And the hooks have been designed to hold the assemblies and casks in place even if the power is cut off.

While the fuel removal operation is seen as a milestone, it is expected to take 30 to 40 years to decommission the plant.

The spent-fuel pools in reactor buildings 1, 2 and 3 are also filled with assemblies, but removing them will take a few years.

It will take even longer to remove the molten fuel in the three reactors hit by meltdowns.

November 19, 2013

## Day 2

## **Day 2 of nuclear fuel removal at Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20131119\\_29.html](http://www3.nhk.or.jp/nhkworld/english/news/20131119_29.html)

Tuesday marked the 2nd day of nuclear fuel removal from a damaged reactor building at the Fukushima Daiichi nuclear power plant.

The storage pool at the Number 4 reactor building holds 1,533 units of nuclear fuel. 1,331 of them are highly radioactive spent fuel and the rest are unused.

It took workers about 3-and-a-half hours to transfer 4 units of unused fuel into a special fuel transport container placed into the pool.

Tokyo Electric Power Company officials say the units are being hoisted slowly from their racks to avoid small bits of debris.

It says underwater cameras monitor the process when the fuel units are placed in the container.

TEPCO says because the process takes time it began the work on Tuesday at 9AM, one hour earlier than scheduled, and will extend the operation by 2 hours to about 9PM.

Officials say they hope to move 18 units on Tuesday. If a total of 22 units are transferred by the end of Tuesday's operation, the container will be raised out of the pool with a large crane on Wednesday.

Nov. 19, 2013 - Updated 06:48 UTC

## **Fuel removal work at Fukushima No. 4 spent fuel pool enters 2nd day**

<http://mainichi.jp/english/english/newsselect/news/20131119p2g00m0dm072000c.html>



TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Tuesday that work to remove fuel from the spent fuel pool at the No. 4 reactor building had entered a second day.

On Monday, workers successfully extracted four unused fuel assemblies from the fuel rack and placed them in a transportation container that will be taken to a different pool at the plant, which will provide more stable conditions for keeping the fuel cool.



The spent fuel pool, located on the top floor of the reactor building, holds 1,533 fuel assemblies, including 202 unused ones. TEPCO plans to finish the removal work by the end of 2014.

A fuel assembly is a bundle of fuel rods comprised of zirconium metal tubes with pellets inside. The pellets, made of uranium, serve as the actual fuel for nuclear reactors.

Once the transportation container is filled with 22 fuel assemblies, workers will load it onto a trailer and take it to another pool around 100 meters away. It is expected to take about a week to complete the work cycle.

The mission requires extreme prudence, as it is an unprecedented attempt to remove fuel from a building that saw its roof and walls blown up by a hydrogen explosion in the 2011 nuclear crisis.

As for preparations to achieve the task, TEPCO has cleared large pieces of rubble that fell on the upper floor of the reactor building as a result of the explosion and created a huge steel-framed cover to blanket the reactor building.

During the nuclear crisis triggered by a huge earthquake and tsunami on March 2011, the Nos. 1 to 3 reactors experienced core meltdowns.

The No. 4 unit, however, only suffered a hydrogen explosion as all of its fuel was stored in the spent fuel pool because the reactor was undergoing periodic maintenance work at the time.

## **AFP: Fuel rod removal**

### **TEPCO tackles delicate fuel rod removal at Fukushima**

[http://voiceofrussia.com/uk/news/2013\\_11\\_19/TEPCO-tackles-delicate-fuel-rod-removal-at-Fukushima-7624/](http://voiceofrussia.com/uk/news/2013_11_19/TEPCO-tackles-delicate-fuel-rod-removal-at-Fukushima-7624/)

AFP

**The operator of the crippled Fukushima nuclear plant on Tuesday offered the first glimpse of the operation to remove its fuel rods. Video footage supplied by the company showed Tokyo Electric**



## **Power (TEPCO) workers with protective suits inside a reactor building as a crane lowered a huge metal cask into a storage pool filled with uranium and plutonium rods.**

**Read more:**

Removal of the fuel rods is the most dangerous job since the runaway reactors were brought under control two years ago

The nuclear fuel rods are bundled together in assemblies which must be pulled out of the storage pool where they were being kept when a tsunami smashed into Fukushima in March 2011. There are more than 1,500 such assemblies in the pool.

Removal of the fuel rods is a tricky but essential step in the decommissioning of the complex, which is expected to take decades.

On Monday, the company said it expects to remove 22 assemblies over two days, with the entire operation scheduled to run for more than a year.

The huge crane, with a remote-controlled grabber, is hooked onto the assemblies, placing them inside the fully immersed cask.

The 91-tonne cask will then be hauled from the pool to be loaded onto a trailer and taken to a different storage pool about 100 metres (yards) away

TEPCO said the work was on schedule with the 22 assemblies expected to be placed inside the cask by Tuesday evening.

The reactor which the pool serves -- No. 4 -- was not in operation on March 11, 2011, when a massive earthquake triggered a killer tsunami that swept the Fukushima nuclear plant, triggering meltdown and explosions.

But the pool was heavily damaged and left at the mercy of earthquakes, storms or another tsunami.

The fuel assemblies needed to be kept in a more stable facility, but experts have warned that slip-ups in the removal operation could trigger a rapid deterioration in the situation.

TEPCO's efforts to contain the crisis have faced a string of setbacks and mechanical glitches which stoked widespread criticism of its handling of the worst nuclear accident in a generation.

The work that began Monday pales in comparison with the much more complex task that awaits engineers, who will have to remove the misshapen cores of three other reactors that went into meltdown.

### **UN experts to review progress**

UN nuclear experts will visit Japan again next week to review government efforts to shut down the devastated Fukushima nuclear plant and prevent further worrying leaks, the IAEA said Tuesday.

*"An IAEA expert team will visit Japan this month at the request of the Japanese government to review the efforts and plans to decommission TEPCO's Fukushima Daiichi nuclear power station,"* the International Atomic Energy Agency said in a statement.

The 19-strong mission will take place from November 25 to December 4, it said.

Tokyo has drawn up a long-term roadmap towards decommissioning the Fukushima plant, which saw the world's worst nuclear disaster in a generation when it went into meltdown after being hit by an earthquake and tsunami in March 2011.

*"The IAEA mission will assess that plan and, in particular, efforts to manage contaminated water at the accident site and to remove fuel assemblies from the Spent Fuel Pool in Reactor Unit 4,"*the Vienna-based UN nuclear watchdog said.  
(AFP, Voice of Russia)

## Video footage of fuel removal (TEPCO)

### **Tepco gives first glimpse of Fukushima fuel rod removal**

[http://www3.nhk.or.jp/nhkworld/english/news/20131119\\_46.html](http://www3.nhk.or.jp/nhkworld/english/news/20131119_46.html)  
AFP-JIJI

Tokyo Electric Power Co. has offered the first glimpse of the operation to remove fuel rods at the Fukushima No. 1 nuclear plant, the most dangerous job since the runaway reactors were brought under control two years ago.

Video footage supplied by Tepco on Tuesday showed workers with protective suits inside reactor building 4 as a crane lowered a huge metal cask into the cooling pool filled with uranium and plutonium rods.

The fuel rods are bundled together in assemblies that must be pulled out of the pool where they were being kept when the March 11, 2011, tsunami smashed into the Tohoku region. There are more than 1,500 assemblies in the pool.

Removal of the fuel rods is a tricky but essential step in decommissioning the complex, which is expected to take decades.

On Monday, the utility said it expects to remove 22 assemblies over two days, with the entire operation scheduled to run for more than a year.

The huge crane's remote-controlled grabber hooks onto the assemblies one by one and places them in the fully immersed cask.

The 91-ton cask will then be lowered to a trailer and taken to a different storage pool about 100 meters away

Tepco said the work was on schedule with 22 assemblies expected to be placed inside the cask by Tuesday evening.

The No. 4 reactor was not in operation when the crisis started in 2011.

But the pool was heavily damaged and left at the mercy of subsequent earthquakes, storms or tsunamis. The fuel assemblies need to be kept in a more stable facility, but experts have warned that mistakes in the removal operation could trigger a rapid deterioration in the situation.

Tepeco's efforts to contain the crisis have faced a string of setbacks and mechanical glitches, stoking widespread criticism of its handling of the worst nuclear accident in a generation.

The work that began Monday pales in comparison with the much more complex task that awaits engineers, who will have to remove the misshapen cores of the three reactors that went into meltdown.

November 20, 2013

## 22 removed

### **TEPCO to remove fuel from reactor building**

[http://www3.nhk.or.jp/nhkworld/english/news/20131120\\_45.html](http://www3.nhk.or.jp/nhkworld/english/news/20131120_45.html)

Tokyo Electric Power Company workers are continuing the process of removing fuel rods from the damaged Fukushima Daiichi nuclear power plant.

Workers on Monday began to remove 22 assemblies of unused fuel rods from racks in the storage pool of the Number 4 reactor building.

They took the 22 assemblies from a total of 1533 in the storage pool. Of the remaining assemblies, 1,331 contain highly radioactive spent fuel rods.

The workers completed by Tuesday night the transfer of the 22 assemblies into a transport container, or cask, within the same pool.

They used a crane on Wednesday to lift the cask out of the pool. They then worked within the reactor building to remove nuclear substances from the cask surface and to check for radioactive water leaks.

They plan on Thursday or later to move the cask out of the reactor building to another storage pool about 100 meters away.

That will mark the first time nuclear fuel rods have been moved outside any of the reactor buildings

### **Workers removing nuclear fuel from pool**

[http://www3.nhk.or.jp/nhkworld/english/news/20131120\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20131120_25.html)

Workers have begun removing nuclear fuel from a storage pool at the Fukushima Daiichi power plant. The procedure is a critical step in the decommissioning of the plant.

The work at the No. 4 reactor building began on Wednesday. Workers are using a crane to lift a container loaded with nuclear fuel out of the pool.

The container, called a "cask," can carry up to 22 fuel units and weighs 91 tons when fully loaded.

The crane is equipped with double cables and a system to mitigate shaking from earthquakes to prevent the cask from falling. Radioactive material could leak if this happens.

Once the cask is out of the pool, workers will remove radioactive substances from its surface, and transfer it to another storage pool about 100 meters away.

The workers have spent the past 2 days transferring nuclear fuel units into the container. They performed this part of the task inside the pool with an underwater camera. Small pieces of debris that fell into the pool during the 2011 accident have made it hard to see.

Tokyo Electric Power Company aims to complete the transfer of the fuel units at the No. 4 reactor building by the end of next year. The pool has 1,533 fuel units, and 1,331 of them contain highly radioactive spent fuel.

### **22 units of nuclear fuel moved to container**

[http://www3.nhk.or.jp/nhkworld/english/news/20131119\\_46.html](http://www3.nhk.or.jp/nhkworld/english/news/20131119_46.html)

The operator of the Fukushima Daiichi nuclear power plant has transferred a 22nd unit of nuclear fuel in a storage pool into a container at a damaged reactor building.

Tokyo Electric Power Company workers moved 18 unused nuclear fuel units into the container submerged in the pool at the Number 4 reactor building on Tuesday. 4 units had been put into the

container on Monday.

The firm plans to lift the container with maximum storage capacity of 22 units out of the pool using a large crane on Wednesday.

The pool holds 1,533 units, of which 1,331 are highly radioactive spent fuel. The rest are unused.

On Tuesday, workers began transferring the 18 unused units into the container at 9 AM, and finished at around 6:30 PM without trouble.

November 21, 2013

## **Trial operation of last ALPS line resumed**

### **Trial run of last ALPS line at Fukushima resumed**

[http://www3.nhk.or.jp/nhkworld/english/news/20131121\\_29.html](http://www3.nhk.or.jp/nhkworld/english/news/20131121_29.html)

The operator of Japan's damaged nuclear plant has resumed trial operation of the last of 3 lines of a key water decontamination system.

Officials of Tokyo Electric Power Company restarted the 3rd line of the Advanced Liquid Processing System, or ALPS, at the Fukushima Daiichi plant on Thursday.

The system is designed to remove from contaminated water 62 kinds of radioactive substances, excluding tritium.

But its test operation was suspended in June following leaks of unprocessed water from a tank due to corrosion.

The utility restarted the lines one by one after working to prevent further corrosion.

The officials say test runs so far have shown that the system is failing to fully remove 4 types of radioactive substances, including cobalt and antimony.

They say they will work to fix the system and confirm the effects of anti-corrosion measures before making it fully operational next year. ALPS was originally to be in full operation this autumn.

Tokyo Electric plans to add more lines to the system so that it will be able to process all radioactive water in the plant's storage tanks by March 2015.

November 22, 2013

## Three ALPS operating simultaneously for the first time

### Three ALPS systems undergoing tests at Fukushima No. 1

by Kazuaki Nagata

Staff Writer

Tokyo Electric Power Co. said all three systems of an advanced water processing machine known as ALPS are now in a test operations for the first time simultaneously.

The advanced liquid processing system can remove all radioactive materials except for tritium from tainted water, so its smooth and full-scale operation is a key to considerably reducing the high levels of radiation in the water being stored at the crippled Fukushima No. 1 plant.

The water treatment system has three individual processing systems, labeled A, B and C, and Tepco started the test operation of the B system Thursday. Each system can process about 250 tons daily.

Although all the three systems are in test operation now, the utility said the machine will basically be running the two systems simultaneously, while the remaining system stands by.

More than 300,000 tons of radioactive water are stored at Fukushima No. 1, and 400 tons of groundwater are entering the buildings housing the crippled reactors daily, much of it later flowing to the sea.

Tepco has been running other water cleanup systems, but they cannot remove as many radioactive materials as ALPS can, including strontium.

The utility had started running a test operation with the A system in March but had to stop it after finding corrosion holes in June. The test run was resumed with the C system in September, while the A system began again in late October.

Tepco spokesman Noriyuki Imaizumi said ALPS currently processes about 1,300 tons of radioactive water weekly.

He added that the utility is still not sure how long it will run the test operation and when real operations will begin.

During the test operation, Tepco will be checking whether ALPS can really clean up the radioactive materials below the legal limits and if the systems can withstand corrosion.

To speed up the filtering process, Tepco will add three more ALPS systems, and the government will pay to install another ALPS machine in about a year.

If all these new machines are installed and work smoothly, the utility will be able to process about 2,000 tons of water a day.

Tepco plans to clean up all of the tainted water through ALPS by the end of March 2015.

Because ALPS cannot remove tritium, Tepco hopes to discharge the processed water into the sea after diluting the tritium below the legal limit.

## **MESSAGE TO THE WORKERS OF FUKUSHIMA**

<http://kna-blog.blogspot.fr/2013/11/full-tyvek-jacket-aux-travailleurs-de.html>



To the workers of Fukushima.

To the first to intervene at the most terrible moments of the nuclear disaster

To those who - day after day - are up against an ever-worsening situation

To those who will have to replace them for many years to come.

To their families and loved ones

This is a message of gratitude and sympathy from France.

You may not be able to rely on your employers or your political leaders to treat you properly, but this doesn't mean you have to face these formidable problems on your own, only being rewarded by criticism in the press.

This may only be a meagre consolation to you, but we want you to know that many thousands of kilometers away, complete strangers, ordinary citizens like you are thinking of you and are grateful for your courage and your dedication.

You are important people who deserve every respect, given the responsibilities you are constantly shouldering, without recognition or reward.

Who can criticize the worker who unplugged the wrong pipe, pressed the wrong button or caused a tank to overflow, when training, precise instructions and means of control are so scarce?



Who can blame the worker who falls into depression when he is confronted by difficult working conditions that endanger his health and his life?

There are probably, throughout the world, millions of people like us who are on your side and count on you, who offer you their trust and moral support, and who don't forget you exist.

We don't know you personally, but like you, we are human beings and citizens of the Earth. We cannot do much to help you, but we want to say **thank you for what you do, thank you for the risks you are taking for us all. You have our heartfelt support.**

Thank you, "Fukushima 50" and all the brave people who from the very beginning of the disaster did not hesitate to risk their lives to prevent an even more dire situation.

Thank you to all these people whose name will never get mentioned but who contribute each day to the colossal task of keeping the radioactive peril at the Fukushima plant in check.

May our moral support and our thoughts reach you, your loved ones, and the families of the victims who have lost their health and their lives in this permanent battle.

----- Participants -----

Franck <http://kna-blog.blogspot.com>

Georges <http://www.vivre-apres-fukushima.fr/>

Odile <http://fukushima-is-still-news.over-blog.com/>

Pectine <http://pectineactualites.wordpress.com>

Pierre <http://www.fukushima-blog.com>

4 from AFAZ <http://afaz.at>

Paolo <http://www.aipri.blogspot.com>

Citizenperth <http://fukushimaemergencywhatcanwedo.blogspot.fr/>

----- Share this message -----

I would be very happy for other individuals or groups to express their support to those who struggle on the Fukushima battlefield.

Spread this message on your website or your blog, contact us for translations in other languages and/or to be added to the list of contributors.

Write your own support message if you wish, and circulate it too.

You can also send a traditional letter. Here is the mailing address of the "rear base" of workers at J-Village:

〒979-0513 福島県双葉郡楡葉町大字山田岡字美シ森 8 番 J ヴィレッジ内  
福島復興公社  
福島第一原発の作業員の皆様へ

Fukushima Revitalization Headquarters at J-Village  
8, Utsukushi-mori, Yamada-oka aza  
Naraha-machi oaza, Futaba-gun  
979-0513, Fukushima  
Japan

If there are enough of us to relay and multiply the impact of this fraternal support movement, if enough media echo it, then maybe this will encourage Japan to do something for these brave men.

Thanks to all of you,  
Franck  
Kna-blog.blogspot.com

November 28, 2013

## Forget radioactive groundwater

### **Tepco puts off removal of radioactive groundwater at Fukushima No. 1 plant**

JJI

<http://www.japantimes.co.jp/news/2013/11/28/national/tepco-puts-off-removal-of-radioactive-groundwater-at-fukushima-no-1-plant/#.UpeSwCfij9k>

Tokyo Electric Power Co. said Thursday that **a shortage of water storage tanks** has forced it to postpone removal of radioactive groundwater at its crippled Fukushima No. 1 nuclear power station.

**The postponement would allow radioactive groundwater to continue to flow beyond soil hardened with chemicals between reactors 2 and 3 and into the sea.**

Early this month, about 6,000 becquerels per liter of strontium-90 and other beta ray-emitting radioactive substances were detected in groundwater in an observation well between the two reactors, far exceeding the standard for water to be released into the sea.

The plant's water storage capacity was 27,700 tons as of Tuesday, according to Tepco.

Meantime, the company plans to begin work next month at the earliest to remove large chunks of rubble from a spent fuel pool in the reactor 3 building, according to officials.

The decommissioning timetable adopted by the utility and the government calls for starting the removal of fuel assemblies from the reactor 3 pool in the April-September first half of fiscal 2015.

## **Oops - TEPCO should check its cables**

### **Workers accidentally drop camera inside Fukushima No. 3 unit pool**

<http://english.kyodonews.jp/news/2013/11/258955.html>

FUKUSHIMA, Japan, Nov. 28, Kyodo

Workers at the disaster-struck Fukushima Daiichi nuclear power plant on Thursday accidentally dropped an underwater camera inside the No. 3 unit spent fuel pool, but it is unlikely to have damaged nuclear fuel there, plant operator Tokyo Electric Power Co. said.

In the unit where the reactor core melted and the reactor building was severely damaged by a hydrogen explosion in the March 2011 crisis, TEPCO has been cleaning the upper floor to prepare for spent fuel removal. Workers were preparing to remove rubble in the pool when the camera was dropped, it said.

The monitoring camera, weighing about 5.5 kilograms and remotely controlled, dropped shortly after 11 a.m. when the cable suspending it from a crane snapped, and a safety device also did not work, TEPCO said.

## ALPS in trouble... again

**For some reason articles were published in French /Swiss newspapers more than 24 hours before i could get any info on this in a Japanese mainstream paper.**

December 2, 2013

### **ALPS system shut down over leak**

<http://www.japantimes.co.jp/news/2013/12/02/national/alps-system-shut-down-over-leak/#.UpyihCfij9k>

AFP-JJI

A trouble-prone system used to decontaminate radioactive water at the crippled Fukushima No. 1 nuclear power plant was switched off Sunday because of a chemical leak, Tokyo Electric Power Co. said.

Hydrochloric acid, used to neutralize alkaline water being decontaminated, was found seeping from a pipe joint, Tepco said in a statement.

The joint was wrapped in a vinyl bag to contain the leakage, Tepco said, adding it was investigating the cause of the trouble.

About 1 liter of hydrochloric acid has been contained in the bag.

The leak was found at one of three Advanced Liquid Processing System units designed to remove radioactivity from contaminated water at the plant, where a massive earthquake and tsunami in March 2011 sent nuclear reactors into meltdown.

The systems are expected to play a crucial role in treating huge amounts of toxic water accumulating at the plant.

The troubled system was one of two ALPS units that had been in trial operation and were scheduled to go into full operation Sunday.

In late September, plastic padding clogged up a drain in the same system, causing it to shut down. In October, it was halted due to a programming mistake.

Thousands of tons of water, used since the meltdown to cool reactors or polluted by other radioactive material, are being stored in huge tanks at the coastal complex.

A series of setbacks, including the flow of radioactive water into the Pacific Ocean, have eroded confidence that Asia's largest utility can tame the world's worst atomic disaster since Chernobyl.

December 3, 2013

## **Additional measures to control radioactive water**

### **Govt. panel urges additional wastewater measures**

[http://www3.nhk.or.jp/nhkworld/english/news/20131203\\_41.html](http://www3.nhk.or.jp/nhkworld/english/news/20131203_41.html)

A government panel has drafted a report on additional measures to control the radioactive wastewater accumulating at the damaged Fukushima Daiichi nuclear plant.

The panel in September announced drastic measures, such as freezing the soil around the reactor buildings to prevent groundwater from getting in.

On Tuesday, **the panel called for the rapid implementation of 5 backup measures, including building large storage tanks with double outer walls, and sealing cracks and piping holes with concrete.**

It says a plan to pave the ground with asphalt to prevent rainwater from seeping in will be effective, while a measure to surround the wall of frozen soil with another wall was put off for later discussion.

The panel also said the handling of wastewater containing radioactive **tritium** should be studied by a team of experts to be set up by the government this month.

The measures will be implemented **with reference to proposals by experts and engineers in Japan and abroad.**

December 5, 2013

## **Nuclear Watch: Inside Fukushima Daiichi**

<http://www3.nhk.or.jp/nhkworld/newsline/201312052313.html>

Visit of the pool at reactor no.4 by an NHK journalist.

"no room for error"

6 teams rotate in shifts of max. 2 hours a day.

Each team has 6 highly competent members (2 of them keep track of the radiation levels)

Workers have 50 times higher limits than civilians.

The workers at Fukushima have many stressful days ahead of them.

December 6, 2013

## **Highest radiation levels measured outside reactor**

[http://www3.nhk.or.jp/nhkworld/english/news/20131207\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20131207_01.html)

Tokyo Electric Power Company says radiation levels are extremely high in an area near a ventilation pipe at the crippled Fukushima Daiichi nuclear power plant.

TEPCO found radiation of 25 sieverts an hour on a duct, which connects reactor buildings and the 120-meter-tall ventilation pipe.

The estimated radiation level is the highest ever detected outside reactor buildings. People exposed to this level of radiation would die within 20 minutes.

The exhaust pipe in question was used to release radioactive gases following the outbreak of the accident 2 years ago.

TEPCO says radioactive substances could remain inside the pipes.

December 6, 2013

December 7, 2013

## Persistent (very high) radiation

### Record outdoor radiation level detected at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201312070041>

Tokyo Electric Power Co. said Dec. 6 it detected the highest estimated radiation level for an outdoor location at the crippled Fukushima No. 1 nuclear plant.

The reading of 25 sieverts per hour was taken **on steel piping near an exhaust stack for the No. 1 and No. 2 reactors**, TEPCO said.

The utility earlier said high radiation levels of at least 10 sieverts per hour were found on the piping.

TEPCO measured airborne radiation at eight locations around the piping to calculate surface radiation on two spots with particularly high readings, and found about 25 sieverts per hour and about 15 sieverts per hour, the company said.

**A TEPCO official said radioactive materials derived from melted fuel likely entered the piping during venting soon after the accident occurred in March 2011 and have remained there.**

## NHK video: It's only the beginning

December 10, 2013

## Quick contaminated water measures

### Govt. panel calls for quick wastewater measures

[http://www3.nhk.or.jp/nhkworld/english/news/20131210\\_46.html](http://www3.nhk.or.jp/nhkworld/english/news/20131210_46.html)

A government panel has called for quick backup measures to control radioactive wastewater accumulating at the damaged Fukushima Daiichi nuclear plant.

The government is working to freeze soil around the plant's reactor buildings to keep out groundwater. It's also building a wall along a coastal embankment to keep wastewater from seeping out to sea. But the measures are taking too long, and their effectiveness is in doubt.

The panel recommended a series of supplemental measures that include building double-walled storage tanks and sealing cracks in the buildings with concrete to keep out groundwater. It also called for paving large parts of the plant's compound with asphalt to keep rainwater out.

The panel also suggested that a team of experts assess the risks and technological challenges of handling wastewater containing radioactive tritium, and reach a conclusion by the end of March.

December 11, 2013

## What additional measures?

### Water woe solution: pave over No.1 land?

<http://www.japantimes.co.jp/news/2013/12/11/national/water-woe-solution-pave-over-no-1-land/#.UqhxQyfij9l>

by Kazuaki Nagata



Staff Writer

The government and Tokyo Electric Power Co. should take more measures to mitigate the radioactive water accumulating at the Fukushima No. 1 plant, including paving the land to block rainwater from seeping into the ground, a new report recommends.

If preventive and multilayer steps can be introduced, most of the risks posed by the tainted water can be taken care of by the end of fiscal 2020, says the report, which a panel submitted to the government Tuesday.

The panel, which consists of experts and Tepco and government officials, stresses the need to come up with additional measures in case steps already planned don't work.

For instance, the government is planning to create a sunken barrier of frozen soil around the buildings housing the crippled reactors to prevent 400 tons of groundwater from reaching their basements every day. The basements are already flooded with highly radioactive reactor coolant water, with the groundwater seeping in making matters worse.

Tepco also plans to repair wells around the buildings from which the groundwater can be pumped.

"The ice barrier and wells may be highly effective . . . but the level of difficulty to successfully implement them is technically and socially high," the report says.

Thus, it says, additional measures are necessary and suggests paving the surface and installing another underground wall, but rather than freezing the soil, this one should be constructed with a hard substance.

According to a simulation by the panel, if 1 sq. km of area west of the reactor buildings is paved with asphalt or a similar material, the amount of groundwater seeping into the reactor buildings would be reduced to 300 tons a day.

The amount would be reduced to 170 tons if the additional hard barrier is set up in an area west of the plant, according to the simulation.

Other measures suggested by the panel include preparing bigger and stronger tanks to store the radioactive coolant water and making the water barrier fences around the tank complexes higher.

The report says the tritium in the water will remain a challenge as there is no technology to separate that radioactive isotope out quickly and effectively.

Tepco is test-operating ALPS (advanced liquid processing system), a machine that can remove all radioactive materials except tritium from tainted water.

About 400,000 tons of tainted water is currently stored at the plant and the utility is planning to process all with the ALPS by the end of fiscal 2014.

The panel plans to set up a task force that will focus on the tritium problem. Some 300 to 400 tons of radioactive groundwater meanwhile flows under the plant to the Pacific daily.

December 12, 2013

**Not so reassuring**

## Increased Radiation Readings Linked To Groundwater Control, Says Tepco

<http://www.nucnet.org/all-the-news/2013/12/12/increased-radiation-readings-linked-to-groundwater-control-says-tepco>

A gradual rise in radiation readings at a test well at the Fukushima-Daiichi nuclear power station appears to be the result of successful efforts to pump groundwater and divert it from flowing into the ocean, operator Tokyo Electric Power Company (Tepco) said.

Tepco said the level of total beta radioactivity (all- $\beta$ ) at the test wells between units 1 and 2 had been monitored since 26 September and remained at levels between 400,000 and 880,000 becquerels per litre (Bq/ $\ell$ ) until 17 October.

On 21 and 24 October, the all- $\beta$  radioactivity levels dropped to their lowest levels at this location: 390,000 Bq/ $\ell$  and 310,000 Bq/ $\ell$  respectively.

However, from 28 October onwards, beta radioactivity readings of samples from test well number 1-16 between Units 1 and 2 began to increase and reached 1,100,000 Bq/ $\ell$  on 28 November and 1,300,000 Bq/ $\ell$  on 2 December.

Measurements for the same period show that the levels of caesium-134 (Cs-134) and -137 (Cs-137), ruthenium-106 (Ru-106), manganese-54 (Mn-54), cobalt-60 (Co-60), and antimony-125 (Sb-125) did not change significantly. Only the level of tritium (H-3) increased considerably.

Tepco engineers said they believe the increase was associated with the residual highly contaminated water that leaked from Unit 2 into the ground in the first month after the earthquake and tsunami that caused the accident at the plant.

Tepco said the increase in all- $\beta$  radioactivity in the test wells might be due to efforts begun on 8 July 2013 to control the flow of contaminated groundwater towards the ocean. Those efforts have included ground improvement work and pumping of groundwater from the area in which it was being contaminated.

Tepco said it is "significant" that there has been no change in the radiation density readings of seawater along with the reported increases in the groundwater.

Lake Barrett, a former US department of energy official and currently advisor to Tepco, said the situation has to be monitored carefully, but **there is no increased level of risk to workers, the public, or the environment.**

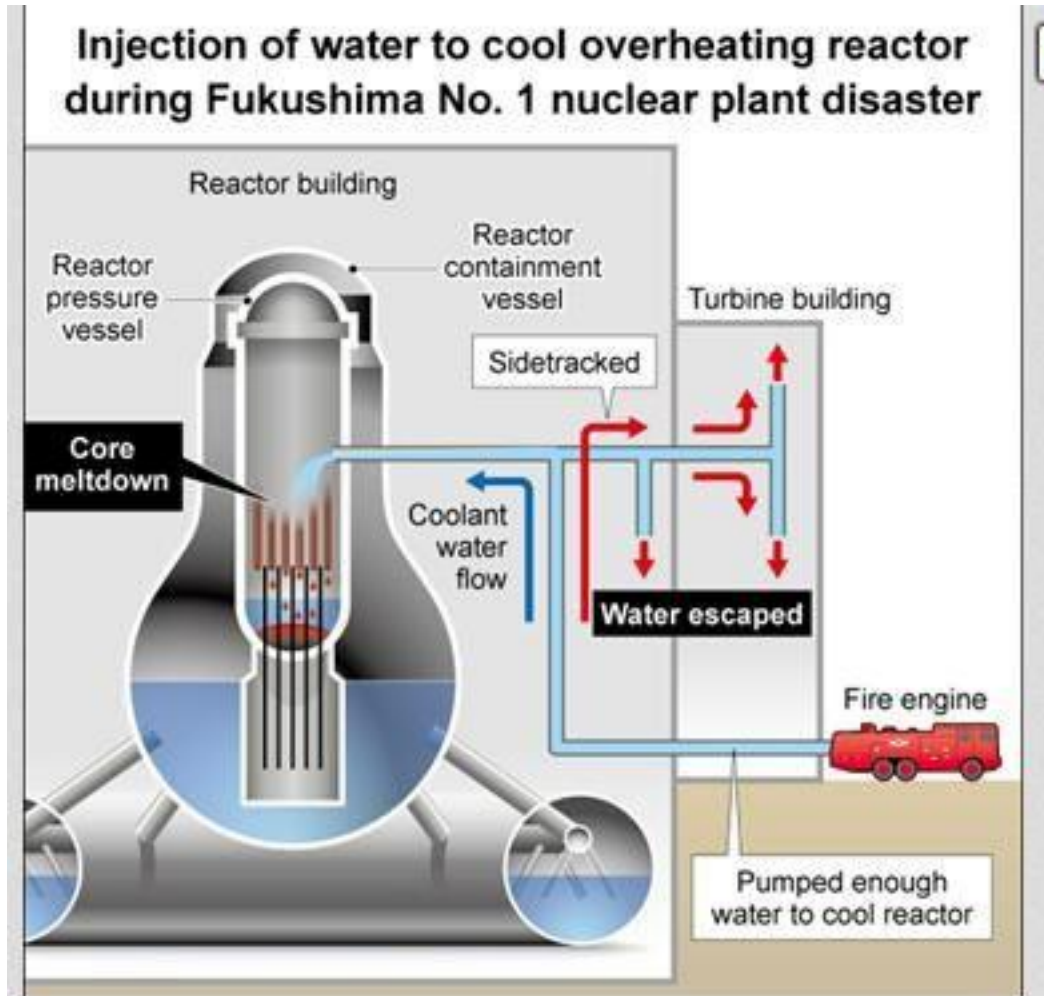
"While the rise in radiation readings is an obvious concern that needs to be carefully monitored, in some respects it is an indication of the success of Tepco's concerted efforts to isolate contaminated water and prevent its flow into the sea," Mr Barrett said.

December 14, 2013

## "Desperate and ultimately futile"

**TEPCO: Not all pumped-in water reached overheating Fukushima reactors**

<http://ajw.asahi.com/article/0311disaster/analysis/AJ201312140030>



Fire engines were used in a desperate, and ultimately futile, attempt to pump water to cool overheating reactors during the early phase of the 2011 Fukushima No. 1 nuclear power plant disaster, Tokyo Electric Power Co. said.

According to a Dec. 13 report by the operator of the crippled facility, water was pumped in sufficient quantity to avert core meltdowns in the No. 1, No. 2 and No. 3 reactors, but much of it strayed into irrelevant pipes and ended up elsewhere.

In the report, TEPCO singled out 52 issues that had been left unanswered in its June 2012 investigation on the disaster triggered by the Great East Japan Earthquake and tsunami. The utility said it will find answers to those questions within two years.

The Dec. 13 report covered analysis results for 10 of those issues.

Equipment to cool reactor cores failed and quickly became unusable following the temblors at the Fukushima plant. For this reason, fire engines were connected via hoses to the piping system of the nuclear reactors to pump in water to cool them.

TEPCO said more than seven times the requisite volume of cooling water was pumped into the No. 2 reactor. But the water failed to cool it and the other reactors efficiently, and could not stop the core meltdowns in the No. 1, No. 2 and No. 3 reactors.

An examination of pipe diagrams and related equipment showed the pipes to the reactors had branches leading off to other areas and devices, such as condensation storage tanks. TEPCO concluded that too much of the pumped-in water leaked into those branches and never reached the reactors.

**TEPCO officials said they knew as early as late March 2011 about those leakage routes.**

**"We should have shared the finding with the public in the belief it would help promote universal safety, but failed to do so,"** said TEPCO Managing Executive Officer Takafumi Anegawa.

The utility has installed electric valves in reactors at its idled Kashiwazaki-Kariwa nuclear power plant in Niigata Prefecture to avert a similar problem during an emergency, the utility said.

TEPCO also said the high pressure coolant injection (HPCI) system for emergency use lost part of its functions early in the No. 3 reactor, which was rocked by a hydrogen explosion.

The government's investigation committee said a manual shutdown of the HPCI system interrupted the cooling operations, which exacerbated the nuclear crisis.

But TEPCO took exception to that theory and said the HPCI system had already lost part of its functions by the time it was shut down manually, because nuclear fuel had become exposed very quickly following the manual shutdown.

**That means nuclear fuel in the No. 3 reactor may be more damaged than an earlier study indicated.** This suggests more melted fuel may have fallen outside the reactor pressure vessel, TEPCO said.

The utility added that the sharp pressure drop in the No. 3 reactor at 9 a.m. on March 13, 2011, was likely due to the activation of its automatic depressurization system, and dismissed the theory that the pressure dropped when a hole opened in a key component, such as the reactor itself.

### **Fire trucks' coolant water did not fully reach reactor cores: TEPCO**

<http://mainichi.jp/english/english/newsselect/news/20131214p2g00m0dm005000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co., the operator of the crisis-hit Fukushima Daiichi nuclear plant, said Friday it is highly likely that coolant water injected by fire trucks immediately after the accident on March 11, 2011 did not fully reach reactor cores where meltdowns occurred.

TEPCO, which has been looking into developments at the plant in the early days of the disaster, said it has confirmed that water supplied by fire trucks flowed into some pipes not leading to cores at the Nos. 1 to 3 reactors.

The utility said the amount of coolant water provided by fire trucks as an emergency measure was several times the amount needed to cool reactor cores, but part of the water was unexpectedly diverted to pipes not connected to the cores.

The company also said workers could not operate valves to keep coolant water from flowing into unintended pipes due to high dose of radiation at the plant.

TEPCO said if the prepared water was fully injected from fire trucks into reactor cores, it could at least have slowed melting of the fuel.

The Nos. 1 to 3 reactors suffered meltdowns as a tsunami triggered by the devastating earthquake flooded electrical equipment and disabled key cooling functions at the units.

The company examined water flow in the pipes as it unexpectedly confirmed the existence of a considerable amount of water at a steam condenser at the No. 2 reactor in late March 2011.

The utility also said it is possible that the amount of coolant water injected into the core of the No. 3 reactor had fallen before workers manually stopped a high pressure coolant injection system.

As for reasons behind a sharp fall in pressure at the No. 3 reactor pressure vessel on March 13, 2011, TEPCO said it is highly likely a valve opened to reduce pressure as the automatic decompression system was turned on by coincidence.

The company had previously pointed to the possibility that the reactor pressure vessel had a hole.

December 14, 2013(Mainichi Japan)

## Record 1.8 million Bq of beta-ray sources

### Record radiation levels detected in well at Fukushima nuke plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201312140043>

A record 1.8 million becquerels of beta-ray sources per liter of water were detected at a monitoring well at the crippled Fukushima No. 1 nuclear power plant, operator Tokyo Electric Power Co. said Dec. 13.

The reading concerns strontium and other beta-ray sources.

The water was sampled at a monitoring well in an area close to the sea near the No. 2 reactor building on Dec. 12. The well is located close to trenches holding highly radioactive water.

TEPCO said the reading apparently spiked after highly radioactive water seeped into the surroundings through failed parts of the trenches.

December 20, 2013

## Contamination of deeper groundwater may also cause leaking into ocean

### Radioactive cesium detected in deeper groundwater

[http://www3.nhk.or.jp/nhkworld/english/news/20131221\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20131221_02.html)

Tokyo Electric Power Company says radioactive substances have been detected in water samples taken from deep underground at the crippled Fukushima Daiichi nuclear power plant.

Highly radioactive substances had been detected in previous months in shallow groundwater that was found to be leaking into the ocean.

But for the first time in December, TEPCO investigators detected radioactivity in groundwater taken from a layer 25 meters beneath the No. 4 reactor's well facing the ocean.

In a water sample taken on Tuesday of last week, 6.7 becquerels per liter of Cesium 137 and 89 becquerels per liter of strontium and other beta ray-emitting radioactive substances were detected. TEPCO officials say radioactive substances may have been mistakenly mixed during the process of getting the sample.

But they are concerned that if contamination of deeper layers of groundwater is confirmed, it could be another source that is leaking into the ocean. The inspectors plan a further examination.

Meanwhile, at the No. 2 reactor, the density of beta ray-emitting radioactivity in groundwater has been rising since November. On Thursday

December 21, 2013

## **New leak at No.2?**

### **TEPCO detects record radiation at Fukushima's reactor 2, new leak suspected**

<http://rt.com/news/fukushima-record-radiation-leak-616/>



No. 2 reactor buildings of the crippled Fukushima Dai-ichi Nuclear power plant (AFP Photo / Pool)

TEPCO has found a record 1.9 million becquerels per liter of beta ray-emitting radioactive substances at its No.2 reactor. Also radioactive cesium was detected in deeper groundwater at No.4 unit's well, as fears grow of a new leak into the ocean.

The level of beta ray-emitting radioactivity in groundwater around the crippled Fukushima reactor No. 2 reactor has been rising since November, NHK reported.

Previous the highest level – 1.8 million becquerels (bq/liter), of beta-ray sources per liter - was registered at reactor No.1 on December 13.

Meanwhile, TEPCO's latest examination of deeper groundwater beneath the #4 reactor's well has raised new concerns that there might be another source of radioactive substances leakage into the ocean.

For the first time, the analysis of water samples taken from a layer 25 meters beneath the No. 4 reactor's well that is facing the ocean has revealed radioactivity in groundwater.

TEPCO investigators detected 6.7 bq/liter of Cesium 137 and 89 bq/liter of strontium as well as other beta ray-emitting radioactive substances.

However, the company's officials said that it is early to talk about a hotspot of radiation leak and more examinations are needed to prove that. TEPCO suggested that current numbers could be wrong because radioactive substances may have been mistakenly mixed during the process of getting the sample.

Leakage of radiation-contaminated water has been the major threat to Japan's population and environment from the very beginning of the Fukushima disaster in March 2011.

Only in late July 2013 did TEPCO acknowledge the fact that contaminated water is escaping from basements and trenches of the Fukushima plant into the ocean.



Since then, TEPCO reported about two major leaks of highly radioactive water into the ocean from storage tanks – a 300-ton leak in August and 430 liters in October.

December 23, 2013

## New leaks from tank barrier - New counter-measures?

### TEPCO: New leaks found in barriers surrounding water storage tanks in Fukushima

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201312230058>



Storage tanks for contaminated water at the Fukushima No. 1 nuclear power plant. A barrier surrounding the tank is seen. (Pool)

Barriers surrounding storage tanks of radioactive water at the Fukushima No. 1 nuclear power plant were found to have four leaks in two tank areas, operator Tokyo Electric Power Co. said.

The company estimated that a maximum of 1.6 tons and 1 ton of contaminated water leaked from two spots of a barrier at one storage tank area on Dec. 21 and Dec. 22, respectively.

Radioactive strontium measuring 190 becquerels per liter, exceeding TEPCO's tentative limit of less than 10 becquerels, was detected in water at the location on Dec. 22.

An estimated 0.8 ton of water leaked from two spots at a different barrier surrounding storage tanks located to the southeast. Three becquerels per liter of radioactive strontium were detected from water in this barrier.

TEPCO officials said the leakage was found mainly in the vicinity of concrete joints of the barriers surrounding the storage tanks of highly contaminated water.

Measures to prevent the water from seeping into the ground have already been taken, the officials added.

### **TEPCO finds 3 more water leaks at Fukushima plant tank barriers**

<http://mainichi.jp/english/english/newsselect/news/20131223p2g00m0dm033000c.html>

TOKYO (Kyodo) -- An estimated 1.8 tons of water has leaked through three newly discovered breaches in concrete barriers around clusters of tanks storing radiation-contaminated water at the stricken Fukushima Daiichi nuclear plant, Tokyo Electric Power Co. said late Sunday.

The finding follows a similar leakage of about 1.6 tons found Saturday.

The latest leaks were confirmed at barriers for two tank clusters, with water piling up 6 centimeters deep inside one of the barriers due to several days of rain and leaking through a gap between the barrier and its base, the plant operator said.

The leaked water is not believed to have flowed into the sea because there is no drainage ditch nearby, the utility said.

At the other cluster, water was confirmed to have leaked from below the barrier and also from a crack in the barrier, it said, adding it is investigating the situation.

The barriers, about 30 centimeters high, have been created around each of the 23 clusters of tanks holding highly radioactive water to block the water from spreading outside when a leak occurs in the tanks.

[ See also: ]

### **Tepco finds three more water leaks**

<http://www.japantimes.co.jp/news/2013/12/23/national/tepcos-finds-three-more-water-leaks/#.Urh4Bfvij9k>

Kyodo

About 1.8 tons of radioactive water has leaked out of three new breaches in the water retention barriers ringing the storage tanks at the Fukushima No. 1 nuclear plant, Tokyo Electric Power Co. said.

The announcement late Sunday followed a report Saturday that 1.6 tons of tainted water had leaked from other barriers set up around the clusters of tanks. The barriers are supposed to prevent any water seeping from the leaky tanks from spreading.

The leaks were confirmed at two tank clusters. Tepco said one of the barriers, holding 6 cm of water augmented by several days of rain, was leaking due to a gap between its wall and base.

The water isn't believed to have entered the sea because unlike previous cases, there is no drainage ditch nearby, the utility said.

At the second barrier, water was confirmed to have leaked both from the bottom and through a crack.

## **Water leaks found near Fukushima tank barrier**

[http://www3.nhk.or.jp/nhkworld/english/news/20131222\\_12.html](http://www3.nhk.or.jp/nhkworld/english/news/20131222_12.html)

The operator of the damaged Fukushima Daiichi nuclear power plant says 1.6 tons of radioactive water is estimated to have drained into the ground from the barrier surrounding tanks storing contaminated water.

TEPCO officials said they found water coming from the barrier's foundation joints on Saturday afternoon.

They also said they measured 93 becquerels per liter of strontium 90 in the water remaining within the fence. The radiation level is about 9 times the national limit for water allowed to be released from the barrier.

The officials said they believe cause of the leakage was deteriorated joints.

They also said that, from the radiation level, they believe the leaked water is not radioactive water from the tanks but rainwater that had collected inside the fence.

They added that they think the high level of strontium 90 was detected because the rainwater absorbed radioactive materials that have been spreading in the environment since the March 2011 accident.

They confirmed that no radioactive water leaked into the ocean, as there are no drainage systems leading to the sea near the site.

## **New fix may be needed for leaks from tank barrier**

[http://www3.nhk.or.jp/nhkworld/english/news/20131223\\_05.html](http://www3.nhk.or.jp/nhkworld/english/news/20131223_05.html)

The operator of the damaged Fukushima Daiichi nuclear plant says radioactive water may have leaked through barriers surrounding contaminated water tanks on the plant site.

TEPCO officials say an estimated 2.6 tons of water leaked through two seams on the concrete bottoms of barriers surrounding the tanks. The seams had been sealed with resin.

They say up to 190 becquerels per liter of strontium 90 were detected in the water inside the barrier. That radiation level is about 19 times the allowed national limit for radioactive water to be released from the barrier.

They say leaks were also found seeping through cracks at 2 other locations. Radiation levels in the water inside the barrier were within the safety limit.

The leaks through poorly made joints and from cracks in the barrier, rather than an overflow, may require TEPCO to take new countermeasures.

The utility has been working to raise the barrier after heavy rain in October caused water inside the barrier to overflow.

TEPCO officials confirmed that no radioactive water leaked into the ocean, as there are no drainage systems leading to the sea.

December 24, 2013

### **Falling water levels within barriers hint at leaks**

[http://www3.nhk.or.jp/nhkworld/english/news/20131224\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20131224_31.html)

The operator of the crippled Fukushima Daiichi nuclear power plant says water levels have dropped sharply inside another 2 barriers surrounding contaminated water tanks.

Tokyo Electric Power Company says its workers discovered the phenomenon on Tuesday at 2 barriers near the number 4 reactor building. The water levels in question were last checked on Friday.

TEPCO officials say the water levels dropped 11 centimeters from Friday inside one barrier, and 7 centimeters in the other.

They say nothing suggests that the water leaked into the surrounding ground. And they have noticed no changes in water levels in tanks in the area.

TEPCO officials say the water within the barriers contains up to 440 becquerels per liter of radioactive strontium---44 times the government limit for radioactive water to be released from the barrier.

The officials suspect that the water might have gradually seeped into the soil beneath the tank lots.

They plan to drain the water within the barriers and find out what caused the water levels to fall. The utility suspects cracks in the concrete barriers.

Contaminated water leaks from similar lots have already been discovered at 4 different locations over the weekend.

December 25, 2013

## 225 tons of radioactive water leaked from tank barriers

### **Tons of contaminated water likely leaked from barriers at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201312250044>

An estimated 225 tons of radioactive rainwater likely leaked from cracks in the barriers surrounding storage tanks at the crippled Fukushima No. 1 nuclear power plant, seeping into the surrounding soil, Tokyo Electric Power Co. said Dec. 24.

The utility said this appears to be the largest amount of radioactive rainwater escaping to date from the barriers around tanks holding contaminated water.

TEPCO plans to apply nonpermeable resin on the inside of the barriers to block future leaks.

The company said water levels inside the barriers of the H4 and H4-East storage areas dropped over four days through Dec. 24.

The water level at the H4-East area fell from 12 centimeters to 1 cm, suggesting a leak of 109 tons. The level at the H4 area dropped from 12 cm to 5 cm, indicating a leak of up to 116 tons.

A reading of 440 becquerels of radioactive strontium per liter was detected Dec. 20 in water in the barriers at the H4-East area. The reading at the H4 area was 20 becquerels per liter. Both figures exceeded TEPCO's provisional limit of less than 10 becquerels for releasing contaminated water.

The figures indicate that the rainwater has been contaminated by absorbing radioactive substances from the surface of the soil.

## **Radioactive water leaks at Fukushima plant again**

<http://mainichi.jp/english/english/newsselect/news/20131225p2a00m0na001000c.html>

Additional leaks of radioactive water at the crippled Fukushima No. 1 Nuclear Power Plant have been revealed following earlier leaks on Dec. 21 and 22.

On Dec. 24, plant operator Tokyo Electric Power Co. (TEPCO) announced that it had found lowered water levels within concrete boundaries set up around radioactive water-containing storage tanks in two areas. The zones were separate from two areas where water leaks occurred on Dec. 21 and 22.

Around 225 tons are suspected to have leaked in the latest incident, but the areas around the concrete boundaries were not wet. "The water may have seeped into the ground. We will investigate," a TEPCO representative said.

According to TEPCO, in one of the bounded areas contaminated water was around 12 centimeters deep on Dec. 20 but was reduced to around 5 centimeters on Dec. 24. In the other area, the water level fell from around 12 centimeters on Dec. 20 to around 1 centimeter on Dec. 24. The radioactive water contained concentrations of radioactive Strontium-90 that were as high as 440 becquerels per liter. TEPCO's temporary limit for the release of radioactive water from the concrete boundaries is that it contains less than 10 becquerels of Strontium-90 per liter.

Some 3.4 tons leaked on Dec. 21 and 22 and contained concentrations of up to 1,000 becquerels per liter of beta-ray releasing radioactive materials like Strontium-90. Possible reasons for those leaks given by TEPCO include a weakening of resin at the connection points of parts of the concrete boundaries and the opening of cracks in the concrete.

## **How to deal with tritium?**

### **Experts study how to deal with tritium**

[http://www3.nhk.or.jp/nhkworld/english/news/20131226\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20131226_03.html)

A panel of experts has begun to assess the risks and technological challenges of handling wastewater containing radioactive tritium at the crippled Fukushima Daiichi nuclear power plant.

The treatment of tritium poses a major challenge at the plant, as removing the substance from water has proven difficult.

Nine experts on radioactive substances and other fields met at the industry ministry on Wednesday. They aim to reach a conclusion by the end of March.

They agreed to identify the risks of keeping tritium-tainted water inside tanks, or releasing it into the ocean. They say they will also look into technical difficulties when developing technologies to remove tritium from water.

They say studying the different options will help determine what action will be the most feasible.

The ministry expects the tainted water at the plant will likely accumulate to about 800 thousand tons in the future.

A team from the International Atomic Energy Agency, dispatched to the plant earlier this month, compiled a report suggesting that Japan consider releasing the water into the ocean after it is diluted to below government-set standards.

The Japanese government will need to win the understanding of residents before undertaking the task.  
Dec. 25, 2013 - Updated 23:22 UTC

January 2, 2014

## **But who will trust TEPCO?**

### **Fukushima-Daiichi Unit 1 Accident Was Not Due To Coolant Loss, Says Tepco**

<http://www.nucnet.org/all-the-news/2014/01/02/fukushima-daiichi-unit-1-accident-was-not-due-to-coolant-loss-says-tepco>

The problems that led to core meltdown and fuel damage at Unit 1 of the Fukushima-Daiichi nuclear plant began as a direct result of the impact of the tsunami and not a loss of coolant from pipe failure caused by the earthquake, a report by plant operator Tokyo Electric Power Company says.

The Fukushima Nuclear Accident Independent Investigation Commission of Japan's Diet (parliament) had raised the possibility that the accident may have been the result of a loss of coolant because of earthquake-induced component damage and not the result of a loss of emergency power because of the tsunami, Tepco said in a statement.

If correct, this assumption would have contradicted the prevailing understanding that the facility had weathered the 9.0 magnitude earthquake, an important consideration for future designs incorporating seismic safety principles.

But the new report says Unit 1 survived the earthquake intact. Data recorded by wave metre records and other instruments, along with photographic sequences of the incoming tsunami, make it clear that the loss



of emergency diesel generator power caused by the tsunami, and the resulting failure of the cooling systems, caused the accident, Tepco said.

Tepco said the report was less conclusive on why water injected into Units 1, 2 and 3 from fire trucks in the immediate aftermath of the tsunami when cooling systems had failed was insufficient to cool the reactor cores and prevent meltdown.

It is possible, the report says, that the water found its way into other systems and failed to reach the core. Because of this, an investigation into the actual amount of water injected into the unit and its impact on the progress of the accident will be “a focus of continued study”.

The new report is the first progress report on Tepco’s continuing investigation into the causes of the crippling of three of the facility’s reactor units after the earthquake and subsequent tsunami of March 2011.

Units 1, 2 and 3 at the six-unit plant were in commercial operation at the time of the earthquake and tsunami and all suffered reactor core, fuel and containment damage.

The other three units did not suffer fuel damage. Unit 4 was offline and was not loaded with fuel, but the reactor building was severely damaged by a hydrogen explosion. Units 5 and 6 were offline, but were still fuelled.

The Tepco report is online:

[www.tepco.co.jp/en/press/corp-com/release/2013/1233165\\_5130.html](http://www.tepco.co.jp/en/press/corp-com/release/2013/1233165_5130.html) (links to main report and annexes, mostly in Japanese only);

[www.tepco.co.jp/en/press/corp-com/release/betu13\\_e/images/131213e0102.pdf](http://www.tepco.co.jp/en/press/corp-com/release/betu13_e/images/131213e0102.pdf) (main report in English).

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January 4, 2013

## **Cleaning up tunnels**

## **TEPCO to clean up Fukushima plant's tunnels**

[http://www3.nhk.or.jp/nhkworld/english/news/20140104\\_18.html](http://www3.nhk.or.jp/nhkworld/english/news/20140104_18.html)

The operator of the crippled Fukushima Daiichi nuclear plant is preparing to begin cleaning underground tunnels at the site after freezing the mouths of the tunnels.

The tunnels are believed to be one of the sources of radioactive materials that are polluting the groundwater at the facility on a large scale.

Tokyo Electric Power Company plans to block the flow of tainted water between the damaged buildings and the tunnels.

Workers will start burying pipes in the ground to carry refrigerants in January. They plan to begin draining the contaminated water from the tunnels in April after the freezing work is completed.

The operator will also begin testing a plan to freeze soil over a large area.

The eventual goal is to surround the reactor buildings and other facilities with walls of ice to prevent fresh ground water from seeping in beneath the facilities. A large amount of highly radioactive water has accumulated beneath the plant.

As for the decommission of the reactors, TEPCO will set up radiation monitoring equipment at various hot spots on the floors of reactor buildings this month. The readings will be used to support the decontamination work by robots that will follow.

TEPCO officials say they will also study how to remotely locate and repair holes in the reactor containment vessels. The vessels were broken in the nuclear accident.

January 8, 2014

## **ALPS stops again**

### **Decontamination system stops working**

[http://www3.nhk.or.jp/nhkworld/english/news/20140108\\_36.html](http://www3.nhk.or.jp/nhkworld/english/news/20140108_36.html)

Tokyo Electric Power Company on Wednesday stopped using its systems to decontaminate radioactive water at the Fukushima Daiichi nuclear power plant.

It has used the Advanced Liquid Processing System, or ALPS, to remove radioactive substances from

contaminated water stored at the site.

TEPCO officials say the crane to remove the container from the ALPS stopped working on Tuesday.

The container which stores radioactive substances has to be replaced when it gets full.

On Wednesday TEPCO stopped operating all 3 ALPS systems. It says **it may take long time to restart.**

The company intends to decontaminate all radioactive water stored in the tanks by March 2015.

January 10, 2014

## More radiation from tanks

### Radiation rises from Fukushima water tanks

[http://www3.nhk.or.jp/nhkworld/english/news/20140110\\_17.html](http://www3.nhk.or.jp/nhkworld/english/news/20140110_17.html)

Nuclear regulators will discuss measures to prevent the increase of radiation levels around the crippled Fukushima Daiichi plant.

The level of radiation at the plant's border rose to **more than 8 millisieverts in annualized figures** in December, from less than 1 millisievert in March in the same year.

The regulators say that's due to the increasing number of storage tanks for radioactive water at the plant. There are now about 1,000 tanks at the site.

They explained that **the water basically emits beta-rays, which are too weak to penetrate the steel tanks. But they say, when beta-rays hit metals, stronger X-rays come out of the tanks, affecting the environment.**

Japan's Nuclear Regulation Authority sets the limit for radiation doses at the plant's border at less than 1 millisievert per year. The current reading is 8 times the targeted limit.

On Friday, the regulators are holding a meeting of experts to discuss measures against the increase.

The officials say they have been aware of the problem for a certain period of time, but could not deal with it as they were occupied with the issue of contaminated water.

They said they will come up with measures against the rise as it is needed to reduce the radiation dose plant workers are exposed to.

## Radiation from tanks (2)

### Radiation levels near Fukushima plant boundary 8 times the government standard

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201401100083>

Radiation levels around the boundary of the crippled Fukushima No. 1 nuclear plant have risen to eight times the government standard of 1 millisievert per year, Tokyo Electric Power Co. said.

The Nuclear Regulation Authority is scheduled to hold a meeting Jan. 10 to discuss countermeasures for a southern area on the plant site that has long been a source of problems.

A level of 8 millisieverts per year was estimated as of December near an area with many storage tanks containing highly radioactive water, company officials said.

After water leaks from underground tanks on the plant's premises were found last April, the utility transferred radioactive water to the aboveground storage tanks near the southern boundary, TEPCO officials said. The readings there were estimated at 7.8 millisieverts per year as of May.

TEPCO said the main factor behind the increase in radiation levels was X-rays from the storage tanks.

Beta rays released from radioactive strontium and other substances in the water reacted with iron and other elements in the storage tank containers to generate the X-rays, the officials said.

The reactor decommissioning plan for the Fukushima plant stipulates that radiation levels around the boundaries of the facility should be below 1 millisievert per year. That way, TEPCO can minimize the negative impact of radiation on areas outside the plant, according to the plan.

With a succession of high radiation levels reported on the plant premises and elsewhere, the NRA set up radiation monitoring devices at an additional 400 locations in 12 cities, towns and villages around the stricken facility, including ones in evacuation zones.

According to the NRA, the number of locations where such instruments are set up has risen from 446 to 815. The newly installed devices started full-scale operations on Jan. 10.

The additional instruments were installed at centers for local community meetings and other places where residents will likely gather after they are allowed to return home.

The NRA measures air dose rates 0.5 to 1 meter above the ground every 10 minutes.

The monitoring results are available on the NRA's website at <http://radioactivity.nsr.go.jp/en/>  
(Akira Hatano contributed to this article.)

## **ALPS functional again**

### **TEPCO restarts water treatment system at Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20140110\\_38.html](http://www3.nhk.or.jp/nhkworld/english/news/20140110_38.html)

Tokyo Electric Power Company has restarted a system to treat radioactive wastewater at the crippled Fukushima Daiichi nuclear power plant.

TEPCO put the ALPS system back online on Friday.

A crane to transfer containers that store removed radioactive materials had stopped working on Tuesday.

One of the crane's 4 motors had broken down, but the utility confirmed that the crane works with just the remaining motors.

The company says it will replace the faulty motor and look into the cause of the breakdown.

ALPS is said to be able to remove almost all radioactive substances from wastewater.

TEPCO has been running the system on a test basis and hopes to start full operation in April.

Tackling the huge amount of water is a key step in dealing with the aftermath of the March 2011 accident.

But ALPS has been hit by a series of troubles and it remains unknown whether the system can operate reliably.

January 11, 2013

## Sounds familiar

### **TEPCO urged to address rising radiation level at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20140111p2g00m0dm018000c.html>

TOKYO (Kyodo) -- Nuclear regulators on Friday called on the operator of the crippled Fukushima Daiichi plant to take action to address the rising radiation level at the border of the plant's premises, which has become eight times higher than the regulatory limit.

According to Tokyo Electric Power Co., an evaluation of radiation exposure caused by toxic water, rubble and debris, and other waste kept at the plant was below the limit of 1 millisievert per year as of March, but increased to 7.8 millisieverts as of August.

The rise in the figure is attributed to radiation emitted from tanks storing contaminated water generated in the process of cooling the damaged reactors.

In April, TEPCO found some of its underground cisterns leaking water and had to transfer the contaminated water to tanks located near the site boundary.

The water stored in the tanks mainly contains strontium-90 and other beta ray-emitting radioactive material. Beta rays can be easily blocked by a thin sheet of metal, but X-rays, with greater ability to penetrate materials, are generated when beta rays hit the interior walls of the tanks, contributing to the rise in the radiation level at the border.

During a meeting of a panel, the Nuclear Regulation Authority and experts agreed that TEPCO should set a clear timeline on when it plans to bring the radiation level below the 1 millisievert limit.

They also pointed to the need to check whether the situation is improving every year.

Currently, areas close to the Fukushima plant are designated by the government as a zone where former residents will not easily be able to return.

January 16, 2014

### **Tackling Tainted Water (NHK video)**

<http://www3.nhk.or.jp/nhkworld/newsline/201401160500.html>

An impediment to starting decommissioning

How to dispose of all this water?

January 18, 2014

## Water leak inside No.3

### Water leak found inside Fukushima reactor building

[http://www3.nhk.or.jp/nhkworld/english/news/20140119\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20140119_01.html)

The operator of the crippled Fukushima Daiichi nuclear power plant says it has found water pouring into a drain inside the number 3 reactor building.

Tokyo Electric Power Company says it is yet to determine where the water comes from, or how much radioactive material it contains.

The company said that the water leak was spotted on the first floor of the reactor building on Saturday by a camera installed on a remote-controlled robot used for removing rubbles. It said that the water flow was about 30-centimeters wide and constant.

TEPCO added that the water is likely flowing toward the building's basement where a large amount of radioactive water has accumulated.

TEPCO says that inside the reactor building there is water for cooling melted fuel and water in the spent fuel storage pool. It says rain water may have entered the damaged building.

TEPCO is trying to find out the source of the leaking water by analyzing footage taken by the camera, as radiation levels are too high for workers to approach the site.

Jan. 18, 2014 - Updated 16:32 UTC

January 19, 2014



### **New leak found in Fukushima plant's wrecked No. 3 building**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201401190019>

By TOSHIO KAWADA/ Staff Writer

A new water leak, possibly from the effort to cool a crippled reactor, has been detected on the first floor of a reactor building at the Fukushima No. 1 nuclear power plant, Tokyo Electric Power Co. said Jan. 18.

TEPCO said workers discovered by a video feed that water was leaking on the first floor of the wrecked No. 3 reactor building earlier in the day.

The utility added that the water was flowing into the basement of the reactor building and not outside the structure. It is investigating the source of the leak.

TEPCO suggested the possibilities that the water was leaking from a pipe that is sending cooling water to the reactor or from the reactor containment vessel.

If the leak is from water being used to cool the reactor, it would be highly contaminated and a new headache for TEPCO and the government. A series of leaks from storage tanks of water that had been used



to cool the damaged reactors and problems with groundwater entering reactor buildings and mixing with radioactive water there has hampered the plant's decommissioning process.

TEPCO, however, said the latest leak could simply be rainwater draining off. The company said no signs of irregularity have been observed in terms of the operation to cool the reactor.

Radiation levels outside the building and the volume of water sent to cool the reactor and the temperature of the reactor remained the same, it added.

Workers spotted the leak in images sent by a remote-controlled robot when they were operating it to remove debris on the first floor of the building around 2:40 p.m.

The water was coming from near the door of a room housing the main steam isolation valve and flowing into a drain.

The flow was about 30 centimeters wide, and the amount of the leak and when it started were unknown, TEPCO said.

Radiation measured about 30 millisieverts per hour near the drain, not substantially different from levels found at other areas of the first floor.

### **Water leak spotted in reactor 3, Tepco says**

<http://www.japantimes.co.jp/news/2014/01/19/national/water-leak-spotted-in-reactor-3-tepco-says/#.Utv9C7Tj1u>

Water that could be tainted by radiation has been pouring into a drain on the first floor of reactor No. 3 at the Fukushima No. 1 power plant, Tokyo Electric Power Co. said.

The camera of a rubble-removing robot operating inside the No. 3 building has captured images of a 30-cm-wide water leak, the beleaguered utility said Saturday. It also claimed that none of the water has leaked outside the building so far.

Tepco, as the utility is known, is perpetually pumping water into reactors 1 through 3 to keep their melted cores cool, but leaks have been spotted in parts of No. 3's containment vessel. Tepco is investigating whether the water spotted by the camera is actually the coolant.

The radiation level on the first floor of the No. 3 reactor is a relatively high 30 millisieverts per hour. Tepco said the amount of radioactive material in the just-found leak is unknown because the radiation in the reactor building is already high.

January 20, 2014

## Probably not cooling water, nor rainwater

### TEPCO: Fukushima leak likely water used to cool nuclear fuel

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201401200049>

By AKIRA HATANO/ Staff Writer

Radiation levels indicate the leak discovered within the stricken Fukushima No. 1 nuclear plant involves water used to cool melted nuclear fuel, Tokyo Electric Power Co. said Jan. 19.

“The leaked water is highly likely to have come from the water that was already used to cool fuel rods, and not from leaked rainwater or cooling water (on its way to the reactor),” a TEPCO official said.

TEPCO said earlier that contaminated water was discovered on the first floor of the plant’s damaged No. 3 reactor building. At the time, the utility said water was flowing into the basement and not outside the building.

Due to high radiation levels, the company used a robot to take a water sample. An analysis found that **the concentration of radioactive materials was higher in the leaked water than in water destined to be used to cool the reactor or rainwater.**

The water sample contained 2.4 million becquerels per liter of radioactive cesium, while the reading for substances emitting beta rays, including strontium, reached 24 million becquerels per liter.

The temperature of the leaked water was around 20 degrees, also higher than that of unused cooling water and rainwater, TEPCO said.

The leak is the latest in a series that has plagued work in the sprawling nuclear complex. Storage tanks for radioactive water have leaked at the site, and groundwater has entered the basements of reactor buildings and mixed with contaminated water

January 28, 2014

## Work on frozen walls to start

### TEPCO to create frozen walls to stop water leaks

[http://www3.nhk.or.jp/nhkworld/english/news/20140129\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20140129_01.html)

Tokyo Electric Power Company is to begin work at the Fukushima Daiichi nuclear plant to stop radioactive wastewater from flowing into the sea.

The task of creating underground frozen walls is due to start at the Number 2 and Number 3 reactors on Wednesday.

Massive amounts of water are being poured into the reactors to prevent melted nuclear fuel from overheating.

Some of the water is contaminated with radioactive substances, and is leaking from the damaged reactor containment vessels.

The water has accumulated in the reactor buildings, adjacent turbine buildings and underground tunnels. TEPCO believes the water is leaking from the tunnels, seeping into the ground and reaching the sea.

Engineers will begin their work by digging vertical holes where the tunnels meet the turbine buildings. Pipes will be installed in the holes to inject liquid coolant to create frozen walls to block the water.

But cables and other objects in the tunnels could hamper the work. Engineers cannot go there because of the radioactive water, so they have to rely on images sent from remote-controlled cameras.

TEPCO hopes to finish installing the pipes by late March and to start removing 11,000 tons of wastewater from the tunnels in May, after the frozen walls are completed.

TEPCO is also digging wells in the compound to see whether water is leaking directly from the buildings.

January 29, 2014

## Seeking Source of Tainted Water (NHK video)

<http://www3.nhk.or.jp/nhkworld/newsline/201401291315.html>

It is urgent to block the flow of contaminated water by going to the sources but the problem is that workers have to inject water all the time (to cool the reactors). The water mixes with radioactive materials and becomes contaminated.

Then it mixes with the groundwater flowing underneath the plant.

A team of scientists/engineers have been building a small boat with a camera and a special cable to control the device. They have rehearsed using that boat with a model reactor (because of the very high levels next to the reactors). The idea was to drop the boat into the space around the containment vessel and use the camera to survey the area.

The levels of radiation are so high that the engineers can only walk there for 15 minutes and so they have to work in shifts.

The radiation level transmitted by the boat was 2000 millisieverts/hour. The photos also showed water gushing out of a broken pipe. Experts were shocked by the pictures.

The space between the metal containment vessel and the concrete that surrounds it is only 5 cm, making it difficult for engineers to get a picture of the crack to figure out how to fix it.

Everything depends on the ability of engineers to design new robots.  
“TEPCO is facing an uphill battle”.

January 30, 2014

## Strontium absorbent

### Strontium absorbent to be tested in Fukushima

[http://www3.nhk.or.jp/nhkworld/english/news/20140131\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20140131_01.html)

Workers at the crippled Fukushima Daiichi nuclear plant are trying to contain leaked and leaking radioactive wastewater in the site. They are using various approaches.

As part of their efforts, they will examine how much an absorbent material placed underground can remove radioactive strontium from leaked wastewater.

The plant has seen a string of radioactive water leaks from storage tanks starting last August. Workers have taken countermeasures, including removing soil from around the tanks. But high levels of radioactivity were detected in groundwater near a tank that leaked large amounts of radioactive water.

To prevent the contamination from spreading further, the government and Tokyo Electric Power Company will start testing the absorbent in February. This is one of the additional measures announced by a government taskforce in December to cope with wastewater leaks.

Workers will dig a 20-meter deep hole near the tank that leaked large quantities of radioactive water and bury the absorbent for strontium there to study its effectiveness.

The measure proved effective in a US nuclear facility. Some believe it won't be as successful with the salty water accumulated at the Fukushima plant.

Tokyo Electric plans to assess test results to decide around late February whether to fully introduce the absorbent.

January 31, 2014

## More investigations for leaks at No.1

### TEPCO to look for more leaks at Fukushima reactor

[http://www3.nhk.or.jp/nhkworld/english/news/20140131\\_04.html](http://www3.nhk.or.jp/nhkworld/english/news/20140131_04.html)

The operator of the Fukushima Daiichi nuclear plant is slowly finding out more about the damage at one of the reactor containment vessels. The destruction was caused by 2011 accident.

To cool molten nuclear fuel in their containment vessels the operator is injecting water into the No.1 to 3 reactors. Because the circulation system was destroyed by the accident the water is leaking from the vessels and pooling in the reactor and other connected buildings.

**The engineers are investigating leaks in a number of places in the containment vessel that houses the core at the No.1 reactor.**

In November, engineers using a camera-equipped robot discovered 2 leaks in lower part of the containment vessel.

They examined the images and other data, and have reached an estimate that up to 3.3 tons of water per hour is leaking from the 2 leaks.

The operator is pouring 4.5 tons of cooling water an hour into the reactor. This means more than one ton of water may be leaking from unknown holes or cracks, as the water does not stay in the containment vessel.

The engineers plan to use another robot to find other possible leaks. They will expand their search to include the suppression chamber linked to the containment vessel through a thick pipe.

## Radiation levels at plant perimeter need reduction

### TEPCO to lower radiation levels at plant perimeter

[http://www3.nhk.or.jp/nhkworld/english/news/20140201\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20140201_01.html)

Japan's Nuclear Regulation Authority has urged the operator of the damaged Fukushima Daiichi plant to lower radiation levels at the plant's perimeter.

Radiation levels measured at some locations were more than 8 millisieverts on an annual basis. The reading is 8 times the limit of 1 millisieverts per year set by the authority.

**The levels rose as the number of storage tanks for radioactive water at the plant increased and additional ones were placed near the perimeter.**

In a meeting with officials from Tokyo Electric Power Company on Friday, regulators demanded that radiation levels be lower than the limit by March 2016.

**Regulators said lowering the radiation level will likely diminish effects on the environment beyond the perimeter. They added that it will also reduce the radiation dose plant workers are exposed to.**

TEPCO officials said that because nearly 90 percent of the radiation at the edge of the plant comes from the storage tanks, the utility plans to decontaminate the waste stored in the tanks.

But experts have questioned whether the proposal can be implemented as planned. TEPCO officials are expected to devise a plan to achieve the target and announce it at the next meeting.

**Experts say that in addition to decontaminating the tank water, TEPCO needs to move contaminated debris and reduce the amount of radioactive substances contained in waste water.**

## **Closing in on Leaks (NHK video)**

<http://www3.nhk.or.jp/nhkworld/newsline/201401311305.html>

TEPCO is discovering more damage at the reactor containment vessel (No.1 reactor)  
In November, crews using a robot equipped with camera discovered two leaks in the containment vessel

Estimates : 3 tons of water leaking every hour + 1 ton leaking from elsewhere

TEPCO is going to check the suppression chamber too.

At the same time the operator is trying to control the leaking waste water on the site. They are to dig a hole to test strontium absorbent (used in the US at Hanford) but some fear that the absorbent will be less efficient due to the salt in the water.

February 3, 2014

## **Bypass the plant and then dump it into the sea**

### **Government explains groundwater bypass plan**

[http://www3.nhk.or.jp/nhkworld/english/news/20140203\\_29.html](http://www3.nhk.or.jp/nhkworld/english/news/20140203_29.html)



The Japanese government has sought the understanding from the nation's fisheries industry to release groundwater into the sea at the damaged Fukushima Daiichi nuclear power plant.

The government presented measures under a new policy to fisheries industry representatives on Monday.

At the Fukushima plant, groundwater flowing into reactor buildings coming into contact with water used to cool nuclear fuel continues to increase the amount of contaminated water.

The central government and the Tokyo Electric Power Company, or TEPCO, which operates the plant want to introduce a bypass plan for the groundwater.

The measure is aimed at reducing the amount of water flowing into the reactor buildings by altering the flow of groundwater.

The groundwater will be pumped up at the mountain side of the compound before it reaches the reactor buildings, where radioactive water has been accumulating, to reduce the amount that flows in. Then, the groundwater will be discharged into the sea.

But the government and TEPCO have yet to obtain consent from local fishermen following a string of leaks into the sea of contaminated water, which has raised concerns over harmful rumors.

Senior vice economy and industry minister Kazuyoshi Akaba met Chairman Hiroshi Kishi of the National Federation of Fisheries Cooperative Associations on Monday.

Akaba explained the measures to reduce the amount of contaminated water and new policies the government has been studying since last fall. Akaba reportedly told Kishi the radioactive levels of the water in the bypass plan will be set lower than the standard set by the state for releasing water into the sea. He also said the government will release information to the public to prevent harmful rumors.



After the meeting, Kishi said he acknowledges the need for the bypass plan, but it can't move ahead without the understanding of local fishermen. He also said he plans to make a final decision after carefully examining how the bypass process will be monitored, and measures to prevent harmful rumors.

Currently, 400 tons of groundwater is flowing into reactor buildings every day. The groundwater bypass plan is expected to reduce the amount by about 100 tons.

February 4, 2014

## How safe is this bypass system?

### Gov't seeks approval for dumping Fukushima plant groundwater into sea

<http://mainichi.jp/english/english/newsselect/news/20140204p2g00m0dm032000c.html>

TOKYO (Kyodo) -- The government on Monday sought approval of a nationwide fisheries federation to dump groundwater at the crippled Fukushima Daiichi nuclear complex into the sea on condition that the water's contamination level is far below the legal limit.

During talks with the head of the National Federation of Fisheries Co-operative Associations, industry ministry officials explained that they plan to set "strict" operational procedures for the pump system to allay the concerns of fishermen who think the move could deal a blow to their business.

Groundwater will be pumped out before it gets mixed with highly radioactive water accumulating at the basement of reactor buildings, and will be directed to the adjacent Pacific Ocean.

The measure is intended to prevent toxic water from continuing to accumulate at the nuclear plant site, but plant operator Tokyo Electric Power Co. has not been able to operate the system in the face of **local resistance** even after it finished installing a dozen pumping wells last March.

Currently, radioactive water, which is increasing by about 400 tons daily, is stored at hundreds of tanks TEPCO has set up at the plant's premises.

During the talks with the federation, the Economy, Trade and Industry Ministry officials proposed a more stringent maximum contamination level for judging the safety of water for release, compared with the legal limit.

The government and TEPCO believe the legal limit will be satisfied if the groundwater contains less than 10 becquerels per liter of beta ray-emitting radioactive material such as strontium-90, and 30,000 becquerels per liter of tritium, among other radioactive substances.

But they decided to set a goal to operate the system on the condition that the water contains less than 5 becquerels per liter of beta ray-emitting radioactive material, and 1,500 becquerels per liter of tritium.

The officials also said the radiation level of groundwater will be checked each time before releasing it into the sea and that **the operator will stop pumping out groundwater if its contamination level exceeds the limit.**

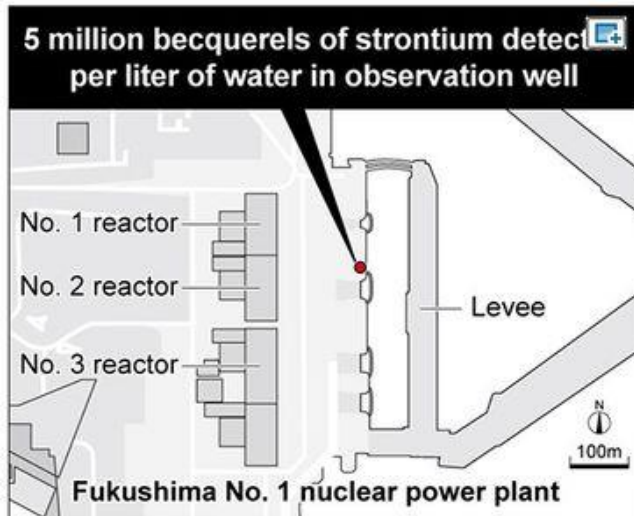
Hiroshi Kishi, the head of the federation, told reporters after the meeting that he understands the importance of the so-called groundwater bypass system and his organization will make a decision on giving a green light to the operation after fully assessing the environmental monitoring system and other measures to prevent the spread of harmful rumors.

February 7, 2014

## **Record-high 5 million becquerels of strontium per liter**

### **TEPCO revises strontium data at Fukushima plant to record level**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402070096>



Tokyo Electric Power Co. corrected its radioactivity readings for groundwater from a well at the crippled Fukushima No. 1 nuclear plant to a record-high 5 million becquerels of strontium per liter.

TEPCO officials said the strontium levels were gauged again because the previous data was wrong. They also said radioactivity readings for water taken from other wells before September were also likely erroneous.

The company had said 900,000 becquerels of beta-ray sources, including strontium, were detected in water taken on July 5, 2013, from the observation well near a water intake for the No. 2 reactor turbine building.

The new strontium data indicates that the concentration of all beta-ray sources totals around 10 million becquerels per liter of water, according to the company.

TEPCO did not announce radioactivity levels of 140 samples of groundwater and seawater taken between June and November after it found strontium readings that were higher than measurements for all beta-ray sources.

The company attributed contradictory data to malfunctions of analytical equipment.

The utility also said Feb. 6 that 600 liters of contaminated water, containing 2,800 becquerels of beta-ray sources per liter, leaked from piping leading to a tank at the Fukushima nuclear plant.

### **Record-high strontium-90 in past Fukushima plant groundwater sample**

<http://mainichi.jp/english/english/newsselect/news/20140207p2g00m0dm038000c.html>

FUKUSHIMA, Japan (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Thursday that a groundwater sample taken from a well at the site in July last year contained a record-high 5 million becquerels per liter of radioactive strontium-90.

Tokyo Electric Power Co. initially said that it had detected 900,000 becquerels per liter of beta ray-emitting radioactive substances, such as strontium, in the water sample taken July 5, but found problems in the measuring equipment in October.

Estimating from the strontium-90 readings, a TEPCO official said that "all beta radiation could have been 10 million becquerels in total."

Strontium tends to accumulate in bones and is thought to cause bone cancer and leukemia.

The utility also said it will reanalyze past water samples, as some of the figures cannot be trusted.

The observation well, which is 16 meters deep, is situated between the Nos. 1 and 2 reactors at the plant.

It is also about 25 meters from the Pacific Ocean and around 6 meters from an underground tunnel from which highly radioactive water was found to be seeping into the sea shortly after the nuclear crisis began in March 2011.

## **TEPCO has been using "improper measuring method"**

### **TEPCO to review erroneous radiation data**

[http://www3.nhk.or.jp/nhkworld/english/news/20140208\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20140208_02.html)

The operator of the damaged Fukushima Daiichi nuclear plant has decided to review radiation data after finding the initial readings may be much lower than actual figures.

Tokyo Electric Power Company, or TEPCO, says it has detected a record high 5 million becquerels per liter of radioactive strontium in groundwater collected last July from one of wells close to the ocean.

That's more than 160,000 times the state standard for radioactive wastewater normally released into the sea.

Based on the result, levels of radioactive substances that emit beta particles are estimated to be 10 million becquerels per liter, which is more than 10 times the initial reading.

TEPCO initially said it had detected 900,000 becquerels per liter of beta ray-emitting substances.

The utility attributes the error to the improper measuring method that had been used until last October. It says the readings of radioactivity can be measured as being lower than they actually are in the highly contaminated water.

TEPCO plans to review other data measured with the improper method, including the radiation level of around 300 tons of waste water that leaked from a storage tank in August.

An initial test of the leaked water found it contained up to 80-million becquerels per liter of beta ray-emitting substances, including strontium.

February 8, 2014

## **M5.0 quake hits Fukushima Prefecture**

### **M5.0, M4.8 quakes jolt Fukushima Pref.**

<http://mainichi.jp/english/english/newsselect/news/20140208p2g00m0dm026000c.html>

TOKYO (Kyodo) -- A couple of earthquakes with a preliminary magnitude of 5.0 and 4.8 shook Fukushima Prefecture Saturday morning, the Japan Meteorological Agency said.

The 2:18 a.m. quake, originating around 40 kilometers underground off the coast of the prefecture, registered intensity 4 on the Japanese seismic scale of 7 in Soma and Shinchi in the prefecture.

Later in the morning, another quake with the same intensity jolted Kawauchi in the prefecture at 11:34 a.m., the agency said.

No tsunami warning was issued following the two quakes, which also shook surrounding areas of Fukushima, such as Miyagi, Tochigi and Ibaraki prefectures

## **Radiation measurements since 3/11 probably too low**

### **Tepco: No. 1 plant readings probably too low**

<http://www.japantimes.co.jp/news/2014/02/08/national/tepco-no-1-plant-readings-probably-too-low/#.Uvc6-oXrV1s>

Kyodo

The bulk of the radiation measurements taken at the crippled Fukushima No. 1 power plant since March 2011 will be reviewed because they were taken improperly and are probably too low, Tokyo Electric Power Co. revealed.

“We are very sorry, but we found cases in which beta radiation readings turned out to be wrong when the radioactivity concentration of a sample was high,” Tepco spokesman Masayuki Ono told a news conference Friday. Materials known to emit beta rays include strontium-90, which causes bone cancer.

The announcement follows Tepco’s finding Thursday that a groundwater sample it had taken from a well at the No. 1 plant last July contained a record-high 5 million becquerels of strontium-90 per liter instead of 900,000 becquerels.

Ono described the data up for review as “massive” and said the utility plans to start the review from the beginning of the nuclear crisis in March 2011 up to October last year, when it started preparing manuals on proper measurement procedure.

Among the data that need to be examined are the readings for around 300 tons of water that inexplicably vanished from a storage tank in August last year. Tepco had detected 80 million becquerels per liter of beta radiation from the leak, part of which is believed to have ended up in the Pacific.

Tepco blamed the measuring errors on what it calls the “counting miss” phenomenon, which occurs in sensors when radioactivity in a sample is too high. In such cases, the proper procedure is to dilute the water sample so the sensors can correctly detect the radioactivity.

If the “counting miss” is not taken into account, the readings will be too low, Ono said.

Tepco meanwhile believes that its data on seawater and other less contaminated liquids is probably sound.

The 16-meter observation well is located between reactors 1 and 2, about 25 meters from the Pacific. It is also about 6 meters from an underground channel from which highly radioactive water was found to be seeping into the sea shortly after the nuclear crisis.

February 9, 2014 [same article as two days before]

### **TEPCO to review erroneous radiation data**

[http://www3.nhk.or.jp/nhkworld/english/news/20140209\\_80.html](http://www3.nhk.or.jp/nhkworld/english/news/20140209_80.html)

The operator of the damaged Fukushima Daiichi nuclear plant has decided to review radiation data after finding the initial readings may be much lower than actual figures.

Tokyo Electric Power Company, or TEPCO, says it has detected a record high 5 million becquerels per liter of radioactive strontium in groundwater collected last July from one of the wells close to the ocean.

That's more than 160,000 times the state standard for radioactive wastewater normally released into the sea.

Based on the result, levels of radioactive substances that emit beta particles are estimated to be 10 million becquerels per liter, which is more than 10 times the initial reading.

TEPCO initially said it had detected 900,000 becquerels per liter of beta-emitting substances.

The utility attributes the error to the improper measuring method that had been used until last October. It says the readings of radioactivity can be measured as being lower than they actually are in the highly contaminated water.

TEPCO plans to review other data measured with the improper method, including the radiation level of around 300 tons of waste water that leaked from a storage tank in August.

An initial test of the leaked water found it contained up to 80-million becquerels per liter of beta-emitting substances, including strontium.

February 12, 2014

## **Cold may have cracked the concrete**

### **Cracks found in floor near Fukushima radioactive water tanks**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402120042>

Two cracks were discovered in a concrete floor near radioactive water storage tanks on the grounds of the stricken Fukushima No. 1 nuclear power plant, the plant operator said Feb. 11.

Officials with Tokyo Electric Power Co. said some of the contaminated water from the melting snow blanketing the area may have seeped into the ground through the cracks.

Workers on patrol discovered the cracks, stretching 12 meters and 8 meters, respectively, near a group of storage tanks where 300 tons of highly radioactive water was found in August last year to have leaked. The tanks hold contaminated water generated in the process of cooling the crippled reactors.

TEPCO detected up to 58 becquerels of radioactive cesium and up to 2,100 becquerels of radioactive strontium per liter of melted snow in the area. Freezing temperatures may have cracked the concrete, the TEPCO officials added.

February 13, 2014

## **Record cesium in groundwater**



## **Record cesium level in Fukushima plant groundwater**

[http://www3.nhk.or.jp/nhkworld/english/news/20140213\\_22.html](http://www3.nhk.or.jp/nhkworld/english/news/20140213_22.html)

The operator of the damaged Fukushima Daiichi plant says water samples taken from a newly-dug well contained the highest levels of radioactive cesium detected so far in groundwater at the site.

Tokyo Electric Power Company says the record levels suggest that the leakage point could be near the well.

The utility on Thursday said it had detected 54,000 becquerels per liter of cesium 137 and 22,000 becquerels per liter of cesium 134 in water samples.

The samples were taken on Wednesday from a new observation well located 50 meters from the ocean near the Number 2 reactor.

The level of cesium 137 is 600 times the government standard for radioactive wastewater that can be released into the sea.

It is more than 30,000 times the level of cesium 137 found in water samples taken from another observation well to the north last week.

TEPCO officials believe radioactive water is leaking from an underground tunnel that extends from the reactor buildings towards the ocean. They have been taking measures to prevent the tainted water from reaching the sea, but have yet to determine where the leak originates.

TEPCO suspects the leakage point is near the new well because radioactive cesium is easily absorbed into soil and is unlikely to be carried over a wide area in groundwater.

Feb. 13, 2014 - Updated 06:12 UTC

February 14, 2014

## **Record radiation in groundwater (follow-up)**

### **Record cesium level found in groundwater beneath Fukushima levee**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402140041>

A record level of radioactive cesium has been found in groundwater beneath a coastal levee east of reactor turbine buildings at the crippled Fukushima No. 1 nuclear power plant, according to the plant operator.

Tokyo Electric Power Co. said Feb. 13 that 37,000 becquerels of cesium-134 and 93,000 becquerels of cesium-137 were detected per liter of groundwater sampled earlier in the day in a monitoring well on the levee. The total reading of 130,000 becquerels per liter is the highest ever observed in groundwater beneath the levee.

The same sampling well had produced a cesium reading of 76,000 becquerels per liter on Feb. 12.

The monitoring well is located close to underground pits, which are being flooded with inflows of highly radioactive water from reactor and turbine buildings. Highly radioactive water leaked from the bases of those pits to nearby areas immediately following the triple meltdown in March 2011.

TEPCO officials said they believe the radioactive contaminants originated from the leaks at that time.

## Discharges into sea one option to "treat" contaminated water

### **IAEA: Consider discharging contaminated water**

[http://www3.nhk.or.jp/nhkworld/english/news/20140214\\_07.html](http://www3.nhk.or.jp/nhkworld/english/news/20140214_07.html)

The International Atomic Energy Agency has advised the operator of the Fukushima Daiichi nuclear plant to examine all options to treat contaminated water. These include resuming controlled discharges of radioactive water into the sea.

At Japan's request, the IAEA sent its second inspection team to the crippled nuclear power plant last November to assess efforts to scrap reactors at the facility.

On Thursday, the IAEA released its final report that was submitted to the Japanese government.

Team leader Juan Carlos Lentijo says Japan has established a good foundation to improve its strategy and allocate the necessary resources to conduct the safe decommissioning of the plant.

But Lentijo adds that the situation remains very complex and there will continue to be challenging issues that must be resolved to ensure the plant's long-term stability.

The report says the IAEA team believes it is necessary to find a sustainable solution to the problem of managing contaminated water at the plant. It says that this would require considering all options, including the possible resumption of controlled discharges to the sea.

The report adds that to pursue this option, the operator Tokyo Electric Power Company should prepare appropriate safety and environmental impact assessments and submit them for regulatory review.

February 15, 2014

## Good intentions

### **TEPCO aims to cut airborne radiation from Fukushima plant to one-eighth**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402150047>

Tokyo Electric Power Co. has set a goal of reducing airborne radiation levels outside its crippled Fukushima No. 1 nuclear power plant to one-eighth the current levels by the end of March 2016.

TEPCO's target of under 1 millisievert a year, part of its plans to decommission the reactors at the Fukushima No. 1 plant, was announced at a meeting with the Nuclear Regulation Authority on Feb. 14.

Annual levels of 8 millisieverts were found in December, mainly due to the effects from radiation-contaminated water kept in storage tanks on the plant site.

Radioactive strontium in the contaminated water emitted beta rays. A chemical reaction with the tank's steel resulted in the production of X-rays, which accounted for the higher airborne radiation levels, according to TEPCO.

TEPCO officials said they would seek to reduce radiation levels due to contaminated water to under 1 millisievert per year by the end of March 2015. They said they would also take measures to reduce the levels from other sources, such as debris or the release of radioactive materials, to under 1 millisievert per year.

After reaching a combined annual level of under 2 millisieverts by March 2015, the utility will further reduce the total to under 1 millisievert by the following March, they said.

The figures are based on estimates of radiation effects only from the Fukushima No. 1 plant.

February 17, 2014

## Contaminated water leaks in barrier near No.4 reactor

### Water leaks from barrier found at Fukushima plant

[http://www3.nhk.or.jp/nhkworld/english/news/20140217\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20140217_02.html)

The operator of the damaged Fukushima Daiichi nuclear plant says officials have found water leaks at 7 locations in a barrier that surrounds tanks holding contaminated water.

Tokyo Electric Power Company officials said they confirmed on Sunday that water had leaked from the barrier near the Number 4 reactor. It's one of 30 barriers in the compound.

The officials said the amount of the leak was about 19.2 tons, which they believe seeped into the ground.

They detected 23 becquerels per liter of radioactive strontium 90 in water still inside the barrier.

The level is below the national standard for the discharge of contaminated water into the sea, but is 2.3 times the standard for discharging from the barriers. [??????]

Heavy rains last October caused the barriers to overflow. That prompted the utility to raise the height of the barriers.

The officials said the leaks occurred at connections between steel plates used to raise the height of the barrier and from where piping was installed in plates.

They said they are investigating why the leaks are concentrated at the barrier.

February 19, 2014

## TEPCO wants to replace almost all tanks

## Storage tanks to be upgraded at Fukushima Daiichi

[http://www3.nhk.or.jp/nhkworld/english/news/20140219\\_18.html](http://www3.nhk.or.jp/nhkworld/english/news/20140219_18.html)

The operator of the Fukushima Daiichi nuclear plant plans to replace almost all of the tanks at the site storing massive amounts of radioactive wastewater.

The tanks are made of steel sheets bolted together. Some of them were leaking last year.

Tokyo Electric Power Company officials said on Tuesday that they will replace 750 of the tanks with new ones that are welded together and are more resistant to leaks.

They say they plan to install the new tanks and start the transfer of contaminated water next month. They want to complete the changeover by March next year.

But the utility must first reduce the accumulation of contaminated water by pumping the groundwater out to sea before it can seep into the reactor buildings.

It also needs the consent of the local fishing industry to do this.

February 20, 2014

## 100 tons of "extraordinarily" contaminated water leak out

### Record-high tainted water leak at Fukushima plant

[http://www3.nhk.or.jp/nhkworld/english/news/20140220\\_22.html](http://www3.nhk.or.jp/nhkworld/english/news/20140220_22.html)

The operator of the Fukushima Daiichi nuclear plant says 100 tons of water containing record high levels of radioactive substances overflowed from a storage tank.

Tokyo Electric Power Company officials on Thursday said workers on patrol found the leak in one of the tanks located on the mountain side of the Number 4 reactor building late Wednesday night.

They said the leaked water contained **an extraordinarily high 230-million becquerels per liter of beta-ray emitting substances, consisting mainly of strontium 90.**

The level is about 7.6 million times the government's permissible standard for the nuclide level of water

allowed to be released into the sea.

It is also the highest level of radioactive substances detected so far in the series of tank leaks at the site.

They say **they also detected 9,300 becquerels per liter of cesium 137 in the water. That is more than 100 times the government's limit.**

They say the water was leaking from a seam near the top of the tank. It traveled along a rainwater pipe that extends to outside the barrier surrounding the tank.

Officials say they managed to stop the leak by transferring water from the overflowing tank to a neighboring one, 6 hours after the problem was first discovered.

The utility estimates that about 100 tons of water had flowed outside the barrier. But **they say the water should not have flowed into the ocean because there are no spillways near the tank that lead to the sea.** Utility officials attribute the leak to a fault in one of the valves in the pipes that transfer water from a decontamination system to storage tanks.

They say 2 other adjoining valves that lead to the troubled tank were open, leading to the unexpected flow of water into the tank and causing an overflow.

They say an alarm had gone off earlier in the day, signaling an increase in the tank's water level. But workers who went to check the tank could find no abnormalities at that time.

Officials say they are continuing their investigation, while **working to recover the leaked water and the surrounding soil now contaminated by the water.**

The Nuclear Regulation Authority has instructed TEPCO to check other tanks for possible leakages.  
Feb. 20, 2014 - Updated 05:26 UTC

## Broken thermometers & human errors

### Human error blamed for broken thermometer at Fukushima reactor

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402200049>

A malfunctioning thermometer in the damaged No. 2 reactor at the Fukushima No. 1 nuclear plant was traced to human error, and operator Tokyo Electric Power Co. said Feb. 19 there was no cause for alarm.

TEPCO said a second thermometer on the bottom of the reactor is working properly. It said the one working improperly was thrown out of action after being short circuited.

TEPCO said human error was almost certainly behind the failure.

According to officials at the utility, workers discovered the damaged instrument on Feb. 18.

The thermometer was installed after the March 2011 earthquake and tsunami that triggered the triple meltdown at the plant.

Workers doing routine instrument checks mistakenly overloaded the device's circuits, resulting in the equipment failure, TEPCO officials said.

The other temperature gauge was fitted before the nuclear crisis unfurled. The broken indicator monitored melted nuclear fuel in the process of cold shutdown as part of efforts to keep it from going critical again.

### **Thermometer out of order at Fukushima No.2 reactor**

[http://www3.nhk.or.jp/nhkworld/english/news/20140220\\_05.html](http://www3.nhk.or.jp/nhkworld/english/news/20140220_05.html)

The operator of the crippled Fukushima Daiichi nuclear plant says there is just one working thermometer monitoring the temperature of melted nuclear fuel in the plant's No.2 reactor.

Officials of Tokyo Electric Power Company say they have discovered a fault in one of the 2 thermometers used to monitor the lower part of the reactor's container vessel.

They say the problem was found this week after workers accidentally caused a short circuit by delivering 250 volts of electricity instead of 100 volts during checks on the thermometers.

The company continues to pour water into the No.2 reactor to cool the melted fuel at the bottom.

A series of problems left just one of 9 thermometers working at the lower part of the pressure vessel by September 2012. The newly malfunctioning thermometer was installed later that year.

The utility's announcement came more than 24 hours after the abnormality was found on Tuesday. Officials say they failed to immediately notice the problem since the faulty thermometer was showing a

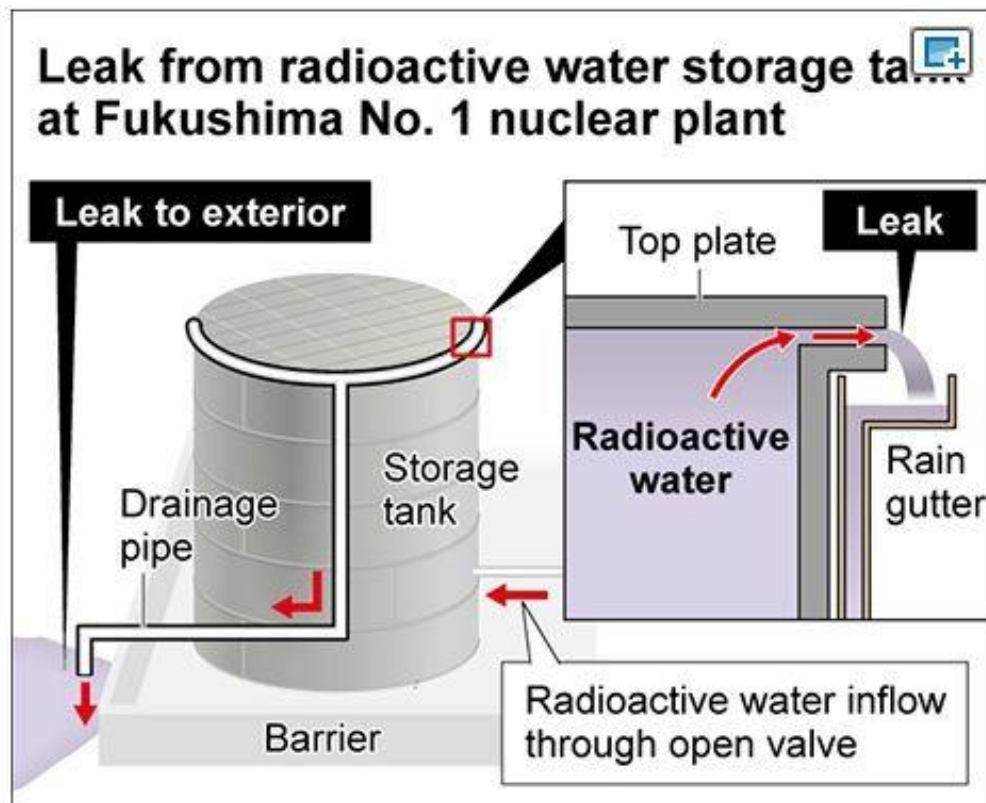
similar reading - about 20 degrees Celsius -- as the working one.

The officials say replacing the gauge is likely to take time because of high radiation levels in and around the reactor. They say a new thermometer will have to be inserted through a pipe.

## Open valves?

### 100 tons of radioactive water spills at Fukushima plant after workers ignore alarm

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402200051>



The Asahi Shimbun

A warning alarm was ignored and 100 tons of highly radioactive water overflowed from a storage tank and seeped into the ground at the Fukushima No. 1 nuclear plant, the plant operator said Feb. 20.

The water did not reach the ocean, Tokyo Electric Power Co. said.



According to TEPCO, a worker on patrol spotted the water leaking from a storage tank in the H6 area at 11:25 p.m. on Feb. 19.

The area is surrounded by a barrier, but the leaking water entered a gutter for rainwater at the tank's top plate and flowed outside the barrier, creating pools covering 870 square meters, TEPCO officials said.

Workers dismissed an alarm that sounded shortly past 2 p.m. on Feb. 19 that indicated dangerously high water levels in the tank, TEPCO said.

They believed that water levels could not be rising because no radioactive water was being transferred into the tank, and **attributed the alarm to faulty instruments**, such as the water level gauges, the utility said.

They did not check on the situation.

But they later concluded that highly radioactive water was leaking from the tank after detecting beta-ray levels of 50 millisieverts per hour and gamma-ray levels of 0.15 millisievert per hour from the water that had escaped.

They also found 230 million becquerels of beta-ray sources, including radioactive strontium, per liter of water in the rain gutter, TEPCO said.

The leak was apparently caused by open valves along a radioactive water conduit leading into the storage tank, a flange type that uses bolts to fasten steel panels. TEPCO officials said radioactive water likely entered the tank via the valves, filled it beyond capacity and escaped through openings in its top plate.

Workers closed the valves and transferred radioactive water to other tanks to lower the water level in the tank. They confirmed the leak stopped at 5:40 a.m. on Feb. 20.

TEPCO officials said workers were collecting the radioactive water that had escaped, adding that they will investigate why the valves were open.

## **100 tons of toxic water leaked at Fukushima plant, no flow to sea**

<http://mainichi.jp/english/english/newsselect/news/20140220p2g00m0dm081000c.html>

TOKYO (Kyodo) -- Roughly 100 tons of highly radioactive water leaked from one of the huge tanks at the crippled Fukushima Daiichi nuclear complex, plant operator Tokyo Electric Power Co. said Thursday, admitting it could be the worst leakage from such containers since August.

Steps have been taken to stop the leakage of the water, which contains 230 million becquerels per liter of strontium and other beta ray-emitting radioactive substances. The utility believes the liquid has not flowed into the adjacent sea as there is no drainage nearby.

According to TEPCO, a worker on patrol noticed water spilling from the tank's lid area at 11:25 p.m. Wednesday. The water, by passing through a rainwater pipe, escaped outside a concrete barrier intended to block liquid from spreading outside when tanks leak.

TEPCO spokesman Masayuki Ono told a press conference the company suspects that radioactive water was mistakenly directed to the tank because valves that should have been closed were open, causing the container to overflow.

Among three valves, one appeared to have been closed, but may have malfunctioned, while two others had been open.

After closing the two valves, TEPCO said it confirmed the leak stopped at 5:40 a.m. Thursday.

More than nine hours before the leak was recognized, an alarm indicating a rise in the tank's water surface level was issued.

But workers thought the device was out of order and also could not find leaks when they patrolled the area at 3 p.m. and 4 p.m. Wednesday.

Ono said the utility may consider clarifying how valves should be operated and improving the design of rainwater pipes, which are attached to tanks as a measure to prevent rainwater from accumulating inside the concrete barriers surrounding clusters of tanks.

He also said the company must determine if and when the valve and a water level indicator malfunctioned.

The latest incident is another sign TEPCO is struggling to manage a massive amount of radioactive water generated in the process of cooling three reactors that have suffered meltdowns during the nuclear crisis triggered in March 2011.

The water passes through a facility that can reduce cesium, but it contains high concentrations of radioactive substances such as strontium-90. Strontium tends to accumulate in bones and is thought to cause bone cancer and leukemia.

In August last year, TEPCO said 300 tons of highly radioactive water escaped from a different tank, some of which is also believed to have flowed into the ocean.

TEPCO has since been stepping up efforts to detect leak incidents as quickly as possible such as by reinforcing patrolling activities and installing water-level indicators to all of the tanks made of steel sheets joined by bolts.



### **Water overflows tank at No. 1 plant**

<http://www.japantimes.co.jp/news/2014/02/20/national/water-overflows-tank-at-no-1-plant/#.UwZivIXrV1s>

by Kazuaki Nagata

Staff Writer

Tokyo Electric Power Co. said Thursday about 100 tons of highly radioactive water overflowed and spilled from a tank at the Fukushima No. 1 plant.

The utility said it believes that the escaped water did not reach the ocean, as there was no drainage ditch that connects to the sea near the leaked area around the tank, which is in an area called H6.

At the crippled Fukushima No. 1 site, Tepco removes cesium from tainted water that flows into the basements of the crippled reactor turbine buildings daily. The water is put into storage tanks.

Tepco said the water was supposed to go to tanks placed at the E area, which is west of H6, but it went to the tank that was already storing water at H6 and overflowed.

According to the utility, two of the three valves of the pipe that control the water flow to the H6 area were open. Yet even if only the third valve was closed, the water should not have flowed, Tepco said, adding that the valve may be broken. But Tepco also admitted the three valves should have all been closed and is still not sure why two were left open.

While cesium was removed from the leaked water, it contains other radioactive materials, like strontium. Tepco said the level of those that emit beta rays was 230 million becquerels per liter.

February 21, 2014

## Blaming the workers... again

### TEPCO says worker error may have caused large radioactive water leak

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402210062>

Tokyo Electric Power Co. said it suspects human error may be behind the leak of about 100 tons of highly radioactive water discovered Feb. 19 from a storage tank at the Fukushima No. 1 nuclear power plant.

The utility said workers may have mistakenly left open valves to a pipe that leads to the holding tank in the H6 area of the facility.

Because of that, the contaminated water overflowed from the tank and spilled into a rain gutter.

According to TEPCO, at around 2 p.m. on Feb. 19, an alarm warning that water levels in the tank were exceedingly high sounded.

But workers did not investigate, believing a malfunctioning water level gauge mistakenly set off the alarm. Only at around 11:25 p.m. that night did workers discover that water was leaking outside the barrier surrounding the tanks via the rain gutter drainage system.

Tests by TEPCO indicated 240 million becquerels of beta-ray emitting radioactive substances per liter of water, including radioactive strontium, were contained in the water that leaked. Their test also showed the actual radiation levels in the water were at 50 millisieverts of beta rays per hour.

TEPCO is currently looking into the operation records involving the valves. The utility said Feb. 20 that it believed none of the water reached the ocean, which is about 700 meters from where the leak occurred.

In a similar leak discovered in August 2013, about 300 tons of radioactive water escaped from a different tank in the plant. Since then, the plant's operator has strengthened measures to prevent radioactive water from leaking from the tanks.

However, increasing volumes of water at the plant are making it difficult for TEPCO to contain the situation. More and more groundwater is seeping into reactor buildings and other facilities, where it is then being contaminated by radioactive substances.

TEPCO has also employed special equipment to remove cesium and other radioactive substances from the water. Despite their efforts, about 400 tons of highly radioactive water is still being moved into storage tanks every day.

To reduce the risk resulting from the highly radioactive water, TEPCO plans to increase the number of ALPS (advanced liquid processing system) devices, which can remove most of the radioactive substances from the water.

The government also plans to develop new, higher-performance equipment to decontaminate the water, with the aim of processing all of it by the end of the next fiscal year, which ends in March 2015.

As of Feb. 18, the volume of radioactive water stored in the 1,000 holding tanks at the plant totaled about 520,000 tons. Of that, 340,000 tons is highly radioactive, according to TEPCO.

The utility said it is employing various measures to prevent further leakage.

For example, TEPCO said it has increased the number of workers whose job is to patrol and observe the tanks and pipes by sixfold to 60 and increased the number of patrols from two to four a day.

More water level gauges have also been added to each tank, the company said.

In addition, TEPCO raised the height of the barriers surrounding the tanks to prevent radioactive water from escaping from the area.

Water leakage has often occurred in tanks where the steel panels are fastened with bolts. Therefore, the government and TEPCO plan to replace those tanks with ones whose seams are welded shut, making them more reliable and leakproof.

The holding tank discovered leaking on Feb. 19 was of the bolt-type design.

(This article was written by Akira Hatano and Shunsuke Kimura.)

### **TEPCO to investigate cause of latest water leak**

[http://www3.nhk.or.jp/nhkworld/english/news/20140221\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20140221_03.html)

The operator of the Fukushima Daiichi nuclear plant will investigate the cause of the latest leak of highly radioactive water from one of the storage tanks.

About 100 tons of contaminated water spilled from a seam near the top of the tank on the mountainside

by the No.4 reactor from Wednesday to Thursday. The escaped water flowed to the ground around the tank.

Tokyo Electric Power Company found the water contained 240 million becquerels per liter of beta-ray emitting substances, including strontium. That's the highest level detected in tainted water leaks at the plant since August.

TEPCO said water from decontamination equipment was mistakenly directed to the tank as 3 valves that should have been closed were open.

The firm said one of the valves may have been broken and the other 2 were open, causing water to overflow from the tank.

TEPCO says it will investigate why the 3 valves, including the one that it suspects is broken, were open.

The firm says an alarm went off more than 9 hours before the leak was spotted, signaling an increase in the tank's water level.

But the tank's water-level gauge showed a sharp drop, leading workers to believe that the alarm sounded due to the malfunction of the gauge.

The workers checked areas around the tank but not inside of the tank.

TEPCO plans to look into how the workers responded to the alarm and what measures should be taken to prevent any recurrence.

Feb. 20, 2014 - Updated 22:39 UTC

## Countermeasures not sufficient

### Measures fail to stop Fukushima plant leaks

[http://www3.nhk.or.jp/nhkworld/english/news/20140221\\_14.html](http://www3.nhk.or.jp/nhkworld/english/news/20140221_14.html)

The operator of the Fukushima Daiichi plant has been coming up with countermeasures to deal with repeated leaks from tanks of contaminated water.

But despite the measures, 100 tons of radioactive water leaked on Wednesday and Thursday.

Last August, more than 300 tons of highly radioactive wastewater leaked from one of the plant's storage tanks.

The estimated volume of the leaked radioactive materials caused Japan's nuclear regulator to rank the leak a level-3 serious accident. The international scale of nuclear and radiological events ranges from zero

to 7.

In October, another leak of highly contaminated water occurred, this time from a different tank on the site.

Tokyo Electric Power Company said the leak resulted from overfilling the tank.

In the wake of repeated leaks, the utility installed water-level gauges in the tanks and alarms to prevent overfilling. It also stepped up patrols of the compound so abnormalities could be detected as soon as possible.

This time the water again overflowed out of a tank and leaked outside the barrier around the tank, running along a rainwater pipe.

But workers first determined that the alarm and information from the gauges were malfunctions, as they found no abnormalities around the tank, at least when the alarm went off.

The utility says they will seek additional measures to address these new problems.

February 22, 2014

## More blaming of workers

### TEPCO investigating possible human errors

[http://www3.nhk.or.jp/nhkworld/english/news/20140222\\_15.html](http://www3.nhk.or.jp/nhkworld/english/news/20140222_15.html)

Tokyo Electric Power Company has yet to determine the cause of a recent leak of radioactive water at the Fukushima Daiichi nuclear plant.

About 100 tons of highly contaminated water leaked from a tank at the number 4 reactor from Wednesday to Thursday.

TEPCO officials at first said the cause may have been mechanical trouble at one of the 3 valves on a pipe linking a treatment facility to the tank. They said contaminated water flowed even though the valve was shut.

However, they later said a photo shows the valve open on Wednesday morning. They also said another valve on a pipe that was to be used to transfer contaminated water was shut at the time but was open after the leak was found.



They now say opening and closing of these 2 valves by someone probably led to the leak.

TEPCO is interviewing workers as to why and how the valves were operated.

The utility is also reviewing ways to supervise engineers who handle valves and monitor water levels in a tank.

This is because the water level was not monitored properly at the time the valves were operated. And tools for closing and opening the valves were not stored properly.

### **TEPCO: Radioactive water leaked after worker opened valves**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402220054>

Tokyo Electric Power Co. has determined an unidentified worker at its crippled Fukushima No. 1 nuclear power plant left valves open along a conduit, which resulted in 100 tons of highly radioactive water overflowing from a storage tank, sources said Feb. 21.

While the utility at first said valve malfunctions could not be ruled out, it concluded the cause was human error after examinations of a photo and water level gauge records.

Three valves line a conduit that sends radioactive water into the storage tank that overflowed. Two of them were open and the remaining one was closed when workers spotted the leak at around 11:30 p.m. on Feb. 19.

Radioactive water normally cannot flow into the tank unless all valves along the conduit are open. But water did flow in, leading TEPCO to initially suspect a malfunctioning valve.

However, a photo shot around 11 a.m. earlier on the day as part of a work procedure showed the third valve in the open position. In addition, readings of a water level gauge in the overflowing tank rose around noon on the same day.

These circumstances led TEPCO officials to believe that somebody opened the valve at around 11 a.m.

TEPCO has interviewed people who were working that day but has yet to identify the worker who operated the valves, the sources said.

## **Human error, not equipment failure, may have caused leak: TEPCO**

<http://mainichi.jp/english/english/newsselect/news/20140222p2g00m0dm037000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear complex said Friday that human error, not equipment failure, may be responsible for the leakage of about 100 tons of highly radioactive liquid from a storage tank earlier this week.

When Tokyo Electric Power Co. first disclosed the incident Thursday, it said that a faulty valve may have allowed water to flow into the tank that was already nearly full.

On Friday, however, the utility dismissed that possibility, saying it found photographs that showed the valve appeared to be operating properly around the time the leak occurred.

"There could have been some (human) error, but we have to check the situation," TEPCO spokesman Masayuki Ono told a press conference.

The photos show the valve was in the "open" position at around 11 a.m. Wednesday, but in a "closed" position as of 12:30 a.m. Thursday. Workers noticed the tank leaking water at 11:25 p.m. Wednesday.

Because the valve was open, radioactive water was directed to the wrong tank.

The photos also showed that a lever to operate valves was left attached to the valve in question, which Ono admitted was not desirable.

"Usually, a lever should not be left attached to a valve so that someone does not accidentally touch the lever when passing and change the valve's status," he said.

TEPCO confirmed early Thursday that water had stopped leaking from the tank. The utility believes the liquid has not flowed into the adjacent Pacific Ocean as there is no drainage nearby.

The incident is another sign TEPCO is struggling to manage a massive amount of radioactive water generated in the ongoing process of cooling three reactors that experienced meltdowns during the nuclear crisis that erupted in March 2011.

The water passes through a facility that can reduce cesium, but it contains high concentrations of radioactive substances such as strontium-90. Strontium tends to accumulate in bones and is thought to cause bone cancer and leukemia.

TEPCO said Thursday it detected 240 million becquerels per liter of beta ray-emitting radioactive substances, such as strontium, from water accumulating near the tank.

### **Human error, not equipment, may have caused water leak: Tepco**

<http://www.japantimes.co.jp/news/2014/02/22/national/human-error-not-equipment-may-have-caused-water-leak-tepco/#.Uwh094XrV1s>



Kyodo

Human error, not equipment failure, may be responsible for the roughly 100 tons of highly radioactive water released from a storage tank earlier this week, the operator of the crippled Fukushima No. 1 power plant says.

On Friday, however, the utility dismissed that possibility and said it found photographs that showed the valve appeared to be operating properly around the time the leak occurred.

“There could have been some (human) error, but we have to check the situation,” Tepco spokesman Masayuki Ono said at a press conference Friday.

The photos show the valve was in the “open” position at around 11 a.m. Wednesday but in a “closed” position at 12:30 a.m. Thursday. The tank leak was noticed at 11:25 p.m. Wednesday.

Because the valve was open, the radioactive water was directed to the wrong tank.

Early Thursday, Tepco confirmed the leak had been stopped.

The photos also show that a lever used to operate the valves was left attached to the valve in question, which Ono said was undesirable.

“Usually, a lever should not be left attached to a valve so that someone does not accidentally touch the lever when passing and change the valve’s status,” he said.

The utility doesn’t think any of the liquid got into the adjacent Pacific Ocean because there is no drainage nearby.

The incident is another sign of Tepco’s ongoing struggle to manage the radioactive water being generated by the cooling operations of the three reactors hit by the triple meltdown in March 2011.

After cooling the fuel rods, the tainted water is pumped through a facility that extracts most of the cesium. But it still contains high concentrations of other radioactive substances, such as hazardous strontium-90, which tends to accumulate in bones and is thought to cause bone cancer and leukemia.

Tepco said Thursday it detected 240 million becquerels per liter of beta ray-emitting substances, such as strontium, from water accumulating near the tank.

February 25, 2014

## **Frozen wall test**

## **Frozen wall test to begin at Fukushima plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20140226\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20140226_03.html)

Engineers are to start testing a plan to build frozen walls at the Fukushima Daiichi nuclear power plant. The government and the operator of the plant will carry out the plan to deal with the massive buildup of radioactive wastewater.

The government and Tokyo Electric Power Company are to begin the test on March 11th at the earliest.

The amount of wastewater has been increasing as 400 tons of groundwater is flowing beneath the facilities from nearby mountains every day.

The government plans to spend more than 300 million dollars to build frozen walls around the Number One to Number 4 reactors. The test will be conducted at the Number 4 reactor.

Engineers will drive steel pipes to a depth of 30 meters in an area measuring 100 square meters. They will inject liquid coolant at a temperature of minus 40 degrees into the pipes. The refrigerant is expected to freeze the soil in a month or so.

Engineers will check whether the frozen wall can stop the flow of groundwater despite the presence of piping or other structures beneath the soil. They will also study how to replace the pipes.

The government and TEPCO aim to start building full-scale walls in the fiscal year that starts in April. They will be 35 meters deep, nearly 5 meters more than initially planned. This is because radioactive substances were detected in groundwater taken from a deep layer last December.

Some engineering and geology experts warn that the walls could change groundwater flows and have a significant impact on underground features.

They also doubt that frozen walls of such an unprecedented size can be properly maintained over the long term.

February 26, 2014

## **Water treatment system at Fukushima plant halts**

[http://www3.nhk.or.jp/nhkworld/english/news/20140226\\_42.html](http://www3.nhk.or.jp/nhkworld/english/news/20140226_42.html)

The operator of the crippled Fukushima Daiichi nuclear plant says one of its key systems to treat radioactive water halted automatically. Concerns are rising ahead of planned full-fledged operation from April.

Tokyo Electric Power Company has been test running 3 systems since December last year. They remove most kinds of radioactive nuclides from the tainted water produced there. They are deemed crucial in making the water safer.

On Wednesday, one of the 2 systems running suddenly stopped after setting off an alarm. The operator is trying to find out the cause of the trouble.

**The firm is planning full implementation of the systems from April.** It hopes to finish treating all of the water at the site stored in hundreds of tanks by March of next year. But the plan has been beset by trouble.

The test operation was also suspended last month due to a glitch in a crane that transfers containers storing radioactive material removed.

February 27, 2014

## **ALPS: Another "glitch"**

### **Water pump glitch stymies decontamination work at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402270030>



Workers inspect an ALPS device at the Fukushima No. 1 nuclear power plant. (Asahi Shimbun file photo)

Tokyo Electric Power Co. had to halt some decontamination work at its crippled Fukushima No. 1 nuclear power plant after a water treatment pump malfunctioned.

The plant operator said Feb. 26 the trouble was due to one of the ALPS (advanced liquid processing system) devices that were undergoing test operations. ALPS can remove 62 kinds of radioactive substances from contaminated water.

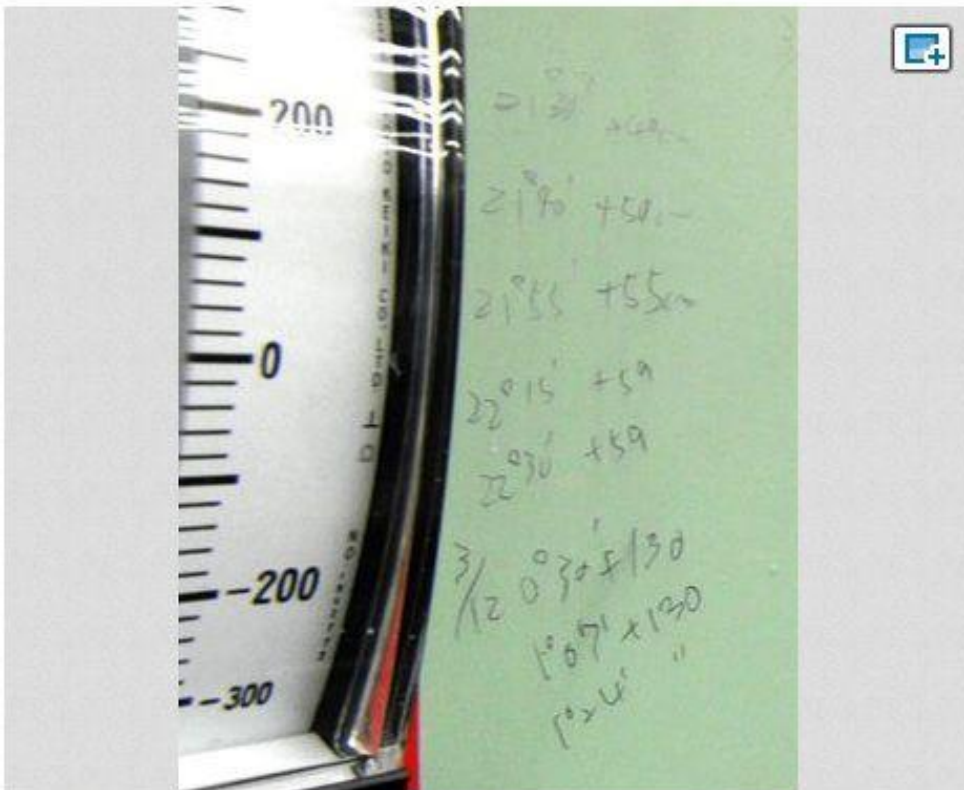
According to TEPCO, an electric system malfunction triggered an alarm at 12:30 p.m. on Feb. 26. As a result, one of the pumps that send water to equipment to absorb radioactive substances stopped.

TEPCO said it has stopped decontamination work at the pump and is investigating the cause of the problem. Other ALPS devices are still in operation, it added.

## Grim reminder

### Grim reminder of the frantic efforts to prevent Fukushima meltdown

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201402270046>



Technicians recorded water-gauge levels as they tried to avert meltdowns in the No. 1 and No. 2 reactors at the Fukushima No. 1 nuclear power plant. (Pool)

By SHUNSUKE KIMURA/ Staff Writer

OKUMA, Fukushima Prefecture--Notations scribbled on a control panel testify to the panic that gripped technicians as disaster enveloped the Fukushima No. 1 nuclear power plant.

Working in darkness after all power was lost at the crippled facility in March 2011, the technicians were frantically recording water levels in the No. 1 and No. 2 reactors before they went into meltdown.



For the first time since then, Tokyo Electric Power Co. on Feb. 26 gave media representatives access to the central control room for the two reactors that failed.

At the time, 24 technicians were stationed in the command center that controlled those reactors. The power outage caused by the Great East Japan Earthquake and tsunami made it impossible to cool the reactors.

Before dawn broke on March 12, 2011, radiation levels in the control room had risen to an alarming one millisievert per hour. Hours later, the building that housed the No. 1 reactor exploded, damaging the control room and causing ceiling panels to peel off.

Other than the hastily written water-gauge levels notations, few reminders of that grim time remain. The damaged ceiling panels have been stripped away and the floor of the room is now covered in pink-colored sheets. Radiation levels have dropped to between four and nine microsieverts per hour.

Still, technicians rarely enter the central control room.

For neighboring reactor buildings, radiation levels are so high that workers dare not enter those facilities.

The extremely high levels of radiation have stymied work on decommissioning the reactors.

February 28, 2014

## **Wishful thinking**

### **TEPCO to prepare for radioactive water leaks**

[http://www3.nhk.or.jp/nhkworld/english/news/20140301\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20140301_03.html)

The operator of the damaged Fukushima Daiichi nuclear power plant has decided to dig observation wells to prepare for the possibility of highly radioactive water seeping into groundwater.

Tokyo Electric Power Company has come under criticism after more than 100 tons of water containing

record-high levels of radioactive substances overflowed from a storage tank last month.

The utility says the leakage occurred when valves that should have been closed were left open, allowing tainted water to enter the tank that overflowed.

But company officials have yet to pinpoint the exact reasons for the oversight.

TEPCO is using pumps to recover about half of the contaminated water, as well as removing soil tainted by the water. But there are concerns that the water may seep into groundwater and spread radiation.

TEPCO officials say they will dig observation wells in 3 locations near the leakage site facing the ocean to monitor groundwater contamination.

They also plan to dig a well that can pump water out once it's found to be contaminated.

Last August, the leakage of 300 tons of contaminated water resulted in a rise in the density of radioactive substances in wells nearby.

TEPCO officials say they are hoping they can learn a lesson from that past incident and prevent the further spread of contamination.

March 2, 2014

## **TEPCO not vigilant enough**

### **TEPCO walks tightrope over toxic water buildup 3 years after crisis**

<http://mainichi.jp/english/english/perspectives/news/20140302p2g00m0dm054000c.html>

TOKYO (Kyodo) -- Japan will mark the third anniversary of the start of the Fukushima Daiichi nuclear complex crisis on March 11, struggling to tackle the buildup of highly radioactive water that is proving to be a major challenge in the decommissioning process.

Just weeks before the anniversary, senior officials of plant operator Tokyo Electric Power Co. were again apologizing for a series of troubles, including the leak of 100 tons of highly toxic water from one of the huge tanks set up at the site.

The direct cause of the incident was wrong valve operation, which caused contaminated water to flow into a tank that was nearly full. But what was more disturbing was how workers had overlooked signs that

something was wrong. The incident triggered renewed concerns over TEPCO's ability to oversee the ongoing cleanup.

"If we had acted more watchfully after hearing an alarm warning of a rise in the tank's water level, we would have been able to minimize the consequences," TEPCO spokesman Masayuki Ono told a press conference after the company announced the leak on Feb. 20, referring to the alarm that went off more than nine hours before workers found water spilling from the tank's lid.

Because the water-level readings showed irregular movements following the alarm and because people on patrol were not able to find any trace of a leak near the tank in the two hours or so after the warning sounded, the utility judged that the water-level gauge had malfunctioned.

But Ono admitted that workers could have noticed the leak sooner had they gone up to the 10-meter-high tank to check how much water it contained or if workers in a control room had paid attention to data showing that the water level in tanks designated to receive the water was not rising.

Nuclear Regulation Authority officials pointed to the need for TEPCO to become more vigilant and criticized its tendency to blame abnormal data readings on mechanical failures.

"I think it is extremely important that workers assume the worst when instruments show abnormal movements, considering that the crippled plant is barely being managed," one of the officials said.

Further efforts to eliminate human error are extremely important until water stored in arrays of tanks can be decontaminated more quickly and bolted-joint tanks are replaced with more reliable containers.

Currently, a large portion of the radioactive water stored in tanks has been sent through a facility that can reduce cesium. But it still contains high concentrations of radioactive substances such as strontium, which is thought to cause bone cancer and leukemia.

TEPCO has said it will seek to drastically reduce by the end of March 2015 the radiation level of all the highly toxic water kept in tanks, totaling some 340,000 tons as of Feb. 11.

But TEPCO has not even finished test-running a trouble-plagued system that is said to be capable of removing 62 different types of radioactive material from the contaminated water, with the exception of tritium.

While TEPCO plans to boost the processing capacity of the facility called ALPS, an acronym standing for Advanced Liquid Processing System, another official admitted that cleaning the water by the end of fiscal 2014 is "an extremely high goal" that cannot be achieved without realizing a high operating rate for the system.

The coming 12 months or so will also be a crucial period in the unprecedented attempt to freeze 1.5 kilometers of soil around the basement areas of the Nos. 1 to 4 reactor buildings as part of efforts to stop the amount of radioactive water from further increasing.

The ice wall, which TEPCO aims to start operating by the end of March 2015, is intended to block groundwater from seeping into the reactor buildings' basement areas and mixing with highly toxic water used to cool the plant's three crippled reactors.

Should the project be successful, it will represent major progress in fundamentally addressing the issue of the buildup of toxic water, which is increasing at a rate of 400 tons daily. But whether or not it works remains to be seen as impermeable walls of this nature, used in civil engineering works such as subway construction, have never been created on such a large scale before and have not been operated for more than two years or so.

Last year, as concerns grew over leaving the huge workload up to TEPCO alone, the government decided to directly fund technically challenging projects that will help contain the toxic water buildup, including the ice wall, and is moving ahead to strengthen its monitoring of the plant's decommissioning process.

Akira Watanabe, a professor at Fukushima University, said local people are encouraged by the government's increased financial support, since they fear the nuclear complex might not be scrapped should TEPCO's business conditions worsen.

But Watanabe, who serves as a member of the NRA's panel monitoring the Fukushima plant's safety measures, is skeptical that government backing alone will bring a change to the overall situation.

"I believe one of the major reasons behind the poor safety management is that TEPCO has no option but to rely on massive numbers of subcontractor workers, six or seven layers in some cases," the professor said. "I wonder whether safety can be managed by a company out of touch with workers involved in various operations at the plant."

## Bright light in the dark

### PHOTO: Fukushima plant shines in the darkness of night

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201403020021>



The Fukushima No. 1 nuclear power plant, foreground, shines in the darkness on Feb. 18. The city of Iwaki in Fukushima Prefecture, top left, and central Tokyo, stretching from east to west on the horizon, are also seen. (Yusaku Kanagawa)

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Seen from an altitude of 13,000 meters at night, the crippled Fukushima No. 1 nuclear power plant shone brightly in a sea of darkness amid the loneliness of the evacuation zone.

The Asahi Shimbun flew its Asuka airplane over the municipalities of Fukushima Prefecture on Feb. 18. The plant was clearly visible because work to deal with the rising volume of contaminated water and to decommission reactors was actively ongoing, even at night.

In stark contrast, near-complete darkness enveloped areas designated as difficult-to-return zones for residents surrounding the plant.

The city of Iwaki in the prefecture and the bright glow of central Tokyo, once the main recipient of electricity generated from the plant, could also be glimpsed from the plane.

March 4, 2014

## Three years after: Radioactive water continues to leak

### Radioactive water still a challenge three years after Fukushima disaster

<http://mainichi.jp/english/english/newsselect/news/20140304p2a00m0na011000c.html>



The Circulating Cooling System at the Fukushima No. 1 Nuclear Power Plant. Implemented in June 2011, the Fukushima No. 1 Power Plant circulating cooling system allows for the reuse of contaminated water, after radioactive materials and salt are removed from it, as a reactor coolant. Because the water is processed in numerous facilities, the pipes extend a total of 3 kilometers. (Mainichi)

Almost three years have passed since the outbreak of the Fukushima No. 1 Nuclear Power Plant disaster, and we have yet to see the 30- to 40-year decommissioning process truly take off. Radioactive water continues to leak from the plant, breeding fears among the public. And while plant operator Tokyo Electric Power Co. (TEPCO) is now removing fuel rods from the No. 4 reactor's spent fuel pool, it has yet to even locate the spent fuel in reactors No. 1, 2 and 3.

Of the 1,000 metric tons of groundwater that passes through the grounds of the Fukushima power plant from the mountain side of the facilities every day, 400 tons come in contact with spent nuclear fuel inside

the reactor buildings and turn into radiation-contaminated water. Some of that radioactive water flows into the ocean, and the remainder is held in storage tanks -- from which numerous leaks have been reported.

As of Feb. 25, at least 430,000 tons of radioactive water was stored in approximately 1,000 holding tanks. And with the increase in the volume of contaminated water, there has been no end to related problems.

Workers found a total of 58,000 tons of water leaking from seven underground storage tanks in April 2013. In July that year, an estimated 300 tons of contaminated groundwater per day was found to be spilling into the ocean from the embankment. The following month, 300 tons of contaminated water leaked from one of the storage tanks, an incident that Japan's Nuclear Regulation Authority (NRA) ranked level 3, the fifth most serious classification on the International Nuclear Event Scale (INES) of 0 to 7. Then in October there were a series of incidents caused by human error, including one in which workers overfilled a storage tank installed on an incline, causing radioactive water to overflow.

In August 2013, TEPCO set up a task force directly headed by its president, Naomi Hirose, to handle the storage of contaminated water. But in February this year, approximately 100 tons of water with up to 240 million becquerels per liter of radioactive substances such as strontium 90 that emit beta radiation leaked from the plant. It appears prospects for controlling contaminated water are grim, with Masayuki Ono, acting head of TEPCO's nuclear power and facilities section, apologizing after the latest incident, "We apologize for the trouble we are causing despite the various measures we are taking."

Radioactive water has caused additional related problems.

Highly-contaminated water with at least 240 million becquerels of radioactive cesium per liter (as of November 2013) was detected in parts of a trench -- an underground tunnel for cables -- that runs from below the reactor buildings and the embankment. In December last year, the installment of storage tanks near the periphery of the plant grounds caused annual radiation exposure doses in the surrounding areas to exceed 8 millisieverts, or eight times the maximum permitted level.

TEPCO is rushing to increase its tank capacity for contaminated water storage to at least 800,000 tons, and has begun work to block groundwater from flowing into reactor buildings to slow the generation of contaminated water. It has plans for a "bypass" of groundwater by pumping water from wells before it is contaminated and dumping it into the ocean. If the plan succeeds, the flow of groundwater into reactor buildings can be cut back by up to 100 tons per day.

The government has decided to inject some 47 billion yen into the construction of a frozen wall in the ground surrounding the No. 1, 2, 3 and 4 reactors to prevent groundwater from coming into contact with spent nuclear fuel, and tests are being run toward its completion in fiscal 2015.

The removal of radioactive substances from contaminated water is crucial in preventing further contamination of the environment and mitigating radiation exposure. The Advanced Liquid Processing System (ALPS), which can remove 62 radioactive contaminants -- not including tritium -- has the capacity to process a maximum 750 tons of water per day, and is expected to be instrumental in water decontamination. An additional installment of ALPS is set for fiscal 2014, and TEPCO President Hirose has announced plans to decontaminate radioactive water held in storage tanks by the end of March 2015. TEPCO also plans to begin removing contaminated water from the plant's trench to reduce the risk of contaminating the ocean.

However, there have been no previous attempts to create such a large-scale frozen underground wall anywhere in the world. Furthermore, it is still unclear whether the fishing industry, which has grave concerns for the effects of radiation fears on their businesses, will be open to the groundwater "bypass" plan. ALPS has run into technical problems, making the removal of cobalt 60 and three other radioactive contaminants difficult. In addition, tritium removal -- which is not possible with ALPS -- has yet to be resolved.

March 5, 2014

## Massive problem of debris

### **Nuclear fuel recovery work underway at Fukushima plant strewn with massive debris**

<http://mainichi.jp/english/english/newsselect/news/20140305p2a00m0na013000c.html>

The fourth floor of the No. 4 reactor building at the Fukushima No. 1 Nuclear Power Plant is seen in this photo taken on March 4. The reactor building remains strewn with concrete debris and twisted pipes brought on by hydrogen explosions three years ago. (Mainichi)

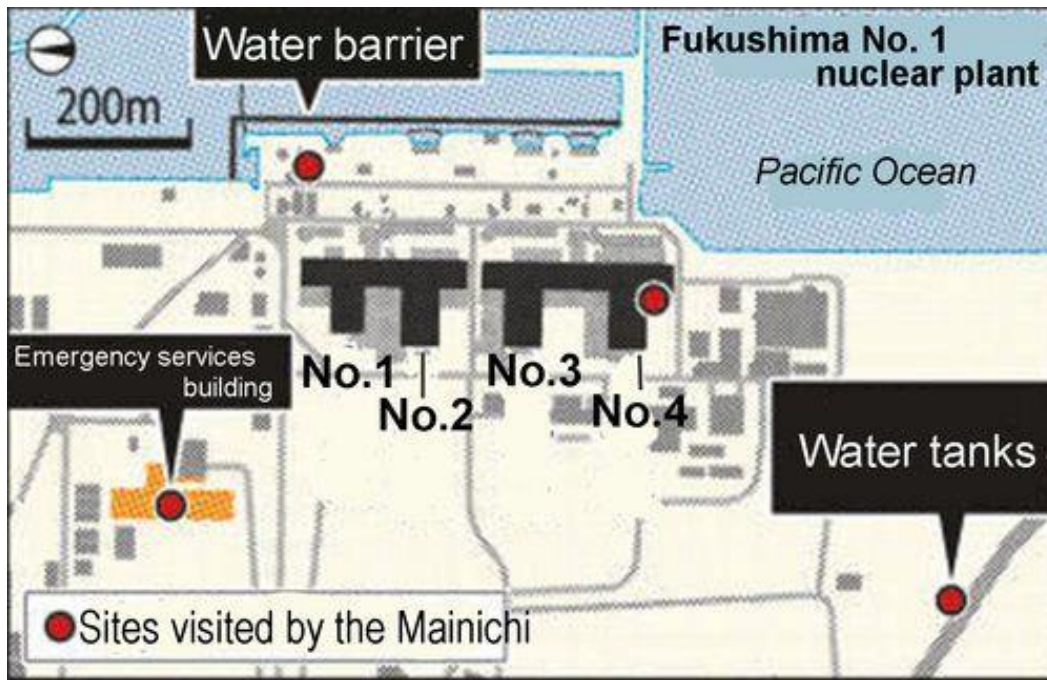




OKUMA, Fukushima -- Although work is underway to recover nuclear fuel from a spent nuclear fuel pool in the reactor building of the No. 4 reactor at the Fukushima No. 1 nuclear plant, the tsunami-crippled nuclear facilities remain strewn with massive amounts of debris -- three years after the outbreak of the nuclear crisis.

A Mainichi Shimbun reporter visited the nuclear power station on March 4 to exclusively cover what is actually happening there. The actual scenes of the devastation underscore a rough road ahead to decommission the facilities -- a daunting task likely to take 30 to 40 years.

The Nuclear Regulation Authority (NRA) has an office on the premises of the nuclear power plant. The Mainichi Shimbun reporter accompanied Atsuhiko Kosaka who heads the NRA office in charge of decommissioning. It was the first time the NRA had allowed a journalist to accompany nuclear regulators at the nuclear power plant since a leakage of contaminated water came to light last summer.



(Mainichi)

拡大写真

First, Kosaka entered a quake-proof emergency building, the outpost for workers tasked with decommissioning the nuclear power plant. After obtaining various data such as reactor core temperatures from Tokyo Electric Power Co. (TEPCO) staff and other workers, Kosaka moved on to the reactor building of the No. 4 reactor to observe the extraction of nuclear fuel from a spent nuclear fuel pool that has been underway since last November. TEPCO staffers are using a special crane to remove fuel rods one by one that lie about 12 meters below the water surface before placing them in special transport vessels. The slogan "Don't fall! Don't drop! Don't get trapped!" is posted on a steel pillar.

Of a total 1,533 nuclear fuel rods, just 418 had been recovered as of March 3. The transparency of the water in the spent nuclear fuel pool was higher than expected, but the recovery work is no less stressful and will continue until the end of this year.

Kosaka took a set of temporary stairs to get down to ground level from the spent nuclear fuel pool on the fifth floor of the reactor building. The areas around the third and fourth floors of the building were strewn with debris including concrete fragments that were blown off by hydrogen explosions three years ago. Twisted pipes also remained untouched. "Walk quickly," a TEPCO official urged from behind. High levels of radiation were being emitted from the adjacent No. 3 reactor.

Near the embankment, a wall is being built to prevent contaminated water from flowing into the ocean. The Mainichi reporter got in a car driven by Kosaka's colleague. The driver stepped on the gas to quickly move past the No. 3 reactor where radiation levels are high. "We can't tell whether radiation levels are high unless we actually go to the site. We want to avoid being exposed to unnecessary radiation," Kosaka said.

Kosaka inspected work being carried out to assemble welded-type tanks for highly radioactive water. In February at the nuclear station, there was an accident in which 100 tons of contaminated water leaked from a flange-type tank.

Kosaka said, "That was the kind of accident that could have been avoided if TEPCO had observed the basics of management. The problem is they didn't do what they were supposed to do. It is our task to regain the way in which we are supposed to control nuclear reactors." After visiting the facilities for about five hours, the Mainichi reporter used his dosimeter to measure his radiation exposure. The cumulative dose was 51 microsieverts -- about twice as much as that of difficult-to-return zones near the crippled nuclear power station.

### **A tour of Fukushima Daiichi with PBS**

<http://video.pbs.org/video/2365191286/>

#### **Fukushima nuclear crisis continues to unfold**

Aired: 02/28/2014

The site of the Fukushima nuclear disaster in Japan remains a post-apocalyptic landscape of abandoned towns, frozen in time. Science correspondent Miles O'Brien got a rare tour inside the plant, where three nuclear reactors melted down after the earthquake and tsunami in 2011, to learn more about the long-term solutions for stemming the radioactive contamination.

March 10, 2014

### **Fukushima Third Anniversary on Fukuleaks**

<http://www.fukuleaks.org/web/?p=12483>

Unit 1 technical report

Fukuleaks.org has actually published reports on each of the reactors at Fukushima Daiichi, on the problems of contaminated water

To read the reports check their "Fukushima Third Anniversary" series.

March 12, 2014

## US assistance

### **US: will continue assistance on Fukushima clean up**

[http://www3.nhk.or.jp/nhkworld/english/news/20140312\\_20.html](http://www3.nhk.or.jp/nhkworld/english/news/20140312_20.html)

The US administration says it will continue to support Japan's efforts to deal with the Fukushima nuclear accident of March, 2011.

White House Press Secretary Jay Carney issued a statement on the 3rd anniversary of the earthquake and tsunami that hit northeastern Japan. The disaster crippled the Fukushima Daiichi nuclear power plant.

Carney said that March 11th is a solemn day to remember those who lost their lives, and to honor the resilience of the Japanese people.

He said the Americans stand side-by-side with the Japanese as they continue the long task of rebuilding impacted lives and communities.

Carney added that the support offered by the government and the people of the United States is a clear sign of their unwavering and enduring friendship and admiration for the Japanese people.

The statement said the US-Japan alliance is the bedrock of peace and security in the Asia Pacific region.

He stressed that the United States will continue assisting Japan in cleaning up areas affected by the nuclear accident and other daunting but indispensable tasks related to the accident.

### **US NRC chief offers continued help for Japan**

[http://www3.nhk.or.jp/nhkworld/english/news/20140312\\_18.html](http://www3.nhk.or.jp/nhkworld/english/news/20140312_18.html)

The head of the US Nuclear Regulatory Commission has offered to continue to cooperate with Japan's regulatory body.

Allison Macfarlane was delivering a speech near Washington on Tuesday, the 3rd anniversary of the accident at Japan's Fukushima Daiichi nuclear plant.

Macfarlane said the US NRC has made good progress in instituting safety enhancement as a result of lessons learned from the Fukushima accident.

She explained that her commission has been taking measures to prepare for a total loss of power and simultaneous accidents hitting multiple reactors.

At a news conference after the speech, Macfarlane praised the work of Japan's Nuclear Regulation Authority, launched after the Fukushima accident in 2012.

She said the Japanese regulator has an enormous amount of work to do. She said the authority has to redevelop standards for waste material, as well as work through license applications for plants to be restarted.

Macfarlane said the NRC is offering Japan all the help it can provide.

## **Chaos in early days (Jaczko)**

### **Jaczko recalls chaos of Fukushima early days**

<http://www.japantimes.co.jp/news/2014/03/12/national/jaczko-recalls-chaos-of-fukushima-early-days/#.UyDFLoXrV1s>

by Kazuaki Nagata

Staff Writer

The central government and Tokyo Electric Power Co. fell into chaos when the triple meltdown crisis started at the Fukushima No. 1 nuclear plant, and the U.S. Nuclear Regulatory Commission also faced a tough crisis-management situation characterized by limited information and mounting pressure to act, a former chief of the NRC said.

The key characteristic is that information is always confusing, conflicted and simply often not there. Communication is difficult and impossible. Actions and events do not transpire according to plans and drills," Gregory Jaczko, who chaired the NRC during the early stage of the Fukushima crisis, said of crisis management in a speech Tuesday at a Tokyo symposium.

According to the book "Countdown to Meltdown" written by journalist Yoichi Funabashi, although the NRC sent staff to Japan, they had a hard time getting enough information from the government and Tepco to grasp what was really going on in the first stage of the disaster.

It was not just between Japan and the U.S., but the central government had difficulty getting information from Tepco.

Despite these circumstances, the need to continuously send out information is enormous, what with 24-hour news services and the Internet, Jaczko said.

The difficulty of getting information and understanding what was really going on may be implied in advice the U.S. issued to its citizens in Japan.

On March 17, 2011, the U.S. Embassy advised Americans to stay outside an 80-km radius of the stricken plant, while the Japanese government's evacuation order was for people within a 20-km radius.

"Because of the compelling need in a crisis to act and to make decisions, we proceeded to make predictions . . . what we found from these analyses was that the radiation releases would . . . potentially extend out to distances of 20, 30, 40 and 50 miles," he said.

"But one of the missing pieces of information we had was a comparable set of analyses from our counterparts in Japan . . . the information we had was known to be good, but we knew it was not complete and it was not precise. We knew that better information was probably available, but we didn't have access to it. But we had to take action," he said

The NRC thought it was better to be conservative and recommend staying outside a 50-mile radius of the plant, said Jaczko.

Funabashi's book said the U.S. Navy actually came up with a 200-mile recommendation, but the NRC didn't see that as unnecessary.

Jaczko also said many in the nuclear industry in the U.S. believed the crisis would be contained more quickly.

"If I'd asked people at NRC, their answer was this would be over by the weekend. And clearly, that was not correct," he said.

The situation kept deteriorating, as the buildings housing reactors 3 and 4 experienced hydrogen explosions three and four days after the crisis started.

“I think the biggest impression I have is how much time really we had for units 2 and 3” to really become unrecoverable, he told The Japan Times in an interview after his speech.

Jaczko also mentioned the NRC’s belief that the spent fuel pool in the reactor 4 building had gone dry not long after the crisis started.

He said the subject was repeatedly brought up in his hourly briefings at the NRC and he came to think that it was important to share with the public, which is why he mentioned it during congressional testimony March 16, U.S. time, which came out as shocking news.

“Some of the best NRC technical experts believed very, very strongly that this statement was correct,” he said.

The Japanese government and Tepco confirmed that the pool still contained water in the evening of March 16, Japan time, and told the NRC, which was not fully convinced, according to the Funabashi book.

As it turned out, the pool did still contain water, but if it had gone dry, the spent fuel rods in contained could have melted down and released a massive amount of radioactive materials into the environment.

Jaczko said people can be wrong while managing a crisis due to a lack of information, but it is important to be transparent and provide facts and the rationale for decisions that are made.

“We believed that we were right (about the pool). And hiding that and not releasing it would have been worse in my mind than what we did,” he said

Jaczko said Fukushima taught him the devastating impact and risks of a meltdown calamity and changed his assumptions about reactor safety.

“I have come to appreciate that the consequences of the nuclear reactor accident are very different than what I had believed before,” he said during the interview.

A crisis like Fukushima is not acceptable, he said, as it caused tens of thousands of people to evacuate and many are still unable to return to their homes. It will also result in trillions of yen in compensation, land decontamination and the scrapping of the plant.

Jaczko said the current design of nuclear reactors will probably be phased out in the long term.

Although countries like China plan to build many reactors, once those reactors go through their natural lives — 40 to 60 years — nuclear power will probably be phased out globally, he said.

The disaster has also forced him to change the assumptions regarding reactor safety, Jaczko said, noting safety isn't assured under existing systems because current reactors have design flaws and their many cooling systems may not protect them.

Systems to cool the fuel rods, no matter how many are in place, will only reduce, but never eliminate, the possibility of an accident, he said.

Therefore, people should start looking into changing the physics of reactors in a way that severe accidents will never happen and the public should demand that the industry design such reactors, he said.

If it is technologically and economically impossible to make such reactors, the world should probably not rely on nuclear power, he said.

March 13, 2014

## Jaczko visits Fukushima Daiichi

### **Ex-U.S. nuclear chief cites progress, problems during Fukushima inspection**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201403130069>

By TOSHIHIRO OKUYAMA/ Senior Staff Writer

Former U.S. nuclear regulatory chief Gregory Jaczko inspected work to prepare for the decommissioning of crippled reactors at the Fukushima No. 1 nuclear power plant on March 12, and gave a tentative thumbs up to the effort.

Jaczko noted progress since his last visit, but also emerging challenges.



“Many things have changed since I was last here,” Jaczko said, referring to the operation to remove spent nuclear fuel from the No. 4 reactor’s storage pool and problems with the enormous amount of contaminated water stored at the facility.

It was his first inspection of the plant since December 2011. Jaczko was the chairman of the Nuclear Regulatory Commission when the disaster unfolded on March 11, 2011.

He inspected an ALPS (advanced liquid processing system) water treatment device, which can eliminate 62 radioactive substances from contaminated water, including strontium.

Jaczko also entered the No. 4 reactor building, which now has a cover to protect the structure during decommissioning.

At a meeting with officials from Tokyo Electric Power Co., which operates the plant, Jaczko asked about water management, specifically whether the company will continue to build storage tanks or eventually release part of the contaminated water into the sea.

Naohiro Masuda, a TEPCO executive who headed the Fukushima No. 2 plant at the time of the 2011 quake and tsunami, said the problem of what to do with the growing volume of radioactive water will be tackled at a later date.

“We believe leaving contaminated water is not a good idea, so we will start with decontamination,” he said. “But what to do with the processed water is a different question.”

Jaczko was visiting Japan to deliver a keynote speech at a symposium on “risk governance leadership” sponsored by the Rebuild Japan Initiative Foundation, a private body, and the University of Tokyo. The event at the university on March 11 was organized to mark the third anniversary of the Great East Japan Earthquake and tsunami, which triggered the nuclear disaster.

March 17, 2014

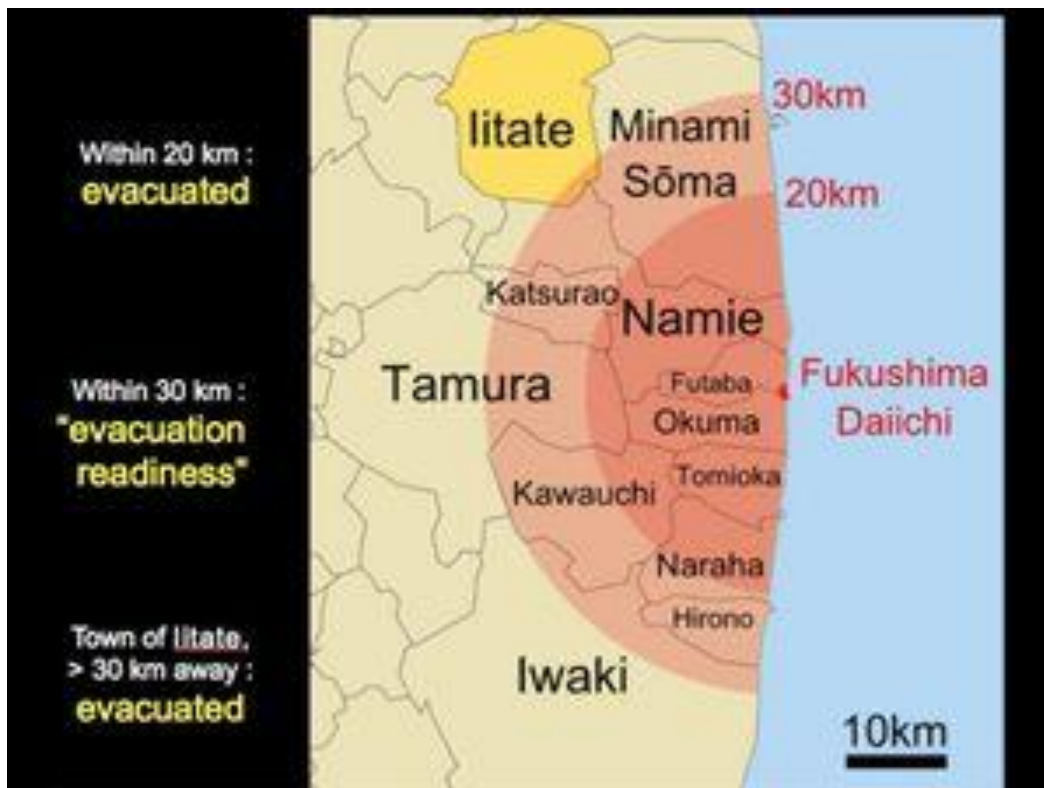
## **Gordon Edwards: Decontamination 3 years after**

## Decontamination Efforts 3 Years after the Fukushima Daiichi Disaster

<http://akiomatsumura.com/2014/03/decontamination-efforts-3-years-after-the-fukushima-daiichi-disaster.html>

*Gordon Edwards*

March 11, 2014, was the third anniversary of the Fukushima Daiichi triple meltdown disaster. Here is a graphic showing the original 211 evacuation zone, within 20 km of the plant, and the band between 20 km and 30 km where people were ordered to be “evacuation ready.” The town of Iitate — a bit more than 30 km northwest of the plant — also had to be evacuated and remains evacuated to this day due to heavy fallout.

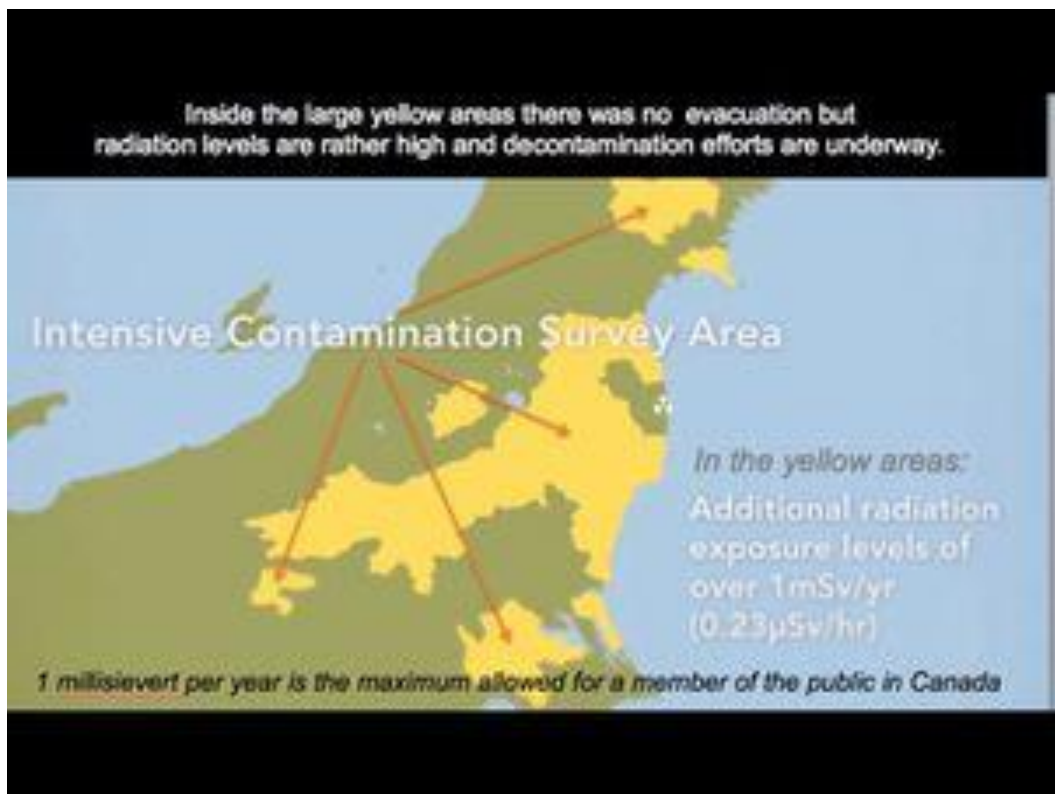


The most heavily contaminated areas include the original 20 km evacuation zone and some irregular areas northwest and a bit south of that. The yellow area in the next graphic shows that radiation levels there were higher than the maximum exposure allowed for atomic workers in the European Union (that is, 20 millisieverts per year).

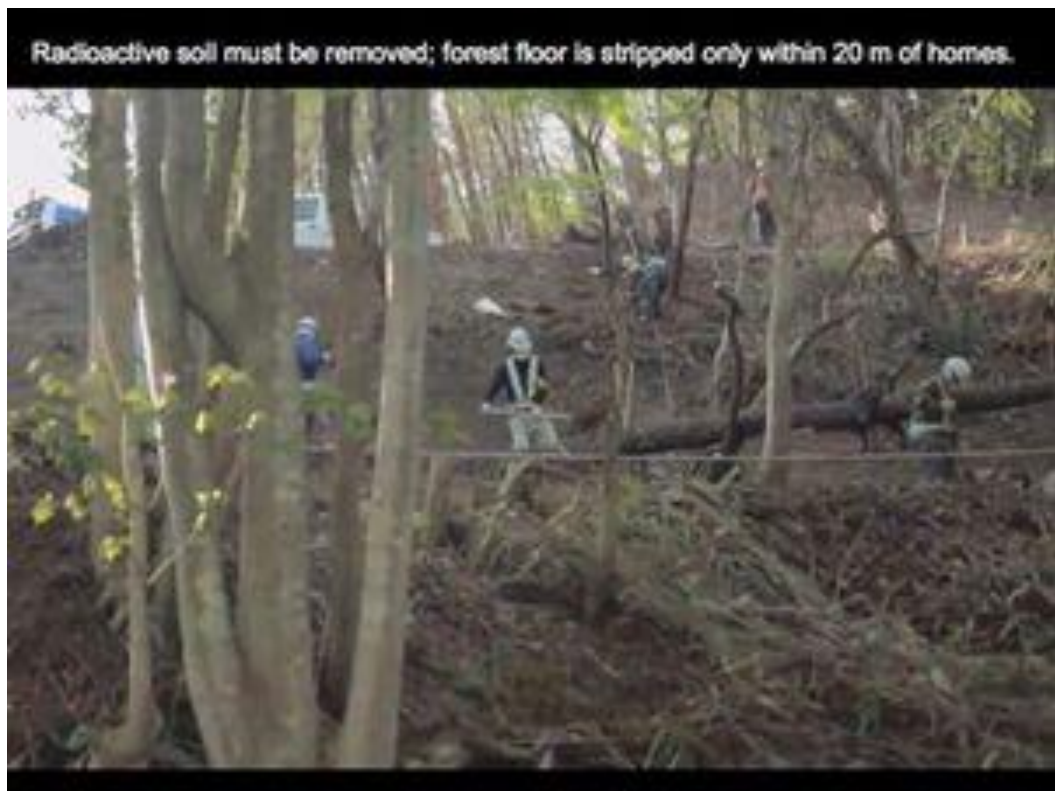


*This graphic was modified from a 2013 video by the Japanese Ministry of Environment — a link to that video is given below in the post-script. Many other graphics presented in this article are also adapted from that video.*

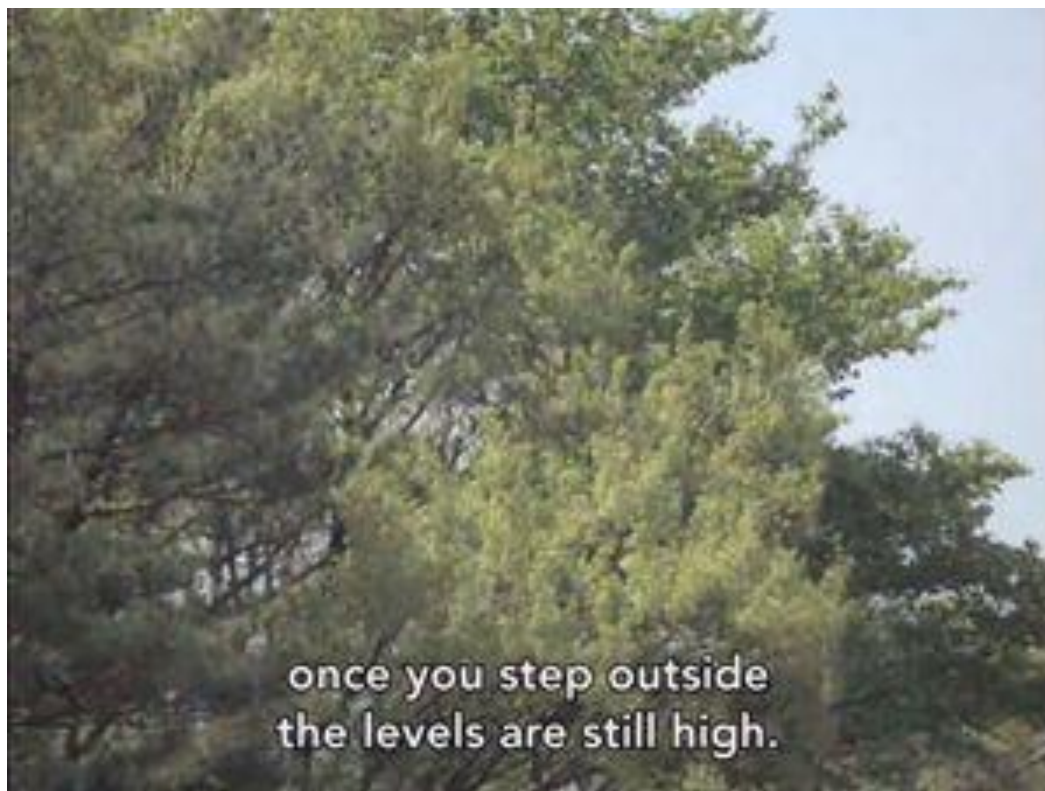
In the next graphic, the “Special Decontamination Area” identified above appears as a green patch inside a large yellow area where the radiation levels are below the 20 millisievert/year radiation limit for atomic workers but above the 1 millisievert/year radiation limit for members of the general public. Similar splotchy yellow areas appear right up to the outskirts of Tokyo, located about 240 km to the south (SSW) of Fukushima Daiichi.



There are about 100 communities contained in the yellow areas, designated as “Intensive Contamination Survey Areas.” In all these towns and villages, huge volumes of contaminated soil are dug up and bagged as radioactive waste, including parts of the forest floor within 20 meters of a residence.



The following caption is taken directly from the government video:



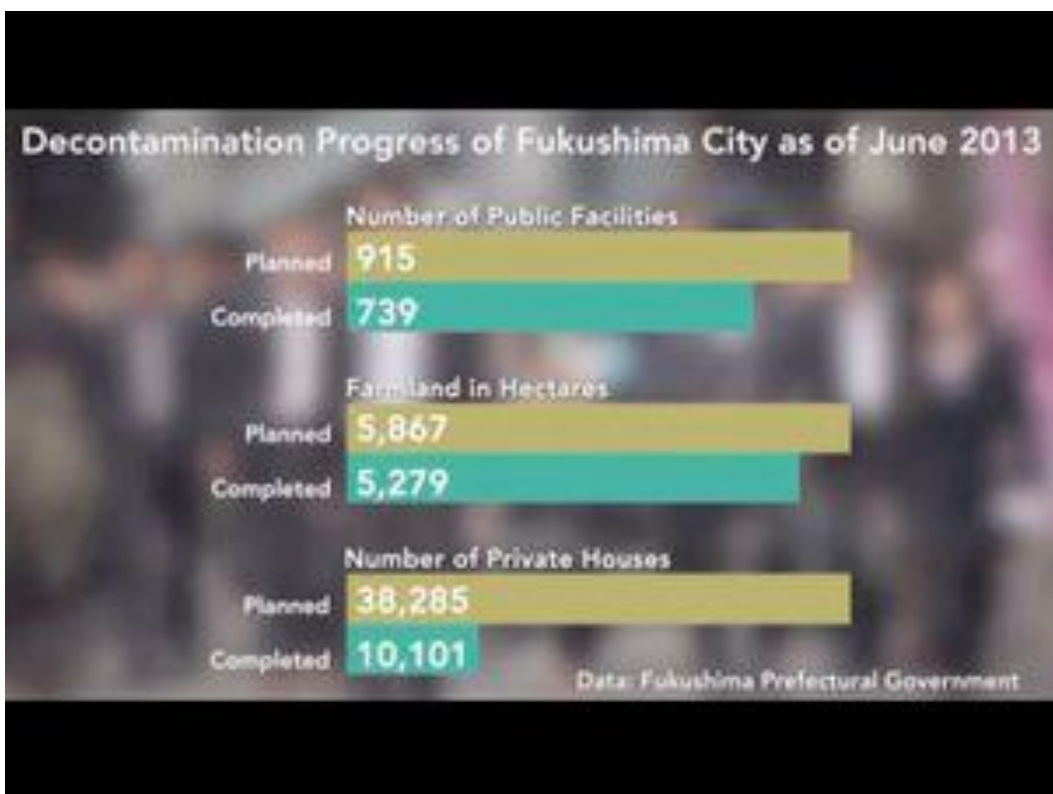
Decontaminating a single home takes several days to a few weeks. Contaminated garden soil must be dug up and bagged, and replaced with uncontaminated topsoil.



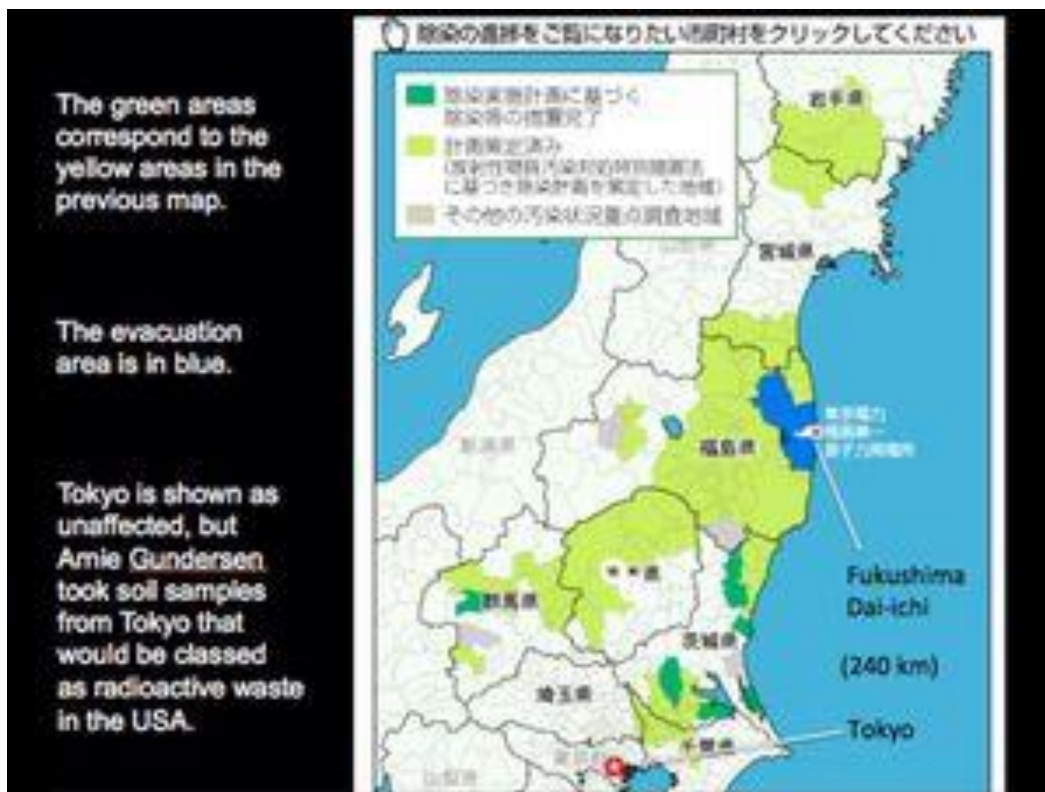
Sacks of contaminated materials are stored in the town, against the wishes of many residents – but better this than nothing. Here we see 4 “layers” of sacks.



House walls and even garden rocks are scrubbed to try to decontaminate them, with only partial success. Radioactivity is very difficult to dislodge from surfaces to which it has “bonded,” even after a long, painstaking effort. Two years after the disaster, in March 2013, only about a quarter of the homes in Fukushima City had been even partially decontaminated.



Tokyo has also been contaminated by the fallout from Fukushima — but the Japanese government does not want to admit this.



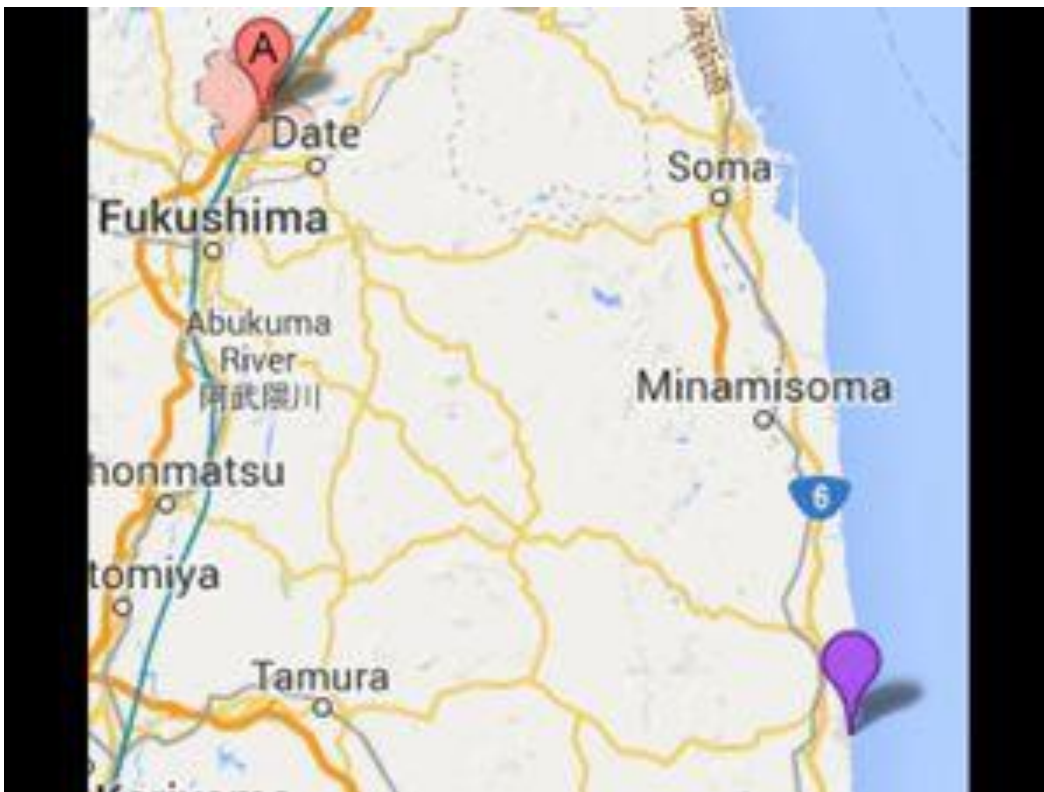
**Post-Script:**

An informative 40 minute video was released by the Ministry of the Environment in Japan in September 2013, about 6 months ago.

Link to Video: [http://josen-plaza.env.go.jp/materials\\_links/index.html#movie131007en](http://josen-plaza.env.go.jp/materials_links/index.html#movie131007en)

It documents radioactive decontamination efforts in places such as Fukushima City and the town of Koori, some 65 kilometers away from the reactors in a northwest direction. As you can see in the video, extensive decontamination efforts are deemed necessary on a house-by-house basis.





*[In this Google Map, Koori is located at the red marker, a little north and a bit east of Fukushima City, while Fukushima Daiichi is located at the purple marker.]*

*All of this is reasonable and helpful, but only partially effective. I know of several examples where people were told (e.g., by US government officials or Canadian nuclear authorities) that they could safely return to live in or work in areas that had been successfully decontaminated, without any need for protective clothing or equipment — only to find out later on that the authorities had been wrong, and the areas were in fact not safe for the people to re-inhabit or to work without protection.*

*The Japanese Government web site where this video was posted is entitled “Measures for Decontamination of Radioactive Materials Discharged by TEPCO’s Fukushima Daiichi NPS Accident.” Here is the link:*

*<http://josen.env.go.jp/en/>*

*Gordon Edwards*

March 18, 2014

### **TEPCO halts water treatment system at Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20140318\\_41.html](http://www3.nhk.or.jp/nhkworld/english/news/20140318_41.html)

Tokyo Electric Power Company has halted its system for decontaminating radioactive water at the disabled Fukushima Daiichi nuclear power plant.

TEPCO says it is testing operation of the ALPS water treatment system at the plant. The system is a key part of decontamination measures and is said to be capable of removing almost all radioactive substances from wastewater.

But TEPCO officials say they found performance had sharply deteriorated in one of 3 lines in the ALPS system when operation was halted to clean filters.

An analysis on Monday of water after treatment showed amounts of beta ray-emitting radioactive substances were reduced to only about one-tenth the amount in the water before the treatment. The system normally reduces radioactive contaminants to about one-millionth the prior level.

TEPCO halted all 3 lines in the treatment system early on Tuesday afternoon to determine the cause of the deterioration.

It plans to resume full operation of the system after April.

The ALPS system has had a series of problems, raising questions about its stability.

March 19, 2014

## **ALPS in trouble again**

### **Fukushima water treatment system remains shut down**

[http://www3.nhk.or.jp/nhkworld/english/news/20140319\\_35.html](http://www3.nhk.or.jp/nhkworld/english/news/20140319_35.html)

Tokyo Electric Power Company has yet to restart its system for decontaminating radioactive wastewater at the disabled Fukushima Daiichi nuclear plant. The shutdown is generating fears that contaminated water may be flowing into the plant's water storage tanks.

TEPCO is testing its Advanced Liquid Processing System, or ALPS. The system is said to be capable of removing almost all radioactive substances from contaminated water.

TEPCO halted all water treatment operations on Tuesday after performance had sharply declined in one

of the 3 lines filtering water in the system. The other 2 lines appeared to be functioning normally.

High levels of beta ray-emitting radioactive substances were detected in 3 tanks storing treated wastewater and other transfer tanks.

All the tanks must be cleaned before the ALPS system is restarted.

TEPCO is aiming to begin full operation next month.

Mar. 19, 2014 - Updated 07:53 UTC

### **ALPS decontamination system malfunctions again at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201403190069>

Key decontamination equipment at the Fukushima No. 1 nuclear plant has malfunctioned again, resulting in radioactive water being stored in tanks meant for treated water, Tokyo Electric Power Co. said March 18.

The utility said the problem occurred in the B unit of the multi-nuclide removal equipment called ALPS (advanced liquid processing system).

ALPS can remove 62 kinds of radioactive substances, including strontium, from contaminated water. It is seen as a crucial tool in reducing the risk of radiation exposure in the event of a leak and dealing with the huge problem of contaminated water accumulating at the crippled nuclear plant.

TEPCO said there were no irregularities on March 14. But on March 17, the utility found that water supposedly treated at the B unit contained about 10 million becquerels of radioactive substances per liter.

The company concluded that the B unit had malfunctioned and halted operations of all three ALPS units since water treated at each unit is mixed together and diverted to storage tanks.

The ALPS system has been plagued by problems since its trial operations in March last year. Contaminated water has leaked inside the equipment. And in the past month alone, TEPCO had to twice suspend operations of ALPS units due to glitches in the electric system.

## **TEPCO suspends toxic water treatment system at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20140319p2g00m0dm033000c.html>

TOKYO (Kyodo) -- Operation of the radioactive water treatment system at the disaster-struck Fukushima Daiichi nuclear power plant was suspended Tuesday when the operator found one of three lines may not be removing radioactive substances sufficiently.

According to Tokyo Electric Power Co., around 10 million becquerels per liter of beta ray-emitting radioactive substances, such as strontium, was detected from water that has passed through the system. Usually the radiation level of treated water drops to around several hundred becquerels.

While the line was originally suspended to clean filters, TEPCO decided to stop operating the two other lines as well to check whether their treatment capability has deteriorated.

The system known as ALPS, for Advanced Liquid Processing System, has been developed to drastically reduce the radiation level of the highly contaminated water that is accumulating at the Fukushima plant.

The toxic water is increasing by about 400 tons daily at the plant because the same volume of groundwater is seeping into the basement of reactor buildings and mixing with water used to cool the three crippled reactors.

If all three ALPS lines operate fully, TEPCO says the system can treat about 750 tons of toxic water per day.

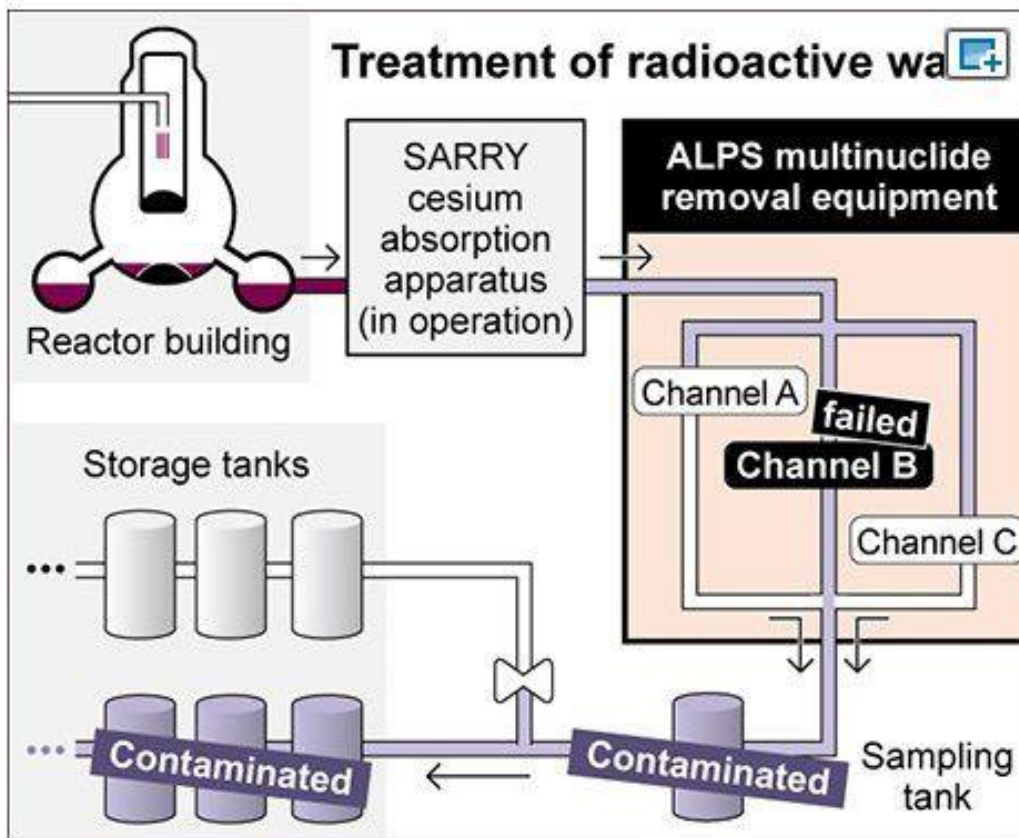
TEPCO started operating the three lines simultaneously on Feb. 12 on a trial basis, and the system has since experienced pump troubles.

March 20, 2014

### **ALPS: Not likely to restart soon**

## Treatment of Fukushima radioactive water unlikely to resume soon

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201403200065>



The Asahi Shimbun

Treatment of radioactive water at the Fukushima No. 1 nuclear plant has been suspended indefinitely after a malfunction shut down the entire purification process and fouled up storage conditions, the plant operator said.

The latest failure in the ALPS multi-nuclide removal equipment has exacerbated Tokyo Electric Power Co.'s struggles in dealing with the stockpile of radioactive water, which is growing at a rate of 400 tons a day, at the crippled nuclear plant.

TEPCO said up to 900 tons of water that was not properly purified in the ALPS equipment flowed into a network of 21 tanks holding about 15,000 tons of treated water.

Workers are trying to gauge the extent of the contamination, TEPCO officials said, adding that nobody noticed problems in the system before March 18 because water sampled on March 14 showed no abnormalities.

Not only have the 21 tanks been rendered unusable to store more purified water, but their contents of 15,000 tons of contaminated water will also have to be re-treated.

In addition, the contamination affected temporary storage tanks and conduits for treated water. TEPCO has yet to determine if this equipment can be cleaned.

“We never expected radioactive water to flow into the storage tanks,” said Masayuki Ono, acting general manager of TEPCO’s Nuclear Power & Plant Siting Division. “We should have been better prepared. We have no idea how long it will take to clean them if we decided to do so.”

The ALPS, short for advanced liquid processing system, is supposed to be able to remove 62 types of radioactive substances, including strontium, from contaminated water generated when water used to cool melted nuclear fuel mixes with groundwater.

The system sends radioactive water through many layers of absorptive material, which bonds with and removes radioactive substances. The equipment, with a maximum daily treatment capacity of 750 tons, has been under trial runs since March 2013.

Although the ALPS cannot remove tritium, a radioactive isotope of hydrogen, the purification of water through the system is expected to reduce damage levels if water leaks from storage tanks.

TEPCO workers on March 17 sampled water that was supposed to have been treated along one of the three channels of the ALPS system. They found the water still contained one-10th of the original concentration of radioactive substances, although the system is supposed to reduce that level to one-100,000th of the initial readings.

The finding prompted TEPCO to shut down ALPS operations along all three channels on March 18.

Aberrations occurring along only one channel indicate the cause may have to do with the replacement of some filters, which took place in early March, a TEPCO official said.

According to TEPCO, 340,000 tons of radioactive water in storage tanks were awaiting treatment by the ALPS on March 18.

The government and TEPCO have set a goal of doubling the capacity of ALPS and treating all radioactive water in the storage tanks by the end of fiscal 2014.

The ALPS system, however, has been operating only intermittently amid a succession of problems.

### **Water treatment system at Fukushima plant halted**

[http://www3.nhk.or.jp/nhkworld/english/news/20140320\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20140320_03.html)

The operator of the crippled Fukushima Daiichi nuclear plant says its water decontamination system will stay suspended until they identify a problem with one of its three lines.

Officials at Tokyo Electric Power Company say the line is malfunctioning but they have been unable to identify the cause.

The Advanced Liquid Processing System, or ALPS, was developed to sharply reduce radiation levels of highly contaminated water accumulating at the plant.

The officials say they have found no problems with the 2 other lines since stopping the whole system to examine it.

They say maintenance work last Thursday, in which metal-eliminating filters were replaced, might have caused the malfunction.

TEPCO officials say they still have tank space for 20,000 tons of contaminated water. So they will keep all the lines offline until the cause of the problem has been identified.

March 24, 2014

### **ALPS resumes service**

#### **ALPS resumes partial operation after 6-day halt**

[http://www3.nhk.or.jp/nhkworld/english/news/20140324\\_24.html](http://www3.nhk.or.jp/nhkworld/english/news/20140324_24.html)

Tokyo Electric Power Company has restarted a key water decontamination system at the Fukushima Daiichi nuclear power plant after a 6-day suspension.

TEPCO resumed operations at 2 of the 3 lines of the Advanced Liquid Processing System, or ALPS, on Monday.

ALPS is said to remove almost all types of radioactive materials from wastewater. This is crucial equipment in dealing with the massive volume of radioactive water.

The utility suspended the system last Tuesday after performance at one of the lines dropped sharply.

Untreated water got mixed with treated water in pipes and storage tanks. To clean the tanks, TEPCO had to temporarily close the 2 lines operating normally.

The company says the troubled line apparently began to malfunction after workers replaced filters that separate metals from water in early March. The malfunctioning line remains closed.

TEPCO hopes to put the system into full operation from April. But the system has been hit by a series of troubles. There are concerns the latest one will cause delays in the water decontamination schedule.

Mar. 24, 2014 - Updated 09:19 UTC

## Groundwater bypass

### Details of groundwater bypass plan

[http://www3.nhk.or.jp/nhkworld/english/news/20140324\\_28.html](http://www3.nhk.or.jp/nhkworld/english/news/20140324_28.html)

The government and Tokyo Electric Power Company -- the operator of the crippled Fukushima Daiichi nuclear plant, are considering releasing groundwater into the sea, bypassing the facility, as a main measure to reduce the volume of contaminated wastewater.

About 400 tons of groundwater flow into the reactor buildings every day. The groundwater becomes contaminated when it mixes with water used to cool the melted nuclear fuel.

In the bypass plan, groundwater will be pumped up before it reaches the reactor buildings.

Twelve wells have already been dug. Each is expected to be able to pump up 1,000 tons of water a day.

The water will be stored in tanks while TEPCO checks its radiation levels. After it is confirmed that the levels are within the firm's standards, the water will be released. The company says its standards are stricter than the government's.



The bypass plan is expected to cut the daily volume of groundwater that flows into the reactor buildings by 100 tons.

TEPCO and the government hoped to implement the plan in early 2013, but a series of accidents and leaks of contaminated water caused local fishermen to doubt its effectiveness.

March 25, 2014

## **Fishermen okay water release**

### **Fukushima fishermen OK TEPCO plan to release diverted groundwater into sea**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201403250058>

IWAKI, Fukushima Prefecture--Fishermen here have given the go-ahead for Tokyo Electric Power Co.'s bypass plan to release uncontaminated groundwater into the sea by diverting it before it reaches the crippled Fukushima No. 1 nuclear power plant.

The Fukushima Prefectural Federation of Fisheries Cooperative Associations confirmed its approval when the heads of its member associations met in the city of Iwaki on March 25.

The groundwater bypass plan, designed by both the plant operator, TEPCO, and the government, is intended to slow the rate at which radioactive water is accumulating in the plant's holding tanks.

The influx of groundwater into contaminated reactor and turbine buildings at the Fukushima No. 1 plant is adding 400 tons a day of radioactive water in the plant site. Storage tanks located on the facility already hold more than 400,000 tons.

TEPCO and the government originally began seeking approval for the plan by the fishermen last year. But those talks were suspended following revelations of more radioactive water leaks and other questionable developments at the damaged nuclear plant.

The government and TEPCO in February resumed their efforts to get the fishermen to green-light the project presenting new, stricter safety standards. Under their new plan, the government and TEPCO said the radioactive cesium levels in the groundwater that will be released will not exceed 1 becquerel per liter, about the same level that is found in nearby rivers.

Fukushima's fishermen have not engaged in commercial fishing operations since the nuclear disaster began to unfurl in March 2011, but they have participated in trial operations since June 2012 to catch and market some fish species that have shown very low radiation levels.

Some fishermen have expressed concern that implementation of the bypass plan could negatively impact the trial fishing operations by raising fears in customers of radioactive contamination.

A majority of fishermen, however, are more fearful that radioactive water from the plant could be released into the sea if the accumulating volume continues to grow.

Members of the fisheries federation, therefore, agreed to approve the bypass plan with a caveat that an independent third-party body should oversee the process.

**see also :**

### **Fukushima fishermen to accept water release plan**

[http://www3.nhk.or.jp/nhkworld/english/news/20140324\\_30.html](http://www3.nhk.or.jp/nhkworld/english/news/20140324_30.html)

A fisheries cooperative near the crippled Fukushima Daiichi nuclear power plant has decided to conditionally allow a scheme to release groundwater into the sea, bypassing the facility.

Monday's decision by the Somafutaba fisheries cooperative will be formally approved at a meeting of the regional Fukushima Prefectural Fisheries Cooperative on Tuesday.

The plan to have the groundwater bypass the facility was proposed by the government and Tokyo Electric Power Company as a way to reduce the volume of radioactive wastewater.

They want to pump up groundwater and release it into the sea before it becomes mixed with contaminated water used to cool the melted nuclear fuel.

The fishermen had been critical of the plan, as wastewater has previously leaked into the sea.

At Monday's meeting, fisheries cooperative leaders expressed safety concerns. But they agreed that an urgent step is necessary to stop further leaks.

The leaders say they will ask the government and TEPCO to meet 9 conditions. These include providing accurate information to consumers and continuing to pay damages to the fishermen affected by the nuclear accident.

Another fishermen's group, Iwaki city fisheries cooperative, has already decided to allow the bypass plan. That decision will also be approved on Tuesday

## **ALPS down again after 6 hours**

### **Tepco halts Fukushima water cleanup system again**

JJI

[http://www.japantimes.co.jp/news/2014/03/25/national/tepc-halts-fukushima-water-cleanup-system-again/#.UzE\\_BIXrXIV](http://www.japantimes.co.jp/news/2014/03/25/national/tepc-halts-fukushima-water-cleanup-system-again/#.UzE_BIXrXIV)

Tokyo Electric Power Co. suspended operations at the advanced radioactive water cleanup system at its crippled Fukushima No. 1 nuclear power plant Monday only some six hours after its resumption.

Tepco resumed operations at two units of the Advanced Liquid Processing System, or ALPS, around 1 p.m. But it suspended them shortly before 7 p.m. after it found drops of water at a tank set up to measure levels of radioactive substances in water processed by the system.

The amount of leaked water is estimated at about 0.5 liter and there are no water leaks outside the plant damaged in the March 2011 earthquake and tsunami, the company said.

Operations at all three ALPS units had been halted since March 18 due to a considerable decline in the ability of one of them to remove radioactive materials in contaminated water.

Tepco regards ALPS as a key facility to deal with contaminated water at the plant as it drastically reduces levels of 62 types of radioactive substances, such as strontium-90, although it cannot absorb tritium.

## **Fukushima water treatment system down again**

[http://www3.nhk.or.jp/nhkworld/english/news/20140325\\_07.html](http://www3.nhk.or.jp/nhkworld/english/news/20140325_07.html)

Tokyo Electric Power Company has shut down a key water treatment system at the Fukushima Daiichi nuclear power plant only 6 hours after a restart.

TEPCO suspended the Advanced Liquid Processing System, or ALPS, on Monday as workers found water leaking from one of the storage tanks.

The system was developed to sharply reduce radiation levels of highly toxic water accumulating at the plant. Experts expect it to play a crucial role in dealing with huge amounts of radioactive water.

Earlier, TEPCO workers resumed operations on 2 of the 3 ALPS lines after a 6-day suspension.

They stopped the entire system last Tuesday after detecting extremely poor performance in one of the lines.

They found untreated water was getting mixed with treated water in pipes and storage tanks. This was due to a malfunction in the systems that remove salt.

The substance was causing a slowdown of the decontamination process.

They did not detect any irregularities in the other 2 lines, allowing the restart on Monday.

TEPCO says about 500 milliliters of water seeped out from a lid on the side of the tank. But no water escaped the building that houses ALPS.

TEPCO engineers plan to find the cause of the leaks.

The utility hopes to put ALPS into full operation from April. But the system has been hit by a series of troubles. There are concerns the latest one will delay the water decontamination schedule.

## **ALPS restarted**

### **TEPCO restarts water treatment system**

[http://www3.nhk.or.jp/nhkworld/english/news/20140325\\_49.html](http://www3.nhk.or.jp/nhkworld/english/news/20140325_49.html)

Engineers at Tokyo Electric Power Company have restarted a key water treatment system at the damaged Fukushima Daiichi nuclear power plant.

Two of the 3 lines of the Advanced Liquid Processing System, or ALPS, were suspended on Monday after workers found water leaking from one of the storage tanks.

The workers changed the packing on a side hatch of the tank. They resumed operation of the 2 lines on Tuesday afternoon after confirming that no water was leaking.

ALPS has been beset by a series of problems.

A week ago, TEPCO halted the entire system after detecting extremely poor performance in one of the 3 lines.

On Monday, workers resumed operation of 2 of the lines, but found the water leak only 6 hours later.

The utility hopes to put ALPS into full operation in April.

## Groundwater diversion

### Fukushima groundwater diversion details

[http://www3.nhk.or.jp/nhkworld/english/news/20140325\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20140325_31.html)

Analysts say government and TEPCO officials will have to win public trust in their plan to divert groundwater away from the troubled Fukushima nuclear plant.

The utility has already built 12 wells outside 4 reactor buildings to pump the water out.

Last August, 300 tons of radioactive wastewater leaked from a storage tank 100 meters away from the southernmost well. Last month, 100 tons leaked from another tank.

TEPCO removed the soil around the tanks, fearing it may have absorbed the wastewater. The firm then increased the number of wells used to monitor the level of radioactivity.

Officials are also considering placing absorbents underground to remove radioactive strontium from the wastewater.

Groundwater brought up from the wells will be stored temporarily in a tank and assessed for radioactive substances.

The groundwater will not be released into the sea if cesium exceeds one becquerel per liter, or tritium exceeds 1,500 becquerels per liter.

The government and TEPCO will have to explain these measures in detail, and make the data available to local fishermen and the public in general to win their support.

Mar. 25, 2014 - Updated 07:47 UTC

## Fishermen OK with water release (2)

### **Fishermen approve groundwater diversion plan**

[http://www3.nhk.or.jp/nhkworld/english/news/20140325\\_39.html](http://www3.nhk.or.jp/nhkworld/english/news/20140325_39.html)

A federation of fishermen in Fukushima prefecture has approved a plan to divert groundwater away from the crippled Fukushima Daiichi nuclear power plant and into the sea.

The government and the plant's operator --Tokyo Electric Power Company -- developed the scheme as a measure to manage the increasing volume of radioactive water at the plant.

Every day, about 400 tons of groundwater flows into the reactor buildings and becomes contaminated when it mixes with water used to cool the melted nuclear fuel.

Under the plan, groundwater will be brought above ground with pumps and released into the sea, bypassing the reactor buildings.

The government and TEPCO estimated the method would reduce the volume of contaminated water by about 100 tons per day. They asked local fishermen to consider the plan.

The Fukushima Prefectural Federation of Fisheries Co-operative Associations gave its approval and conveyed the decision to the government and TEPCO officials at a meeting in Iwaki city on Tuesday.

Fisheries co-operatives in Iwaki and Soma cities had already approved of the plan.

Federation chairman Tetsu Nozaki requested that all efforts be made to ensure the safety of the plan. He also asked for continued compensation for fishermen affected by the nuclear accident, and for information to be published to prevent damaging rumors.

Government and TEPCO officials say they will implement the groundwater diversion plan as soon as possible after explaining it to local governments in Fukushima prefecture.

March 26, 2014

## "Essential to prevent operational errors" ...

### 1,500 valves at Fukushima plant still untagged

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201403260050>

By ASAKO MYORAKU/ Staff Writer

Labeling tags were not attached to 1,500 valves controlling the flow of radioactive water in piping and other equipment at the Fukushima No. 1 nuclear power plant in the aftermath of the March 2011 disaster, sources said.

The revelation shows that plant operator Tokyo Electric Power Co.'s measures to deal with the accident are still lagging three years after the triple meltdown triggered by the Great East Japan Earthquake and tsunami.

Tags are used to indicate where pipes and other equipment are connected to prevent workers from operating the wrong valves and releasing radioactive water to the wrong places. The pipes connect contaminated water storage tanks, pumps and other equipment.

In principle, valves are accompanied with tags at nuclear power plants across the country, sources said. At the Fukushima plant, each tag is usually numbered to prevent radioactive water from leaking due to erroneous operation of the valves.

Even though the use of tags is not legally mandated, their use is regarded as “essential to prevent operational errors,” according to a central government official who is in charge of radioactive water measures.

According to TEPCO and other sources, there are about 5,000 valves at the Fukushima plant that should be tagged, such as those on piping for radioactive water accumulated inside turbine buildings and those at contaminated water processing facilities.

The utility started attaching tags on Oct. 21 last year. A total of 3,500 tags have been attached, but work is still outstanding on 1,500 more, or 30 percent.

The work is not expected to be completed until June 27.

A TEPCO spokesperson, commenting on the lack of tags, said the utility “was able to identify valves that have to be operated based on piping drawings.”

The official said the utility started fitting tags last autumn “because it took time to identify valves (that have to be operated) and there was a need to lower the risk of erroneous operations.”

The Democratic Party of Japan said TEPCO’s failure to attach tags could be behind the string of leakages of contaminated water at the plant.

DPJ member Yuichiro Tamaki raised the issue at a session of the Lower House Committee on Economy, Trade and Industry on March 26.

March 27, 2014

## **ALPS halted again**

### **Water treatment system halted again**

[http://www3.nhk.or.jp/nhkworld/english/news/20140327\\_23.html](http://www3.nhk.or.jp/nhkworld/english/news/20140327_23.html)

The operator of the crippled Fukushima Daiichi nuclear power plant has halted one of the 3 lines of the key water treatment system at the complex.

Tokyo Electric Power Company says the line of the Advanced Liquid Processing System, or ALPS, was suspended on Thursday morning after workers found possible signs of abnormality in the water to be fed into the facility.

The utility says the water was found to be unusually cloudy. It's supposed to be more transparent as it already has had organic matter removed.

TEPCO is investigating what went wrong and why. Officials say they don't know when the operation can be resumed.

ALPS is capable of removing almost all nuclear materials from radioactive water at the plant and has been undergoing a test run. But it has recently encountered a series of troubles.

Last week, TEPCO halted the entire facility after the performance of one of the lines sharply deteriorated due to malfunctioning filters.



On Monday, 2 of the lines resumed operation, but water was found leaking from one of the storage tanks shortly afterward, forcing them to shut it down again.

The operation on the 2 lines was resumed on Tuesday.

TEPCO is aiming to get ALPS fully operational as early as April. But the plan may face more delays.

March 30, 2014

## **ALPS trouble**

### **Water treatment system halted with pump trouble**

[http://www3.nhk.or.jp/nhkworld/english/news/20140330\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20140330_13.html)

The operator of the crippled Fukushima Daiichi nuclear power plant temporarily halted the key water treatment system at the complex.

Tokyo Electric Power Company says it suspended the sole working line of the Advanced Liquid Processing System, or ALPS, on Sunday morning.

A pump that takes contaminated water from storage tanks to check pre-processing water quality was found to have a lower flow rate than usual.

Workers washed the pump on Saturday night, but could not bring the intake flow back to normal.

Later, they succeeded in bringing the pump back to full function, and resumed treatment of the contaminated water.

ALPS is capable of removing almost all nuclear materials from radioactive water at the plant and has been undergoing a test run.

But it recently suffered a series of troubles.

On March 18th, TEPCO halted operation of all 3 lines in the system, after the performance of one of the lines sharply decreased due to malfunctioning filters.

Two of the 3 lines had resumed operation, but water in one of the two was found to be unusually turbid, forcing TEPCO to shut it down again on Thursday.

The utility is hoping to process all the contaminated water in storage tanks by the end of March 2015 but has no prospective date for when ALPS will be back in full operation.

April 2, 2014

## All the way to Fukushima

### **Fukushima Daiichi wary of Chile tsunami**

[http://www3.nhk.or.jp/nhkworld/english/news/20140402\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20140402_33.html)

The operator of the damaged Fukushima Daiichi nuclear power plant has cancelled work at the seaside planned for Wednesday night through Thursday morning.

The possibility of tsunami caused by the huge earthquake off Chile forced it to call off the work.

Tokyo Electric Power Company made the decision after Japan's Meteorological Agency said that advisory-level tsunamis up to one meter high could reach the country.

The planned work involves taking samples from wells dug near the seaside to check radiation levels of groundwater.

Since the nuclear accident in 2011, TEPCO has built breakwaters around 2 to 4 meters high on a site located 10 meters above sea level.

TEPCO has also moved pumps for cooling the reactors and emergency generators to higher ground.

April 4, 2014

## Leaks from barriers

### **Rainwater leaks from barriers at Fukushima Daiichi**

[http://www3.nhk.or.jp/nhkworld/english/news/20140404\\_21.html](http://www3.nhk.or.jp/nhkworld/english/news/20140404_21.html)

Rainwater overflowed the barriers around some of the tanks storing contaminated water at the crippled Fukushima Daiichi nuclear power plant.

This came after the heavy rains that hit the area from Thursday night through Friday. TEPCO said the total rainfall for the first 6 hours of Friday reached 70 millimeters at the plant.

TEPCO patrol staff discovered on Friday morning that water was leaking from the barriers around a storage tank south of the Number 4 reactor.

Water overflowed the inner, 25 centimeter-high barrier.

It appears to have leaked from the bottom of the outer barrier, which is still under construction.

TEPCO said levels of radioactive materials such as cesium and strontium contained in the water were below detectable amounts. Workers piled up sandbags around the barriers to stop further leaks.

Water was also found to have leaked out of the barriers around another tank to the north of the Number One reactor on the same day.

TEPCO is checking whether the leaked water is contaminated.

The utility had been working to transfer water that had already built up inside the barriers into 3 tanks to prevent overflowing due to the heavy rains.

## More water tanks

### **TEPCO to add more water storage tanks by March 31**

[http://www3.nhk.or.jp/nhkworld/english/news/20140405\\_11.html](http://www3.nhk.or.jp/nhkworld/english/news/20140405_11.html)

The operator of the Fukushima Daiichi nuclear power plant says it plans to add more tanks to store contaminated water by the end of next March. That would move the plan up a year earlier than originally scheduled.

Tokyo Electric Power Company will increase the capacity of the tanks to up to 800,000 tons by March 31st.

Currently, tanks at the plant can store about 480,000 tons of radioactive water, but 90 percent of them are already full.

TEPCO has been building additional tanks on the southern side of the compound to handle the buildup of contaminated water.

The utility says it has accelerated the construction plan as it is now possible to transport prefabricated tanks from manufacturers by ship.

TEPCO officials also say they have come up with more efficient ways to build tanks inside the compound.

Meanwhile, the company plans to build frozen walls around reactor buildings to prevent groundwater from flowing beneath the facilities and decrease the amount of contaminated water.

TEPCO officials say they now expect the amount of contaminated water to be less than 800,000 tons by March 2016.

## TEPCO's video on bypass



Documents from TEPCO

<http://photo.tepco.co.jp/en/date/2014/201404-e/140404-01e.html>

### **Groundwater bypass system at Fukushima Daiichi**

[http://www.tepco.co.jp/en/news/library/archive-e.html?video\\_uuid=vh03stud&catid=61785](http://www.tepco.co.jp/en/news/library/archive-e.html?video_uuid=vh03stud&catid=61785)

TEPCO has put a video online to explain how they intend to prevent the (400 tonnes a day of) groundwater from entering the site of Fukushima Daiichi power plant.

This water comes down from the mountain side and the idea is to pump it BEFORE it gets contaminated on the site.

TEPCO rather takes it from granted that this groundwater is mostly uncontaminated or only very slightly.

To make absolutely sure the radiation level is acceptable, TEPCO says they will temporarily stored that water after pumping it into tanks (but different from those used to store the radioactive water) and test it before they release it into the ocean. They promise the test results will be posted on TEPCO's site.

April 8, 2014

## **Pumping up groundwater starting on April 9**

### **Motegi on Fukushima groundwater release into sea**

[http://www3.nhk.or.jp/nhkworld/english/news/20140408\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20140408_25.html)

Japan's industry minister Toshimitsu Motegi says the government and Tokyo Electric Power Company, or TEPCO, will soon start preparations to dump groundwater into the sea at the crippled Fukushima Daiichi nuclear power plant.

Fishery cooperatives in Fukushima Prefecture on Friday consented to a plan to pump up groundwater before it can be mixed with highly radioactive water in the basement of the reactor buildings. TEPCO will release the water into the sea.

The plan is considered key in tackling an increase in the volume of contaminated water that's hampering efforts to scrap the damaged plant.

Motegi said on Tuesday that groundwater will be pumped up on a test basis soon for procedural checks as well as a detailed analysis of water quality.

He said the work will take about one month.

He noted that radiation checks will be strictly carried out for the groundwater. He added that a third party will join TEPCO in the process and the government will monitor the work.

The government and TEPCO earlier promised to make sure that radiation levels of released groundwater will meet safety standards.

The government hopes to start to release groundwater into the sea next month, at the earliest.

## **Fukushima groundwater to be pumped up Wed.**

[http://www3.nhk.or.jp/nhkworld/english/news/20140408\\_29.html](http://www3.nhk.or.jp/nhkworld/english/news/20140408_29.html)

The government and Tokyo Electric Power Company will begin pumping up groundwater at the Fukushima Daiichi nuclear power plant on Wednesday. The water is expected to be released into the sea next month.

This will mark the start of one of several key measures to reduce the increasing volume of radiation-contaminated water at the facility.

According to the plan, clean groundwater that flows from the mountains near the plant will be pumped up before it can mix with highly contaminated water in the basements of the reactor buildings. The groundwater will then be released into the ocean.

The government and TEPCO decided to move ahead with the operation after fishery cooperatives in Fukushima Prefecture consented to the project on Friday.

The fishermen gave their approval on condition that the released groundwater meets strict environmental safety standards. They also require a third party to be involved in the inspection and discharge process.

**TEPCO says it will take about one month to analyze the groundwater quality in detail.** If there are no problems, it will begin releasing the water into the sea in May.

The Fukushima Prefectural Federation of Fisheries Cooperative Associations says decisions on whether to allow the groundwater discharge can be made only after stringent analysis of its radiation levels.

April 9, 2014

## **Groundwater pumping plan starts**



## Groundwater plan begins at Fukushima Daiichi

[http://www3.nhk.or.jp/nhkworld/english/news/20140409\\_23.html](http://www3.nhk.or.jp/nhkworld/english/news/20140409_23.html)

Workers started a water management system near the Fukushima Daiichi nuclear power plant on Wednesday. They are pumping up groundwater to prevent it from reaching the crippled facility.

Water flowing under the ground from nearby mountains is seeping into the basements of the reactor buildings, where it mixes with highly radioactive water. The bypass plan was developed to reduce the buildup of contaminated water.

The Japanese government and the plant's operator, Tokyo Electric Power Company, started the bypass system after fishery cooperatives in Fukushima Prefecture consented to the plan last week.

TEPCO says the groundwater will be pumped up for several days from 12 wells built on a mountainside. The water will be stored at special tanks. Private organizations will test radiation levels over the course of a month. If the levels are below the safety standards set by the government and TEPCO, the water will be released into the nearby Pacific Ocean.

TEPCO says when the system is in full operation, it will reduce the amount of contaminated water at plant by up to 100 tons per day. Currently, the plant has a daily buildup of 400 tons.

## Groundwater at Fukushima plant pumped in plan to release it to sea

<http://mainichi.jp/english/english/newsselect/news/20140409p2g00m0dm060000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. on Wednesday started pumping groundwater at the crippled Fukushima Daiichi nuclear power plant as part of an operation to direct it into the sea before it gets highly contaminated by passing through the site.

The so-called groundwater bypass system is seen as a key measure to slow the pace of increase of highly radioactive water accumulating at the plant. Local fishermen have agreed to the dumping of groundwater on condition that it is below stringent safety criteria.

Groundwater pumped through wells will be first stored in a tank to check the contamination level. After the safety of the water is confirmed by analysis, which is expected to take about a month, TEPCO will release the water into the Pacific Ocean.

TEPCO will operate the system on the condition that groundwater contains less than 1 becquerel per liter of cesium-134 and cesium-137, 5 becquerels per liter of beta ray-emitting radioactive material and **1,500 becquerels per liter of tritium**. The cesium level of rivers nearby is also about 1 becquerel, according to the utility.

Highly radioactive water has been increasing by about 400 tons a day at the plant because the same volume of groundwater is seeping into the basement of reactor buildings and mixing with water used to cool three reactors that suffered meltdowns in the 2011 accident.

TEPCO is installing more tanks so that it will not run out of water storage capacity, but it also wants to stop the total volume of radioactive water from further increasing.

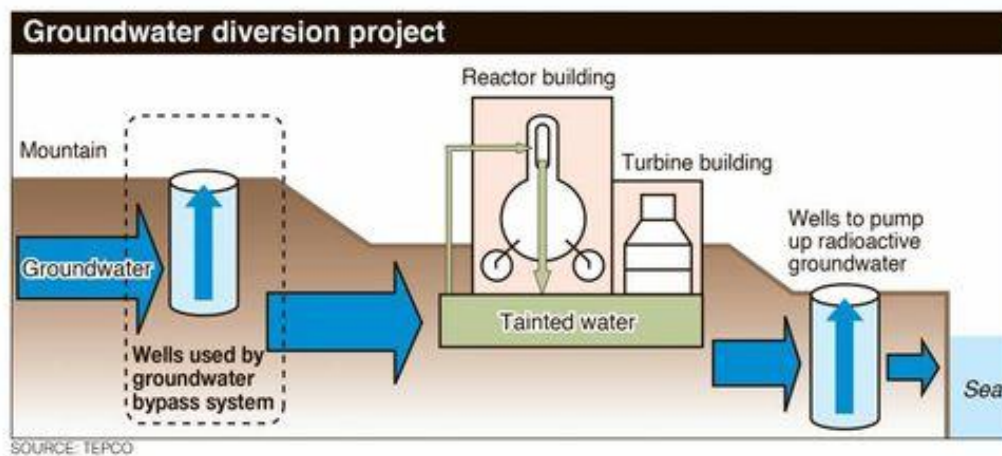
By operating the groundwater bypass system, TEPCO says it can reduce the amount of water seeping into the reactor buildings by up to 100 tons per day.

An official of TEPCO said Tuesday that it cannot currently foresee how frequently the water discharge will take place after the system gets on track.

As a trial, TEPCO has already pumped about 1,100 tons of groundwater and confirmed that its contamination level is below the safety criteria, the official said. The water is kept in tanks, but is also expected to be released.



## Pumping groundwater into tanks before releasing it into ocean



### Tepco to curb toxic water leaks with tanks

Kyodo

<http://www.japantimes.co.jp/news/2014/04/09/national/groundwater-at-fukushima-plant-pumped-in-plan-to-release-it-to-sea/#.U0pf61edHQg>

Tokyo Electric Power Co. on Wednesday started pumping groundwater into tanks before it passes through the crippled Fukushima No. 1 nuclear plant and gets highly contaminated.

Pumped from wells, the water will first be stored in tanks, where its level of contamination will be checked. Once its safety is confirmed by analysis, which is expected to take about a month, Tepco will release the water into the Pacific Ocean.

The so-called groundwater bypass system is a key measure to slow the pace of increase of highly radioactive water accumulating at the plant. Local fishermen have OK'd the dumping of groundwater on condition that it passes stringent safety criteria.

About 400 tons of groundwater a day is seeping into the basements of reactor buildings and mixing with water used to cool three reactors that suffered meltdowns in the 2011 disaster, adding to the total volume of highly radioactive water at the plant.

Although Tepco is installing more tanks to avoid running out of storage space, it also wants to stop the total volume of radioactive water from further increasing. With the groundwater bypass system, Tepco says it can reduce the amount of water seeping into the reactor buildings by up to 100 tons per day.

April 10, 2014

## Explanation found for ALPS breakdown

### Defect found in water treatment system

[http://www3.nhk.or.jp/nhkworld/english/news/20140410\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20140410_02.html)



The operator of the crippled Fukushima Daiichi nuclear plant is blaming a chipped filter for the latest breakdown of its water decontaminating system.

Tokyo Electric Power Company stopped the Advanced Liquid Processing System, or ALPS, last month after the performance of one of its 3 processing lines declined sharply.

The company said officials found that about 6 centimeters of resin material in a filter dividing radioactive and processed water had chipped off.

The company said radioactive substances could have passed through the gap.

The company said the same type of filter is used in the other 2 lines so it will check for similar problems.

ALPS can remove most nuclear materials from radioactive water at the plant. It is undergoing a test run.

The utility aims to treat all the tainted water stored in tanks by the end of March next year. But there is no prospect for now of bringing the system into full operation.

## Inspection of bypass system

### Monitors inspect groundwater bypass system

[http://www3.nhk.or.jp/nhkworld/english/news/20140410\\_14.html](http://www3.nhk.or.jp/nhkworld/english/news/20140410_14.html)

A team of monitors have visited the crippled Fukushima Daiichi nuclear plant to check how groundwater is being pumped up to stop it from mixing with radioactive water.

**Local government officials and experts** on Wednesday inspected wells and the special tanks used to store the water.

Water flowing underground from nearby mountains is seeping into the basements of the reactor buildings.

It mixes with highly radioactive water there and adds to the volume of contaminated water at the plant.

The central government and the plant's operator, Tokyo Electric Power Company, decided to pump up the groundwater before it reaches the facility.

They plan to release the water into the sea after confirming that its radioactivity level meets their safety standards.

The monitors asked questions about a third-party body that will assess the quality of the pumped-up water.

They also suggested studying the possible effects of the operation on marine products.

A Fukushima prefectural government official in charge of nuclear safety says the most important thing is to ensure safety. He says officials will work with the independent body and the central go

## First stage of groundwater bypass plan

### TEPCO moving to divert groundwater from Fukushima reactors

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201404100044>

By YURI OIWA/ Staff Writer

Tokyo Electric Power Co. put the first stage of its groundwater bypass plan into action on April 9 in an effort to prevent contaminated water from accumulating at the Fukushima No. 1 nuclear power plant.

TEPCO started pumping underground water from wells dug on the mountain side of the plant into storage tanks, where radiation levels will be checked. The utility plans to start releasing uncontaminated water into the sea in early May, after the Golden Week holiday period ends.

TEPCO said the influx of groundwater into reactor buildings was adding 400 tons of radioactive water daily.

The bypass project calls for intercepting groundwater at 12 wells that are 20 to 30 meters deep before it reaches the plant's reactor buildings, where it is becoming contaminated.

Independent inspectors will be responsible for checking radiation levels and making sure they do not exceed the safety standards jointly set by the central government and TEPCO.

Those standards dictate that levels of cesium and other radioactive substances in the groundwater must be under 1 becquerel per liter, about the same level as found in nearby rivers.

Until it begins to release the underground water into the ocean, TEPCO will pump 100 tons of water a day from the wells. If all goes as planned, TEPCO will raise the daily amount to 1,000 tons, which the utility estimates will cut the amount of radioactive water that accumulates by 20 to 100 tons per day.

TEPCO and the government needed the approval of local fishermen to proceed with the project. Talks got under way last year, and the Fukushima Prefectural Federation of Fisheries Cooperative Associations finally green-lighted the project late last month.

Local residents were particularly concerned about oversight of TEPCO's plan.

"Third parties are expected to check the quality of pumped groundwater, but we will also strictly monitor the water quality," said Hitoshi Watanabe, the chief of Fukushima Prefecture's nuclear safety management section.

On April 9, the Fukushima prefectural government's expert committee responsible for monitoring the reactor decommissioning effort at the plant, which Watanabe also sits on, visited the facility to inspect water pumps, storage tanks and related infrastructure.

If the operation proceeds smoothly, the bypass project will be a boon for TEPCO, which has weathered a succession of contaminated water leaks at the plant.

On April 4, water that had accumulated behind barriers protecting storage tanks holding contaminated water spilled over due to heavy rains. TEPCO failed to measure radiation levels of the spilled water.

April 14, 2014

## **Radioactive water floods basements**

### **Radioactive water floods Fukushima plant basements after wrong pumps switched on**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201404140055>

Tons of highly radioactive water have flooded basements at the crippled Fukushima No. 1 nuclear power plant after pumps that should not have been in use were mistakenly turned on.

Plant operator Tokyo Electric Power Co. announced April 14 that 200 tons of contaminated water have flooded the basements of buildings on the plant site.

Although TEPCO officials said there were no channels for the contaminated water to leak out of the flooded basements, the Nuclear Regulation Authority ordered the utility to continue to monitor the situation and collect the leakage as soon as possible.

TEPCO officials said the water was highly contaminated because it was used to cool reactors at the Fukushima No. 1 plant. The water contains several tens of millions of becquerels per liter of radioactive cesium because it has yet to be purified using a system that removes radioactive materials.

The contaminated water has been collected beneath a group of buildings that house the central waste processing facilities.

Workers noticed something amiss on April 10, as the water levels in buildings that should have been pumping out water were found to be rising.

Workers discovered April 12 that four pumps that should not have been used were in operation. Those pumps are normally used to reverse the flow of water or to send the water to other destinations when problems arise in pumping the water to the original destination.

All the temporary pumps were halted around 5 p.m. on April 13. However, by that time about 200 tons of contaminated water had flooded the basement floors where water should not be accumulating.

The pumps have to be manually operated to send the water to other destinations. TEPCO will check to see if workers mistakenly operated the pumps.

## **Basement of incineration building flooded with radioactive water**

### **Over 200 tons of radioactive water pumped into wrong building at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20140414p2a00m0na008000c.html>

Tokyo Electric Power Co. (TEPCO) said April 14 that 203 tons of highly radioactive waste water was transferred to a building at its crippled Fukushima No. 1 Nuclear Power Plant by mistake.

It is believed the tainted water was delivered to the building, which was only supposed to store such water during emergencies, via temporary pumps. TEPCO officials said that the water contained 37 million becquerels per liter of radioactive cesium, but that there had been no leaks outside the building.

According to TEPCO, the contaminated water was found in the basement floor of an incineration building. Cesium removal equipment that is no longer used is located on the ground floor of the building.

On April 10, TEPCO officials noticed that the water level in two other storage facilities was fluctuating. When officials investigated, they found four temporary pumps that were only supposed to be used during emergencies running. The pump switches were located in the incineration building and another structure, and it is possible workers accidentally switched them on.

TEPCO reported the situation to the Secretariat of the Nuclear Regulation Authority under the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors.

Separately on April 13, one ton of treated radioactive water leaked from a storage tank at the nuclear plant, apparently from a damaged part of the tank. This water was contaminated with 1,640 becquerels per liter of cesium and 11 becquerels per liter of strontium. None of the water was released into the sea, officials said.

### **Contaminated water wrongly transferred**

[http://www3.nhk.or.jp/nhkworld/english/news/20140414\\_09.html](http://www3.nhk.or.jp/nhkworld/english/news/20140414_09.html)

The operator of the damaged Fukushima Daiichi nuclear plant says highly contaminated water was mistakenly sent to a building that is neither a storage nor processing facility.

At the plant's No.1, 2 and 3 reactors, water is injected to cool melted nuclear fuel. The highly contaminated water is pumped out and sent to multiple storage buildings before it is sent to a processing facility.

Tokyo Electric Power Company officials say that between Thursday and Sunday they found the water level at storage facility buildings has not risen, but rather decreased.

Their investigation found that 4 pumps which were not supposed to be used were in operation.

The 4 pumps sent the contaminated water in a reverse direction, or into the basement of a facility known as the Incineration Workshop Building.

TEPCO officials estimate about 200 tons of highly- contaminated water leaked into the building. They say the radioactive cesium in the water is 37 million becquerels per liter.

The officials say that the contaminated water in the building should not leak outside as there is no direct connection between the basement and the outside.

They are closely watching the changes in the water level inside the building as well as the water quality of the wells in the surrounding area. They are also investigating the cause of the pumps' malfunction.

## New leak

### **TEPCO: Contaminated water leaks from plastic tank**

[http://www3.nhk.or.jp/nhkworld/english/news/20140414\\_11.html](http://www3.nhk.or.jp/nhkworld/english/news/20140414_11.html)

The operator of the Fukushima Daiichi nuclear power plant says water leakage was found from a small plastic tank near storage tanks for contaminated water.

Workers found a one-centimeter hole on a side of the plastic tank on Sunday. The container is about 700 meters from the sea.

Tokyo Electric Power Company says the remaining water in the tank contains 1,200 becquerels per liter of cesium 137 and 440 becquerels per liter of cesium 134. Both amounts are above the limit for discharging rainwater.

TEPCO officials estimate up to one ton of water leaked out and seeped into the ground.

They say they do not expect sea water to be affected by the leakage as there is no gutter that leads to the sea in the area.

## TEPCO will pump back radioactive water

### **TEPCO pumping back contaminated water**

[http://www3.nhk.or.jp/nhkworld/english/news/20140414\\_38.html](http://www3.nhk.or.jp/nhkworld/english/news/20140414_38.html)

The operator of the damaged Fukushima Daiichi nuclear plant says it has corrected a problem in which highly contaminated water was sent to a building that is neither a storage nor a processing facility.



Tokyo Electric Power Company says it is sending the water back to the original storage facilities. The reason for the action is not yet known.

TEPCO officials say they have found no leaks of contaminated water from the basement of a building where the water was stored. The building is known as the Incineration Workshop Building, and is neither a storage nor processing facility.

Water injected to cool the melted nuclear fuel becomes highly contaminated. It is then pumped out and sent to multiple storage buildings before being sent on to a processing facility.

Last Friday, the officials discovered that the water levels at the storage facility buildings had not risen, but rather dropped.

TEPCO officials found four pumps operating that were not supposed to be used.

The pumps sent the contaminated water to the wrong building.

The officials say about **203 tons of highly contaminated water** were pumped into the building. The water is reportedly contaminated with radioactive cesium. The radioactive material in the water measures 37 million becquerels per liter.

TEPCO officials are looking into the cause of the pumps' unexpected operation. They say it is not known whether the pumps were intentionally started, and that they will interview workers if necessary.

April 15, 2014

### **TEPCO pressed to probe contaminated water problem**

[http://www3.nhk.or.jp/nhkworld/english/news/20140415\\_12.html](http://www3.nhk.or.jp/nhkworld/english/news/20140415_12.html)

The operator of the Fukushima Daiichi nuclear plant is under pressure to find out why more than 200 tons of highly contaminated water was mistakenly pumped to a wrong building at the compound.

Water injected to cool the melted nuclear fuel becomes highly contaminated. The water is then sent to storage buildings before it is sent on to a processing facility.

Workers noticed the problem last Friday when water levels had dropped at a storage building that was supposed to be receiving the contaminated flow.

Tokyo Electric Power Company has blamed 4 pumps for misdirecting the water to a building not intended for storage. The pumps were supposed to be out of use.

TEPCO officials said on Monday that they did not know whether the 4 pumps were deliberately switched on, and that they may interview workers if necessary.

The officials have said little about the problem, including why an investigation began a day after the water level abnormality was found.

Local authorities have criticized the utility for its failure to pinpoint the causes of a series of troubles at the disabled plant.

In February, more than 100 tons of contaminated water leaked from a tank due to a deliberately opened valve. TEPCO officials have interviewed about 100 workers, but have yet to find out exactly what occurred.

April 16, 2014

## TEPCO under pressure?

### **TEPCO ordered to act on contaminated water problem**

[http://www3.nhk.or.jp/nhkworld/english/news/20140416\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20140416_25.html)

Japan's nuclear regulator has ordered the operator of the Fukushima Daiichi nuclear power plant to strengthen safety measures for handling contaminated water. The Tokyo Electric Power Company announced a mishandling incident at the plant and the regulator wants to prevent a reoccurrence.

Workers at the plant inject water into damaged reactors to cool melted fuel. The water becomes highly radioactive in the process, and is supposed to be held in storage buildings before being sent to a decontaminating facility.

On Monday TEPCO learned that more than 200,000 liters of highly contaminated water was mistaken pumped to the basement of a building in the compound. The company says 4 pumps for emergency use directed the water.

Nuclear Regulation Authority Commissioner Toyoshi Fuketa called for stronger measures at a regular meeting of the group on Wednesday. He suggested steps such as setting up security cameras and locking the pumps' switch boxes.

The regulator ordered the utility to come up with preventative measures and report them at an experts' panel scheduled for Friday.

TEPCO has yet to determine who turned on the pumps and how the incident came about. The regulator has also asked to be briefed on the results of TEPCO's investigation.

## Contaminated water leaks from ALPS system

### Radioactive water overflows at treatment facility

[http://www3.nhk.or.jp/nhkworld/english/news/20140416\\_35.html](http://www3.nhk.or.jp/nhkworld/english/news/20140416_35.html)

The operator of the crippled Fukushima Daiichi nuclear plant says another setback has hit a key system used to decontaminate highly-radioactive water.

The Tokyo Electric Power Company says water used to wash contaminated equipment overflowed from a storage facility on Wednesday.

TEPCO says workers discovered the problem while washing a tank used for filtering radioactive substances from water. The tank is on one of the 3 separate lines of the Advanced Liquid Processing System, or ALPS.

The utility says more than 1,000 liters of water overflowed and are now within a barrier inside the ALPS building.

The firm says the water contains 3.8 million becquerels of beta ray emitting materials such as strontium and 6,700 becquerels of cesium 137.

The company says no workers have been exposed to radiation from overflow.

It is checking the concentration of radioactive substances in the water and investigating the cause of the accident.

Only 1 of the three 3 lines in the decontamination facility is in service following a problem last month, when the system's performance dropped sharply.

ALPS is the main facility at the plant used to decontaminate water, and can remove almost all radioactive substances. Test operations started last year, and full-fledged use was scheduled to begin this month.

However, the system has experienced various technical difficulties, forcing it to be shut down frequently.

April 17, 2014

## Leak of highly contaminated water from ALPS

### Contaminated water found leaking from ALPS at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201404170034>

Tokyo Electric Power Co. said April 16 it detected a leak of 1 ton of highly contaminated water from the ALPS multinuclide removal equipment at the Fukushima No. 1 nuclear power plant.

TEPCO said the water contained 3.8 million becquerels of beta-ray sources per liter, but has not leaked outside the building housing the ALPS equipment. The utility added that the water contains radioactive material-absorbing agents.

The ALPS system has three water purification channels, and TEPCO found the contaminated water containing absorbing agents leaking from Channel B, where operations were suspended after a malfunction shutdown in March.

The plant workers found that the water was overflowing from a container for processed radioactive water and absorbing agents, called the high integrity container (HIC), in the early afternoon of April 16. They were moving granular radioactive material-absorbing agents into the tank with water.

TEPCO said the leakage has not compromised the entire purification process of the ALPS system.

April 17, 2014

## Under control?

## Manager at Japan's Fukushima plant admits radioactive water "embarrassing"

<http://www.reuters.com/article/2014/04/17/japan-fukushima-water-idUSL2N0N606720140417>

- \* Fukushima power plant manager says water problem must be brought under control
- \* Workers build new tanks to handle water, upgrade filtration system
- \* Underground ice wall planned to control groundwater

By Yuka Obayashi

OKUMA, Japan, April 18 (Reuters) - The manager of the Fukushima nuclear power plant admits to embarrassment that repeated efforts have failed to bring under control the problem of radioactive water, eight months after Japan's prime minister told the world the matter was resolved.

Tokyo Electric Power Co, the plant's operator, has been fighting a daily battle against contaminated water since Fukushima was wrecked by a March 2011 earthquake and tsunami.

Prime Minister Shinzo Abe's government pledged half a billion dollars last year to tackle the issue, but progress has been limited.

"It's embarrassing to admit, but there are certain parts of the site where we don't have full control," Akira Ono told reporters touring the plant this week.

He was referring to the latest blunder at the plant: channeling contaminated water to the wrong building.

Ono also acknowledged that many difficulties may have been rooted in Tepco's focus on speed since the 2011 disaster.

"It may sound odd, but this is the bill we have to pay for what we have done in the past three years," he said.

"But we were pressed to build tanks in a rush and may have not paid enough attention to quality. We need to improve quality from here."

The Fukushima Daiichi station, 220 km (130 miles) northeast of Tokyo, suffered triple nuclear meltdowns in the worst nuclear disaster since Chernobyl in 1986.

The issue of contaminated water is at the core of the clean-up. Japan's nuclear regulator and the International Atomic Energy Agency say a new controlled release into the sea of contaminated water may be needed to ease stretched capacity.

But this is predicated on the state-of-art ALPS (Advanced Liquid Processing System) project, which removes the most dangerous nucleides, becoming fully operational. The system has functioned only during periodic tests.

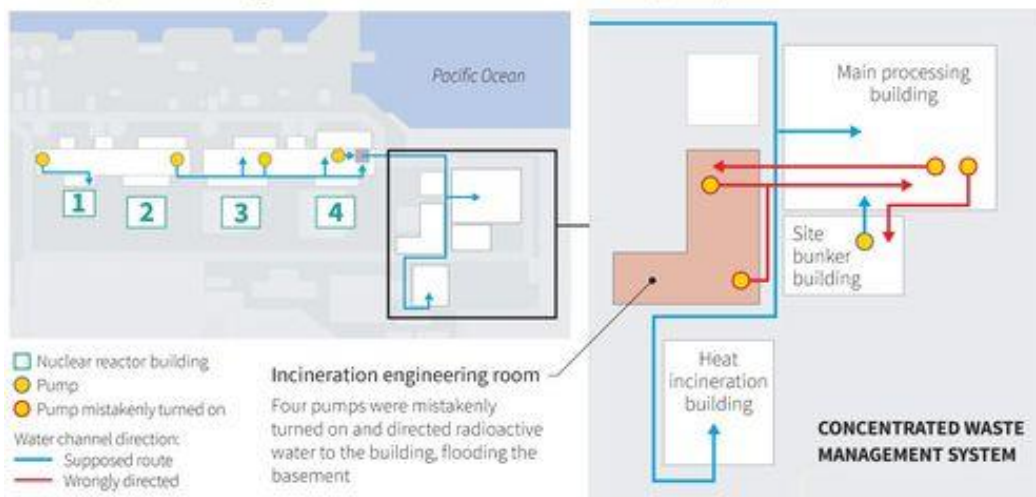
As Ono spoke, workers in white protective suits and masks were building new giant tanks to contain the contaminated water - on land that was once covered in trees and grass.

A cluster of cherry trees, unmoved since the disaster, is in bloom amid the bustle of trucks and tractors at work as 1,000 tanks in place approach capacity. Pipes in black insulation lie on a hill pending installation for funneling water to the sea.

Graphic: Fukushima problems [link.reuters.com/fev22v](http://link.reuters.com/fev22v) Graphic: Fukushima ALPS [link.reuters.com/tes72v](http://link.reuters.com/tes72v)  
Graphic: Latest leak at Fukushima [link.reuters.com/xun58v](http://link.reuters.com/xun58v)

## Radioactive water leak

Tokyo Electric Power Co. said on Monday that about 203 tons of highly radioactive water were erroneously sent to a building at the accident-hit Fukushima Daiichi nuclear power plant.



Source: Tepco

K.Pong, staff, 15/04/2014

REUTERS

HUGE FLUSH

"We need to improve the quality of the tanks and other facilities so that they can survive for the next 30-40 years of our decommission period," Ono said, a stark acknowledgement that the problem is long-term.

Last September, Abe told Olympic dignitaries in Buenos Aires in an address that helped Tokyo win the 2020 Games: "Let me assure you the situation is under control."

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In a rare success, the government won approval from fishermen for plans to divert into the sea a quarter of the 400 tonnes of groundwater pouring into the plant each day.

But things keep going wrong.

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In February, a tank sprouted a 100-tonne leak of radioactive water, the most serious incident since leaks sparked international alarm last year.

A hangar-like structure houses Toshiba Corp's ALPS system, able to remove all nucleides except for less noxious tritium, found at most nuclear power stations, its planners say.

It sat idle for 19 months after a series of glitches. The latest miscue occurred on Wednesday, when a tonne of radioactive water overflowed from a tank.

"The ultimate purpose is to prevent contaminated water from going out to the ocean, and in this regard, I believe it is under control," Ono said. But the incidents, he said, obliged officials to "find better ways to handle the water problem".

The government says it will help fund the filtration system, build an underground ice wall and erect more storage tanks.

The 1,000 tanks hold 440,000 tonnes of contaminated water. Some 4,500 to 5,000 workers, about 1,500 more than a half year ago, are trying to double the capacity by 2016.

Once the deal was clinched with the fishermen, Tepco embarked on a plan to use a water bypass, from as early as next month, to funnel clean groundwater to the sea.

But the latest samples next to the bypass found elevated levels of radiation and the project was placed under further scrutiny. Tepco said the radiation was within permitted limits.

Plans also call for a 1.4-km underground wall of ice to block groundwater. Tests began last month and Tepco hopes next year to begin construction - sinking giant refrigeration rods into the ground to create an impermeable wall of frozen earth.

(Additional reporting by Mari Saito in TOKYO; Editing by Ron Popeski)

April 18, 2014

## **Groundwater too radioactive to be released into sea**

### **TEPCO discovers radioactivity levels beyond threshold for release in pump well**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201404180057>

Radioactivity levels exceeding standards to release groundwater into the ocean were discovered in a pump well at the crippled Fukushima No. 1 nuclear power plant, Tokyo Electric Power Co. said April 17.



TEPCO said 1,600 becquerels per liter of tritium were detected in one of 12 wells dug on the facility's grounds to lift uncontaminated underground water before it can reach reactor buildings and become contaminated. **The level tops the utility's self-imposed standards of 1,500 becquerels per liter.**

TEPCO said it has suspended pumping operations and that it intends to decide whether to resume operations after conducting an investigation into the groundwater on April 18.

The utility currently plans to divert groundwater from reactor buildings by pumping and storing it before it reaches the crippled reactors and then releasing it into the ocean.

The 1,600 becquerels of tritium were found in water sampled from the No. 12 pump well on April 15, TEPCO officials said. The officials said radioactivity levels there were 1,300 becquerels a week earlier.

Although legal standards allow nuclear facility operators to release up to 60,000 becquerels per liter of tritium contaminated water into the sea, TEPCO has imposed stricter restrictions on itself to win consent from local residents for its water bypass project.

Fishermen in Fukushima Prefecture expressed concerns over the relatively high readings.

"We know that TEPCO will not release the water immediately, but it is only natural for us fishermen to feel anxiety," said Hiroyuki Sato, president of the Soma-Futaba fisheries cooperative, on April 17. Masakazu Yabuki, who heads the Iwaki city fisheries cooperative, requested that TEPCO determine the causes of higher radioactivity levels.

"All we can do now is just monitor what TEPCO will do," Yabuki said. "I want the utility to work to prevent (the water) from affecting other wells."

Although the Fukushima prefectural government has required the utility to decide the general steps to be taken when readings beyond its self-imposed standards are discovered in the respective 12 wells, the utility says it will take countermeasures on a case-by-case basis.

"I hope TEPCO will reveal results of a detailed analysis and show how it intends to respond as early as possible," said an official of the prefecture's nuclear safety management division.

Sato said fishermen need to be involved in the process of making rules on how to deal with the issue of higher radioactivity levels in the pump wells.

“We will call on the central government and TEPCO to allow local fisheries cooperatives to develop new rules together with them,” he said.

April 20, 2014

## Under control? (2)

### **Fukushima No. 1 boss admits water woes out of control**

#### **Abe told an Olympic Committee meet situation was under control**

by Yuka Obayashi

Reuters

OKUMA, FUKUSHIMA PREF. – The manager of the Fukushima No. 1 nuclear power plant admits to embarrassment that repeated efforts have failed to bring under control the problem of radioactive water, eight months after Prime Minister Shinzo Abe told the world the matter had been resolved.

Tokyo Electric Power Co., the plant’s operator, has been fighting a daily battle against contaminated water since Fukushima was wrecked by the March 2011 earthquake and tsunami.

Abe’s government pledged half a billion dollars last year to tackle the issue, but progress has been limited. “It’s embarrassing to admit, but there are certain parts of the site where we don’t have full control,” Akira Ono told reporters touring the plant last week.

He was referring to the latest blunder at the plant: channeling contaminated water into the wrong building.

Ono also acknowledged that many difficulties may have been rooted in Tepco’s focus on speed since the 2011 disaster.

“It may sound odd, but this is the bill we have to pay for what we have done in the past three years,” he said.

“But we were pressed to build tanks in a rush and may have not paid enough attention to quality. We need to improve quality from here.”

The Fukushima No. 1 plant, some 220 km northeast of Tokyo, suffered three reactor core meltdowns in the world’s worst nuclear disaster since Chernobyl in 1986.

The issue of contaminated water is at the core of the clean-up. Japan’s nuclear regulator and the International Atomic Energy Agency say a new controlled release into the sea of contaminated water may be needed to ease stretched capacity as the plant runs out of storage space.

But this is predicated on the state-of-art ALPS (Advanced Liquid Processing System) project, which removes the most dangerous nuclides, becoming fully operational. The system has functioned only during periodic tests.

As Ono spoke, workers in white protective suits and masks were building new giant tanks to contain the contaminated water — on land that was once covered in trees and grass.

A cluster of cherry trees is in bloom amid the bustle of trucks and tractors at work as the 1,000 tanks already in place approach capacity. Insulation-clad pipes lie on a hill pending installation for funneling water to the sea.

“We need to improve the quality of the tanks and other facilities so that they can survive for the next 30 to 40 years of our decommission period,” Ono said, a stark acknowledgement that the problem is long-term.

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In a rare success, the government won approval from fishermen for plans to divert into the sea a quarter of the 400 tons of groundwater pouring into the complex each day.

But things keep going wrong.

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Once the deal was clinched with the fishermen, Tepco embarked on a plan to use a water bypass, from as early as next month, to funnel clean groundwater to the sea.

But the latest samples next to the bypass found elevated levels of radiation and the project was placed under further scrutiny. Tepco said the radiation was within permitted limits.

Plans also call for building an experimental 1.4-km underground freezer to create a wall of ice around the plant to block the groundwater. Tests began last month and Tepco hopes next year to begin construction — sinking giant refrigeration rods into the ground to create an impermeable wall of frozen earth.

April 21, 2014

## TEPCO, groundwater and fishermen

### TEPCO reports on radioactivity in groundwater

[http://www3.nhk.or.jp/nhkworld/english/news/20140421\\_40.html](http://www3.nhk.or.jp/nhkworld/english/news/20140421_40.html)

Some contamination in the groundwater drawn from near the Fukushima Daiichi nuclear plant is making the area's fishermen uneasy, as the plant's operator plans to release it into the sea.

Tokyo Electric Power Company has a plan to pump up groundwater and release it into the Pacific Ocean before it can be contaminated with radioactive materials at the plant.

On Monday, officials from the operator explained their preparations for the release at a fishermen's meeting in Iwaki City, Fukushima Prefecture.

They said they tested samples from 12 wells dug to pump out groundwater before it reaches the highly contaminated plant buildings.

They said technicians detected radioactivity exceeding the target level in one of the wells. They added that after 3 days, a sample taken from the same well registered below that level.

Some fishermen expressed concern about the plan and urged the operator to check the water through proper procedures. Others demanded that the company determine the cause of the temporary hike in radioactivity.

A senior executive of the utility, Tsunemasa Niitsuma, said it is their duty to strictly observe the rules set for the release plan. He added that they will assess the situation and decide what to do if radiation levels in the pumped-up water greatly exceed the target level.

April 24, 2014

## ALPS - Another mistake

## **TEPCO: Mistake may have caused latest trouble**

[http://www3.nhk.or.jp/nhkworld/english/news/20140424\\_12.html](http://www3.nhk.or.jp/nhkworld/english/news/20140424_12.html)

The operator of the Fukushima Daiichi nuclear power plant says human error may be responsible for the latest disruption to the water treatment system at the complex.

Tokyo Electric Power Company suspended one of 3 lines of the Advanced Liquid Processing System on Tuesday after workers found it was not reducing the concentration of calcium through the decontamination process.

The utility says the process relies on the chemical agent carbonate of soda to remove the calcium.

But it says a valve used to inject the agent was found to be shut, and that this was the cause of the problem.

The utility says it opened the valve and resumed the operation of the line on Wednesday.

The trouble arose not long after workers fixed another problem with the line that caused the water to be unusually cloudy in late March.

The company says it is possible the latest incident occurred because workers forgot to open the valve.

The treatment system is capable of removing almost all nuclear materials from radioactive water at the plant. TEPCO has been putting it through a test run since last year, and wants to launch full-fledged operation from April.

April 25, 2014

## **A lot of becquerels**

### **4 crippled Fukushima reactors dogged with 3.4 quadrillion becquerels of tritium**

<http://mainichi.jp/english/english/newsselect/news/20140425p2a00m0na006000c.html>

The combined level of radioactive tritium at four reactors at the Fukushima No. 1 Nuclear Power Plant is estimated at about 3.4 quadrillion becquerels, Tokyo Electric Power Co. (TEPCO) said on April 24.

The figure is more than 900 times the annual limit of 3.7 trillion becquerels per reactor set by the central government.

TEPCO reported the estimate at a meeting of the government's task force on tritium. Of the 3.4 quadrillion becquerels at the No. 1 to 4 reactors, about 2.5 quadrillion becquerels were detected in melted nuclear fuel, 834 trillion becquerels in contaminated water stored on the premises, about 50 trillion becquerels in stagnant water in reactor and turbine buildings, and about 46 trillion becquerels in water in trenches -- or underground tunnels from the basements of structures to seawalls.

The level of tritium detected in contaminated water has risen by about 17 trillion becquerels since TEPCO's last estimate in a report in January, raising fears that tritium may have begun to dissolve in water used to cool melted nuclear fuel.

May 2, 2014

## Ice wall may not be a solution

### **Nuclear expert doubts ice wall will solve Fukushima plant leaks**

<http://www.japantimes.co.jp/news/2014/05/02/national/nuclear-expert-doubts-ice-wall-will-solve-fukushima-plant-leaks/#.U2NqQVfi91s>

Kyodo

An international nuclear expert expressed skepticism Thursday over Tokyo Electric Power Co.'s plan to set up an ice wall to ultimately stop radioactive water from further increasing at the troubled Fukushima No. 1 nuclear complex.

"I'm not convinced that the freeze wall is the best option," former U.S. Nuclear Regulatory Commission Chairman Dale Klein, who heads a supervisory panel tasked with overseeing the plant operator's nuclear safety efforts, said in an interview with Kyodo News.

"What I'm concerned about is unintended consequences," Klein said.

"Where does that water go and what are the consequences of that? I think they need more testing and more analysis," he said.

Former British Atomic Energy Authority Chairwoman Barbara Judge, who was also present at the interview in Tokyo and is part of the panel, said there is a need to assess during summer whether the ice wall method would be effective.

The remarks by the two overseas experts came at a time when concerns over the plan are being raised by Japan's Nuclear Regulation Authority and engineering experts. Their opinions may cast a shadow on Tepco's plan to begin operating the ice wall by the end of next March.

"No one has built a freeze wall this long for this period of time. Typically, you build a freeze wall for a few months," Klein said.

Faced with a string of problems including radioactive water leaks at the Fukushima plant, Tepco is attempting to freeze 1.5 kilometers of soil around the basement areas of the Nos. 1 to 4 reactor buildings.

The ice wall is envisioned to block groundwater from seeping into the reactor buildings' basement areas and mixing with highly toxic water used to cool the plant's three crippled reactors.

"I am much in favor of the bypass system," Klein said, referring to the groundwater bypass system in which Tepco pumps groundwater at the Fukushima plant to direct it into the sea to reduce the amount of water seeping into the reactor buildings.

"The freeze wall is expensive," he said, urging Tepco and the government to look at the cost of building one and whether the plan is making the "best use of limited resources."

"I would encourage them to get international advice a little bit more," Klein said about Tepco, in terms of its decontamination work and future plans to scrap the plant.

Klein also urged the company to work with and share information with relevant authorities in the United States and Britain given that those nations are experienced in water management and decontamination efforts at former military or weapons-related sites.



May 4, 2014

## More doubts about "Great Icewall"

### More experts challenge Tepco's 'Great Icewall' for Fukushima No. 1

[http://www.japantimes.co.jp/news/2014/05/04/national/experts-challenge-tepcos-great-ice-wall-fukushima-1/#.U2ZyLFfi\\_IX](http://www.japantimes.co.jp/news/2014/05/04/national/experts-challenge-tepcos-great-ice-wall-fukushima-1/#.U2ZyLFfi_IX)

AP

Experts on Friday heaped further criticism on a plan to build a costly underground frozen wall around the radiation-tainted Fukushima No. 1 power plant, a development that could delay the start of the experimental project.

The experts and nuclear regulatory officials said at a meeting in Tokyo on Friday that they weren't convinced the project can resolve the serious problems involving contaminated water at the plant, which suffered multiple meltdowns following the 2011 megaquake and tsunami.

The frozen wall is a ¥32 billion state-funded project to surround the plant's four crippled reactors and turbine buildings with an ice wall to block groundwater from flowing into their basements and mixing with highly radioactive water leaking from the cores.

Toyoshi Fuketa, a commissioner with the Nuclear Regulation Authority, said the hydrological impact of creating a frozen wall in the area was unclear.

"We need to know if a frozen wall is really effective, and more importantly, we need to know whether a frozen wall may cause any trouble," Fuketa said.

Government officials say a feasibility test at the plant, run by Tokyo Electric Power Co., proved successful and that they hope to start construction in June, though the project could be delayed because of the experts' concerns.

International experts have raised similar concerns.

Dale Klein, a former U.S. Nuclear Regulatory Commission chairman who now heads a supervisory panel for Tepco, on Thursday said he was not convinced the frozen wall is the best option and worth the high cost. He also suggested that the government and Tepco review the plan to balance risk and benefit and see whether they should spend the money elsewhere.

“Any time you make a decision, it should be based on current, relevant science, and you have to strike a balance between science and policy,” Klein said in an interview in Tokyo. “At the end of the day, it may be a good alternative. But I’m just not convinced.”

Experts have said that while the wall is a proven technology, the size and planned duration of use at Fukushima is unprecedented.

Tepco is setting up a bypass system to pump up groundwater before it hits the contaminated reactor area as a way to reduce the amount of underground contaminated water. The plant is also installing another groundwater drainage system around the reactor buildings, which some experts say could serve as a sufficient alternative to an ice wall.

More than three years after the March 2011 meltdowns, the plant is still plagued by a massive amount of contaminated water. Repeated water leaks from storage tanks and other mishaps at the plant have hampered a decommissioning effort that is expected to take decades and caused environmental concerns among local fishermen.

May 14, 2014

### **Kennedy tours wrecked Fukushima plant for first time**

<http://www.japantimes.co.jp/news/2014/05/14/national/kennedy-tours-wrecked-fukushima-plant-first-time/#.U3Ro0Sji-1s>

AP

Caroline Kennedy, the U.S. ambassador to Japan, got a firsthand look Wednesday inside the Fukushima No. 1 nuclear plant devastated by the March 2011 earthquake and tsunami.

Kennedy, wearing a yellow helmet and a white protective suit with her last name emblazoned on it, toured the Fukushima plant for about three hours with her son, Jack Schlossberg.

The plant was damaged beyond repair by the disaster, and continues to be plagued by radioactive water leaks. Decommissioning the reactors is expected to take decades.

“It’s very hard to visualize and understand the complexity of the challenge when you just read about it, so this was a very informative visit,” Kennedy told reporters after the tour. She expressed her gratitude to “those who are working here every day and to those who showed us around.”

Kennedy visited the Unit 4 reactor building, and the control room for reactors 1 and 2. A guide explained how events unfolded in the control room on March 11, 2011. The reactors shut down, cutting off power after the earthquake, and the operators initially felt the situation was safe. Then the tsunami came, knocking out power to the backup cooling systems. Eventually, three of the reactor cores would melt down.

Schlossberg, who is 21, said, “I hope my peers, my generation in the United States will keep Fukushima in mind and understand that there is still work to be done and we can all do something to help.

### **Kennedy visits Fukushima Daiichi nuclear plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20140514\\_34.html](http://www3.nhk.or.jp/nhkworld/english/news/20140514_34.html)

US Ambassador to Japan Caroline Kennedy has visited the Fukushima Daiichi nuclear plant, which was heavily damaged by the March 2011 earthquake and tsunami.

Kennedy is visiting Fukushima Prefecture for the first time as ambassador.

On Wednesday she toured the plant’s compound and watched nuclear fuel being removed from a pool at the facility’s No. 4 reactor building.

She also inspected the control room for the No.1 and 2 reactors, and was briefed by officials of the plant’s operator, Tokyo Electric Power Company, on how they dealt with a loss of power after the tsunami.

Kennedy later issued a statement saying the United States will help Japan’s government and Tokyo Electric decommission the plant, particularly to resolve the issue of radioactive wastewater.

The ambassador is scheduled to inspect an offshore floating wind power generator on Thursday, as well as a facility to support children who survived the disaster.

## **Release of Fukushima pumped groundwater to start**

[http://www3.nhk.or.jp/nhkworld/english/news/20140514\\_32.html](http://www3.nhk.or.jp/nhkworld/english/news/20140514_32.html)

The government and the operator of a damaged Fukushima nuclear plant are expected to start next week releasing into the sea ground water pumped up at the plant.

Officials of the government and Tokyo Electric Power Company say 2 surveys of groundwater show radiation levels of the water are below TEPCO's safety target, which is lower than the government-set standard, at the Daiichi Nuclear Power Plant.

A study by an outside body, [the Japan Chemical Analysis Center](#), shows 0.039 becquerels of cesium 137 and 230 becquerels of tritium 230 per liter. TEPCO's analysis shows 0.047 becquerels of cesium 137 and 220 becquerels of tritium 230 per liter.

Officials will explain the findings to the Fukushima prefectural government and fishermen before starting the release of groundwater, probably next Wednesday.

In response to a request by the fishermen, third-party officials will observe the water discharge into the sea.

The government and TEPCO have been preparing for this water bypass operation by pumping up water before it reaches the damaged reactors, where it gets contaminated.

The radiation surveys involved samples from [about 600 tons of groundwater that were pumped up last month from 12 wells on a mountainside near the plant](#).

The utility expects the water bypass operation to reduce the daily buildup of 400 tons of highly radioactive water at the plant by up to 100 tons.

May 15, 2014

## **Kennedy at Fukushima Daiichi**

### **Kennedy in Fukushima for 1st time as envoy, visits nuclear plant**

<http://mainichi.jp/english/english/newsselect/news/20140515p2g00m0dm044000c.html>

FUKUSHIMA, Japan (Kyodo) -- U.S. Ambassador to Japan Caroline Kennedy visited Fukushima Prefecture on Wednesday for the first time since she assumed her post last November and toured the crippled Fukushima Daiichi nuclear power plant.

"We are committed to providing support as long as it is necessary," Kennedy said in a statement released after her visit to the Tokyo Electric Power Co. plant, which suffered a severe nuclear meltdown after the March 2011 earthquake and tsunami.

Clad in protective gear and mask, Kennedy toured the plant to see the situation firsthand at a time when Japan and the United States are cooperating in decommissioning and cleaning up the troubled power plant.

"I was struck that more than three years after the tragic events of March 11, 2011, the destructive force of the Great East Japan Earthquake and the resulting tsunami are still visible," she said.

Before coming to Fukushima, Kennedy visited neighboring Miyagi Prefecture, another northeastern area hit hard by the quake and tsunami, accompanied by her 21-year-old son, John Schlossberg. During her stay in Miyagi from Tuesday, she interacted with local senior high school students and saw how locals are rebuilding their lives.

At a forum in Tokyo in February, the ambassador stressed the importance of Japanese and U.S. firms sharing lessons of the nuclear disaster and the significance of U.S. firms contributing to efforts to rebuild Fukushima Prefecture.

## **Release of diverted groundwater next week**

### **TEPCO: Diverted Fukushima groundwater to be released into sea next week**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201405150048>

FUKUSHIMA--Tokyo Electric Power Co. said May 14 that groundwater collected before it reaches the Fukushima No. 1 nuclear power plant will be released into the sea **from next week**.

The move is part of the plant operator's "bypass project" and comes after samples collected near the stricken facility met government standards.

According to tests conducted by TEPCO and two outside organizations, **radiation levels in the water measured between 220 and 240 becquerels of tritium per liter, well below the 1,500 becquerels set as the safety standard.**

The "bypass project" is designed to prevent further accumulation of contaminated water at the nuclear power facility. The utility said the influx of groundwater at the plant was adding 400 tons of radioactive water daily.

**About 100 tons of groundwater** is expected to be siphoned off before it can reach the reactor buildings and become contaminated.

The siphoned off water will be temporarily stored in tanks before being diverted to the sea.

A detailed analysis of the water by a third-party was one of the demands made by the local fisheries federation before it would agree to the project.

TEPCO will hold briefing sessions with the local fishery associations and the prefectural government to explain the results.

## Groundwater release

### **TEPCO to release 'safe' groundwater within days**

<http://www.japantimes.co.jp/news/2014/05/15/national/fukushima-operator-release-safe-radioactive-groundwater-within-days/#.U3YEwyji-1s>

Kyodo

Groundwater at the crippled Fukushima No. 1 nuclear power plant site has passed detailed safety tests, officials said, and officials are preparing to vent hundreds of tons of water into the Pacific Ocean rather than store it as early as next Wednesday.

Tokyo Electric Power Co. is expected to spend the next few days completing preparations, including informing local communities.

Tepco carried out some of the radiation tests, but in a bid to ensure the results are seen as credible, other tests were conducted by the Japan Atomic Energy Agency and the Japan Chemical Analysis Center.

Beta ray-emitting isotopes such as strontium-90 were found to be undetectable, and cesium-134 and -137 were detected at below the safety threshold of 1 becquerel per liter.

Tepco said it will start releasing groundwater currently stored in one of the plant's tanks as soon as it has explained the findings to the Fukushima Prefectural Government and the Fukushima Prefectural Federation of Fisheries Co-operative Associations.

The first batch to be released will total around 560 tons of groundwater, said an official from the Ministry of Economy, Trade and Industry involved in the ongoing recovery effort. That amount of water will take about two hours to pour into the sea.

Tepco is under pressure to free up storage space after three years of filling up hundreds of hastily constructed short-term storage tanks.

Establishing a so-called groundwater bypass is considered a key measure to slow the buildup of highly radioactive water.

Local fishermen have agreed to the release of groundwater that meets stringent safety criteria.

Tepco is installing more tanks to ensure that it has reserve storage capacity, but it also wants to reduce the overall buildup of water requiring storage.

May 16, 2014

**Leak coming from (No3?) containment vessel located**

## Source of water leakage spotted at Fukushima plant

[http://www3.nhk.or.jp/nhkworld/english/news/20140516\\_14.html](http://www3.nhk.or.jp/nhkworld/english/news/20140516_14.html)

The operator of the Fukushima Daiichi nuclear power plant has pinpointed the **location of a leak where radioactive water is escaping a containment vessel** at one of the facility's damaged reactors.

Tokyo Electric Power Company, or TEPCO, says a remote-controlled camera in a room just outside the containment vessel recorded water leaking from a joint where a pipe is connected to the vessel.

TEPCO says the water flow is about **the width of two to four pencils and is continuous**. After reaching the floor, the water is flowing away from the containment vessel and spreading across the floor.

The utility believes that what is being released is water injected into the vessel to cool melted nuclear fuel inside.

Based on the findings, TEPCO plans to study ways to stop the leak.

This is the first time for TEPCO to pinpoint the exact location of a leak from one of the reactors that suffered meltdowns following the March 2011 earthquake and tsunami.

Identifying the specific locations of the water leakage is important for TEPCO's plan to remove melted nuclear fuel after plugging the leaks and filling the vessels with water.

The utility is also planning to conduct robotic surveys of the two other reactors. One will focus on the bottom section of the containment vessel of the No.1 reactor, where water flow was earlier detected. Another survey will cover a unit called a suppression chamber situated below the containment vessel of the No.2 reactor.

## Leak from no.3 containment vessel located (2)

### TEPCO finds source of water leak in reactor 3

<http://www.japantimes.co.jp/news/2014/05/16/national/tepcoco-locates-source-water-leakage-fukushima-3-reactor/#.U3YEJiji-1s>

Kyodo

TEPCO has found the exact place where radioactive water is leaking from the primary containment vessel of the No. 3 reactor at the Fukushima No. 1 power plant.



Using a camera survey, Tokyo Electric Power Co. found the water leaking near a pipe joint that penetrates the containment vessel, officials said Thursday.

The vessel still contains water because the cooling of the plant's crippled reactors must continue daily.

The leak is probably occurring because the level of the water in the containment vessel is higher than the area where the pipe joint is, Tepco said.

Nailing down the area is an important process in Tepco's plan to scrap reactors 1, 2 and 3, which suffered meltdowns during the early stage of the crisis in 2011.

The damaged vessel is likely leaking water that is being injected as coolant.

But, to remove the melted fuel, the utility wants to first plug the leak and fill the container with water, which serves as a shield against radiation.

Based on the latest findings, Tepco plans to calculate the amount of water that is leaking and study ways to stop the leak.

The survey was conducted after Tepco found in January that water was pouring into a drain on the first floor of the building housing the No. 3 reactor.

see also:

### **Source of water leakage spotted at Fukushima plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20140516\\_14.html](http://www3.nhk.or.jp/nhkworld/english/news/20140516_14.html)

## **Frozen soil test site shown to media**

## **Frozen soil test site shown to media at Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20140516\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20140516_33.html)

Media crews have visited the Fukushima Daiichi nuclear plant to observe an experiment to create an underground barrier around damaged reactor buildings by freezing the ground.

The government and Tokyo Electric Power Company plan to freeze soil over a 1.5 kilometer stretch around reactors No.1 through 4. The aim is to hold back groundwater, preventing it from seeping into the structures where it can get contaminated.

TEPCO has frozen soil on a smaller scale within the plant premises to test the feasibility of the plan.

Media crews observed the test site, where steel pipes have been placed at intervals around an area of 10 square meters. The pipes reach about 30 meters below ground level.

TEPCO officials say engineers filled the pipes with minus 30 degrees Celsius coolant. After around one month, the soil around the pipes froze, creating an underground wall.

Officials said the frozen wall made for the test is blocking groundwater, even where there are obstacles.

TEPCO hopes to begin work around the reactor buildings in June, if the plan is approved by the Nuclear Regulation Authority, or NRA.

**A panel of NRA experts is asking the utility to assess how the ground structure could be affected, and what may happen if the project fails.**

An official of TEPCO's in-house unit in charge of decontamination and decommissioning says the experiment has shown that frozen soil can block water.

He said the utility plans to offer a detailed briefing to the NRA.

May 17, 2014

## **NRA's approval of frozen wall not gained yet**

### **Work on frozen soil walls at Fukushima plant hits glitch**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201405170031>

By AKIRA HATANO/ Staff Writer

Plans to start construction in June of frozen underground soil walls at the crippled Fukushima No.1 nuclear power plant are now askew after concerns were raised by the nation's nuclear watchdog body.

The Nuclear Regulation Authority said plant operator Tokyo Electric Power Co. has yet to submit documents demonstrating the safety and efficacy of the project, which is unprecedented in scale. Announced in May 2013, the frozen walls are intended to stem the flow of groundwater into the nuclear complex.

“Once the project is started, it will be difficult to turn back,” said Toyoshi Fuketa, an NRA commissioner who is screening the project planned by TEPCO and the central government. “We have to thoroughly examine every aspect of this project because it is such a drastic measure.”

TEPCO has been grappling with ways to staunch the daily flow of 400 tons of groundwater into the plant complex. The groundwater mixes with melted nuclear fuel debris and has significantly raised the volume of contaminated water that TEPCO has to deal with, in addition to tons of highly radioactive water used to cool the reactors.

The technique to build the walls of frozen soil is similar to a method used in the construction of tunnels.

A series of steel pipes that contain a liquid at minus 30 degrees spaced at 1-meter intervals will be placed around the buildings housing the four reactors, as well as the turbine buildings.

Stretching 1,500 meters, the frozen walls are expected to cut the inflow of groundwater to 130 tons from the current 400 tons a day.

TEPCO and the government plan to **begin the actual freezing of soil in March 2015, with the expectation the walls could last for seven years.**

The government has provided 32 billion yen (\$313 million) in funding for the project.

In a test-run for building the frozen walls that was observed at the plant on May 16, the groundwater level outside the site was close to the surface of the ground, but no water was observed in holes inside the walls.

An official with Kajima Corp., which is in charge of the construction, said the trial was successful in blocking groundwater.

“We cleared a first hurdle,” the official said.

But the trial involved walls only 10 meters square, a fraction of the actual size of the massive walls that are due to be constructed.

Experts have warned that if something goes wrong with the walls, it could critically affect work to handle the contaminated water and decommissioning operations.

In March, TEPCO submitted a three-page document in its application for NRA approval of the project.

But Fuketa pointed out at a review meeting that the document fell far short of providing the necessary safety assurances to pass screening.

The NRA told the utility to provide answers to 24 items that the watchdog is concerned about, such as the possibility of land sinking, leaks of contaminated water and countermeasures in the event the frozen soil thaws.

The NRA is also demanding that TEPCO explain how the construction of the walls of frozen soil will be able to cut the volume of contaminated water.

The industry ministry, which gave the green light to the project, was baffled by the NRA’s reaction. “We believed that we had already gained the NRA’s understanding,” a ministry official said.

But some experts are saying that TEPCO is to blame for dragging its feet and not applying until March.

“We should not relax our position as the (nuclear industry) regulator established in light of the Fukushima disaster,” said an official with the NRA secretariat.

## Radiation spikes to all-time highs

## **Record high radiation in seawater off Fukushima plant**

<http://www.japantimes.co.jp/news/2014/05/17/national/record-high-radiation-in-seawater-off-fukushima-plant/#.U3hTvyji-1s>

JJI

Radiation has spiked to all-time highs at five monitoring points in waters adjacent to the crippled Fukushima No. 1 power station, plant operator Tokyo Electric Power Co. said Friday.

The measurements follow similar highs detected in groundwater at the plant. Officials of Tepco, as the utility is known, said the cause of the seawater spike is unknown.

Three of the monitoring sites are inside the wrecked plant's adjacent port, which ships once used to supply it.

At one sampling point in the port, between the water intakes for the No. 2 and No. 3 reactors, 1,900 becquerels per liter of tritium was detected Monday, up from a previous high of 1,400 becquerels measured on April 14, Tepco said.

Nearby, also within the port, tritium levels were found to have spiked to 1,400 becquerels, from a previous high of 1,200 becquerels.

And at a point between the water intakes for the No. 1 and No. 2 reactors, seawater sampled Thursday was found to contain 840 becquerels of strontium-90, which causes bone cancer, and other beta ray-emitting isotopes, up from a previous record of 540 becquerels.

At two monitoring sites outside the port, seawater was found Monday to contain 8.7 becquerels and 4.3 becquerels of tritium. The second site was about 3 km away.

Tepco is struggling to reduce contamination at the poorly protected plant, which was damaged by the March 2011 earthquake and tsunami. Measures include plans to build a gigantic underground ice wall around the plant to keep the daily flow of groundwater from entering the cracked reactor buildings and mingling with the highly radioactive cooling water in their basements.

The ice wall project is expected to cost ¥31.9 billion and will put a massive burden on the power grid when completed: It will need about 45.5 million kilowatt-hours of electricity to operate, equal to annual power consumption of 13,000 average households.

The project involves freezing the soil into barricades 30 meters deep and 2 meters thick for a distance of 1,500 meters around the buildings housing reactors 1 through 4.

The soil will be frozen by sinking pipes into the ground and running liquids through them at a temperature of minus 30 degrees.

On Friday, the Ministry of Economy, Trade and Industry and contractor Kajima Corp. demonstrated a miniature ice wall to reporters at the site.

“We can confirm the frozen soil’s effect in blocking water,” a ministry official said afterwards.

The department aims to begin construction next month. But the Nuclear Regulation Authority has not approved the plan, saying its backers have so far provided insufficient reassurances about public safety. International nuclear experts have also expressed concern about the effectiveness of the plan.

## **ALPS halted again**

### **Water treatment system halted at Fukushima plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20140517\\_17.html](http://www3.nhk.or.jp/nhkworld/english/news/20140517_17.html)

The operator of the Fukushima Daiichi nuclear power plant has again shut down a key water treatment system at the plant.

Tokyo Electric Power Company says it shut down one of the 3 lines of the Advanced Liquid Processing System, or ALPS, on Saturday morning. It says it took the decision because the system failed to reduce the calcium level in the water before treatment.

The presence of calcium hampers the removal of radioactive substances and has to be eliminated using sodium carbonate or a filter before water treatment. TEPCO is trying to find out why the calcium level did not drop and whether there's any problem with the treatment process.

The line of the ALPS system was shut down in March due to problems with the filter to remove metals including calcium. It was closed again in April when workers forgot to open a valve used to insert sodium

carbonate.

One of the other 2 lines of the ALPS system has been shut down since March due to the partial loss of a filter that seriously damaged the performance.

**TEPCO initially planned to begin a full operation of all 3 ALPS lines last month.**

## Hopeless battle?

### **Outcome of battle against radioactive water at Fukushima plant in doubt**

<http://mainichi.jp/english/english/perspectives/news/20140517p2a00m0na006000c.html>

We are facing a problem so large it's impossible to see all its dimensions. Eventually, we'll be able to grasp what's happening, but for now, no. The radioactively contaminated water at the Fukushima No. 1 nuclear plant is but one, relatively small part of the greater cleanup at the disaster-stricken facility, and yet in absolute terms it is enormous.

There is the relentless flow of the groundwater, a massive amount of it gushing into the plant's basements every day. There are plant operator Tokyo Electric Power Co. (TEPCO) and the central government, both desperate to make the water stop somehow. And there are the Nuclear Regulation Authority (NRA) and the mass media, surveying the contaminated water countermeasures with a dubious eye. Such is the disposition of the combatants in the battle to contain the toxic water building up every day at the Fukushima plant.

The enemies in this battle are high radiation levels and the ceaseless flow of groundwater. If this water pours into the reactor buildings and touches the atomic fuel inside, it picks up high concentrations of radioactive material, turning toxic. At the moment, this radioactive water is impossible to deal with.

The battle plan calls for contaminated water already pooling in the buildings to be pumped out and stored temporarily in tanks on-site before being put through the ALPS decontamination system, which filters out radioactive elements. To prevent yet more water from coming into the buildings, an ice wall is to be created beneath the ground that will block further incursions.

However, serious doubts have been raised over the feasibility of this battle plan. The water tanks that now cover much of the plant grounds have sprung leaks, and the ALPS system is plagued by seemingly endless breakdowns. Meanwhile, experts have questioned both the safety and effectiveness of the proposed subterranean ice wall. The sheer number of news reports of "yet another leak" and

countermeasures that were "unreliable" risks numbing the public to their significance, but the battle at the plant continues nonetheless.

I talked to one source with first-hand experience of the Battle of Fukushima; someone close to TEPCO itself. When I asked why measures to deal with the water were so far behind, the source responded by displaying a sense of distrust in the NRA.

"Do you know why starting up the ALPS system is more than six months behind schedule? Because it took so much time just to check if the (filtered radioactive material) canister would be all right if dropped at a certain angle," the source said. "It's true that these procedures have to be followed under the law, but this canister is never going to be transported off the plant grounds anyway. Don't you think that there might be a few higher priority problems at the Fukushima plant than that?"

"Everyone at the plant is working desperately to move the contaminated water, being told all the while that they have to stay under the 1 millisievert radiation dose per year (set by international standards)," the source continued. "The fact is, efforts at the plant are not being concentrated on dealing with the contaminated water, which is actually the most important task."

The NRA, the primary target of my source's tongue-lashing, was formed in 2012. Before then, both the operation and the regulation of nuclear power plants came under the jurisdiction of the Ministry of Economy, Trade and Industry. These functions were split during the taking-stock that followed the Fukushima meltdowns. However, if you asked TEPCO, it would say the NRA lacks the flexibility to deal effectively with emergencies.

When I asked one person connected with the NRA for thoughts on this, the person replied, "TEPCO's failed to get a firm grip on the management of the plant site. The company has no clear view of what constitutes progress in its work."

On April 25 this year, the NRA submitted 24 questions on the safety and effectiveness of the ice wall plan to TEPCO and the national government, and it now looks like the operation -- scheduled to commence in June -- will be delayed.

Some critics have said that a concrete wall would be better than ice. TEPCO, however, has pointed out that the ice barrier requires only that holes be drilled into the ground, limiting workers' exposure to the high radioactivity on the site. The national government, meanwhile, wants to see the contaminated water problem solved before the 2020 Tokyo Olympics. The plan, however, could fail, and there is a further risk that the excavation work could disturb the crust around the reactors.



All this has created a sense of tension within the government, as a result of which some aspects of the situation at the Fukushima plant are becoming clearer there is as yet no politician willing to take the lead on the project as a whole.

As I went from place to place and person to person asking questions for this column, I remembered the afterword from the historical novel "A Record of the Battle of Leyte" by the late Shohei Ooka. Ooka wrote that one's own experience of combat cannot define an entire war, and that he had written the novel from his own reminiscences combined with prolonged research.

Ooka finished "A Record of the Battle of Leyte" in the 26th year after the end of World War II. We are now three years into the Fukushima nuclear crisis. **We still cannot see everything that's going on. What we can say for certain, though, is that neither the radiation nor the contaminated water at the plant is getting any less, and there is no guarantee that the battle against them will turn in our favor. (By Takao Yamada, Expert Senior Writer)**

May 19, 2014

## **TEPCO will monitor work at plant more closely**

### **TEPCO steps up control to prevent troubles**

[http://www3.nhk.or.jp/nhkworld/english/news/20140519\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20140519_31.html)

The operator of the damaged Fukushima Daiichi nuclear power plant says it will monitor work there more closely.

Tokyo Electric Power Company told the government on Monday that it has designated 14 blocks within the plant, covering the Number One to Number 4 reactor buildings and wastewater storage tanks.

TEPCO has appointed managers to oversee work in each of the 14 blocks. Official at the utility introduced the measure after a string of problems in recent months.

About 100 tons of highly radioactive wastewater leaked from a tank in February because a valve that should have been closed was open.

Pumps that should have been idle were found running in April. 200 tons of wastewater flowed into the wrong building.

Workers at the plant are battling to deal with the buildup of contaminated water. But the amount of time they can spend at the plant is limited to prevent overexposure to radiation.

TEPCO officials have informed the government that work to install more storage tanks for contaminated water is about a month behind schedule. They blamed a flawed plan and a shortage of concrete.

Officials at the utility say they will allocate more workers to build tanks for 800,000 tons of wastewater by the end of next March.

May 20, 2014

## ALPS system completely off

### Fukushima water treatment lines off for some time



The operator of the Fukushima Daiichi nuclear power plant suggests it will take some time before all 3 lines of a wastewater treatment system can resume operations.

Tokyo Electric Power Company turned off Line C of the Advanced Liquid Processing System on Tuesday after discovering that the calcium levels of untreated water weren't falling.

Calcium hampers the removal of radioactive substances and needs to be eliminated before water is treated.

Another problem forced the utility to halt Line A last Saturday.

TEPCO believes that the filters on these 2 lines are malfunctioning.

Back in March, Line B was shut down after its performance dropped.

TEPCO assumes that the plastic parts of the filters have deteriorated due to radiation exposure.

It has replaced the parts with ones made from another material. Line B is likely to resume operation on Friday.

But the company says Line A will remain turned off until mid-June and it has no idea when it can restart Line C.

### **Fukushima's last water treatment line shut down**

[http://www3.nhk.or.jp/nhkworld/english/news/20140520\\_24.html](http://www3.nhk.or.jp/nhkworld/english/news/20140520_24.html)

The last functioning water treatment line at the trouble-ridden Fukushima Daiichi nuclear power plant has been shut down.

The plant operator, Tokyo Electric Power Company, says it turned off the last of the 3 working lines of the Advanced Liquid Processing System, or ALPS, on Tuesday morning.

It says the concentration of calcium in contaminated water did not drop before treatment. Calcium hampers the removal of radioactive substances and needs to be eliminated before water is treated.

TEPCO says there may have been problems with the filter that removes calcium and metals.

The utility shut down a second line on Saturday and the first in March after a defective filter caused its performance to drop considerably.

The filter has since been replaced and equipment was cleaned. The operator hopes to restart the line at the end of this month.

TEPCO had initially planned to have all 3 lines fully operational in April, but now there are no prospects for the system to restart stable operations.

May 20, 2014 - Updated 05:25 UTC

## **TEPCO to start releasing pumped water into sea**

### **Groundwater release to begin at Fukushima Daiichi**

[http://www3.nhk.or.jp/nhkworld/english/news/20140520\\_38.html](http://www3.nhk.or.jp/nhkworld/english/news/20140520_38.html)

The operator of the crippled Fukushima Daiichi nuclear plant plans to start pumping groundwater at the site and releasing it into the sea on Wednesday.

The operator hopes to prevent the water from reaching tainted reactor and turbine buildings and becoming contaminated.

The plan is aimed at reducing the volume of contaminated water accumulating at the site.

Officials of the government and the operator, Tokyo Electric Power Company, on Tuesday met officials of Fukushima Prefecture and local municipalities, and experts.

They said they confirmed that radioactivity levels in groundwater from 12 wells to be used in the operation are below safety standards set by the firm for release into the sea.

They also said that if the radioactivity rises above the standards, they will stop pumping up the water and not discharge it until it is confirmed to be safe.

A participant asked the government and TEPCO to provide sufficient information not only in Fukushima but also outside the prefecture, to prevent groundless rumors from spreading.

Another participant asked for a full-fledged survey to determine whether the operation will affect marine life.

No opposition was expressed at the meeting to the operation, the first of its kind to be attempted.

May 21, 2014

## **Bypass plan: Starting today**

## **Groundwater release begins at Fukushima Daiichi**

[http://www3.nhk.or.jp/nhkworld/english/news/20140521\\_19.html](http://www3.nhk.or.jp/nhkworld/english/news/20140521_19.html)

Workers at the crippled Fukushima Daiichi nuclear power plant have started releasing groundwater into the ocean as part of the so-called "bypass plan."

The plan is part of Tokyo Electric Power Company's strategy to stem the accumulation of contaminated water on site.

It involves pumping up groundwater before it reaches the damaged reactor and turbine buildings, where it becomes heavily contaminated.

The pumped water is stored in tanks and tested for radiation. The last phase of the plan is to discharge the water into the ocean if radioactive levels are found to be below safety standards.

Government and TEPCO officials say they began releasing the water on Wednesday morning. They say radioactive levels were found to be below TEPCO's own safety target, which is lower than government standards.

A total of 560 tons of water will be released into the Pacific Ocean from an outlet south of the nuclear plant's port. The operation is expected to take more than 2 hours.

TEPCO officials estimate that 400 tons of groundwater seep every day into the basements of the facility. They hope to reduce this figure by up to 100 tons once the bypass plan is implemented on a full scale.

## **Groundwater within safety criteria released from Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20140521p2g00m0dm035000c.html>

TOKYO (Kyodo) -- Tokyo Electric Power Co. said Wednesday it started dumping into the Pacific Ocean hundreds of tons of groundwater collected at the crippled Fukushima Daiichi nuclear complex after having confirmed that its radiation level meets safety guidelines.

The groundwater has been pumped out before it approaches the heavily contaminated area of the site. By repeating the pumping and dumping, TEPCO aims to slow the pace of highly radioactive water accumulating at the plant.

The release of groundwater has long been planned as a key measure to address the toxic water buildup at the plant, but the operation has been delayed amid toxic water leaks and other problems that have undermined local people's confidence in TEPCO.

To allay safety concerns, TEPCO and the government have decided to release groundwater only after confirming that its contamination level is far below the legal limit.

Under the criteria, which TEPCO says are below the World Health Organization's guidelines for drinking-water quality, groundwater for release should contain less than 1 becquerel per liter of cesium-134 and cesium-137, 5 becquerels of beta ray-emitting radioactive material, such as strontium-90, and 1,500 becquerels of tritium.

TEPCO pumped a total of 560 tons of groundwater from wells dug in the mountainside of the plant between April 9 and 14 and have confirmed that the radiation levels satisfy the criteria before the planned release on Wednesday.

**Some 790 tons of groundwater collected last year is expected to be released next**, although a TEPCO official did not make clear on Tuesday when the discharge will take place.

TEPCO plans to gradually increase the volume of groundwater pumped from the wells. **If the so-called groundwater bypass system goes into full operation, the official said water discharge could take place around once a week.**

Highly radioactive water has been increasing by around 400 tons a day at the plant because the same volume of groundwater is seeping into the basement of reactor buildings and mixing with water used to cool three reactors that suffered meltdowns in the 2011 disaster.

TEPCO is installing more tanks so that it will not run out of water storage capacity, but it also wants to stop the total volume of radioactive water from increasing.

The official said **the amount of water seeping into the reactor buildings may be reduced by up to 80 tons per day**, but added that the effect of the groundwater bypass system needs to be checked through actual operation.

### **Suga lauds start of Fukushima bypass plan**

[http://www3.nhk.or.jp/nhkworld/english/news/20140521\\_20.html](http://www3.nhk.or.jp/nhkworld/english/news/20140521_20.html)

Chief Cabinet Secretary Yoshihide Suga has welcomed the start of work at the Fukushima Daiichi nuclear plant to release groundwater into the sea.

Suga said this means the effort to manage the accumulation of large volumes of contaminated water can now be shifted to handling other problems.

He said it is a small step forward but still represents progress in relieving public anxiety over the handling of the cleanup.

**Suga said the government is fully aware that local fishermen had no choice but to accept release of the groundwater into the sea.**

He said the industry ministry will strictly oversee the work to ensure radioactive levels in the water never exceed safety standards.

May 21, 2014 - Updated 04:38 UTC

## **ALPS system shut down completely (2)**

### **Glitch-prone ALPS water treatment equipment shut down at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201405210026>

By AKIRA HATANO/ Staff Writer

Hundreds of thousands of tons of highly contaminated water accumulating at the crippled Fukushima No. 1 nuclear plant will go untreated for some time, as key equipment to remove radioactive substances has been shut down completely.

According to Tokyo Electric Power Co., the last of three channels of the ALPS multinuclide removal equipment that treats contaminated water was switched off May 20 due to trouble with prior processing.

It is the first time for all three channels to be out of operation simultaneously. The equipment has been operating intermittently due to a series of glitches since it was introduced for trial runs in March 2013.

It seems likely that the failure of the ALPS will affect plans by the government and TEPCO to accelerate the decontamination operation by increasing the capacity of removing radioactive material from contaminated water this autumn.

Additional ALPS equipment was due to be installed to deal with growing stockpiles of radioactive water at the plant.

About 350,000 tons of highly contaminated water are in storage, awaiting purification with the ALPS.

The ALPS, short for advanced liquid processing system, is able to remove 62 types of radioactive substances, including strontium, from contaminated water, which is generated after water is used to cool melted nuclear fuel.

The three channels of the ALPS--called A, B and C--are theoretically able to treat a combined 750 tons of radioactive water a day.

However, this does not mean that the total amount of contaminated water stored in tanks at the plant gets less because the ALPS cannot remove tritium, a radioactive substance.

The equipment was introduced to reduce the risks in the event of contaminated water leaks from tanks.

In the treatment, contaminated water is filtered to remove substances such as calcium, which interferes with the absorption of radioactive material, as prior processing. After that process, the water is sent through many layers of absorptive material.

TEPCO said May 20 that the water that underwent prior processing for the C channel was found to be cloudy, instead of being transparent, when workers took samples in a routine check that day. The concentration of calcium measured about six times the normal level.

TEPCO decided to suspend the operation of the C channel at 9 a.m. the same day.

All the channels had resumed operations last February. The B channel went out of operation March 18 after troubles with its filters caused water not to be treated properly and stored in tanks. It is expected to go back online May 23 or later.

The A channel was halted after a malfunction similar to the C channel on May 17.



Reducing the total of contaminated water piling up at the nuclear complex is proving to be an enormous challenge for TEPCO.

About 400 tons of groundwater flow into the reactor buildings daily and mix with highly radioactive water that was used to cool melted nuclear fuel.

TEPCO plans to build 1,500-meter-long underground walls of frozen soil around the reactor buildings to help cut the inflow of groundwater.

But the Nuclear Regulation Authority's screening of the project has been stalled due to doubts raised about the safety of the engineering task.

A project to scoop up groundwater before it flows into the reactor buildings and release it into the sea began May 21. The bypass project is expected to reduce up to 100 tons of groundwater daily.

## **Groundwater released into sea (follow-up)**

### **TEPCO begins releasing groundwater diverted at Fukushima plant into sea**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201405210035>

Tokyo Electric Power Co. has started diverting uncontaminated groundwater at the crippled Fukushima No. 1 nuclear power plant into the sea, in an attempt to reduce the vast quantity of radioactive water accumulating on site.

At a news conference on May 21, Chief Cabinet Secretary Yoshihide Suga said the start of the water bypass project represents a "small step" in tackling the buildup of contaminated water, which has been a major source of public concern.

At 10:25 a.m. on May 21, the utility started releasing about 560 tons of water that it had pumped from 12 wells located in the plant compound in April. It took about two hours to release the water.

Each day 400 tons of groundwater have been seeping into contaminated reactor and turbine buildings at the Fukushima No. 1 plant. TEPCO estimates that the groundwater bypass project will reduce the amount by 20 to 100 tons per day.

TEPCO released water from storage tanks into the sea at locations south of the No. 1 to No. 4 reactor buildings through drainpipes it installed in spring 2013.

The Fukushima Prefectural Federation of Fisheries Cooperative Associations gave its consent to the water bypass project in March.

“It was an agonizing decision for fishermen in the area to endorse the plan,” Suga said. “We will have the industry ministry strictly instruct TEPCO to abide by its rules on contamination levels of water to be released.”

The 12 wells intercepting the underground flow of water were dug into the mountainside of the reactor buildings. Contamination levels of the water pumped from the wells are checked while it is stored in surface tanks.

TEPCO said it confirmed that the concentration of radioactive materials in the water released on May 21 was below its standard on water allowed to be released into the sea.

Local municipalities have endorsed the bypass project on condition that contamination levels of intercepted water remain below the standard and the water is closely monitored by TEPCO.

The utility and Fukushima Prefecture will conduct sample checks of seawater off the plant to investigate the impact of the water bypass project.

After the nuclear crisis unfolded, TEPCO drew criticism from local fishermen and others when it released water with relatively low contamination levels into the sea to make space in storage tanks for highly contaminated water.

Local residents have come to feel mistrust toward the utility after the plant experienced a series of accidental contaminated water leaks.

### **In new phase, Fukushima workers begin releasing groundwater**

<http://www.japantimes.co.jp/news/2014/05/21/national/in-new-phase-fukushima-workers-begin-releasing-groundwater/#.U3xzICji-1s>

Kyodo

Tokyo Electric Power Co. said Wednesday it began dumping into the Pacific Ocean hundreds of tons of groundwater collected at the crippled Fukushima No.1 nuclear complex after the water passed radiation tests.

The water was pumped last month from wells uphill of the reactors and stored in tanks, in a cycle that aims to reduce the amount seeping into heavily contaminated ground and into the building basements. By repeated pumping and dumping, Tepco now aims to slow the buildup of too-hot-to-release water, which it must collect and store.

A company official said if the so-called groundwater bypass is found to work, it is projected to reduce the water reaching the reactor buildings by up to 80 tons per day.

The release of groundwater has long been seen as an important milestone, but the operation has been delayed until now because repeated problems such as leaks damaged public confidence in the recovery effort.

To allay fears, Tepco and the government jointly decided to begin releasing groundwater only after confirming that it passes stringent safety tests.

The limits, which Tepco says are tighter than World Health Organization guidelines for drinking water, state that released groundwater should contain less than 1 becquerel per liter of cesium-134 and cesium-137, 5 becquerels of beta ray-emitting radioactive material such as strontium-90, and 1,500 becquerels of tritium.

Tepco pumped a total of 560 tons of groundwater from wells above the plant between April 9 and 14 and tested it ahead of Wednesday's release.

The next release is expected to involve about 790 tons of groundwater stored since last year, although a Tepco official stopped short Tuesday of saying when that may take place.

Tepco plans to step up the rate at which it pumps groundwater from the wells and feeds into tanks. If Wednesday's procedure becomes a routine cycle, the official said there could be a water discharge roughly every week.

Highly radioactive water has been increasing by around 400 tons a day at the plant because the same volume of groundwater is seeping into the basement of reactor buildings and mixing with water used to cool three reactors that suffered meltdowns in the 2011 disaster.

Short of storage, Tepco is installing more tanks, but it also wants to prevent a major increase in the total amount of water it needs to store.

May 23, 2014

## Partial restart of ALPS (line B)

### TEPCO partially restarts water treatment system

[http://www3.nhk.or.jp/nhkworld/english/news/20140523\\_30.html](http://www3.nhk.or.jp/nhkworld/english/news/20140523_30.html)

Workers at the Fukushima Daiichi nuclear plant have restarted one of the 3 water treatment systems that had been shut down due to problems with filters.

They reactivated Line B of the Advanced Liquid Processing System on Friday. They had replaced a damaged filter component with one that's more radiation-proof.

Line B was shut down in March. Lines A and C were also halted over the past week. Plant operator Tokyo Electric Power believes exposure to radiation degraded the ability of filters to remove calcium from the contaminated water.

The utility says it plans to restart Line A in early June, and Line C later the same month.

The utility considers steady use of the water treatment system crucial in dealing with the massive buildup of contaminated water at the damaged plant.

TEPCO plans to treat all the water stored in tanks by the end of March next year.

May 23, 2014 - Updated 08:17 UTC

May 24, 2014

## ALPS line B restarted (2)

### TEPCO restarts ALPS water-decontamination system at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201405240043>

Tokyo Electric Power Co. said May 23 it has resumed operations of one of three channels in the troubled ALPS system that decontaminates radioactive water at the crippled Fukushima No. 1 nuclear plant.

The B channel restarted shortly after noon, the utility said, adding that repairs to the A and C channels should be completed for a resumption of full-scale operations by mid-June.

The Advanced Liquid Processing System (ALPS) equipment is capable of removing 62 types of radioactive substances, but not tritium. It has operated intermittently since its trial runs started in March 2013.

The B channel stopped running on March 18 after filters that remove calcium and other substances that interfere with the absorption of radioactive materials began slowing the decontamination process.

TEPCO officials said high levels of radiation damaged rings locking the filters in place. It cleaned the inside of the equipment and replaced the filters before restarting.

The company said it switched off the C channel on May 20 due to trouble with prior processing, marking the first time that all three channels have simultaneously been out of commission.

May 26, 2014

## Frozen wall approved by NRA

### NRA to approve frozen wall work at Fukushima plant

[http://www3.nhk.or.jp/nhkworld/english/news/20140526\\_23.html](http://www3.nhk.or.jp/nhkworld/english/news/20140526_23.html)

The Japanese government and Tokyo Electric Power Company may start construction as soon as next month of underground frozen soil walls at the Fukushima Daiichi nuclear power plant.

The measure is considered key to preventing groundwater from entering the damaged facility and becoming contaminated with radioactivity.

The Nuclear Regulation Authority reviewed the project at a meeting in Tokyo on Monday.

Officials from TEPCO said their estimates show the ground around the Number 1 to Number 4 reactors would sink as much as 16 millimeters after the underground walls are built.

They said this would not be a problem because the degree of sinkage is smaller than the limit set for nuclear power plants.

Commissioner Toyoshi Fuketa of the Nuclear Regulation Authority suggested the regulator will approve the frozen walls plan.

To build them, tunnels will be dug on the mountain side of the plant's buildings. A series of steel pipes that circulate liquid coolant will then be planted inside to freeze the surrounding soil and create massive walls.

The government and TEPCO hope to start work as early as June.

The NRA will continue to examine plans to construct similar frozen soil walls on the seaside of the facility. It will also consider ways to prevent wastewater in the reactor buildings from seeping into the environment.

### **Nuclear Regulation Authority approves ice wall plan for Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20140526p2a00m0na009000c.html>

A Nuclear Regulation Authority (NRA) working group approved a plan on May 26 for an ice wall at the Fukushima No. 1 Nuclear Power Plant that is aimed at reducing the inflow of groundwater that becomes contaminated with radiation.

The wall is part of a three-pronged strategy to lower the inflow of groundwater. Currently the amount of radiation-contaminated water at the plant increases by around 400 tons per day due to groundwater flowing into the crippled plant's reactor buildings.

The Ministry of Economy, Trade and Industry and Tokyo Electric Power Co. (TEPCO) want to start construction of the wall in June. The wall will be made by inserting 26.4 meter-long freezing tubes into the

ground at one-meter intervals and circulating minus 30 degree Celsius cooling liquid through the tubes to freeze the nearby groundwater. The process should create an ice wall around two meters thick, 30 meters deep and 1.5 kilometers long that will surround the No. 1 through 4 reactors at the plant and block much of the water flow.

However, the NRA raised around 30 points of concern about the ice wall, such as over its safety and effectiveness at blocking water. It sent these concerns to the main authorities behind the plan, which include the Agency for Natural Resources and Energy and TEPCO. In particular, the NRA sought the release of evidence that the creation of the ice wall will not interfere with the cooling system of the melted nuclear fuel in the No. 1 through 4 reactors by lowering the ground level and causing the reactor buildings to tilt.

In response, at an NRA meeting on May 26 to discuss and evaluate the Fukushima plant, TEPCO released an estimate that an ice wall would cause at most a ground level fall of 1.4 to 1.6 meters, and "the reactor buildings will hardly move." No major concerns were raised from the NRA side, and the ice wall plan received an overall green light to proceed. The wall is planned to be finished sometime during fiscal 2015.

May 28, 2014

## **Tritium over the limit but water dumped nevertheless?**

### **Tritium levels at Fukushima No. 1 top Pacific Ocean dumping limit, Tepco admits**

<http://www.japantimes.co.jp/news/2014/05/28/national/tritium-in-fukushima-groundwater-tops-limit-for-discharge-into-sea/#.U4ZHayji91s>

JJI

Water sampled from a well at the crippled Fukushima No. 1 nuclear plant has been found to contain levels of radioactive tritium that exceeds the limit for dumping it into the Pacific, operator Tokyo Electric Power Co. said.

The discovery was the first report of over the limit tritium in groundwater at the wells since Tepco began discharging water into the ocean last week.

In samples taken from one of the 12 wells on Monday, 1,700 becquerels per liter of tritium was detected, exceeding the maximum limit of 1,500 becquerels, the utility said on Tuesday.

Tritium levels in samples taken last month also topped the limit.

Tepco stopped pumping water from the well on Tuesday night, and said it plans to step up groundwater monitoring.

The utility is now releasing groundwater from the 12 wells into the sea after temporarily storing it in tanks and checking radiation levels.

Tepco hopes to use the wells to block the inflow of groundwater to the reactor buildings of the plant's wrecked reactors, and to minimize the amount of highly toxic water building up on-site, by starting to dump water into the sea.

Also Tuesday, Tepco said it had confirmed water was leaking from a pipe in the reactor containment vessel inside the plant's No. 1 reactor building. The utility used a camera-mounted remote-controlled robot in the operation. It was determined last November that water was leaking from the vessel's bottom near the pipe, at a rate of up to 3.2 tons per hour.

In the No. 1 to No. 3 reactor buildings, highly contaminated water leaking from the vessels has amassed, preventing work to remove nuclear fuel from the vessels.

## **TEPCO explains leak at number 1 reactor**

### **Tepco pinpoints leak at Fukushima No. 1 reactor**

Kyodo

The operator of the crippled Fukushima No. 1 nuclear power plant has identified the location of a leak at the bottom of the container in the No. 1 reactor, a company official said on Wednesday.



According to a remote-controlled robot survey conducted by Tokyo Electric Power Co., water was leaking from a joint in a pipe connected to the No. 1 reactor's primary containment vessel.

The metal bellow the joint is likely corroded from seawater that was used as an emergency measure to cool the reactor during the early stage of the nuclear crisis that followed the March 2011 earthquake and tsunami, the official said.

The official denied the possibility that the earthquake damaged equipment, causing the leak.

He said the company will continue to investigate if there are other leaks nearby.

Nailing down the location of water leaks is part of Tepco's plan to scrap the Nos. 1 to 3 reactors, which suffered all suffered meltdowns.

The damaged nuclear reactors are apparently leaking water that is being injected as a coolant. Before removing the melted fuel, the utility wants to plug the leaks and fill the containers with water, which serves as a shield against radiation.

### **Water leak point detected at No.1 reactor**

[http://www3.nhk.or.jp/nhkworld/english/news/20140528\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20140528_01.html)

The operator of the crippled Fukushima Daiichi nuclear plant says it has found the source of a water leak at the Number 1 reactor.

Tokyo Electric Power Company has been investigating the damage to the reactor's containment vessel, which contains melted nuclear fuel due to the 2011 accident.

The water is leaking from a point on a pipe leading to the containment vessel. An image taken by a robot probe shows a black area on the brown pipe.

The leak point is above a donut-shaped unit called a suppression chamber where a robotic investigation detected flows of contaminated water last November.

The chamber is in the lower part of the containment vessel.

Utility officials believe water from the damaged pipe is flowing to the lower part of the vessel. They say they will study ways to stop the leak.

Identifying the specific locations of the water leakage is important for TEPCO's plan to remove melted nuclear fuel after plugging the leaks and filling the vessels with water.

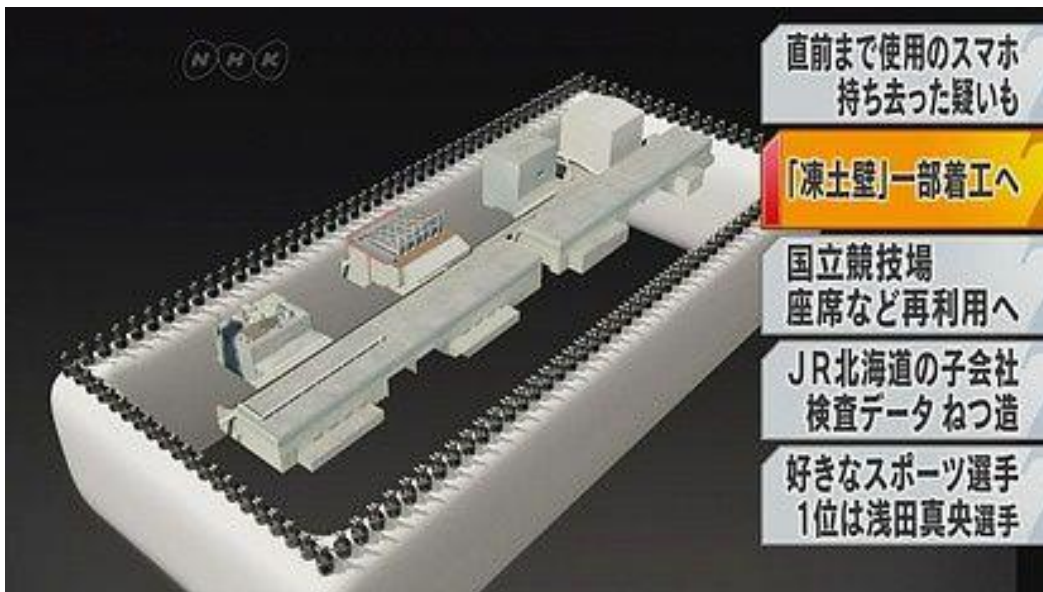
A contaminated water leak has also been found in the containment vessel of the Number 3 reactor. Officials say they will now investigate the suppression chamber and other parts of the Number 2 reactor.

May 30, 2014

## Building of frozen wall to start on Monday (June 2)

### Frozen wall set to be built at Fukushima Daiichi

[http://www3.nhk.or.jp/nhkworld/english/news/20140530\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20140530_33.html)



The operator of the crippled Fukushima Daiichi nuclear plant on Monday will start constructing an underground "frozen soil wall" to surround the damaged reactor and turbine buildings.

The wall is to prevent groundwater from flowing into the facilities and being contaminated with highly radioactive materials there.

The government and Tokyo Electric Power Company plan to freeze the soil in a 1.5 kilometer zone around the facilities of reactors No.1 through 4.

The utility submitted a partial plan for the wall's construction to the nuclear regulator and got approval. **Coolant pipes are to be buried at the hill behind the facilities where the soil is not as contaminated as the seaside.**

But **the utility has yet to come up with the plan for the plant's coastal area as it has to include some difficult areas with tunnels filled with highly contaminated water.**

**Another issue is how to prevent dangerously radioactive water in the plant's basements from seeping out of the buildings and expanding the contamination. Stopping the flow of groundwater into the plant could lower its level around the facility to less than the water level at basements.**

The expert panel at the Nuclear Regulation Authority will continue to discuss how to address these issues as well as how to monitor construction of the "frozen soil wall".

May 31, 2014

## **Very high radiation in suppression chamber of No.1 reactor**

### **Probe detects high radiation at Fukushima reactor**

[http://www3.nhk.or.jp/nhkworld/english/news/20140531\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20140531_13.html)

The operator of the crippled Fukushima Daiichi nuclear plant is using a robot to map damage to the reactors to lesson radiation exposure for workers.

It says the robot has detected an extremely high level of radiation at a spot on a doughnut-shaped suppression chamber of reactor No.1.

The operator, Tokyo Electric Power Company, has been conducting the remote-controlled investigation into the basement which houses the chamber. The chamber makes up the lower part of the reactor.

Officials say the robot moved on a catwalk around the chamber and detected a spot that measures about 2,400 millisievert an hour.

They say the level is about 5 to 10 times higher than that in other areas around the chamber.

The operator's engineers suspect some material is emitting very strong radiation there and they are looking into the cause.

Earlier during Tuesday's probe of the basement, the robot located a hole at a pipe leading to reactor No. 1's containment vessel. It is believed to be a major source of leaks of contaminated water at the reactor.

June 2, 2014

## **Work on giant underground ice wall begins at Fukushima plant**

Kyodo <http://www.japantimes.co.jp/news/2014/06/02/national/work-on-giant-underground-ice-wall-begins-at-fukushima-plant/#.U41odyji91s>

Tokyo Electric Power Co. on Monday started building a huge underground ice wall around the Fukushima No. 1 nuclear plant to reduce the generation of toxic water at the crippled complex.

Under the government-funded project, 1,550 pipes will be inserted into the ground to circulate coolant and freeze the surrounding soil. The measure is aimed at preventing groundwater from seeping into the plant's four cracked reactor buildings and mixing with heavily radioactive water leaking out of them.

Tepco, as the beleaguered utility is known, plans to finish the 1.5-km wall and have it up and running by the end of March 2015. It will then take a few months or so to fully freeze the soil, a Tepco official said.

Late last month, nuclear regulators gave the green light to the unprecedented project after the utility succeeded in convincing them that it will not trigger significant subsidence that could further endanger the buildings. Evidence of land subsidence was seen at one of the buildings early in the crisis and more recently under some of the hundreds of water tanks set up on land overlooking the reactor buildings.

On Monday afternoon, plant workers started digging a hole for one of the pipes near the No. 1 reactor building, but the utility said it still needs the Nuclear Regulation Authority's permission for work that could undermine the plant's safety.

The buildup of radioactive water generated by the need to cool the damaged reactors is a major problem at the plant, where toxic water is building by around 400 tons a day due to the groundwater from the mountains that is entering reactor buildings 1 to 4.

In another effort to deal with the toxic water problem, Tepco said Monday it had dumped 833 tons of untainted groundwater into the Pacific Ocean after intercepting it and diverting it through wells. The third release brought the total volume of clean water released under the so-called groundwater bypass system to 2,035 tons.

## **Work on frozen wall begins at Fukushima Daiichi**

[http://www3.nhk.or.jp/nhkworld/english/news/20140602\\_24.html](http://www3.nhk.or.jp/nhkworld/english/news/20140602_24.html)

Workers have started building part of an underground frozen soil wall that will eventually surround the reactor and turbine buildings at the damaged Fukushima Daiichi nuclear power plant.

The wall is intended to prevent groundwater from nearby hillsides from flowing into the plant and mixing with highly radioactive materials there.

The government and the plant's operator, Tokyo Electric Power Company, plan to freeze the soil in a 1.5 kilometer zone at a depth of about 30 meters around the facilities of reactors No.1 through 4.

The Nuclear Regulation Authority has yet to authorize the entire construction plan as studies on some technical issues are still underway.

But with its partial approval, construction started from the hillside behind the No.1 facility on Monday afternoon. Workers began digging a hole for coolant pipes to be laid and setting up equipment needed to freeze the soil.

The plan is to start freezing the soil around next March, and to complete the wall about 1 month later.

NHK's reporters say the frozen soil wall is expected to keep groundwater from being contaminated.

But, they point out that the wall will also change the flow of groundwater into the plant, and this might cause radioactive water in the buildings' basements to seep out. The utility is being urged to work out measures to prevent this from happening.

They also note that the construction is taking place in a area with seaside tunnels filled with contaminated water that are linked to the reactor buildings.

An expert panel of the Nuclear Regulation Authority will continue to study what monitoring systems and measures need to be put in place.

June 3, 2014

## **Ice wall construction started**

### **Construction work for ice wall begins at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20140603p2g00m0dm039000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant began construction on Monday of a huge underground ice wall around four reactor buildings, a key measure to tackle the toxic water buildup at the complex.

Under the government-funded project, 1,550 pipes will be inserted deep into the ground to circulate coolant and freeze the nearby soil. The measure is aimed at preventing groundwater from seeping into the buildings and mixing with heavily contaminated water.

Tokyo Electric Power Co. plans to finish constructing the 1.5 kilometer ice wall and start operating it by the end of March 2015. It will then take around a few months to fully complete the process of freezing the soil, a TEPCO official said.

Late last month, nuclear regulators gave the green light to TEPCO to implement the unprecedented project after the utility was able to convince them that it will not trigger significant sinking of the ground supporting the buildings.

On Monday afternoon, workers at the plant started digging a hole to place one of the pipes near the No. 1 reactor building. But the company said it still needs the Nuclear Regulation Authority's permission for work that could undermine the plant's safety.

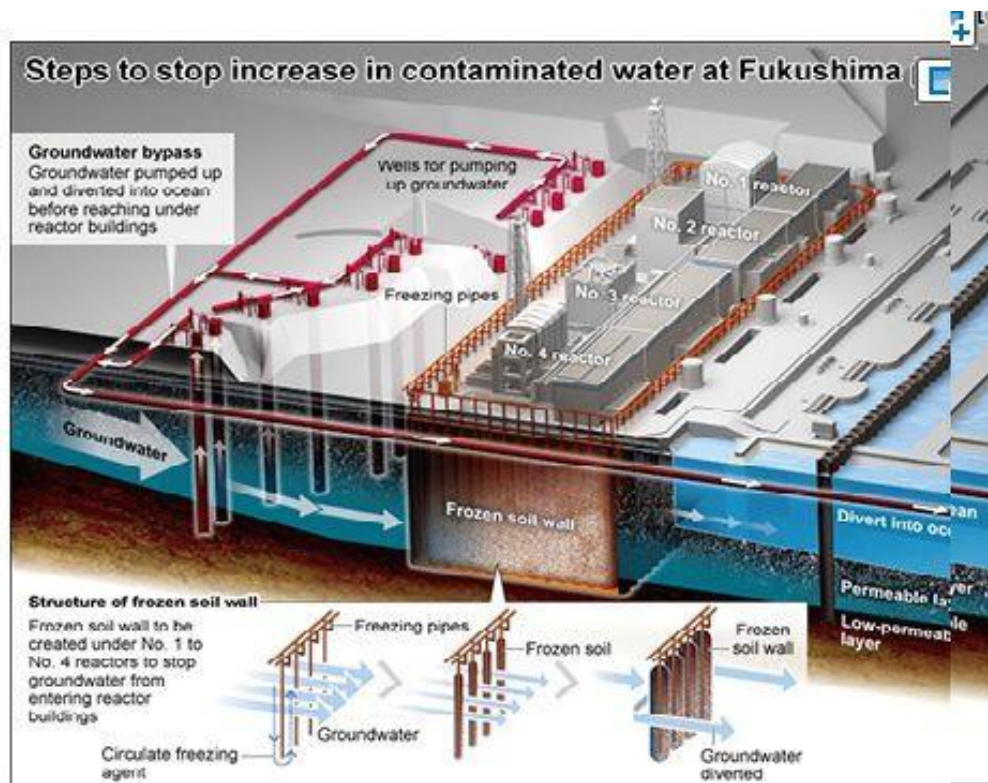
The buildup of radioactive water at the complex is a major problem facing workers at the plant, where toxic water is increasing by around 400 tons per day due to the inflow of groundwater into the Nos. 1 to 4 reactor buildings.

In another effort to deal with the toxic water problem, TEPCO said Monday it had dumped into the Pacific Ocean 833 tons of groundwater that is pumped out through wells before it can flow into the reactor buildings, the third such release, bringing the total volume of water released under a so-called groundwater bypass system to 2,035 tons.

## Numerous hazards of frozen wall

### Ground broken for frozen soil wall at Fukushima nuclear plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201406030043>



The Asahi Shimbun

Work started June 2 on a 32-billion-yen (\$314 million) project to build an underground frozen wall at the stricken Fukushima No. 1 nuclear plant to address a chronic problem plaguing work at the site.

The plan is for the wall of frozen soil to divert groundwater into the ocean and prevent it from seeping into reactor buildings and becoming contaminated by radiation.

But given the enormity of the project--unprecedented in terms of scale and period of use--numerous risks and potential hazards exist.

More than 1,500 pipes will be used to create the frozen soil wall, which will be about 30 meters deep underground and extend for about 1,500 meters around the buildings housing the No. 1 to No. 4 reactors.

Under the plan, the freezing process will start in March 2015 and take an estimated six months to complete. The wall will be kept frozen until fiscal 2020.

Tokyo Electric Power Co., the plant's operator, has been forced to continually pump in huge amounts of water to cool the three nuclear reactors that melted down after the Great East Japan Earthquake and tsunami struck on March 11, 2011.

However, an estimated 400 tons of groundwater is entering the reactor buildings on a daily basis and mixing with the contaminated water used to cool the nuclear fuel. This has exacerbated TEPCO's problems of storing and decontaminating accumulating radioactive water at the site.

Government officials estimate the wall will reduce the daily volume of groundwater entering the reactor buildings by 280 tons.

TEPCO submitted an application in March 2014 to begin work on the frozen soil wall. The Nuclear Regulation Authority approved the application on the condition that the work would not damage the network of underground pipes already in place under the Fukushima No. 1 nuclear plant.

Frozen soil walls have previously been used as a temporary measure for tunnel construction to prevent the flow of groundwater from causing the tunnel to collapse. There has never been a frozen wall project as large as the one envisioned for the Fukushima nuclear plant.

The work that started June 2 involved digging holes at 1-meter intervals for the eventual burial of 1,550 pipes. Liquids at temperatures of minus 30 degrees will be circulated through those pipes to freeze the surrounding soil.

The Nuclear Regulation Authority, TEPCO and the central government must carefully monitor construction work for possible cracks in the underground piping that could cause leaks of the freezing agent. They also must ensure that the frozen soil wall does not cause a dramatic change in the groundwater flow that could cause radiation-contaminated water in the basements of the reactor buildings to spill out.

The agent in the piping system will have to be continuously circulated to freeze the surrounding soil, meaning electricity equivalent to the amount used by about 13,000 households will be needed to operate the frozen soil wall system.

But there is no assurance that the frozen wall will reduce the volume of contaminated water by the levels forecast. Groundwater could still flow under the 30-meter wall and enter the reactor buildings.



Rain falling on the Fukushima No. 1 plant site could also become contaminated after mixing with the water used to cool the nuclear fuel.

Even if the frozen soil wall succeeds as planned, TEPCO would still have about 480,000 tons of contaminated water--including 360,000 tons containing high levels of radiation--on its hands.

As of May 27, about 900 tanks at the plant site were holding that volume of water. TEPCO plans to install more tanks at the plant site so that a total of 800,000 tons can be stored by the end of fiscal 2014.

If the tanks leak--a repeated problem at the site--the water would contaminate the surrounding environment and affect work to eventually decommission the four reactors.

TEPCO in May began another measure to divert groundwater away from the reactor buildings at the Fukushima No. 1 plant.

On June 2, about 830 tons of groundwater that had been pumped up before it flowed under the reactor buildings was released into the ocean, the third such release since the groundwater bypass system started.

TEPCO officials initially said the bypass system could reduce 100 tons of groundwater that reached the reactor buildings.

However, that estimate was later reduced to between 20 and 100 tons because several months are needed before the full effects of the system come into play, according to TEPCO officials.

## **Construction of underground ice wall begins at Fukushima nuke plant under wary eyes**

<http://mainichi.jp/english/english/newsselect/news/20140603p2a00m0na007000c.html>



A heavy machine is used to drill a hole on June 2 near the No. 1 nuclear reactor building in which a frozen pipe is to be inserted to build an underground frozen wall at the Fukushima No. 1 Nuclear Power Plant. (Photo courtesy of Tokyo Electric Power Co.)

Tokyo Electric Power Co. (TEPCO) started to build a 1.5-kilometer underground frozen wall around the buildings housing the No. 1 to 4 reactors at the Fukushima No. 1 Nuclear Power Plant on June 2 -- a key project to address the buildup of radioactive water at the complex.

People in the fisheries industry in Fukushima Prefecture, who have been plagued with problems caused by contaminated water, are keeping a wary eye on the ambitious project, saying something like: "We can't tell if it will be truly effective until it is completed" and "We can do nothing but pray that it will not move in a worse direction."

According to TEPCO, the operator of the crippled nuclear power station, the utility started drilling a hole in which a frozen pipe (12 centimeters in diameter and 26.4 meters in length) is to be inserted in the area northwest (on the mountain side) of the No. 1 reactor building at 4:43 p.m. on June 2. The utility plans to insert a total of 1,550 pipes into the ground at 1-meter intervals, but TEPCO says it will take about five days to insert one pipe into the ground. The utility says it plans to start freezing the underground wall in March next year.

Minus 30 degrees Celsius coolant will circulate through the pipes so that a wall of frozen soil about 30 meters deep and about 1.5 kilometer long will be created. The Nuclear Regulation Authority (NRA) has been wary of possible ground sinking and tilting of the reactor buildings as a result of changes in the flow of ground water. But TEPCO said at the NRA's working group meeting on May 26 that the ground could sink only up to 16 millimeters. Thus, the NRA broadly endorsed TEPCO's plan to begin the construction of the frozen wall.

The amount of radioactive water increases by about 400 tons at the plant every day as ground water keeps flowing into the reactor buildings. Chief Cabinet Secretary Yoshihide Suga said at a news conference on June 2, "We hope it will make major progress toward resolving the problem of contaminated water."

People in the fisheries industry, who have suffered from damage stemming from harmful rumors about radioactive contamination of their seafood, are anxiously hoping that the project to build the ice wall will go smoothly.

Hiroyuki Sato, who heads the Soma-Futaba fisheries cooperative association, said, "We want to take the start of the construction work itself positively." But he still cannot remove a sense of distrust in TEPCO and the central government which have failed to take timely and effective measures in the past. "We can't tell whether the frozen wall is effective until we conduct research after the completion of the project," Sato said. Kenji Nakata, a senior official of the Fukushima Prefectural Federation of Fisheries Co-operative Associations, said, "In any case, fishery operators are praying that it will not move in a worse direction. We want them to carry out the work with no mistakes first."

Residents of the Miyakoji district in Tamura, Fukushima Prefecture, for which an evacuation order was lifted in April this year, called on TEPCO to adopt thorough safety measures. Kazuo Endo, a 65-year-old decontamination worker who recently returned to the district, says that only seven or eight of the 25 households in his village have returned to their original homes there. "It is difficult for the residents to decide to return home while it is not clear what will happen to the nuclear power station until it is actually decommissioned. We want them (TEPCO and the central government) to take proper measures."

With respect to the project to build the underground ice wall, meanwhile, some experts point to a possibility that contaminated water will trickle out after the water levels in the reactor buildings become relatively higher as a result of the lowering of water levels outside the reactor buildings. For this reason, Hitoshi Watanabe, who heads the nuclear safety division at the Fukushima Prefectural Government, called for carefully carrying out the project, saying, "Methods of controlling ground water must be established."

June 4, 2014

## Contaminated water leaking outside barriers

### **TEPCO: Tainted water may have leaked from barriers**

[http://www3.nhk.or.jp/nhkworld/english/news/20140604\\_41.html](http://www3.nhk.or.jp/nhkworld/english/news/20140604_41.html)

Tokyo Electric Power Company says contaminated water may have leaked from barriers surrounding storage tanks at the damaged Fukushima Daiichi nuclear power plant.

Officials from the Nuclear Regulation Authority on Monday found water leaking around 2 of the storage tanks.

The tanks contain water with radiation levels above the government-set standards.

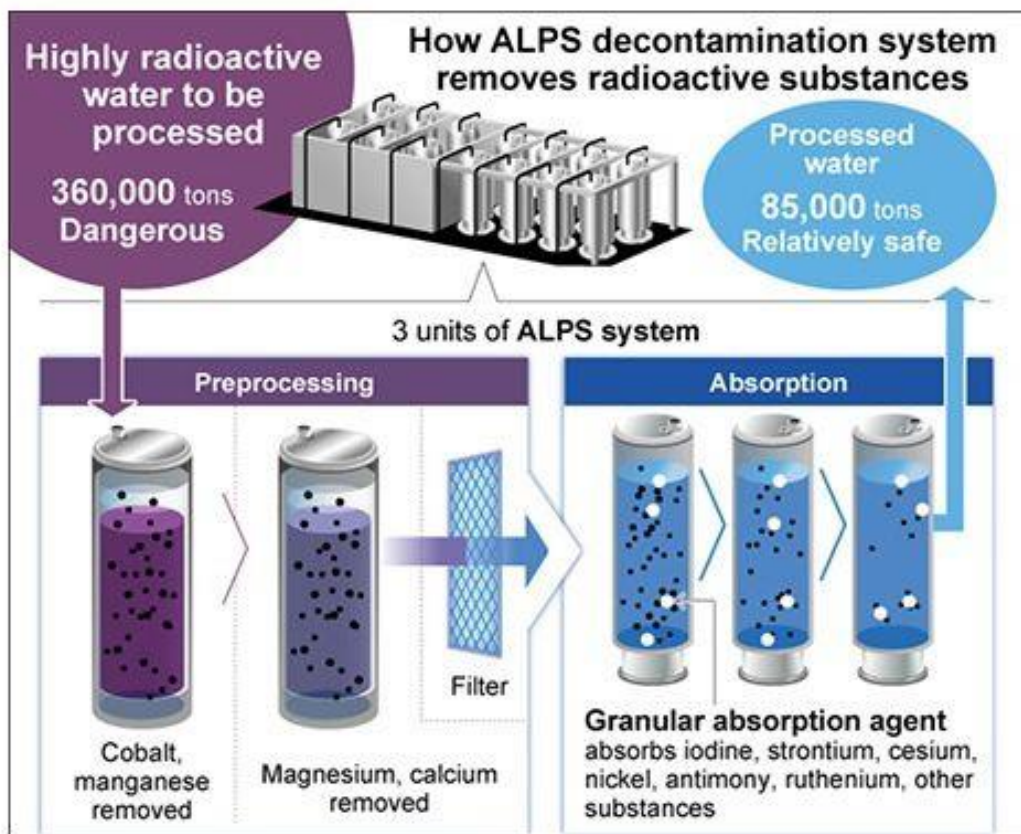
About 4 tons of water was found in barriers surrounding the tanks. The water contained 9,800 Becquerels per liter of beta-ray emitting substances. But TEPCO officials said the leaked water had remained inside the barriers.

However, TEPCO's later investigations found that a drain valve had accidentally been left open. Regular patrols had not been conducted at the leaking tanks.

TEPCO is now examining the soil around the 2 tanks. Officials say that contaminated water may have leaked outside the barriers.

June 5, 2014

## ALPS far from perfect solution



### Problems still plague ALPS decontamination system at Fukushima plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201406050041>

By SHUNSUKE KIMURA/ Staff Writer

High radiation levels and technical difficulties continue to stymie full-scale operations of key decontamination equipment at the Fukushima No. 1 nuclear power plant even though tests started more than a year ago.

The multi-nuclide removal equipment, called ALPS (advanced liquid processing system), began trial runs in March 2013 to reduce levels of 62 kinds of radioactive substances in contaminated water, such as strontium, to below detectable limits.

But Tokyo Electric Power Co. has been forced to repeatedly suspend operations, having discovered holes from corrosion and liquid leaks.

Cloudy water was found at the B channel of the ALPS system in March. Two months later, all three ALPS channels were stopped after cloudy water was detected at the A channel and the C channel on May 17 and 20, respectively.

TEPCO, operator of the embattled nuclear plant, concluded that the packing to fill gaps had deteriorated due to radiation exposure and resumed operations at the B channel on May 23. TEPCO also plans to restart the A and C channels by the end of June after replacing the packing.

High radiation readings have not only damaged the system, but have also prevented workers from spending long hours near ALPS for inspections and repairs.

Radioactive water to be processed contains various impurities derived from seawater and concrete, and chemical agents are necessary to remove them. An elaborate pipe arrangement also makes it difficult for workers to handle ALPS.

The ALPS system consists of two facilities: **preprocessing and absorption.**

The system first removes materials that can hamper radioactive substance removal procedures at its preprocessing facility. At this stage, mud and metal in contaminated water stored in tanks are precipitated with chemical agents. Then calcium and magnesium are filtered out by adding sodium carbonate and other chemicals to the water.

The deteriorated packing was found at a filter used at the last stage of preprocessing.

After all preprocessing procedures are complete, the water is transferred to the absorption facility, where radioactive materials will be absorbed by particles 0.5 millimeter in diameter and removed. A total of 15 devices of seven types can remove 62 kinds of radioactive substances.

But one of the three ALPS channels has been found to fail to significantly decrease levels of four radioactive materials.

As of May 27, about 360,000 tons of highly contaminated water remain stored in tanks on the plant site to be processed with ALPS.

While the decontamination equipment has processed just 85,000 tons of water since the start of trial runs, TEPCO and the government expect all the water on the premises to be processed by the end of the fiscal year.

To achieve that goal, the utility plans to double ALPS' current processing capacity of up to 750 tons per day by this fall.

The government is also expected to provide funding to introduce a similar system with the capacity of up to 500 tons per day in the near future.

**However, even after readings for the 62 types of radioactive substances fall to well below detectable limits, radioactivity levels of those materials in the processed water will likely remain at several hundreds of becquerels per liter in total.**

**In addition, ALPS cannot remove tritium,** raising radioactive levels in the processed water by several hundreds of thousands of becquerels per liter. Those levels of tritium are not allowed to be released into the sea.

**It is possible that contaminated water on the premises contains radioactive materials other than the 62 kinds.** The Nuclear Regulation Authority has told TEPCO to re-examine the water to decide if it includes additional radioactive substances.

TEPCO intends to replace current bolted storage tanks for radioactive water with ones made of welded steel plates to prevent water leaks. But if the start of ALPS' full-scale operations is delayed even further, it will likely become difficult for the utility to continue storing contaminated water at the plant site alone.

June 6, 2014

## 3 tons-leak of contaminated water since March

### **TEPCO: Contaminated water may have leaked**

[http://www3.nhk.or.jp/nhkworld/english/news/20140606\\_37.html](http://www3.nhk.or.jp/nhkworld/english/news/20140606_37.html)

The operator of the damaged Fukushima Daiichi nuclear power plant says more than 3 tons of radioactive water may have leaked from barriers surrounding storage tanks.

Tokyo Electric Power Company made the announcement on Friday following the discovery of water leaking around 2 of its storage tanks on the hillside earlier this week.

The tanks contain rainwater with radiation levels above government-set standards.

TEPCO found that regular patrols have not been conducted in the area near the tanks since March, and that the leakage may have begun then.

The company also determined that a drain valve for barriers surrounding the tanks had accidentally been left open.

It detected higher levels of radiation around the area than at other locations in the complex.

TEPCO has concluded that up to 3.4 tons of contaminated water may have leaked outside the barriers since March. The company continues to collect soil samples in the area.

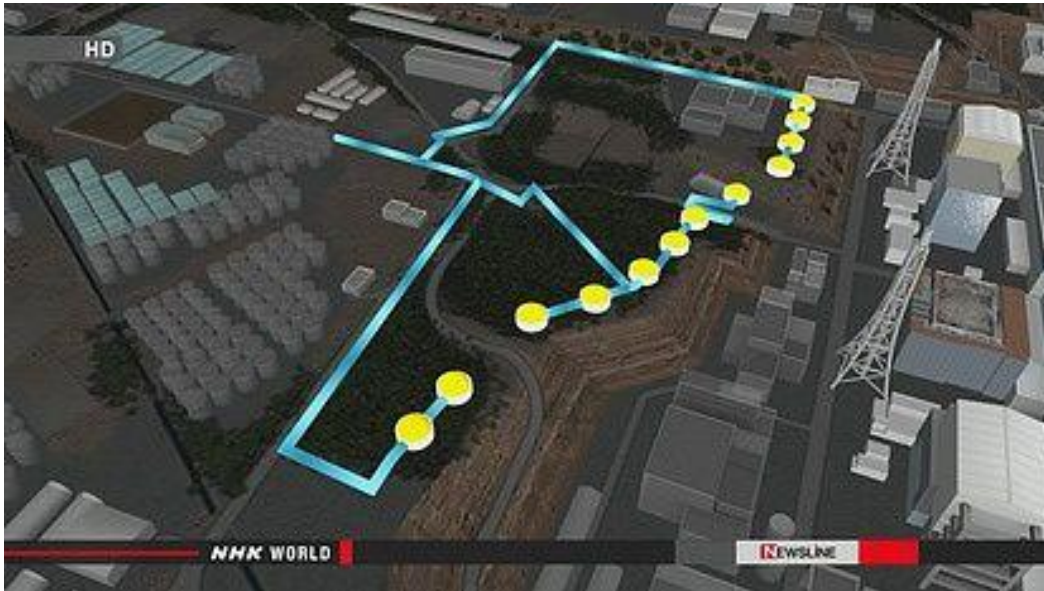
TEPCO officials say regular patrols did not cover the area where only smaller tanks for rainwater are located. They add that they will thoroughly check for other facilities that may have been left unattended.

See also : June 4, 2014 <http://fukushima-is-still-news.over-blog.com/article-contaminated-water-leaking-outside-barriers-123830012.html>

June 9, 2014



## More groundwater released



### More groundwater released from Fukushima Daiichi

[http://www3.nhk.or.jp/nhkworld/english/news/20140609\\_22.html](http://www3.nhk.or.jp/nhkworld/english/news/20140609_22.html)

The operator of the damaged Fukushima Daiichi nuclear power plant has released groundwater into the ocean for the fourth time. It is part of a 'bypass operation' to stem accumulation of contaminated water at the site.

Tokyo Electric Power Company last month began pumping up groundwater for release into the ocean before it becomes contaminated by the damaged reactor and turbine buildings.

The operation on Sunday took workers more than 6 hours to discharge 1,563 tons of water. That's the largest amount to date.

Analyses of seawater in the area by the plant operator and Fukushima Prefecture show no significant change in the amount of radioactive levels of groundwater since discharging began.

TEPCO expects the water bypass operation, once fully implemented, will reduce the daily buildup of 400 tons of highly radioactive water at the plant by up to 100 tons.

Meanwhile, work to pump up groundwater from one of the 12 wells at the site remains suspended. Water there was found to have radioactivity levels exceeding the safety standards.

TEPCO says it will decide whether to resume pumping at the well after determining the contamination risks to groundwater stored in nearby tanks.

## **TEPCO in hot water**

[http://voiceofrussia.com/radio\\_broadcast/no\\_program/273329303/](http://voiceofrussia.com/radio_broadcast/no_program/273329303/)

**The 2011 nuclear disaster at the Fukushima Daiichi plant was one of the worst in the history of nuclear power. Three years later, the plant's operator, the Tokyo Electric Power Company, or TEPCO, is still struggling to contain the damage.**

TEPCO's failure to tackle the buildup of contaminated water came to light last summer, when it admitted that at least 300 tons of tainted water was leaking into the sea every day.

Seungkoo Choi, Secretary General of the Reactor Suppliers Lawsuit Plaintiff Team, says that there is sufficient evidence proving the manufacturers of the plant together with its operator were responsible for the accident.

*"GE, or General Electric, made the first NPPs, or nuclear power plants in Japan. But in the United States, engineers are opposed to exploiting them, because it is dangerous. So, as for the makers of the Fukushima plant or the Tokyo Electric Power Company, they are well aware of the dangers such plants can present. Secondly, the tsunami or the earthquake. They expected that such kind of big earthquake will happen. They know it and we understand it, because of the Japanese referral to the Atomic Energy Commission. We have proof and we can say that they are responsible for the accident,"* Seungkoo Choi said.

Meanwhile, radioactive materials continue leaking into the groundwater from the plant even though TEPCO is working hard to contain the damage. Storage space for the water is rapidly running out, and there is a danger that radioactive materials will simply be dumped into the Pacific Ocean.

*"What the water did do is to be moving down into groundwater, which will get to the ocean shortly. So while the Japanese are technically correct by saying that the water did not run across the surface of the site and down into ocean, it is heading for the ocean anyway. The site is going to bleed into the ocean for hundreds of years. So this problem is not going to be stopped by just fixing this tank, which contaminated the entire groundwater underneath the site. Eventually, all the water will move into the Pacific,"* Arnie Gundersen, a veteran US nuclear engineer and director of Fairewinds Energy Education said.

In the meantime, TEPCO has started diverting uncontaminated groundwater at the Fukushima plant, in an attempt to reduce the huge quantity of radioactive water accumulating on the site.

Under the new system, groundwater is being pumped into storage units before it reaches the plant. It is then released into the sea after radiation levels are checked.

According to Japan's Chief Cabinet Secretary Yoshihide Suga, the launch of the water bypass project is just a "small step" in tackling the buildup of contaminated water, which remains a major source of public concern.

## **US Kurion hired to remove strontium at Fukushima Daiichi**

### **U.S. firm hired to scrub Fukushima No. 1 water**

<http://www.japantimes.co.jp/news/2014/06/09/national/u-s-firm-hired-to-scrub-fukushima-no-1-water/#.U5a1Diji91s>

Bloomberg

Tokyo Electric Power Co. will use a truck-mounted filtration system to extract strontium from water stored at the damaged Fukushima No. 1 power plant as the utility struggles to overcome technical problems with its existing water-processing facility.

Tepco has signed a contract with Kurion Inc. to remove strontium from more than 340,000 metric tons of radioactive water stored at the wrecked plant using the mobile filtration system, the U.S.-based firm said in a statement Monday.

The system will be used to improve site safety while testing of the ALPS processing facility continues. ALPS is designed to remove strontium and 61 other isotopes from cooling and other water tainted by contact with the plant's melted fuel rods. Strontium has been linked to bone cancer.

"Strontium is the greatest emitter of radiation impacting site dose-rates," Kurion founder and President John Raymont said in the statement. "So reducing strontium in tank water stored on-site will significantly improve worker safety and reduces the risk to the surrounding environment."

Two of ALPS's three units, each capable of processing 250 tons of water per day, were taken offline last month after high levels of calcium were found in the water leaving the system. The third resumed operation on May 23 after two months offline because of problems with filters and gaskets deteriorating from radiation exposure.

Tepco hopes to soon have the facility fully operational, it said in a May 29 statement. The system, made by Toshiba Corp., filters out all remaining contaminants but tritium after a separate unit removes most of the cesium.

Kurion plans to demonstrate its tritium-removal techniques to the Ministry of Economy Trade and Industry, which is involved in procuring equipment and technology for the nuclear cleanup, Raymont said in an email.

Kurion's strontium-removal contract requires it to "rapidly" establish a system that can process 300 tons per day, according to the statement from the company, which expects filtration to begin this summer. The Nuclear Regulation Authority must approve the system before it can be activated, Tepco spokesman Tatsuhiro Yamagishi said.

Financial terms of the deal won't be disclosed, Raymont said. Toshiba spokeswoman Midori Hata had no immediate comment on Tepco's decision to adopt a strontium-filtration system separate from ALPS.

June 10, 2014

## **Water in No.2 only 30 cmm deep**

### **TEPCO: Water in reactor half expected level**

[http://www3.nhk.or.jp/nhkworld/english/news/20140610\\_04.html](http://www3.nhk.or.jp/nhkworld/english/news/20140610_04.html)

Officials with the operator of the damaged Fukushima Daiichi nuclear plant say the water level inside the No.2 reactor's containment vessel is about half what they had estimated.

Workers with Tokyo Electric Power Company used robotic probes to measure the level and temperature of cooling water inside the vessel.

They found the water was around 30 centimeters deep. They had estimated it would be 60 centimeters, based on images captured by an endoscope 2 years ago.

The water was around 35 degrees Celsius.

TEPCO officials say this suggests the melted fuel is being kept cool. But they say they don't know whether the fuel is entirely submerged.

They say they suspect water is leaking into a unit called a suppression chamber via a pipe that's around the same height as the water. They believe it's then flowing out of the reactor building through holes in the chamber.

TEPCO is planning to plug the holes and add water to the containment vessel before removing fuel from the reactor.

## **TEPCO still struggling after more than 3 years**

### **TEPCO confirms water level of Fukushima No. 2 reactor container**

<http://mainichi.jp/english/english/newsselect/news/20140610p2g00m0dm037000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Monday it is now able to properly measure the temperature and level of water used as a coolant inside the container of the No. 2 reactor that suffered a meltdown, after a robot successfully inserted new equipment inside.

As of last week, the water level was around 30 centimeters from the bottom of the reactor's primary container vessel and the temperature of the water was about 35° C, which indicates that melted fuel is being cooled, according to Tokyo Electric Power Co.

TEPCO had tried to insert equipment in an attempt to gauge the water level and temperature inside the vessel in the past, but the equipment became stuck in grating and did not work properly.

A TEPCO official added, however, that the detailed condition of the melted fuel remains unknown.

## How many more breaches and where?

### Details of reactor damage still unknown

[http://www3.nhk.or.jp/nhkworld/english/news/20140610\\_11.html](http://www3.nhk.or.jp/nhkworld/english/news/20140610_11.html)

TEPCO officials are struggling to find the exact locations of breaches in the containment vessels for reactors 1, 2 and 3, and the condition of the melted fuel that they eventually plan to retrieve.

Officials believe that at reactor number 2, water is leaking from a donut-shaped suppression chamber at the bottom of the containment vessel, but do not know exactly from where.

As for reactors 1 and 3, the utility has found the sources of some leaks, but suspects there are other breaches that have yet to be identified.

Nothing is known about the condition of the melted fuel in all 3 reactors. TEPCO is considering various forms of surveys, including a plan to send a camera-mounted robot into the facilities.

June 16, 2014

## Water in tunnels doesn't freeze as expected

### TEPCO finds water in tunnels not yet frozen

[http://www3.nhk.or.jp/nhkworld/english/news/20140617\\_04.html](http://www3.nhk.or.jp/nhkworld/english/news/20140617_04.html)

Workers at the crippled Fukushima nuclear plant say their effort to freeze radioactive water in underground tunnels hasn't gone as planned.

In April, they began pouring chemical solutions into tunnels at the No.2 reactor. They hoped to freeze the water to stop it flowing out to the sea.

But tests show the water remains above freezing temperature.

Operator Tokyo Electric Power Company believes **objects in the tunnels are preventing the coolant from spreading evenly. They also said running wastewater is slowing the process.**

They say they are planning to find ways to control the water currents and add pipes to pour in more coolant.

They say they may not be able to complete the frozen barrier by the end of the month, and dry up the tunnel next month, as scheduled.

They are trying the same process in a tunnel around the No.3 reactor. About 11,000 tons of wastewater is believed to be in tunnels at the two reactors.

TEPCO hopes to remove wastewater from tunnels around all reactors in fiscal 2014.

The utility also has to deal with groundwater flowing into the plant from nearby hillsides and mixing with contaminated materials. Workers have been creating a 1.5-kilometer underground wall of frozen soil surrounding all four damaged reactors.

June 22, 2014

## **ALPS resumes operation (for the umpteenth time)**

### **Full water treatment resumes at Fukushima plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20140622\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20140622_13.html)

The operator of the damaged Fukushima nuclear plant has resumed full-scale operation of a system for treating radioactive water.

Tokyo Electric Power Company says the advanced liquid processing system, or ALPS, can decontaminate up to 750 tons of water per day.

Mechanical problems had stopped all 3 lines by May 20th. Two of them were later reactivated.

The utility says the remaining line resumed operations on Sunday after its filters were replaced, making all 3 operational for the first time since March.

It had planned to have the system fully operational in April, but a series of problems caused the delay.

Although the 3 lines are online again, 2 of them will be stopped temporarily next month, as corrosion needs to be treated in connecting pipes.

June 23, 2014

## **TEPCO resumes operation of water treatment system at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20140623p2g00m0dm012000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant on Sunday resumed operation of the complex's radioactive water treatment system that has been plagued by a string of problems.

But the multinuclide removal facility, called the advanced liquid processing system, or ALPS, is still at the test stage as its three treatment lines have been suspended intermittently due to filter gasket corrosion caused by radiation and other problems.

It is unclear when the test run will end so that full-fledged operation can begin, Tokyo Electric Power Co. said.

The system is said to be capable of removing almost all types of radioactive materials except tritium from toxic water generated in the process of cooling the plant's reactors that suffered meltdowns in the 2011 nuclear crisis, triggered by a massive earthquake and tsunami.

Tokyo Electric is aiming to finish processing the toxic water building up at the complex by March 2015. To accelerate its efforts to tackle contaminated water, the utility is planning to build two more facilities, including one with enhanced performance.

As of Wednesday, around 360,000 tons of toxic water requiring processing by ALPS was stored in tanks at the complex. When in full operation, the facility will be able to process 750 tons of water per day, according to the company.

June 25, 2014

## **Contamination of deep water: A side-effect of ice wall?**



## TEPCO: Contamination could spread in deep water

[http://www3.nhk.or.jp/nhkworld/english/news/20140625\\_09.html](http://www3.nhk.or.jp/nhkworld/english/news/20140625_09.html)



The operator of the Fukushima Daiichi nuclear plant has found that radioactive water can now easily spread in a deep layer of groundwater. It says it will speed up construction work on a barrier aimed at preventing contaminated water from leaking into the ocean.

The deep layer of water is about 25 meters below the surface. Water there was found to be contaminated on June 4th, when 4,700 becquerels of tritium per liter were detected in a well near the No. 1 reactor building.

Following further study, officials of Tokyo Electric Power Company found that the water pressure in the layer was lower than that of a shallower layer. They say this makes it easier for contaminated water to spread in the deep layer. They suspect the radioactive water could be spilling into the ocean.

**TEPCO officials say the ongoing construction of the barrier may be to blame for the lower pressure.** The work involves drilling into the deep layer. The barrier is scheduled to be completed in the fall.

TEPCO officials say they will take more action to keep radioactive water from spreading in the deep layer.

This will involve fortifying holes in an underground frozen-soil wall. Those holes go through the layer and

are filled with pipes. The frozen-soil wall is intended to keep groundwater from seeping into the facility and becoming contaminated.

## Why is water not freezing?

### **Nuclear body to examine delay in freezing water**

[http://www3.nhk.or.jp/nhkworld/english/news/20140625\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20140625_33.html)

Japan's nuclear regulatory body will examine the delay in efforts to prevent radiation-contaminated wastewater from flowing into underground tunnels at the damaged Fukushima Daiichi nuclear power plant.

About 11,000 tons of water used to cool melted-down fuel has leaked out of reactor buildings into underground utility tunnels, from where it is believed to be flowing out to sea.

Tokyo Electric Power Company began pouring a chemical solution into the joints between the reactor buildings and the tunnels in April. This process is designed to freeze the wastewater and create a wall of ice to prevent more water from coming in. But the water has not fully frozen as planned.

At a meeting of the Nuclear Regulation Authority on Wednesday, Commissioner Toyoshi Fuketa said work to stop water flowing into the tunnels, the part of the problem with the highest risk, has been slow. He said until this work succeeds, there can be no discussions on a larger plan to freeze soil around the reactor buildings.

Chairman Shunichi Tanaka said the work needs to be monitored and guided, to ease public concern.

The authority plans to convene a meeting of experts to study why the water hasn't frozen as planned, and how to proceed.

June 28, 2014

## Is groundwater bypass helping?

## Impact of Fukushima groundwater bypass eludes Tepco

<http://www.japantimes.co.jp/news/2014/06/28/national/impact-of-fukushima-groundwater-bypass-eludes-tepco/#.U68EpbHi91s>

JJI

Tokyo Electric Power Co. can't confirm whether the groundwater bypass operation at the crippled Fukushima No. 1 nuclear plant is working, Tepco officials said.

The operation is intended to reduce the tons of radiation-tainted water being generated by the plant each day. The melted reactor fuel at the plant, which was heavily damaged by three core meltdowns after the March 2011 earthquake and tsunami, must be perpetually cooled by water that then leaks into the basements and taints incoming groundwater from the hills behind the plant.

In the operation, which started about a month ago, the company pumps groundwater from wells dug near reactors 1 to 4 to intercept it before it can flow into the flooded basements and mix with highly contaminated cooling water. After being temporarily stored in tanks, the pumped-up water is released into the sea after radiation checks.

Tepco began pumping up groundwater in early April and releasing it in late May. More than 8,600 tons of groundwater have been released into the Pacific so far.

The problem is, the water levels in the observation wells near the reactor buildings haven't fallen that much, officials said. The water levels tend to rise after it rains, they said.

"We will wait patiently until the effects of the bypassing operation become evident," Naohiro Masuda, head of the reactor decommissioning division at Fukushima No. 1 told a news conference Friday.

July 1, 2014

## Leaks

### TEPCO reports on radioactive substance leak

[http://www3.nhk.or.jp/nhkworld/english/news/20140701\\_38.html](http://www3.nhk.or.jp/nhkworld/english/news/20140701_38.html)

The operator of the crippled Fukushima Daiichi nuclear power plant estimates that it recovered about 80 percent of a radioactive substance that leaked with contaminated wastewater last year.

About 300 tons of wastewater contaminated with radioactive substances leaked from a storage tank at the plant in August 2013.

Tokyo Electric Power Company, or TEPCO, submitted a report on the leak to Japan's Nuclear Regulation Authority on Monday.

The report says the substance with the highest concentration in the water was radioactive strontium with an estimated 45 trillion becquerels of radioactivity.

TEPCO estimates that it has recovered about 80 percent of the strontium by collecting soil soaked with the contaminated water. The firm says the substance remains in soil.

The utility says 20 percent of the substance likely seeped into soil below tanks and other facilities, and remains there. The company says it's highly unlikely that the substance was carried into the sea by underground water.

**TEPCO added that high levels of radioactive tritium have been detected in wells pumping up underground water to keep it from being contaminated by reaching crippled reactor buildings.** The firm says it's trying to find out why this happened.

July 4, 2014

### **Combatting Contaminated Water (NHK video)**

<http://www3.nhk.or.jp/nhkworld/newsline/201407042011.html>

About the construction of the massive ice wall by TEPCO:

Workers insert pipes that will reach 30 meters into the soil (the wall will be 1,5km long with a pipe every meter, i.e 1,500 pipes). These pipes will surround the reactor buildings and coolant will be inserted, into a giant ice wall which is supposed to stop groundwater from seeping into the buildings.

But the wall will cross a whole network of pipes underneath the reactors and experts fear this will interfere with the freezing process.

ALPS 'manager: Radiation is damaging the Teflon coating of the equipment ..."there are many things we don't know".

**"The trial and error continues"...**

July 7, 2014

## Cooling halted at No.5 fuel pool

### No prospect to resume cooling No.5 fuel pool

[http://www3.nhk.or.jp/nhkworld/english/news/20140707\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20140707_25.html)

The operator of the Fukushima Daiichi nuclear power plant says it has no idea when it can resume the cooling system for one of the spent fuel pools.

Tokyo Electric Power Company halted the cooling system at the No.5 reactor on Sunday after workers found seawater leaking from a pipe. Seawater is used to lower the temperature of coolant water in the storage pools for spent nuclear fuel.

TEPCO found a small hole in a valve for adjusting the flow of seawater. Workers covered the hole as a stopgap measure, but they are still considering how to repair the pipe.

The temperature in the pool rose to 25.7 degrees Celsius on Monday, up 2 degrees from Sunday.

**TEPCO says the temperature will reach the company's safety limit of 65 degrees in a little over a week.**

The operator plans to channel seawater into the pool to curb the rise in temperature.

The No. 5 reactor was offline when the plant had an accident in March 2011 and escaped damage. TEPCO has decided to decommission the reactor.

## TEPCO & icewall problems

### TEPCO plan to block contaminated water with ice walls hits snag

<http://mainichi.jp/english/english/newsselect/news/20140707p2a00m0na011000c.html>

A plan by Tokyo Electric Power Co. (TEPCO) to block the flow of contaminated water at the Fukushima No. 1 Nuclear Power Plant faces problems as ice walls meant to stop the flow have failed to form.

The TEPCO plan was to use tubes of coolant to freeze the water around the connecting points between the No. 2 and No. 3 reactors' turbine buildings and underground trenches, stopping the flow of water at these points and allowing workers to remove around 11,000 tons of contaminated water from the trenches, which are further down the flow. TEPCO began work to install 17 coolant tubes this April and planned to create the ice walls in mid-June and start removing the trench water in mid-July. However, come July the ice walls had not formed.

If the contaminated water is not removed from the trenches it could leak out from them. Furthermore, the continued presence of the water will prevent the creation of outer ice walls encircling the No. 1 through No. 4 reactors, which are a central part of TEPCO's plans to cut down on contaminated water at the plant.

The trenches are about five meters wide and five meters tall, and run around 22 meters underground. TEPCO speculates that the reason the ice walls have failed to form is that "contaminated water flows back and forth between the turbine buildings and the trenches." The utility will add two more coolant tubes, but whether this will solve the issue is unclear.

However, TEPCO remains optimistic, saying, "The construction of the outer ice wall toward the ocean is scheduled for October or later, so there is time." But Toyoshi Fuketa, a member of the Nuclear Regulation Authority, says, "The contaminated water in the trenches is the risk factor of greatest concern at the Fukushima No. 1 Nuclear Power Plant. If the flow of water cannot be stopped, there is no point in talking about ice walls."

July 8, 2014

## Cooling restarted at No.5

### Cooling resumes at No.5 reactor

[http://www3.nhk.or.jp/nhkworld/english/news/20140708\\_37.html](http://www3.nhk.or.jp/nhkworld/english/news/20140708_37.html)



The operator of the Fukushima Daiichi nuclear plant says it has restarted the cooling system for a pool that contains spent fuel. The system had been suspended for 2 days due to a mechanical problem.

Engineers of Tokyo Electric Power Company on Sunday found water leaking from a pipeline for the system that cools spent fuel rods at the No.5 reactor building.

The engineers shut down the system. They found a small hole in a valve that adjusts the flow of water.

TEPCO officials say the temperature of the fuel rods is below the company's safety limit and that their condition is stable.

The No.5 reactor was offline at the time of the accident in March 2011. The unit did not melt down.

## **NRA worried about icewall**

### **Regulators concerned over delay in TEPCO's plan to freeze toxic water**

<http://mainichi.jp/english/english/newsselect/news/20140708p2g00m0dm035000c.html>

TOKYO (Kyodo) -- Nuclear regulators expressed strong concern Monday about a delay in Tokyo Electric Power Co.'s plan to freeze highly toxic water building up in underground trenches at its crippled Fukushima Daiichi nuclear site, amid fears it could flow into the ocean and spread pollution.

The problem of the contaminated water being pooled in the trenches -- resulting from cooling water for reactors that suffered meltdowns in the 2011 Fukushima nuclear crisis -- is seen as one of the most urgent tasks TEPCO needs to address.

According to the utility, a total of some 11,000 tons of highly radioactive water has flowed into the trenches through the Nos. 2 and 3 reactor turbine buildings.

Before pumping out the water, the operator has inserted frozen ducts to try to freeze some of the water near joint parts of the No. 2 reactor turbine building and the trenches -- where pipes and cables are stored -- to stop further inflow, but the water has not fully frozen after more than two months.

At a meeting Monday, Nuclear Regulation Authority Commissioner Toyoshi Fuketa urged TEPCO officials to review its plan as soon as possible and propose additional measures to successfully freeze the water.

TEPCO blamed the fluctuating water levels in the tunnels for preventing it from freezing, but the regulatory officials questioned the contention and told the company to investigate other possibilities.

Fuketa said earlier that the radioactive water in the trenches is the "biggest concern" among challenges facing workers at the Fukushima plant.

A glitch in the process has also raised concern about TEPCO's plan to build a massive underground ice wall around the complex's four reactors to address the buildup of toxic water, as similar technologies are used for the wall.

### **TEPCO pressed to make sure ice wall works**

[http://www3.nhk.or.jp/nhkworld/english/news/20140708\\_12.html](http://www3.nhk.or.jp/nhkworld/english/news/20140708_12.html)





Tokyo Electric Power Company is under pressure to make sure that its plan to install "frozen walls" to halt the flow of radioactive water at the crippled Fukushima Daiichi nuclear power plant actually works.

Officials of the Nuclear Regulation Authority, or NRA, expressed their concern at a meeting on Monday.

TEPCO began work in April to create a wall of ice between the basement of the No.2 reactor building and its utility tunnel.

The idea was to prevent highly radioactive water in the reactor building from flowing into the tunnel, where the runoff could become mixed with groundwater and end up in the sea.

The wall of ice was supposed to be in place in May, but the structure remains incomplete.

TEPCO officials told the NRA that currents in the water in the tunnel are preventing it from freezing, and that they'll have to put off pumping out radioactive water from the tunnel for about 3 months.

NRA officials urged the utility to come up with concrete measures by the end of July to complete the ice wall.

NRA officials also expressed concern that similar problems may hamper the freezing of soil around 4 reactor buildings at the plant. The massive underground wall is supposed to prevent groundwater from flowing into the buildings.

July 9, 2014

## No ice

### **TEPCO faces hurdles in construction of ice walls to block flow of contaminated water**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201407090052>

An ambitious plan by Tokyo Electric Power Co. to halt the seepage of contaminated water at the stricken Fukushima No. 1 nuclear power plant has hit a major glitch: "ice walls" have failed to form in underground trenches.

TEPCO workers are busy installing underground pipes to circulate coolant to create frozen soil walls encircling the No. 1 through No. 4 reactor buildings on the side away from the sea. Reporters were given a peek at the construction work on July 8.

TEPCO intends next March to start circulating coolants through the pipes to create frozen walls to block underground water from flowing into the reactor buildings.

But on the seaward side of the reactor buildings, the utility must first remove around 11,000 tons of contaminated water from underground trenches connected to the No. 2 and No. 3 reactor turbine buildings.

The trenches, built to house electrical cables and water pipes, are supposed to be kept dry. But contaminated water began seeping into them after the onset of the March 2011 nuclear crisis.

If the contaminated water is not removed from the trenches, it could eventually leak out. The Nuclear Regulation Authority instructed TEPCO to promptly remove the water, calling it the "most serious source of concern."

To stop the flow of contaminated water into the trenches from reactor turbine buildings, workers have installed cement, clay and coolant pipes to create ice walls around the four connecting points between the reactor turbine buildings and trenches.

After installing the pipes, TEPCO started to freeze them on April 28 to create ice walls in the trenches. It was expected to take about a month to create ice walls, but they had not formed as of July 8.

After the flow of water is halted, the plan calls for the removal of the contaminated water in the trenches.

But TEPCO officials said the ice walls failed to form because of the constant flow of a maximum 2 milliliters of water per minute around the connecting points.

Toyoshi Fuketa, an NRA commissioner, has instructed TEPCO to come up with steps to resolve the matter by the end of July, arguing that the frozen walls should be able to withstand certain levels of water flow under normal circumstances.

The continued presence of water threatens to prevent the creation of outer frozen soil walls encircling the No. 1 through No. 4 reactors, which are a central part of TEPCO's plans to reduce the amount of contaminated water at the plant.

On June 2, the utility began installing more than 1,500 pipes around the four reactor and turbine buildings to circulate coolant of minus 30 degrees to create ice walls stretching 1,500 meters and running 30 meters deep.

On July 8, workers using heavy machinery were drilling holes to install pipes on the south side of the No. 4 reactor building.

Outfitted in radiation-proof vests, three to four workers manned each drilling machine, making sure not to hit underground obstacles. TEPCO officials said the work can only be carried out between 5 p.m. and 11 p.m. to avoid heatstroke.

The workers are able to install three pipes per day on average. They had installed 90 pipes as of July 7. (This article was written by Akira Hatano and Shunsuke Kimura.)

July 15, 2014

**More tanks at Fukushima Daiichi**

## **TEPCO to build more storage tanks at Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20140715\\_01.html](http://www3.nhk.or.jp/nhkworld/english/news/20140715_01.html)

The operator of the damaged Fukushima Daiichi nuclear power plant will build additional tanks on the site to store 100,000 tons of radioactive water.

Tokyo Electric Power Company revealed its revised storage plan at a meeting with government officials on Monday.

TEPCO had planned to build tanks to store a total of 830,000 tons of water by the end of fiscal 2014, which ends on March 31st next year.

Now the firm says additional storage should be ready in case the planned tanks are not enough to store all tainted water at the site.

It says the capacity may be exceeded if preventative measures, including frozen underground walls, do not work as well as planned.

Senior vice industry minister Kazuyoshi Akaba chaired Monday's meeting. He said the risk of radioactive water overflow can be avoided if the tanks are built on schedule.

He added his ministry will work to develop technology to decontaminate water.

July 20, 2014

## **New leak at number 5 sign of deterioration**



Fukushima prefectural government officials inspect the piping in the No. 5 reactor building at the Fukushima No. 1 nuclear power plant on July 7. (Provided by the Fukushima prefectural government)

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### **Water leaks continue to plague No. 5 reactor at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201407200016>

A leak of radioactive water was found in the piping of water used to cool the spent fuel pool in the undamaged No. 5 reactor building of the Fukushima No. 1 nuclear power plant, its operator said on July 19, a sign of possible deterioration in the system.

Tokyo Electric Power Co. said water from the cooling pond leaked, citing comparable levels of the concentration of radioactive substances in the leak and the pool.

A TEPCO employee found a pool of water in each of two boxes--75 centimeters by 50 cm--that house a control valve in the cooling water piping system on the fifth floor of the No. 5 reactor building at 1:25 a.m. on July 19.

The water had collected to a depth of 9 cm in one box and 18 cm in the other.

The water contained 2-3 becquerels of cobalt 60 per cubic centimeter, according to the utility. This particular piping section has been unused since July 6, when a similar leak was discovered at another section.

Experts say the continuing leaks indicate that valves are deteriorating, and that the utility's inspections are inadequate.

"We are aware that our approach proved to be lax as we were unable to detect the problem until the leak occurred," a TEPCO official said. "We are reviewing the way checks should be conducted."

At the also undamaged No. 6 reactor building, the pumping of cooling water was temporarily halted after a leak in a similar piping system was detected on July 11.

The latest leak at the No. 5 reactor building came after the Fukushima prefectural government urged TEPCO to conduct thorough checks of its equipment.

The No. 5-6 reactors had been shut down for maintenance when the earthquake and tsunami struck the nuclear complex on March 11, 2011, and resulted in meltdowns in three of the plant's four other reactors.

TEPCO plans to use the No. 5 and 6 reactors as training centers for the decommissioning work of the other reactors.

July 24, 2014

## Ice blocks and trenches

## **TEPCO to use ice blocks to stem flow of radioactive water in Fukushima plant trenches**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201407240054>

Tokyo Electric Power Co. unveiled a plan that would place blocks of ice in trenches at the stricken Fukushima No. 1 nuclear power plant to help stanch the flow of radioactive water.

The method was revealed at a July 23 meeting of the Nuclear Regulation Authority. The NRA instructed TEPCO to pump out contaminated water in the trenches as early as possible because water inside the underground tunnels could be leaking into the surrounding soil.

The trenches originate at the turbine buildings and extend to the seaward side of reactors. A large volume of radioactive water, which flowed into the tunnels after the March 2011 Great East Japan Earthquake and tsunami, still has to be removed.

In late April, TEPCO began work to prevent additional water in the turbine buildings from flowing into the trenches. The utility has been constructing "ice walls" at joint sections connecting the tunnels and turbine buildings after installing bags containing cement and clay at those points.

Although the operations were scheduled to be completed at the end of May, the cement and clay bags are still not sufficiently frozen.

During the July 23 meeting, TEPCO said a small stream of water in the trenches has hampered the freezing operations.

The utility said it will introduce additional freezing pipes and blocks of ice and dry ice to lower water temperatures, and also use liquid chemical agents to interrupt the water flow. The plan was approved by the NRA, but the nuclear watchdog said it will check on the efficacy of the new countermeasures as early as mid-August.

TEPCO is currently constructing a frozen soil wall around the plant's No.1 through No. 4 reactor buildings to prevent more contaminated water from accumulating.

The delay in draining the radioactive water from the tunnels could slow the construction of the frozen wall on the seaward side of the reactors.

July 23, 2014

## **Fukushima plant measures to freeze tunnels**

[http://www3.nhk.or.jp/nhkworld/english/news/20140723\\_23.html](http://www3.nhk.or.jp/nhkworld/english/news/20140723_23.html)

The operator of the crippled Fukushima Daiichi nuclear power plant will take additional measures to accelerate the behind-schedule work of freezing radiation-contaminated water in underground tunnels.

Water used to cool melted-down fuel in damaged reactors has leaked out of reactor buildings into underground utility tunnels. The tainted runoff, mixed with ground water, is believed to be seeping into the ground and ending up in the sea.

The work is designed to prevent that outcome for the tainted water. But the tunnels have yet to be fully frozen nearly 3 months into the project.

On Wednesday, the Tokyo Electric Power Company briefed members of the Nuclear Regulation Authority about the additional measures.

These include installing more pipes that carry refrigerants in and out of the tunnels and adding ice in the tunnels by late next month. TEPCO will also use sandbags to fill sections where the pipes cannot be installed.

Regulatory officials criticized TEPCO's original plan for being too optimistic. Commissioner Toyoshi Fuketa instructed TEPCO to take the necessary measures quickly. He told it to prepare devices with extra capacity and freeze the water inside the tunnels perfectly.

A separate and larger project is now underway at the plant to freeze soil and create a wall of ice around the 4 reactor buildings. This is to prevent groundwater from coming into the damaged buildings and getting tainted with radioactivity.

But that work could also be delayed due to a suspension in freezing the water in the tunnels, because part of the work areas overlap.

July 25, 2014

## **Pumping up ground water has only limited effects**



## **TEPCO: Groundwater bypass showing limited effects**

[http://www3.nhk.or.jp/nhkworld/english/news/20140725\\_24.html](http://www3.nhk.or.jp/nhkworld/english/news/20140725_24.html)

Work to pump up groundwater to keep it from flowing into the contaminated Fukushima Daiichi nuclear plant is apparently having limited effects.

Plant operator Tokyo Electric Power Company, or TEPCO, reported the results of the operation so far at a meeting of experts at the industry ministry on Friday.

TEPCO began the so-called groundwater bypass operation in May. It involves draining water from wells and releasing it into the sea to keep it from flowing into reactor buildings and becoming contaminated.

The utility had said the operation would reduce the amount of highly radioactive water created this way by up to 100 tons per day, down from roughly 400.

But TEPCO officials told the meeting that in the past 2 months, water levels at 3 wells located 70 to 150 meters from the reactor buildings dropped by only around 10 centimeters at most.

Experts voiced concerns about the limited effects of the operation. Others pressed TEPCO to come up with concrete data, saying that fishermen in Fukushima accepted the plan because they expected results.

The utility says rain is partly to blame for the limited effects of the operation. It says it plans to cover soil near the wells with asphalt by the end of next March, to keep rain from seeping into the ground.

July 29, 2014

## **Groundwater bypass not working**

### **Operation to halt flow of groundwater into No. 1 reactor buildings falters: Tepco**

<http://www.japantimes.co.jp/news/2014/07/29/national/operation-to-halt-flow-of-groundwater-into-no-1-reactor-buildings-falters-tepco/#.U9eRkrHi91s>

Jiji, Staff Report

Tokyo Electric Power Co. admitted Monday that the so-called groundwater bypass operation at its crippled Fukushima No. 1 nuclear power plant is not working.

In May, the utility began the operation to pump untainted groundwater into the sea to prevent it from flowing into and accumulating in reactor buildings.

The operation is intended to reduce the tons of radiation-tainted water being generated by the plant each day. The melted reactor fuel at the plant, which was heavily damaged by three core meltdowns after the March 2011 earthquake and tsunami, must be perpetually cooled by water that then leaks into the basements and taints incoming groundwater from the hills behind the plant.

Tepco official Teruaki Kobayashi told a news conference Monday that the utility has yet to see tangible results from the operation in the reactor buildings.

According to Tepco, 400 tons of groundwater flow on average into reactor buildings and other areas at the plant per day, causing the buildup of contaminated water. The company has said the operation could lower that amount by up to 100 tons per day.

Two months after the start of the operation, however, there is still no sign that the buildup of contaminated water has been halted. Even so, Kobayashi noted that water levels had dropped by up to 10 centimeters at the point halfway between the reactor buildings and the wells used to pump out groundwater.

Rainfall at the plant site has been hampering the operation, Tepco said, adding that it plans to solidify the soil with asphalt near the hills where the groundwater flows from, according to NHK.

For the water inflow to decline by 100 tons per day, levels at the halfway point need to fall by several dozen centimeters, to 1 meter.

Kobayashi declined to specify when groundwater levels could begin to fall.

**A total of 15,828 tons of groundwater was released into the sea between May 21 and July 20.**

July 30, 2014

## Ice put into tunnels

## **Ice put into utility tunnels at Fukushima plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20140730\\_29.html](http://www3.nhk.or.jp/nhkworld/english/news/20140730_29.html)

The operator of the damaged Fukushima Daiichi nuclear power plant has begun putting ice into underground utility tunnels to help freeze radiation-contaminated wastewater.

The Tokyo Electric Power Company began work in April to create a wall of ice between the basement of the No. 2 reactor building and its utility tunnel.

TEPCO initially planned to freeze radioactive wastewater that's been flowing into underground utility tunnels at the plant. It hoped the measure would prevent the wastewater from mixing with groundwater and flowing out to sea.

But 3 months into the project, the water hasn't frozen as planned.

Workers began putting ice into the water on an experimental basis this month. They say they found that 2 tons of ice reduced the water temperature by more than 4 degrees by the next day.

On Wednesday, workers increased the daily input of ice to 15 tons.

Utility tunnels between the No. 2 and No. 3 reactors and the sea are estimated to hold a total of 11,000 tons of radiation-contaminated wastewater.

August 1, 2014

## **More promises to get ALPS going**

### **Water treatment to get into full swing at Fukushima No. 1 in December, Tepco claims**

<http://www.japantimes.co.jp/news/2014/08/01/national/water-treatment-get-full-swing-fukushima-1-december-tepco-claims/#.U9tTjmPi91s>

Kyodo

Tepco says it will begin full-scale operation in December of its trouble-plagued radioactive water treatment facility at the Fukushima No. 1 nuclear plant after taking steps to improve its performance.

Tokyo Electric Power Co. began a test-run of the facility, called the advanced liquid processing system, or ALPS, back in March 2013. It initially planned to start full-scale operation in April to accelerate efforts at tackling the toxic water buildup at the complex.

It was forced to delay the plan due to a series of problems.

ALPS, which Tepco says will be capable of removing 62 types of radioactive substances from toxic water generated in the process of cooling the damaged reactors, has also not been as good as expected because some of the substances remain untreated.

With treatment lines at the facility having been suspended intermittently due to filter gasket corrosion caused by radiation and other problems, the utility said Thursday it has replaced the gaskets and will also introduce new absorbents to improve the facility's performance.

ALPS has been developed to substantially reduce the radiation level of the highly contaminated water generated in the process of cooling the reactors. It is said to be capable of removing almost all types of radioactive materials except tritium from the toxic water.

August 2, 2014

## **ALPS? Oops, another snag**

### **Plan to complete radioactive water purification at Fukushima plant hits snag**

<http://mainichi.jp/english/english/newsselect/news/20140802p2a00m0na009000c.html>

Tokyo Electric Power Co. (TEPCO) is unlikely to reach its target of completing purification of radiation-contaminated water stored at the crippled Fukushima No. 1 Nuclear Power Plant by the end of fiscal 2014, it has been learned.

The anticipated failure is attributed to the malfunction of ALPS, the multi-nuclide removal equipment installed at the plant. While the apparatus is supposed to remove radioactive materials from contaminated water, the device has not worked properly as planned. TEPCO has admitted to the dim prospects of not reaching the target deadline at this rate.

With the utility's work to build ice walls to prevent an influx of groundwater into reactor buildings at the plant also hitting a snag, the latest development once again underscores the difficulties in reducing the amount of contaminated water.

Then TEPCO Vice President Zengo Aizawa had earlier told a September 2013 press conference, "We'd like to purify the full amount (of contaminated water) by the end of fiscal 2014." His statement came in response to Prime Minister Shinzo Abe's assertion during Tokyo's bid presentation for the 2020 Olympics that "the situation (at the Fukushima nuclear plant) is under control."

The utility had planned to reduce the amount of 62 types of radioactive substances in contaminated water to levels that meet standards, aside from tritium that cannot be removed by ALPS.

A trial operation of ALPS commenced in March last year. However, the device has often been suspended following various incidents of trouble. While roughly 470,000 metric tons of contaminated water is currently stored on the plant's premises, only about 110,000 tons -- or slightly over 20 percent -- has so far been treated for purification. What's more, even the processed water **still contains cobalt-60 and three other types of radioactive substances above acceptable levels, on top of tritium.**

TEPCO plans to start installing additional ALPS devices sometime after September and bolster its ability to process contaminated water to 2,000 tons a day starting in October. However, even if all these devices go into full operation, only up to around 400,000 tons of tainted water would be processed by the end of March next year at best. This means the utility may be able to treat some 360,000 tons of highly concentrated radioactive water remaining in storage tanks but will not be able to finish reprocessing the 110,000 tons that have already undergone treatment but still contain four types of radioactive materials.

"Our goal is to reduce the risks of contaminated water. We can say we have lowered the risks once we have had the entire amount of contaminated water go through the ALPS system once by the end of March next year," said a TEPCO public relations official.

An official at the Agency for Natural Resources and Energy said, "It will be fine if the risks of storing contaminated water are reduced, even if the four types of radioactive substances remain."

The Nuclear Regulation Authority (NRA), however, offered a skeptical view. "Even if additional ALPS devices are installed, we can't tell if they will be activated properly. Under such circumstances, it is impossible to predict how much contaminated water will be treated," said an NRA official.

If highly concentrated radioactive water remains in storage at the plant, there will be a constant risk of leakage of such water. **Moreover, since radiation levels near the storage tanks holding highly contaminated water are very high, workers would be exposed to greater doses of radiation during decommissioning work.**

Contaminated water at the plant has been accumulating because a daily amount of 400 tons of groundwater flow into reactor buildings where melted nuclear fuel has yet to be removed. While TEPCO has been taking measures such as pumping up groundwater, the effects remains unclear.

August 4, 2014

## Optimistic view of groundwater discharge

### Fukushima Bypass System Continues To Pump Clean Groundwater Into Pacific

<http://www.nucnet.org/all-the-news/2014/08/04/fukushima-bypass-system-continues-to-pump-clean-groundwater-into-pacific>

Almost 16,000 cubic metres of clean groundwater has been discharged into the Pacific Ocean near the Fukushima-Daiichi nuclear power station since operations began to reduce the accumulation of contaminated water by diverting uncontaminated groundwater around the reactor buildings, the Japan Atomic Industrial Forum said.

**Since the discharge operation began on 21 May 2014, station operator Tokyo Electric Power Company (Tepco) has discharged groundwater 11 times, representing a total volume of 15,828 cubic meters,** a statement said.

Tepco said "some time" would be needed to fully determine the effectiveness of the operation and that it would continue monitoring the situation. It said measurements at various observation wells showed levels of groundwater had dropped by about 10 centimetres.

Tepco began discharging groundwater into the Pacific Ocean after it installed a groundwater bypass system, which diverts the flow of naturally occurring groundwater between the hilltop behind Fukushima-

Daiichi and the reactor buildings, which are close to the ocean.

The groundwater bypass system intercepts clean groundwater as it flows downhill toward the ocean, and reroutes it safely around the facility. The water is temporarily stored to verify its quality before it is released into the ocean.

The groundwater bypass system is one of several strategies being used to reduce the accumulation of contaminated water at the station. The aim is to substantially reduce the amount of groundwater flowing into the reactor building basements.

Another strategy is the construction of impervious underground “ice walls” in the grounds of the facility to try to slow the build-up of radioactive water.

The walls are being built by drilling shafts and inserting freezer pipes designed to freeze soil and prevent the flow of groundwater through the soil. Jaif said in a statement today that work on the walls is progressing, but they are not yet fully frozen and Tepco is looking at “additional measures” including adding dry ice to the shafts.

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August 5, 2014

## Dumping ice blocks in the trenches

### **Tepco dumping ice in Fukushima trenches in bid to freeze toxic water**

<http://www.japantimes.co.jp/news/2014/08/05/national/tepc-dumping-ice-in-fukushima-trenches-in-bid-to-freeze-toxic-water/#.U-C60mPi91s>

Kyodo

Tokyo Electric Power Co. says it has placed tons of ice blocks in underground trenches at the Fukushima No. 1 complex in an attempt to freeze highly toxic water pooled there, a necessary step before a 1.5-km ice wall can be constructed to keep groundwater out.

**Tepco is racing to stop the buildup of radioactive cooling water in the trenches.**

To keep groundwater from becoming contaminated and spilling into the ocean, Tepco is attempting something unprecedented: to freeze 1.5-km of soil around the basements of the four reactor buildings.

In April, Tepco inserted refrigeration rods in the trenches to try to freeze the water but abandoned the effort after more than three frustrating months.

According to the company, some 11,000 tons of highly toxic water has flowed into the trenches through the No. 2 and No. 3 reactor buildings.

As an additional measure, Tepco started putting 15 tons of ice per day into the trenches late last month. Though there is now 58 tons of ice in the trenches, the utility has “yet to see” whether it will work, a Tepco official said Monday.

The new method was introduced after an increasingly alarmed Nuclear Regulation Authority urged the company last month to take additional steps as soon as possible to handle the radioactive water.

The official said **the company will also consider putting blocks of dry ice in the trenches to help freeze the water.**

August 6, 2014

## **No.3 meltdown happened earlier than previously thought**

### **Meltdown at Fukushima reactor 3 worse than thought**

[http://www3.nhk.or.jp/nhkworld/english/news/20140806\\_21.html](http://www3.nhk.or.jp/nhkworld/english/news/20140806_21.html)

The operator of the crippled Fukushima Daiichi nuclear plant says the damage to nuclear fuel in one of its reactors may be worse than previously thought.

Tokyo Electric Power Company engineers have been working to size up damage at the plant from the March 2011 accident and start the process of decommission.

Officials with the utility now say **most of the nuclear fuel in the No. 3 reactor melted through the reactor core and is now resting at the bottom of the containment vessel.**

They had previously said some of the fuel was still inside the reactor. Their latest assessment suggests



decommissioning the No. 3 reactor could be more challenging than previously thought.

A government panel investigating the meltdown had said an improper shutdown of an emergency cooling system called "HPCI" had contributed to the accident.

**But the utility's latest analysis states the cooling system was already dysfunctional before workers shut it down. It says a meltdown in the No. 3 reactor started at 5.30 AM on March 13th. That's about 5 hours earlier than previously estimated.**

It says most of the fuel melted through the reactor core and had dropped into the containment vessel by the following morning.

### **Fukushima reactor 3 meltdown was worse than estimated: Tepco**

<http://www.japantimes.co.jp/news/2014/08/06/national/fukushima-reactor-3-meltdown-worse-estimated-tepco/#.U-JPGWpi91s>

by Kazuaki Nagata

Tokyo Electric Power Co. said Wednesday that its new estimate shows that all the fuel rods in reactor 3 at the Fukushima No. 1 nuclear power plant apparently melted down and fell onto the bottom of the containment vessel.

In November 2011, the company had said it believed only about 63 percent of reactor 3's fuel core had melted.

The utility updated its estimate as part of an effort to probe unclear points about the triple meltdown at the Fukushima No. 1 plant caused by a megaquake and monstrous tsunami in March 2011.

The revised estimate is based on the finding that an emergency cooling system, known as HPCI, of reactor 3 stopped working six hours earlier than previously thought, and that the meltdown had also started more than five hours earlier.

Tepco had previously said that the HPCI had shut down at 2:42 a.m. on March 13, 2011. But further investigation over the past year determined that the HPCI appeared to have lost its cooling function about at 8:00 p.m. on March 12.

According to the new estimate, all the melted fuel penetrated the pressure vessel, fell onto the bottom of the containment vessel and melted about 68 cm into the concrete.

The pressure vessel is located inside the massive containment vessel.

The analysis shows that the fuel did not penetrate the containment vessel, according to Tepco.

While the new analysis announced on Wednesday, based on temperature, pressure and other data, shows that all the fuel had melted down to the containment vessel, Tepco has a more optimistic view.

“We think some fuel still remains at the core part based on the actual plant data,” said Shinichi Kawamura, a Tepco spokesman, during a news conference.

According to Kawamura, this is because the temperature of the pressure vessel decreased when the water was injected, meaning some warm fuel was still there.

August 7, 2014

## **Situation at No.3 reactor**

### **TEPCO: Nearly all nuclear fuel melted at Fukushima No. 3 reactor**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201408070055>



The upper part of the No. 3 reactor building at the Fukushima No. 1 nuclear power plant was blown off in an explosion in March 2011. (Provided by Tokyo Electric Power Co.)

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Almost all of the nuclear fuel in the No. 3 reactor of the Fukushima No. 1 nuclear power plant melted within days of the March 11, 2011, disaster, according to a new estimate by Tokyo Electric Power Co.

TEPCO originally estimated that about 60 percent of the nuclear fuel melted at the reactor. But the latest estimate released on Aug. 6 revealed that the fuel started to melt about six hours earlier than previously thought.

TEPCO said most of the melted fuel likely dropped to the bottom of the containment unit from the pressure vessel after the disaster set off by the Great East Japan Earthquake and tsunami.

The utility plans to start fuel removal operations at the No. 3 reactor no earlier than in the latter half of fiscal 2021.

“(The new estimate) does not mean we are now facing a higher risk (in the planned removal work),” a TEPCO official said. “It is still impossible for us to evaluate the potential impact (of the findings) on the decommissioning of the reactor.”

TEPCO released its first report on the nuclear crisis in June 2012. But because many details of the disaster remain unknown, TEPCO is still looking into the causes of the disaster.

The previous report was compiled on the assumption that an emergency cooling mechanism for the No. 3 reactor, known as a high pressure core flood system, continued to properly inject water into the reactor until it was manually shut off in the early morning of March 13, 2011.

Because the system does not work properly unless certain levels of pressure inside the reactor are secured, TEPCO made a new estimate based on the premise that the cooling mechanism stopped functioning at 8 p.m. on March 12, when the internal pressure dropped sharply.

According to the latest estimate, fuel at the No. 3 reactor began melting at 5:30 a.m. on March 13, and almost all the melted fuel had dropped to a broad area on the bottom of the containment vessel soon after 7 a.m. on March 14.

TEPCO officials said they believe part of the melted fuel still remains inside the pressure vessel, citing the fact that the temperature inside the pressure vessel fell after a later water injection.

The estimated start of the fuel melting is roughly consistent with when neutrons were detected near the front gate of the nuclear plant, according to the officials.

Neutrons were also detected when nuclear fuel started to melt at the No. 2 reactor at midnight on March 14. For this reason, TEPCO estimates that radioactive substances released from the No. 3 reactor emitted neutrons near the front gate.

All of nuclear fuel at the No. 1 reactor is estimated to have melted after the disaster, while around 60 percent is believed to have melted at the No. 2 reactor. TEPCO said it will now consider how to remove the melted nuclear fuel from the No. 3 reactor.

## **Fukushima No. 3 reactor meltdown worse than previously believed: TEPCO**

TOKYO (Kyodo) -- Fuel inside the No.3 reactor at the Fukushima Daiichi nuclear plant began melting earlier than thought, and more fuel than previously estimated fell into the outer primary container after the cooling function failed following the 2011 earthquake and tsunami, a new analysis showed Wednesday.

Tokyo Electric Power Co. initially estimated that around 60 percent of the fuel melted through the base of the pressure vessel and dropped into the outer primary containment vessel.

But a company official told a press conference now most of the fuel "is believed to have dropped," and the utility is still studying ways to remove it.

TEPCO's latest analysis is expected to add to concern that safely removing the melted fuel at the reactor could be even more difficult.

A massive earthquake and tsunami ravaged the northeastern Japan on March 11, 2011, sparking the nuclear crisis in which three reactors including the No. 3 unit at the Fukushima complex suffered meltdowns.

The new analysis showed the fuel meltdown at the No. 3 reactor is likely to have begun at around 5:30 a.m. on March 13, about five hours earlier than originally estimated.

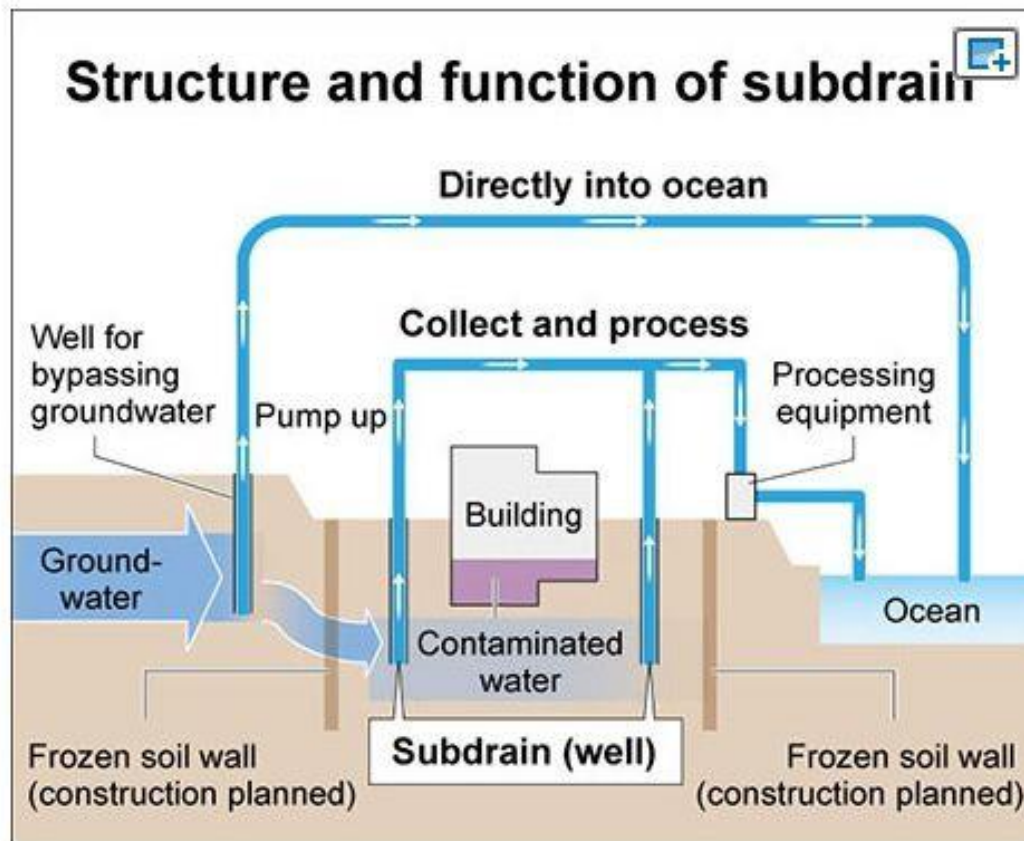
The reactor's cooling system is believed to have failed at around 8 p.m. on March 12, about seven hours earlier than initially thought.

Even after more than three years, details of what happened at the time of the crisis and the situations surrounding the reactors remain unknown, and TEPCO is continuing its investigation.

## **TEPCO desperate to dump "decontaminated" water into sea**

## Decontaminated water from Fukushima plant to be dumped into sea

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201408070060>



Tokyo Electric Power Co. wants to dump decontaminated water from the Fukushima No. 1 nuclear power plant into the ocean.

Frustrated at past efforts to deal with this vexing problem, the company is in talks with government ministries to pump contaminated water found around the buildings on the plant site, process it to remove the radioactive materials and then release it into the Pacific Ocean.

TEPCO has also presented an outline of the plan to the Fukushima Prefectural Federation of Fisheries Cooperative Associations. A federation official said officials of the central government and TEPCO will visit local fisheries cooperatives to explain the plan.

"We would never consider dumping the water into the ocean unless we received the consent of local residents," a TEPCO official said.

The proposal is designed to reduce the volume of groundwater that is flowing into buildings that already hold contaminated water.

The plan would involve wells called subdrains that have been built around buildings on the plant site. Before the 2011 Fukushima nuclear accident, the subdrains were used to pump out groundwater and dump it into the ocean as a means to lower the groundwater level.

But after the Great East Japan Earthquake in March 2011, the subdrains became unusable because the pumps were damaged and the groundwater had become contaminated with radioactive materials.

The daily flow of groundwater into the plant buildings is what's causing 400 tons of contaminated water to be generated on a daily basis.

TEPCO officials plan to use the existing 27 subdrain wells and dig 15 additional wells to reduce the volume of contaminated water created to around 200 tons a day, or half the present level.

Processing equipment would be used to remove the radioactive cesium and strontium in the groundwater before the water is released into the sea.

The utility is seeking to begin the new process this autumn and has submitted a request for screening the processing equipment with the Nuclear Regulation Authority.

If the plan is approved, it would be the first time since the Fukushima nuclear accident for contaminated water to be dumped into the ocean after it has been purified.

Although TEPCO will seek the consent of local residents and fisheries cooperatives, a high-ranking official with a Fukushima fisheries cooperative said the utility may face an uphill road in gaining approval.

"The water close to the plant buildings is already contaminated," the official said. "Fishermen are sure to raise objections to the plan so it will be difficult to gain their understanding."

In May, TEPCO began pumping out groundwater from the mountain side of the plant and dumping it into the ocean. This was done to prevent the water reaching the plant and becoming contaminated.

The company is now constructing an underground frozen soil wall to stop groundwater from reaching the plant.

### **TEPCO plans to release treated water to ocean**

[http://www3.nhk.or.jp/nhkworld/english/news/20140807\\_09.html](http://www3.nhk.or.jp/nhkworld/english/news/20140807_09.html)

The operator of the damaged Fukushima Daiichi nuclear power plant is seeking approval from fishermen to discharge decontaminated ground water into the ocean.

Highly radioactive water at the plant is seeping into the earth and mixing with ground water. Experts estimate around 200 tons of contaminated ground water are leaking into the ocean each day.

Engineers with Tokyo Electric Power Company are building an iron barrier along a coastal embankment in a bid to contain the problem.

TEPCO officials say they plan to pump the water and remove radioactive substances using a decontamination system they are building. They say the barrier and the decontamination system will be in place in September.

But they have limited capacity in storage tanks at the plant, and want to discharge the decontaminated water into the ocean.

The officials say they explained the plan to the Fukushima prefectural fisheries association, and they will seek approval from the local fisheries cooperative.

They say they also want to decontaminate ground water collected at wells near reactor buildings before releasing it into the ocean. They will apply to the government to build drainage pipes and other facilities to do so.

But the officials say they will not go ahead without the consent of the fishermen.

**They say their plan is an improvement on the current situation, as contaminated water is spilling directly into the ocean.**



## Dumping "decontaminated" water into the sea (follow-up)

### TEPCO presents new water treatment plan

[http://www3.nhk.or.jp/nhkworld/english/news/20140807\\_39.html](http://www3.nhk.or.jp/nhkworld/english/news/20140807_39.html)

The operator of the crippled Fukushima Daiichi nuclear power plant has sought approval by local fishermen for a new plan to deal with contaminated groundwater.

Tokyo Electric Power Company, or TEPCO, is running a so-called bypass system that pumps up untainted groundwater to keep it from mixing with toxic cooling water from the plant's damaged reactors.

But groundwater continues to flow into the reactors' buildings and become contaminated. Part of it is believed to be seeping into the nearby Pacific Ocean.

On Thursday, TEPCO officials met members of a fisheries association in Soma City, Fukushima Prefecture.

In the closed-door meeting, the officials are said to have explained that they plan to collect contaminated groundwater both at wells near reactor buildings and at an iron barrier along a coastal embankment.

The officials said they will remove radioactive substances from the water before discharging it into the ocean. They also said they will apply to the government to build drainage pipes and other necessary facilities.

Fishermen expressed concern that the move will increase consumer suspicion about sea pollution. They asked why the measure must be added to the newly introduced bypass operation.

Fisheries association head Hiroyuki Sato told reporters that fishermen were shocked to hear that the measure is needed only 3 months after the bypass operation began.

He said TEPCO will have difficulty obtaining their consent.

### Tepco to collect toxic groundwater at Fukushima, dump in ocean after treatment

<http://www.japantimes.co.jp/news/2014/08/07/national/tepcu-collect-toxic-groundwater-fukushima-dump-ocean-treatment/#.U-SCJ2Pi91s>

Kyodo

Tokyo Electric Power Co. is planning to pump contaminated groundwater from drainage wells at the Fukushima No. 1 nuclear plant and dump it into the ocean after removing almost all radioactive materials, company officials said Thursday.

The plan is aimed at reducing the amount of toxic water building up at the complex, a problem that has been plaguing Tepco since it started trying to clean up the stricken power plant in 2011.

An estimated 400 tons of untainted groundwater is seeping into the shattered reactor buildings and mixing with toxic water generated in the process of cooling the reactors.

Currently, Tepco is running another system it calls “ground bypass” that is aimed at pumping up untainted groundwater before it mixes with toxic water. The utility has dumped such water into the Pacific Ocean numerous times after confirming its safety, but has not released water that was contaminated and then treated.

The utility explained the plan to Fukushima fishermen at the end of July, the Tepco officials said, who added that the water will be dumped in the sea only after obtaining consent from them.

Concern remains high that the move will increase consumer suspicion about marine products from the area.

Tepco is currently constructing a new water treatment facility, as well as an iron wall on the sea side of the plant, in an attempt to keep the toxic water from flowing into the ocean. Both are expected to be completed in September.

See also :

<http://fukushima-is-still-news.over-blog.com/article-tepco-desperate-to-dump-decontaminated-water-into-sea-124321756.html>

&

<http://fukushima-is-still-news.over-blog.com/article-an-optimist-view-of-groundwater-discharge-124321709.html>

August 9, 2014

## **New drain system**

## **TEPCO applies to build new water drain system**

[http://www3.nhk.or.jp/nhkworld/english/news/20140809\\_14.html](http://www3.nhk.or.jp/nhkworld/english/news/20140809_14.html)

Aug. 9, 2014 - Updated 08:10 UTC+2

The operator of the Fukushima Daiichi nuclear power plant says it will apply to the regulation authority to build new facilities to discharge decontaminated ground water into the ocean.

A large amount of contaminated ground water from beneath the plant continues to leak into the ocean.

Engineers with Tokyo Electric Power Company are building an iron barrier along a coastal embankment.

Then, they plan to pump up the ground water, and decontaminate it before discharging it into the ocean. TEPCO officials also want to decontaminate ground water collected at wells near reactor buildings.

They say they will apply on Monday to the Nuclear Regulation Authority for permission.

They say they've explained the plan to local fishermen, and there has been no objection about the plan so far.

Regulators will examine the plan for its effectiveness and safety.

TEPCO says it will make a final decision on whether to discharge the water into the ocean after consulting with locals.

The plan is likely to meet opposition as fishermen are voicing concern that the move will increase consumer worries about sea pollution. See also : <http://fukushima-is-still-news.over-blog.com/article-dumping-decontaminated-water-into-the-sea-follow-up-124329594.html>

August 11, 2014

## **Filing for new drainage system**

### **TEPCO files application for new drainage system**

[http://www3.nhk.or.jp/nhkworld/english/news/20140811\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20140811_25.html)

The operator of the damaged Fukushima Daiichi nuclear power plant has applied for a permit to install a system that would discharge decontaminated groundwater into the sea.

Tokyo Electric Power Company is now building an iron embankment that will prevent radiation-contaminated groundwater from leaking into the ocean. The barrier is expected to be ready by late September.

TEPCO says it wants to pump up groundwater and water from wells near the reactor buildings, decontaminate it, and then discharge the water into the ocean.

On Monday, TEPCO submitted its plan to the Nuclear Regulation Authority for approval. The new facilities would include drainage pipes to transport the water.

The utility says it has explained the plan to local fisheries groups and there have been no major objections so far.

TEPCO already has a water treatment system in place at Fukushima Daiichi that pumps up untainted groundwater for release into the ocean.

It says the new system will improve the current situation, in which large amounts of contaminated groundwater have leaked into the sea.

But the company says it will not release decontaminated water into the ocean unless it wins full approval from locals.

Fisheries groups have expressed concerns that the release of treated water will reignite harmful rumors about the safety of marine resources from waters near Fukushima.

### **Tepeco seeks OK for toxic-groundwater dumping facility at Fukushima plant**

<http://www.japantimes.co.jp/news/2014/08/11/national/tepeco-seeks-ok-for-toxic-groundwater-dumping-facility-at-fukushima-plant/#.U-iwxmPi91s>

Kyodo

FUKUSHIMA – Tokyo Electric Power Co. on Monday asked regulators for permission to build a facility to dump radiation-tainted groundwater from the Fukushima No. 1 power plant into the sea after filtration, sources said.

Tepeco filed the application with the Secretariat of the Nuclear Regulation Authority after briefing local officials on the plan. It wants to start pumping the filtered groundwater on a trial basis.

Tepeco plans to lay pipes at the crippled power plant to direct the water to the compound's seaport. Even after nearly all the radioactive contaminants have been removed, the water won't be dumped into the Pacific until consent has been obtained from local authorities, the utility said.

In May, Tepeco separately started a "groundwater bypass" project to reroute less risky groundwater from the land side of the reactors to the sea to prevent it from seeping into the radiation-contaminated facility. Eventually, such water will be dumped into the ocean after checking contamination levels.

**The latest move will for the first time dump water that has been contaminated from the core meltdowns of March 2011 into the sea.** Tepeco has not yet explained the full details of the dumping plan to local fishermen, who fear it will further mar the reputation of their catches.

Local fishermen have yet to be formally briefed on the Tepco plan but are likely to be unreceptive, for fear of raising even higher consumer concerns about marine products.

About 400 tons of groundwater are believed to be seeping into reactor buildings each day and mixing with toxic water generated in the process of cooling the reactors, which melted down in the nuclear disaster in 2011.

The new facility could cut the amount of toxic water to some 200 tons a day, utility sources said, noting that Tepco would remove almost all the radioactive materials before dumping the water.

Radioactive substances, such as tritium and cesium, have been detected in some water samples from the wells. Tepco says it aims to clean the water to a level that will not harm the environment. However, the water treatment facility cannot remove tritium.

There were 57 wells at the power plant before the nuclear disaster on March 11, 2011, which was triggered when a powerful earthquake and following tsunami crippled the seaside plant in Fukushima Prefecture. Most of the wells were damaged by the disaster. But Tepco restored 27 wells and dug 15 new ones to control the level of toxic water underground

August 12, 2014

## **Areva decontamination system to be scrapped**

### **TEPCO to scrap Areva system at Fukushima**

[http://www3.nhk.or.jp/nhkworld/english/news/20140812\\_04.html](http://www3.nhk.or.jp/nhkworld/english/news/20140812_04.html)

The operator of the Fukushima Daiichi nuclear power plant has decided to scrap a French-made decontamination system that's been out of operation for nearly 3 years.

Tokyo Electric Power Company installed the system made by the French nuclear energy firm Areva 3 months after the nuclear accident at the plant. TEPCO used it to deal with accumulated radioactive water.

The system uses chemical agents to remove radioactive material, including cesium, from water.

TEPCO said 76,000 tons of tainted water was treated during the first 3 months of use. But the system was soon marred by pump malfunctions and other problems.

The machine has been unused for nearly 3 years, while another system was introduced to take over the task.

TEPCO said the device now has high levels of radiation after processing water with highly radioactive substances.

The company says there is a high risk of radiation exposure to workers during monthly maintenance and

regular operation of the system.

It is planning to file an application to scrap system with the Nuclear Regulation Authority.

TEPCO says the device was helpful in the early stage of decontamination. It also says it will not disclose its price and maintenance fees, as that would affect company management.

## Getting rid of contaminated groundwater

### TEPCO begins pumping up groundwater at Fukushima plant

<http://mainichi.jp/english/english/newsselect/news/20140812p2g00m0dm037000c.html>

FUKUSHIMA, Japan (Kyodo) -- Tokyo Electric Power Co. on Tuesday began pumping up groundwater at disaster-hit Fukushima Daiichi nuclear power plant on a trial basis in a process necessary to build a facility for dumping such water into the ocean after removing almost all radioactive materials from it. TEPCO plans to pump up about 500 tons of groundwater from drainages near the plant to store in tanks for a while.

The utility firm will then start experiments around Aug. 20 to check whether the level of radioactive materials in the water can be reduced through a cleanup system.

Under the plan filed with the Nuclear Regulation Authority on Monday, the operator of the crippled nuclear plant aims to lay pipes at the complex to transport the treated groundwater to a seaport within the premises.

Local fishermen are expected to oppose the water release plan. TEPCO says the water will not be dumped into the Pacific unless local consent is obtained, and plans to brief those concerned on the plan after the experiments.

About 400 tons of groundwater is believed to be seeping into reactor buildings each day and mixing with toxic water generated in the process of cooling the reactors that suffered meltdowns in the nuclear disaster in 2011.

The amount of toxic water could be reduced to around 200 tons each day with the new facility, according to utility sources.

### TEPCO to start new drainage system

[http://www3.nhk.or.jp/nhkworld/english/news/20140812\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20140812_02.html)

The operator of the crippled Fukushima Daiichi nuclear power plant has unveiled its latest strategy to deal with the buildup of contaminated water at the site. The plan involves treating contaminated groundwater and discharging it into the ocean.

Tokyo Electric Power Company on Monday applied for a permit to install the system, which includes drainage pipes leading to the ocean.

On Tuesday workers will start a trial operation to pump up groundwater from wells near the reactor buildings.

They will then test the treatment system's ability to remove radioactive material.

TEPCO is also building an iron embankment to prevent contaminated groundwater from leaking into the ocean before it can be treated. The utility plans to pump up water that will build up at the barrier in order to treat it.

This is TEPCO's first plan to release decontaminated groundwater into the ocean. Previously, the utility only allowed groundwater that had not been contaminated to be released into the ocean.

TEPCO says it will only go ahead with the plan if residents agree. The company is planning to meet with officials from local municipalities and representatives of the fishing industry.

But many in the fishing community are voicing concerns that discharging of decontaminated water may trigger unwelcome rumors over seafood safety.

## Pumping up radioactive groundwater

### TEPCO begins pumping up groundwater at Fukushima plant

<http://mainichi.jp/english/english/newsselect/news/20140812p2g00m0dm037000c.html>

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The system uses chemical agents to remove radioactive material, including cesium, from water.

TEPCO said 76,000 tons of tainted water was treated during the first 3 months of use. But the system was soon marred by pump malfunctions and other problems.

**The machine has been unused for nearly 3 years, while another system was introduced to take over the task.**

**TEPCO said the device now has high levels of radiation after processing water with highly radioactive substances.**

The company says there is a high risk of radiation exposure to workers during monthly maintenance and regular operation of the system.

It is planning to file an application to scrap system with the Nuclear Regulation Authority.

**TEPCO says the device was helpful in the early stage of decontamination. It also says it will not disclose its price and maintenance fees, as that would affect company management.**



August 19, 2014

## **TEPCO struggling to freeze radioactive water**

[http://www3.nhk.or.jp/nhkworld/english/news/20140819\\_25.html](http://www3.nhk.or.jp/nhkworld/english/news/20140819_25.html)

The operator of the damaged Fukushima Daiichi nuclear power plant is planning to try another method to freeze radiation-contaminated water in underground tunnels. In April, Tokyo Electric Power Company began installing pipes to carry coolants in and out of the tunnels at the No.2 reactor. Workers hoped to freeze the wastewater to stop it flowing out to the sea. But 3 months into the project, the water had yet to freeze. So the utility last month added more than 400 tons of ice and dry ice. It says this helped freeze over 90 percent of the tunnel cross sections, but there are still unfrozen areas where pipes could not be installed. TEPCO now says it will be difficult to halt the flow of water with an ice blockade alone, so it has decided to seal chinks in the ice with filler material such as cement. The utility on Tuesday explained the new plan at a meeting of the Nuclear Regulation Authority. NRA experts agreed to make a decision on whether to approve the plan after they assess the effectiveness of using filler material in tests to be conducted by TEPCO. A separate and larger project is now underway at the plant to freeze soil and create a wall of ice around the 4 reactor buildings. But concerns about the ice wall plan are rising, as the measure hinges on the success of removing contaminated water from the tunnels.



Workers prepare to pour ice into a trench filled with contaminated water in an attempt to create a sealant at the Fukushima No. 1 nuclear power plant in July. (Provided by Tokyo Electric Power Co.)

August 20, 2014

## Review icewall scheme

### TEPCO to review 'ice wall' scheme to stop flow of contaminated water from reactor

<http://mainichi.jp/english/english/newsselect/news/20140820p2a00m0na019000c.html>

Tokyo Electric Power Co. (TEPCO) has revealed a plan to review its ambitious scheme to create an ice wall in the entire section between a turbine building and an underground trench at the crippled Fukushima No.

1 Nuclear Power Plant to block radioactive water from flowing from the reactor building into the underground tunnel.

TEPCO, the operator of the Fukushima nuclear power station, had planned to remove contaminated water from the trench near the No. 2 reactor building after creating an ice wall to stop the inflow of contaminated water. But because the utility failed to completely freeze the water in the section between the turbine building and the trench, it will take an additional step of filling chinks in the ice with filler material.

A total of 11,000 metric tons of contaminated water has accumulated in the trenches built near the No. 2 and No. 3 reactors facing the Pacific Ocean, and the utility is to first start work to remove contaminated water from the trench for the No. 2 reactor. If the utility fails to remove contaminated water from the underground tunnels, it will not be able to proceed with a project to freeze soil and create a wall of ice around the four reactor buildings. Therefore, whether the additional measure is effective or not is likely to vastly affect measures to reduce radiation levels of water at the wrecked nuclear complex.

TEPCO has been trying to create the frozen wall since April by installing underground pipes to circulate coolant, but the work has not been done as originally planned. The company started to add a total of about 415 tons of ice and dry ice at the end of July, but it could freeze only 92 percent of the water in the section between the turbine building and the trench. Therefore, TEPCO judged that there were chinks at four locations in the frozen section at least. TEPCO officials say the speed of the water flow through the chinks increased, making it difficult to freeze water there.

At a meeting of experts from the Nuclear Regulation Authority (NRA) on Aug. 19, TEPCO showed a plan to seal chinks with filler material such as special cement. NRA officials are concerned about whether TEPCO's plan will have an adverse effect on the entire "ice wall" project. TEPCO will proceed with its original plan to install more refrigeration equipment. The utility will then decide whether to go ahead with the additional step after confirming the status of the operations again as soon as early September or mid-September.

NRA Commissioner Toyoshi Fuketa said, "The situation needs to be firmly confirmed because it could affect subsequent measures."

## **Trial test for groundwater**

### **TEPCO starts test-treating groundwater**

[http://www3.nhk.or.jp/nhkworld/english/news/20140820\\_29.html](http://www3.nhk.or.jp/nhkworld/english/news/20140820_29.html)

The operator of the crippled Fukushima Daiichi nuclear power plant has begun a test on a new water management plan. It is removing radioactive materials in contaminated groundwater that would be released into the ocean if deemed safe.

Tokyo Electric Power Company started the trial at the plant on Wednesday.

Earlier, TEPCO pumped up about 500 tons of radioactive groundwater from drainage wells around the reactor buildings.

In Wednesday's test, workers put about 290 tons of the water into the system to find how much it can reduce radioactive materials.

So far, the results of the test have not been available. TEPCO says the treatment system will be able to reduce radioactive substances in the water to a range of one-thousandth to one-10 thousandth.

The move aims to prevent tainted groundwater from flowing from the plant into the ocean. The utility also hopes to reduce the daily flow of groundwater into reactor buildings of around 400 tons by half.

TEPCO says it will release treated water into the ocean only if local residents and municipalities accept the plan.

The company is planning to meet officials from local governments and representatives of the fishing industry to explain the test results.

But members of the local fishing community are concerned that discharging treated water may cause reputational damage to the industry.

## Icewall concerns

### **TEPCO to review 'ice wall' scheme to stop flow of contaminated water from reactor**

<http://mainichi.jp/english/english/newsselect/news/20140820p2a00m0na019000c.html>

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between the turbine building and the trench. Therefore, TEPCO judged that there were chinks at four locations in the frozen section at least. TEPCO officials say the speed of the water flow through the chinks increased, making it difficult to freeze water there.

At a meeting of experts from the Nuclear Regulation Authority (NRA) on Aug. 19, TEPCO showed a plan to seal chinks with filler material such as special cement. NRA officials are concerned about whether TEPCO's plan will have an adverse effect on the entire "ice wall" project. TEPCO will proceed with its original plan to install more refrigeration equipment. The utility will then decide whether to go ahead with the additional step after confirming the status of the operations again as soon as early September or mid-September.

NRA Commissioner Toyoshi Fuketa said, "The situation needs to be firmly confirmed because it could affect subsequent measures."

## **TEPCO plans to add sealant to ice walls to halt flow of radioactive water**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201408200056>

By SHUNSUKE KIMURA/ Staff Writer

Tokyo Electric Power Co. said it will test cement and other materials as a sealant to completely stem the radioactive water pouring from turbine buildings into trenches at the crippled Fukushima No. 1 nuclear power plant, as ice walls are proving insufficient.

TEPCO's latest plan comes after ice walls at connecting points between the turbine buildings and the trenches failed to halt about 10 percent of the flow.

The plan was reported at a meeting of the Nuclear Regulation Authority on Aug. 19, which will consider the utility's proposal in September. If it gets the green light, TEPCO will immediately begin implementation, which is expected to be complete by the end of the month.

Currently, 11,000 tons of highly radioactive water have accumulated in the trenches, which extend from the turbine buildings toward the ocean. The water flowed into the trenches after the March 11, 2011, Great East Japan Earthquake.

The government and TEPCO have been constructing "frozen soil walls" to encircle reactor buildings and turbine buildings to prevent groundwater from entering those buildings and increasing the amount of contaminated water.

The process calls for first pumping out the radioactive water in the trenches. That also requires the construction of walls at connecting points between the turbine buildings and the trenches to prevent more contaminated water from flowing into the trenches. The construction of ice walls in trenches started in late April.

In the construction, bags filled with clay and cement are amassed before being frozen with chilled pipes to create the ice barriers.

But the ice walls have failed to completely block the flow of radioactive water. From late July, TEPCO added more than 400 tons of ice and dry ice around the connecting points in an attempt to freeze the radioactive water.

Ninety percent of the radioactive water at the connecting points was successfully frozen, but the remaining 10 percent continued to flow into the trenches. TEPCO concluded that the ice walls are insufficient.

The utility said it will test the effectiveness of concrete, adhesive sodium silicate glass, iron sand and various absorption agents as an additional barrier to halt the remaining flow.

TEPCO will decide by mid-September on which materials are most effective.

During the Aug. 19 NRA meeting, Shigeaki Tsunoyama, former president of the University of Aizu in Fukushima Prefecture, asked TEPCO to consider measures other than the ice walls.

"You took the current measures without making sufficient preparations and are now facing difficulties," said Tsunoyama, who is an adviser to the Fukushima prefectural government on nuclear issues. "You should change your way of thinking."

However, TEPCO director Takafumi Anegawa said the ice walls have been effective, despite allowing the remaining flow.

"The ice walls can block 90 percent (of the flow of radioactive water)," he said. "We want to continue efforts with this method for the time being."

August 25, 2014

## **TEPCO tries to convince fishermen**

### **Fukushima fishermen briefed on new drainage system**

[http://www3.nhk.or.jp/nhkworld/english/news/20140825\\_33.html](http://www3.nhk.or.jp/nhkworld/english/news/20140825_33.html)

The operator of the crippled Fukushima Daiichi nuclear plant says a new drainage system has successfully removed radioactive substances from the underground water it pumped up. It's Tokyo Electric Power Company's latest strategy in dealing with the buildup of contaminated water at the site.

TEPCO officials explained the results of the test run at a meeting held by the Fukushima prefectural fisheries cooperative union in Fukushima city on Monday.

The operator conducted a trial operation of the new system last week. Workers pumped up radioactive groundwater from wells near the reactor buildings and put it through the drainage system. They then tested the amount of radioactive material left in the water.

TEPCO officials said that with several exceptions, most radioactive substances in the water dropped to an undetectable level. They said the water was found to be cleaner than the groundwater which is being pumped up for release into the sea to keep it from flowing into reactor buildings.

But members of the union opposed the release of water treated through the new system, saying it could lead to negative rumors among concerned consumers.

Participants decided to ask TEPCO to provide more details about the new system.

The head of the local union, Tetsu Nozaki, says the cooperatives want confirmation that releasing the treated water will not contaminate the sea. He said the local fishermen will discuss TEPCO's plan and decide whether or not to accept it.

August 28, 2014

## **New ALPS?**

### **TEPCO to test-run second water treatment system**

[http://www3.nhk.or.jp/nhkworld/english/news/20140828\\_12.html](http://www3.nhk.or.jp/nhkworld/english/news/20140828_12.html)

The operator of the Fukushima Daiichi nuclear plant is preparing to test a new system for decontaminating radioactive wastewater.

Tokyo Electric Power Company installed a filtration system known as ALPS 17 months ago. But it has been forced to suspend operations on several occasions after discovering leaks in the equipment. It is still using the system on a trial basis.

Members of the Nuclear Regulation Authority on Wednesday approved a request to install the second system for trial from next month. They say TEPCO has put measures in place to prevent leaks.

TEPCO officials had expected ALPS to remove 62 kinds of radioactive material from wastewater. But they say it has so far failed to reduce 4 types of particles to sufficiently low levels.

They also say technical difficulties have made it hard to remove radioactive tritium.

The officials plan to eventually install a third decontaminator, which is a new version of ALPS. They hope to begin full-scale operation of all 3 systems in December.

They say that together, the systems would decontaminate up to 2,000 tons of wastewater a day. Experts will be waiting to see if TEPCO can operate them stably.

### **More ALPS equipment approved for use at Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201408280043>



Additional decontamination machines will be installed at the crippled Fukushima No. 1 nuclear power plant to treat the hundreds of tons of radioactive groundwater collected at the facility daily, the Nuclear Regulation Authority said Aug. 27.

The multi-nuclide removal equipment, called ALPS (advanced liquid processing system), began operating in late March 2013 and has handled 127,000 tons of contaminated water to date. But continuing glitches are still limiting the system to trial runs.

Tokyo Electric Power Co., the operator of the plant, intends to begin trial runs for the second set of ALPS from mid-September. When combined, the two systems will be able to manage twice the amount of contaminated water than before, or about 1,500 tons.

Approximately 400 tons of groundwater flows into the reactor buildings of the power plant every day, mixing with the highly contaminated water that cooled the nuclear fuel following the triple meltdown in 2011.

The ALPS was introduced to reduce the amount of radioactive materials in the contaminated groundwater. Because the system cannot completely eradicate radioactivity, the total amount of water that requires management remains the same, with or without the equipment.

However, the process minimizes risks of contamination if leaks or other accidents occur.

Along with the additional equipment, TEPCO plans to introduce an improved version of the system funded by the government in October.

**As of Aug. 26, 367,000 tons of highly contaminated water sat in tanks placed inside plant grounds awaiting treatment.**

August 29, 2014

## **Bypass has no impact**

### **TEPCO bypass operation failing to have an impact**

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

An operation to curb the accumulation of radioactive water at the Fukushima Daiichi nuclear plant is not making a significant impact.

Tokyo Electric Power Company is pumping up groundwater at the plant to keep it from entering contaminated reactor buildings.

TEPCO officials say contaminated water levels in the buildings have seen little change after the launch of the so-called underground bypass operation in May.

The officials say as of August 17th, water levels in 3 wells around the buildings were down about 10 centimeters from late last month. They were down 20 to 30 centimeters compared to before the measure



was implemented.

The officials believe that in order to reduce the roughly 400 tons of water flowing daily into the buildings by 100 tons, they would need to lower the wells' water levels by amounts in a range from tens of centimeters to one meter.

The officials say **the limited impact is due to the slow movement of groundwater and unclear effects of rain on contaminated water levels. They expect the operation will take several more months to show tangible effects.**

## Crane drops back in No.3 fuel fuel

### Heavy control console falls back into Fukushima fuel pool: Tepco

<http://www.japantimes.co.jp/news/2014/08/29/national/heavy-control-console-falls-back-into-fukushima-fuel-pool-tepco/#.VACvOWOnrIU>

Bloomberg

Tokyo Electric Power Co. said it's detected no change in radiation levels in the No. 3 reactor building of the Fukushima No. 1 power plant after a 400-kg piece of equipment slipped from a crane and fell back into a pool holding spent uranium fuel rods.

The accident happened at around 12:45 p.m. on Friday as the beleaguered utility was attempting to move what it described as a crane control console, according to a statement on its website.

The console, about a meter wide and 1.6 meters high, was blown into the pool on March 14, 2011, when the No. 3 reactor building exploded following an earthquake and tsunami that wrecked the power plant and caused a station blackout.

On Friday, the utility, also known as Tepco was attempting to move the device as part of the cleanup, said spokesman Hiroshi Itagaki. No one was injured and no changes in radiation levels have been detected, he said. The crane was being operated by remote control.

Itagaki said Tepco is unable to say at present whether the accident damaged any of the uranium fuel rods in the pool, but the stable radiation readings indicate otherwise.

Three reactor cores melted in the disaster at the Fukushima plant on March 11, 2011. Tepco is in the midst of the hazardous task of removing spent fuel assemblies from the spent fuel pool perched on top of the No. 4 reactor.

### Crane drops debris into fuel pool at Daiichi plant

[http://www3.nhk.or.jp/nhkworld/english/news/20140829\\_42.html](http://www3.nhk.or.jp/nhkworld/english/news/20140829_42.html)

Aug. 29, 2014 - Updated 11:36 UTC+2

Workers at the Fukushima Daiichi nuclear plant have mistakenly dropped debris into a fuel pool at the Number 3 reactor building.

Tokyo Electric Power Company, or TEPCO, says the incident took place shortly after noon on Friday during work to remove debris using a remotely operated crane.

TEPCO says the dropped item is a controlling console for equipment to move nuclear fuel rods to and from the pool. It says the device measures about one meter square and weighs 400 kilograms.

Officials say they've detected no change in radiation levels near the pool or at the plant's monitoring posts, and that no one was hurt.

The Number 3 reactor building was badly damaged by a hydrogen explosion in March 2011, and its fuel pool is littered with debris.

TEPCO says the pool contains 566 nuclear fuel rods, and that it is trying to check whether any of them have been damaged.

The utility is planning to start removing the fuel rods during the first half of next year, at the earliest.

September 3, 2014

## Fukushima clean-up

### News Navigator: How is the Fukushima nuclear disaster cleanup going?

<http://mainichi.jp/english/english/perspectives/news/20140903p2a00m0na009000c.html>

It has been nearly three years since the triple meltdown at the Fukushima No. 1 nuclear plant, and the cleanup operation in Fukushima Prefecture is ongoing. The Mainichi answers some common questions readers may have about how much progress those cleanup operations have made.

Question: So what's going on with the decontamination project?

Answer: There are in fact three types of decontamination work going on in Fukushima Prefecture. The first covers 40 municipalities that registered an ambient radiation level of more than 0.23 microsieverts per hour after the meltdowns. The second is being conducted in "special decontamination areas" within 20 kilometers of the stricken plant, and the third is being carried out under central government auspices in 11 municipalities. There are, however, so-called "difficult to return home areas" where radiation levels remain high and no decontamination work of any kind has been done. Cleanup work will start in some parts of these areas in April 2015 or later.

Q: But is progress being made?

A: The cleanup involves scraping off the top layer of soil contaminated with radioactive materials, disposing of fallen leaves and branches, and washing building exteriors with water. In the regular cleanup areas, some 70 percent of town halls, schools and farmland have been decontaminated. Only about 40

percent of residences, however, have been cleaned up so far, while the ratio is just 30 percent for roads, woodland and other areas frequented by local residents.

On the other hand, cleanup work in "special decontamination areas" in four municipalities including the city of Tamura is complete. The Environment Ministry's original decontamination plan called for operations in the remaining seven to be finished by spring 2014, but the work has fallen behind schedule and the ministry is now shooting for a late fiscal 2016 deadline.

Q: So why did the operation fall behind schedule?

A: One major reason is that it took so long to decide on a storage site for the contaminated soil. The national government finally set aside a 16-square-kilometer interim disposal site straddling the towns of Okuma and Futaba -- hosts to the Fukushima No. 1 plant -- and plans to start transporting contaminated dirt there in January next year. On Sept. 1, Fukushima Gov. Yuhei Sato informed Tokyo that the prefecture would accept the storage site, officially putting the plan in motion. Once the plan is under way, the heaps of waste at temporary disposal sites should begin to disappear, and hopes are high that the decontamination work will speed up.

Q: Was the decontamination work effective?

A: In Tamura, for example, the hourly radiation dose in residential neighborhoods was brought down from an average of 0.65 microsieverts to 0.41 microsieverts. After that, the natural effects of wind and rain pushed that down further, to 0.36 microsieverts.

Q: But that's still not under 0.23 microsieverts per hour. Can they really say they've achieved the decontamination goal?

A: The goal of the cleanup operation is to get local radiation exposure under the annual maximum of 1 millisievert per year. The hourly maximum dose of 0.23 microsieverts was set based on certain assumptions about the patterns of residents' daily lives, and is therefore more educated guess than hard limit. In July, the Environment Ministry announced that analysis of hard data from the contaminated zones revealed that an hourly airborne radiation dose of 0.3-0.6 microsieverts per hour would still add up to about 1 millisievert over a year. As such, the ministry plans to switch focus from airborne radiation levels to individual radiation doses to help guide its cleanup operations. (Answers by Shuichi Abe, Science & Environment News Department)

## Special cement for Fukushima port

### TEPCO coating seafloor at Fukushima port with special cement mixture

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201409030043>

By SHUNSUKE KIMURA/ Staff Writer

Tokyo Electric Power Co. has begun using a special cement mixture to coat the seafloor of the port at its stricken Fukushima No. 1 nuclear power plant to contain radioactive substances released in the 2011 disaster.

TEPCO said the work was intended to ensure that high concentrations of radioactive materials in the mud and sand do not spread to the open sea.

In going ahead with the operation, officials conceded that it would likely be difficult to later dredge the area to remove the contaminated mud.

“The first priority is to keep the material where it is,” said a TEPCO official. “No decision has been made on whether to recover the (radioactive) mud at some point in the future.”

Highly radioactive water used to cool melted nuclear fuel spilled into the port area after the triple meltdowns triggered by the Great East Japan Earthquake and tsunami.

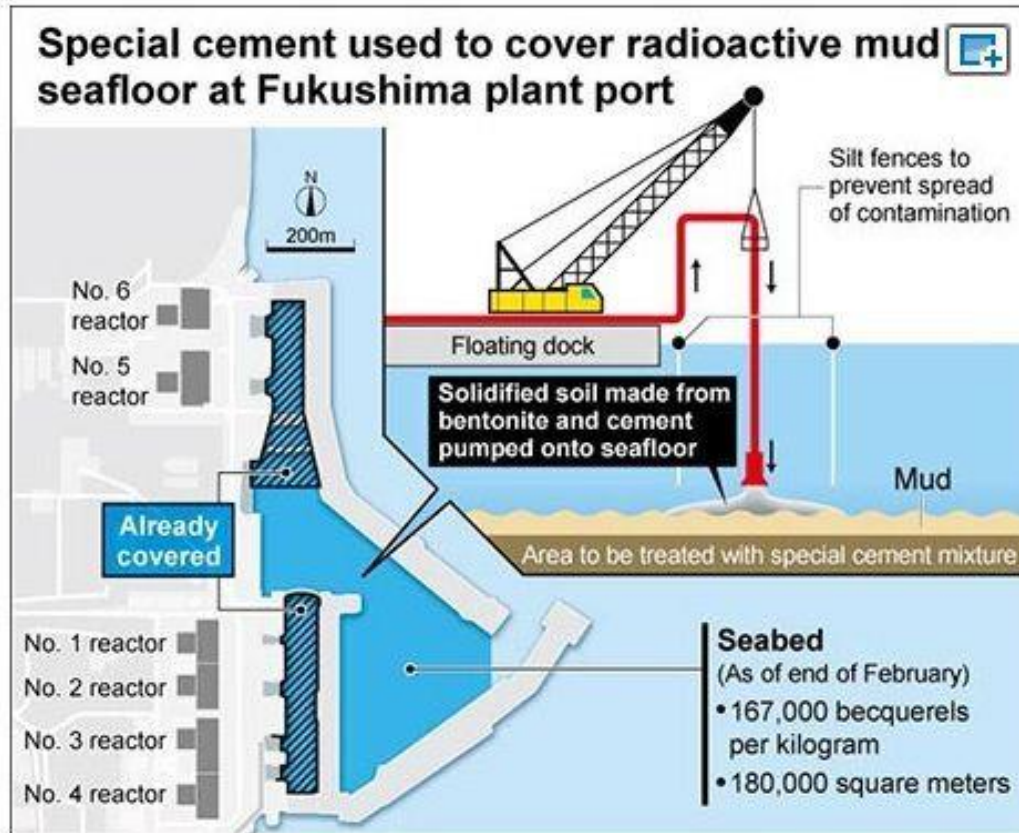
TEPCO in 2012 coated areas of the seafloor near the outlets of underground tunnels through which the radioactive water was released. Other parts of the port were left untouched until now.

A survey of the site in late February turned up readings of 167,000 becquerels per kilogram of radioactive cesium near the quay where vessels dock, TEPCO said, adding that cesium readings of 2,200 becquerels per kg were detected close to the port entrance and open ocean.

Ships use the port to unload equipment and materials for the plant.

In July, the plant operator began work to coat a 50,000-square-meter area near the quay with a special soil and cement mixture. TEPCO plans to coat the remaining 130,000 square meters in phases.

TEPCO said the process will be done twice to ensure durability. The first part of the operation is scheduled for completion by the end of this fiscal year.



September 4, 2014

## "Yet another leak of highly radioactive water"

### **Radioactive water leaking from Fukushima tank**

[http://www3.nhk.or.jp/nhkworld/english/news/20140904\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20140904_31.html)

The operator of the damaged Fukushima Daiichi nuclear plant has reported yet another leak of highly radioactive water from its storage tanks.

Officials of Tokyo Electric Power Company say workers found a leak from piping connecting two tanks around noon on Thursday.

The officials say a drop of water was leaking from a valve every few seconds. They found what looked like a crack in it.

The tanks hold contaminated water that was used to cool melted nuclear fuel. Cesium had been removed from the water.

The officials say the piping was covered with sheets as an emergency measure. The water in the two tanks is being transferred to other tanks.

The officials say there is no danger of the water seeping into the ground or out to other areas. That's because the storage tanks are surrounded by concrete barriers about 60 centimeters high, and the floors within the barriers are covered with resin.

The utility is stepping up efforts to prevent leaks following a series of similar incidents. About 300 tons of highly radioactive water leaked from a tank in August last year.

The firm is increasing patrols and installing water gauges and alarms to tanks.

September 18, 2014

## **Bypass might help**

### **TEPCO: Groundwater bypass helps lessen waste water**

[http://www3.nhk.or.jp/nhkworld/english/news/20140919\\_02.html](http://www3.nhk.or.jp/nhkworld/english/news/20140919_02.html)

The operator of the crippled Fukushima Daiichi nuclear plant says the strategy to pump up groundwater before it reaches the plant has been effective in reducing contaminated water.

Tokyo Electric Power Company has been struggling with a buildup of radioactive water at the plant due to the inflow of groundwater that amounts to about 400 tons a day.

As one of the ways to combat this, in May TEPCO started pumping up groundwater on the hillside of the plant to prevent it from reaching the contaminated reactors and other buildings.

They call the method a "groundwater bypass" and have discharged 36,000 tons in to the sea since May.

The operator on Thursday said the measure may be decreasing the buildup of radioactive water at the plant by 50 to 80 tons per day.

Engineers calculated the figure by excluding the estimated effect of rainfall from the increased volume of contaminated water in the reactor and other buildings and wastewater tanks.

TEPCO also says the groundwater levels at three monitoring points near the pumping sites have been lowered by 20 centimeters compared to before the plan was implemented. It says it will continue to monitor the effect of the bypass operation.

The operator is also considering pumping up contaminated groundwater around the plant and discharging it to the sea after purification.

But local fishermen are against it due to concern about the operation's safety and how negative public perception might affect their business.

## TEPCO tries new ALPS system

### TEPCO begins test runs of new ALPS system at stricken plant

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201409180042>

Tokyo Electric Power Co. said it has begun trial runs of a decontamination channel of a newly installed ALPS system to process radioactive water at the damaged Fukushima No. 1 nuclear power plant. Three channels of the Advanced Liquid Processing System equipment have been in operation since March 2013, but have frequently been suspended because of accidents.

TEPCO said it will start trial runs of two additional channels of the new ALPS equipment by early October. When all six channels become operative, the ALPS system can decontaminate up to 1,500 tons of contaminated water per day, twice as much as the current capacity.

There are 365,000 tons of highly-contaminated water in storage tanks at the plant as of Sept. 16, posing a risk of accidental leaks.



In addition to the two ALPS systems, an upgraded model whose development was financed by the central government is scheduled to begin operations as early as October. The plant's three ALPS systems will handle up to 2,000 tons of contaminated water a day, TEPCO officials said. The government and TEPCO are implementing measures to reduce the risk of accidental leaks of contaminated water at the plant. So far, the existing trouble-prone ALPS equipment has processed 138,000 tons of contaminated water.



Workers clad in protective suits check the ALPS equipment at the Fukushima No. 1 nuclear power plant in November 2013. (Asahi Shimbun file photo)

### **Fukushima fishermen against water release plan**

[http://www3.nhk.or.jp/nhkworld/english/news/20140918\\_35.html](http://www3.nhk.or.jp/nhkworld/english/news/20140918_35.html)

Fishermen have voiced opposition to a plan for well water from around the crippled Fukushima Daiichi plant to be dumped into the ocean.

About 90 fishermen attended a briefing held in Iwaki City in Fukushima on Thursday by Tokyo Electric Power Company.

The plan involves removing radioactive particles from the water before discharging it, and is part of TEPCO's efforts to reduce the buildup of contaminated water at the site.

Company officials said they would only release decontaminated groundwater after tests confirm radiation levels are below safe levels.

Many fishermen said they are not convinced about the safety of water to be released into the sea. They said it could still be contaminated to a certain degree.

They said if problems occurred and highly contaminated water were accidentally released, the negative media coverage would destroy Fukushima's fishing industry.

TEPCO has agreed to a request by fishermen to hold another briefing, as not all the fishermen who wanted to attend could get into the meeting space.

One of the participants said the electric power company should do more research and present data that will be more convincing to fishermen.

September 19, 2014

## Fishermen against water release plan

### **TEPCO struggling to win approval of fishermen over water-discharge plan**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201409190046>

By HIROKI ITO/ Staff Writer

Local fishermen are crying foul over Tokyo Electric Power Co.'s latest plan to discharge processed contaminated water from the crippled Fukushima No. 1 nuclear power plant into the ocean. TEPCO and the central government held the first explanatory briefing over the plan on Sept. 18, seeking to win the approval of fishermen operating in southern Fukushima Prefecture.

Their explanation was apparently unconvincing.

"I can't believe anything TEPCO says," one of the attendees said after the meeting.

The plan is designed to limit the amount of radioactive water accumulating at the nuclear complex, which was severely damaged in the 2011 earthquake and tsunami.

Under the plan, tainted water stored in 42 wells outside the reactor buildings would be pumped into the nearby sea after undergoing a purification process.

The plant operator believes the new drainage efforts would drastically reduce the amount of contaminated water in the buildings. About 400 tons of contaminated water a day is produced from groundwater flowing into the No. 1 through 4 reactor buildings.

In March, fishermen in Fukushima Prefecture gave TEPCO the green light to release groundwater into the ocean before it reaches the crippled reactors and becomes contaminated.



However, many members of local fisheries associations opposed the plan on the opening day of the briefing sessions, held in Iwaki in the prefecture.

Among the 90 in attendance, Yoshinori Sato, a 55-year-old fisherman of sea urchin and abalone, expressed concern over the plan's safety.

"If a critical problem should occur, (local fisheries) would be severely damaged," he said. "They wouldn't be able to recover."

Another member criticized the utility for burdening local fishermen with such proposals, asking, "How many times will we have to make a similar painful decision?"

Near the end of the meeting, TEPCO, the central government and fishery association members agreed to pursue the issue on another occasion.

## Not there yet

### Tainted water problems still plague Fukushima, despite some positive signs

BY KAZUAKI NAGATA

STAFF WRITER

More than three years since it was crippled by a megaquake, tsunami and triple core meltdown, the Fukushima No. 1 power plant is **still bleeding tons of toxic radioactive water into the Pacific Ocean**. Since the crisis in 2011, the water solution that saved eastern Japan from nuclear calamity has developed into a wider problem that is **stoking public concern about seafood safety** and what the utility will do when the plant runs out of space for its seemingly endless lines of water tanks.

To improve the situation, Tepco has been taking steps to reduce the daily buildup of tainted water and to empty the filled trenches running beneath it.

One of those steps, the so-called groundwater bypass, finally began showing progress this week. The bypass is designed to reduce the amount of groundwater merging with tainted water from the plant by pumping it up beforehand and discharging it into the sea.

Other steps have proved unsuccessful, including a recent effort to build ice walls between two of the flooded turbine buildings and their trenches.

The mingling of the waters is a huge headache for Tepco: 400 tons of groundwater seep into the cracked reactor and turbine buildings every day. It then mixes with highly radioactive water in the flooded basements of reactors 1, 2 and 3, which were hit by the meltdowns, and increases the overall volume.

To stop the buildup, Tepco started using wells to pump up the groundwater before it seeps into the buildings. It is then dumped into the sea after radiation checks.

The bypass project, launched in late May, was something Tepco had wanted to try for a long time because it looked like a promising solution.

But it took a while to convince local fishermen to let them dump the untainted water into the sea.

The utility estimated the bypass project would cut the amount of groundwater seepage by about 50 tons daily after three to four months. On Thursday, however, it said the reduction was 50 to 80 tons.

"We all believe this result is better than our previous analysis," Tepco spokesman Shinichi Kawamura told a news conference.

**Tepco is pumping up 300 to 350 tons of groundwater each day, and as of Friday had released 35,979 tons.**

“If the groundwater bypass is really cutting the amount by that much, it’s good progress,” said Atsunao Marui, a groundwater expert who is a member of a government panel dealing with the tainted water issue. But the bypass is only part of the solution, Marui said.

“The project is designed to work effectively with other measures, such as paving the ground surface of the site” and the ice walls, said Marui, who is also a researcher at the National Institute of Advanced Industrial Science and Technology, a semi-public research body.

The plan is for the underground ice walls to encircle the reactor and turbine buildings to prevent the groundwater from entering. It also plans to pave the site to halt rainwater seepage.

Once all these measures are in place, they will work together to stop the tainted water from increasing, he said.

Storage tanks at the plant are already holding close to 400,000 tons of contaminated water, so the utility is eager to slow the rate of increase.

But the groundwater bypass is important for another reason, he said, which is to determine whether groundwater from the west side of the plant is contaminated.

That is where hundreds of full storage tanks stand and where there have been several leaks.

Contaminated water may have seeped into the ground and polluted the groundwater.

“It’s important to continuously monitor so groundwater can be discharged safely. . . . If some wells pump up contaminated water that can’t be dumped into the sea, the effect of the project would be smaller,” he said.

**Tepco set up 12 wells to pump groundwater, and water from one well was found with a high level of tritium.**

**Tepco also wants to pump up water from wells dug around the reactor buildings to divert more groundwater, but the beleaguered utility will have to get consent from local fishermen because it wants to dump it into the sea.** Tepco does not know when it will be able to start this project.

Although the bypass project has started showing signs of life, the utility is still trying to find a way to deal with the plant’s utility trenches, which are filled with highly contaminated water.

The trenches, which run beneath the plant, were built to house cables and pipes needed to transport electricity and water to the reactor and turbine buildings. The pipes were installed to bring in seawater for cooling purposes.

The trenches are connected to the basements and run underneath the flooded turbine buildings. The toxic water is entering the trenches via small spaces in the pipes and cables.

Leaving the tainted water in the trenches is risky.

For instance, if another major quake hits and damages the trenches, the toxic water will escape and contaminate the groundwater.

Tepco said the trenches connected to the No. 2 and No. 3 turbine buildings are filled with radioactive water but **can’t be drained until the leaks from the buildings are plugged first.**

To do that, Tepco started building ice walls. It has installed freezing pipes and thrown in tons of ice and dry ice over the past few months, but the utility has been unable to seal the leaks completely.

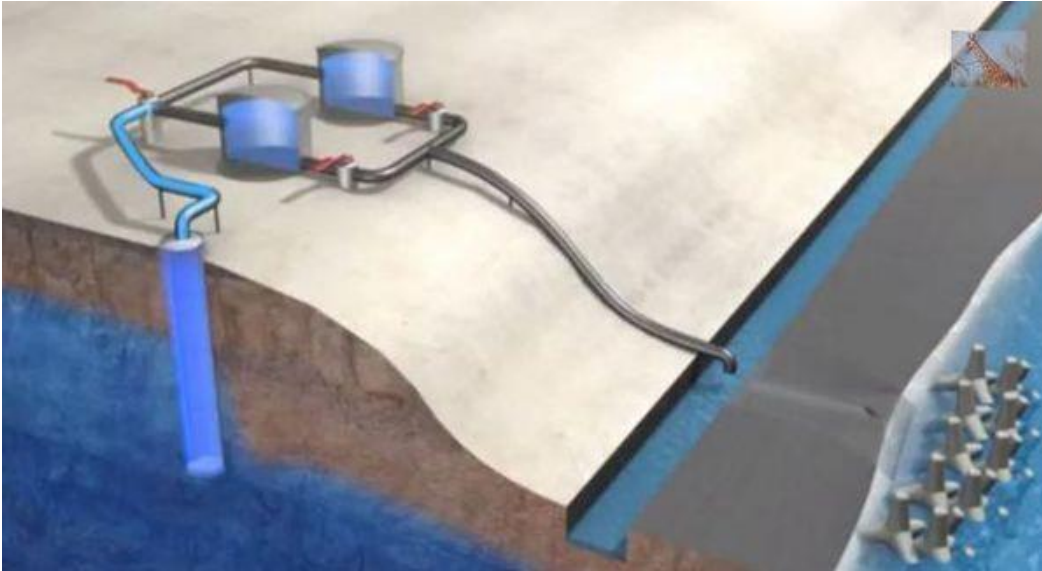
While about 90 percent of the wall is up and running, the rest of it hasn’t been able to freeze because the water is flowing too fast.

Tepco is trying to figure out how it can seal up the leaky parts by other means, such as by using fillers, but it is still unclear when it will be able to plug the leaks.

Marui said Tepco has been spending too much time trying to make the ice walls work, and should give up and explore other alternatives.

## No more space for radioactive water

Article published on August 20, 2014



### TEPCO is out of space for contaminated water, eyes Pacific Ocean

<http://www.digitaljournal.com/news/environment/tepcos-out-of-space-for-contaminated-water-eyes-pacific-ocean/article/397789>

By Karen Graham

The Tokyo Electric Energy Corporation (TEPCO) announced today their failure to create an ice wall in a part of the underground tunnel connecting to a damaged reactor at Fukushima No. 1 power plant. This has not stopped TEPCO from pursuing an alternative.

The Fukushima Daiichi nuclear disaster has now become the world's worst "man-made" disaster ever, and one that is continuing without any end in sight. The difficulty in attempts at stopping the seepage of radioactive water has proven to be an insurmountable task, as the notification from TEPCO officials today has proved.

#### Leaking water the most pressing problem

The earthquake and resulting tsunami on March 11, 2011 resulted in the meltdown of three of the plant's six reactors. It wasn't until August of 2013 that it became clear that the most pressing problem affecting

cleanup was the escaping radioactive water. At that time, it was estimated the cleanup would take several decades.

TEPCO officials have tried several remedies, yet radioactive water has continued to escape into the ocean. As late as August 20, 2013, it was discovered that radioactive water had been continually leaking into the Pacific Ocean, as many people suspected, but TEPCO had denied. This discovery resulted in the government taking "emergency measures" on August 27, 2013.

In trying to contain and then reduce the radiation levels of all the groundwater that continues to seep into the reactor basements, TEPCO has been trying several unique remedies, and to date, none of them has worked. Earlier this year, they started construction of an "ice wall" that would freeze the contaminated water, sealing it forever, but that in itself is questionable.

### **Alternative plan: Dump the treated water in the ocean**

Up until now TEPCO has been pumping the contaminated water up out of the basement areas, and storing it in large storage tanks on the site of its Fukushima reactor. About five days ago, TEPCO officials said they were running out of space to store the contaminated water. They made a request to the Nuclear Regulatory Authority (NRA) to treat the radioactive water and then dump it into the ocean.

We know we have to get an agreement from the relevant government authorities, the prefecture and local fishing unions," a TEPCO spokesman said recently. TEPCO is well aware of what the public reaction will be, locally and worldwide. A TEPCO official told Asahi Shimbun, "We would never consider dumping the water into the ocean unless we received the consent of local residents. The water close to the plant buildings is already contaminated. Fishermen are sure to raise objections to the plan, so it will be difficult to gain their understanding."

Diagram of proposed pumping of groundwater, treatment and disposal into the ocean.

TEPCO

The plan is meant to reduce the amount of groundwater flowing into buildings that already have contaminated water. It also involves wells called sub-drains that have already been built around the buildings on the site. The two-pronged measure would allow uncontaminated groundwater to be pumped directly into the ocean, and through the use of the sub wells, the contaminated water would be pumped up, treated and then dumped into the ocean.

### **Nuclear Regulatory Authority critical of TEPCO**

Shunichi Tanaka, NRA chairman was critical of TEPCO when he spoke at a news conference on August 7, according to the Wall Street Journal. Saying the stricken company needed to get their priorities straight, and place greater emphasis on solving the issues with the greatest risk.

"The biggest risk is the trench water. Until that matter is addressed, it will be difficult to proceed with other decommissioning work," Shunichi Tanaka, chairman of the Nuclear Regulation Authority, said on Wednesday at his weekly news conference. "It appears that they are getting off track," he told reporters.

### **Another failure announced today**

Tanaka was referring to the now failed attempt by TEPCO to freeze a section of the underground tunnel that connects to a damaged reactor, blocking the escape of the highly radioactive water. By freezing the water, TEPCO thought they would have a wall of ice blocking the flow of water between the turbine building and the tunnel.

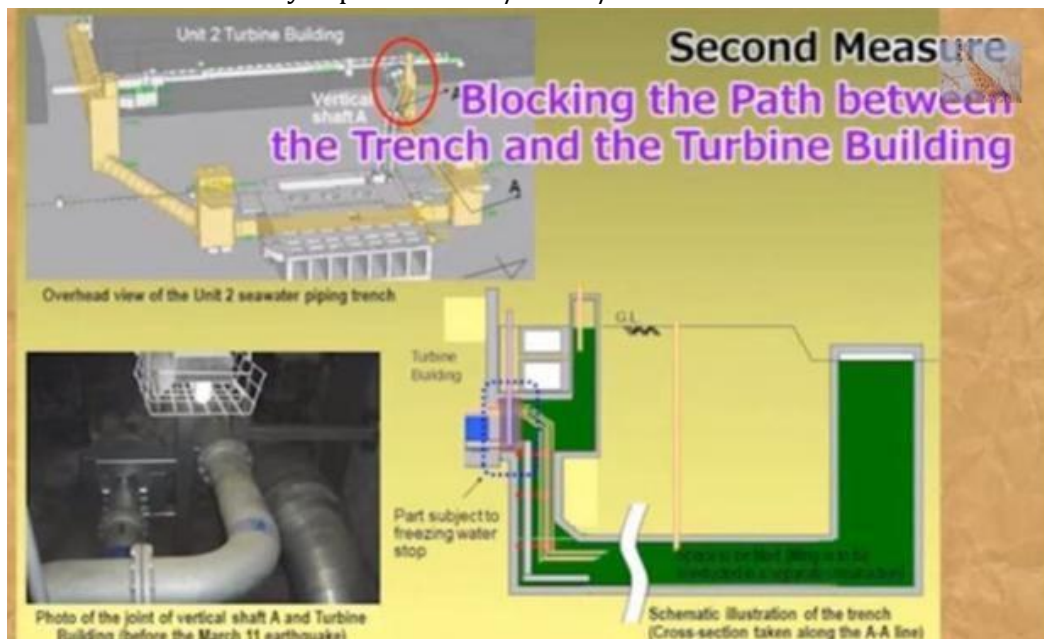
Diagram showing failed proposal at blocking tunnel with an ice wall.

TEPCO

This tunnel holds about 5,000 to 6,000 tons of highly-contaminated water, and since July the power company has used over 400 tons of ice and dry ice trying to create the ice wall. The temperature never fell low enough to freeze the radioactive water. TEPCO told the NRA today they are going to try using filler in an attempt to slow the flow of water until maybe the freeze they want takes affect.

TEPCO's past history with the Fukushima power plant has greatly influenced public opinion against nuclear power use in Japan. The disaster ultimately ended up being labeled a "man-made" disaster with blame being put on, among other things, poor judgement in locating the plant in an active seismic zone. Probably even worse has been the cover-up by TEPCO officials of the true conditions at the site. And this issue is still a problem today.

Read more: <http://www.digitaljournal.com/news/environment/tepcos-out-of-space-for-contaminated-water-eyes-pacific-ocean/article/397789#ixzz3E3ILffil>  
[contaminated-water-eyes-pacific-ocean/article/397789](http://www.digitaljournal.com/news/environment/tepcos-out-of-space-for-contaminated-water-eyes-pacific-ocean/article/397789)



## The plague of contaminated water

### Tainted water problems still plague Fukushima, despite some positive signs

BY KAZUAKI NAGATA  
STAFF WRITER

More than three years since it was crippled by a megaquake, tsunami and triple core meltdown, the Fukushima No. 1 power plant is still bleeding tons of toxic radioactive water into the Pacific Ocean.

Since the crisis in 2011, the water solution that saved eastern Japan from nuclear calamity has developed into a wider problem that is stoking public concern about seafood safety and what the utility will do when the plant runs out of space for its seemingly endless lines of water tanks.

To improve the situation, Tepco has been taking steps to reduce the daily buildup of tainted water and to empty the filled trenches running beneath it.

One of those steps, the so-called groundwater bypass, finally began showing progress this week. The bypass is designed to reduce the amount of groundwater merging with tainted water from the plant by pumping it up beforehand and discharging it into the sea.

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But it took a while to convince local fishermen to let them dump the untainted water into the sea.

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"We all believe this result is better than our previous analysis," Tepco spokesman Shinichi Kawamura told a news conference.

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Marui said Tepco has been spending too much time trying to make the ice walls work, and should give up and explore other alternatives.

September 23, 2014

## **TEPCO to change water plan**

### **TEPCO changes radioactive water plan**

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

Officials overseeing the decommissioning of the Fukushima Daiichi nuclear plant are struggling to stop contaminated water from entering the ocean. Now Tokyo Electric Power Company is drawing up another plan to use a newly developed cement to stem the radioactive flow.

Highly contaminated water is flowing into a maze of underground tunnels at the facility. Engineers believe that it is mixing with groundwater and then leaking into the ocean.

In April workers started to work on an underground wall of ice to stop the flow. They planned to start

removing the tainted water in July and then bury the emptied tunnels in cement. However, the underground water has yet to freeze.

**So now they are considering plugging the tunnels with the special cement while they are still filled with water.**

Company officials say the risks of the contaminated water leaking into the sea are small. **They say they will first explain the plan to the Nuclear Regulation Authority and hope to start the operation from mid-November in order to complete the work by next January.**

The company is carrying out a separate and even larger project to freeze soil and create a wall of ice around all 4 crippled reactors.

Officials say **the latest plan for the tunnels will not affect the larger project.**

## **Plans for removing debris from No.1**

### **Tepco to start removing blast debris from reactor 1 building in late 2015**

<http://www.japantimes.co.jp/news/2014/09/23/national/tepco-plans-remove-blast-debris-inside-reactor-1-building-late-15/#.VCGjgxanp1s>

JJI

IWAKI, FUKUSHIMA PREF. – Tokyo Electric Power Co. will begin removing hydrogen explosion debris from the reactor 1 building at the Fukushima No. 1 nuclear plant in winter 2015, officials said.

Prior to the move, the utility will soon start dismantling the building's cover, the officials said Monday during a meeting with government officials in Iwaki, Fukushima Prefecture.

A hydrogen explosion tore apart the reactor 1 building on March 12, 2011, the second day of the crisis. Tepco and the government vowed to take steps to prevent radioactive materials from being spread during the debris removal and protect local residents from possible exposure.

Similar work at reactor 3 last year is believed to have spread radioactive contaminants in nearby areas. The removal work raised dust containing radioactive materials, causing radiation levels to rise at monitoring posts at the plant. Critics say the dust spread, polluting rice paddies in some parts of Fukushima Prefecture.

Tepco also plans to start removing nuclear fuel rods from the spent fuel storage pool inside the reactor 1 building in the latter half of fiscal 2017. The planned debris removal is necessary to start that work. At present, a cover encloses the whole of the destroyed reactor building. Tepco said it would take about one year to remove the cover.

But the process may not go as smoothly as planned, given the problems Tepco has been facing on another front: dealing with tainted water at the plant.

Tepco said Monday that it now expects a further delay in work to remove highly radioactive water from an underground trench at the plant.



To enable the removal, Tepco plans next month to halt the radioactive water's flow between the trench and the No. 2 reactor's turbine building by injecting filler materials, including cement, into the section connecting the trench and the building, officials said.

The company hopes to complete the operation by January. Tepco previously aimed to finish the injection by the end of this month.

The trench, used to place cables and other equipment, holds some 5,000 tons of highly radioactive water, some of which may be leaking into the ground and the sea.

In preparation for the removal, Tepco in late April began an attempt to freeze radioactive water in a section that connects the tunnel to create a wall of ice to block the flow of water between the turbine building and the tunnel. The process would have made it easier to pump out highly radioactive water from the tunnel.

However, after the utility was unable to sufficiently freeze the water by the initially set deadline of mid-August, it switched to the use of fillers in an attempt to stop the flow by the end of this month.

The No. 2 reactor is one of the three that suffered a core meltdown.

A similar trench at reactor 3, which also had a meltdown, holds some 6,000 tons of radioactive water. It remains uncertain when work to remove that water will begin.

September 24, 2014

## Cesium removal system stops

### System to remove cesium at plant stops

[http://www3.nhk.or.jp/nhkworld/english/news/20140924\\_34.html](http://www3.nhk.or.jp/nhkworld/english/news/20140924_34.html)

Apparent human error has resulted in stoppage of a system for removing cesium from radioactively contaminated water at Tokyo Electric Power Company's Fukushima Daiichi nuclear plant.

The firm says the stoppage is thought to have resulted from mistaken closing of a pump valve. It adds that a pump for sending tainted water to the system stopped with an alarm around 8:30 AM on Wednesday. The operator later shut down the system.

Officials of the firm say the error lowered power to siphon off contaminated water, stopping the pump.

The system can treat 30 tons of tainted water per hour.

Tokyo Electric says its water treatment plan was not affected, as another system is available.

The utility says it wants to resume the halted system on Wednesday after looking into the cause of the suspected mishandling.

## Seal it in with concrete?

### **Regulator: Cementing radioactive water unavoidable**

[http://www3.nhk.or.jp/nhkworld/english/news/20140924\\_42.html](http://www3.nhk.or.jp/nhkworld/english/news/20140924_42.html)

The head of Japan's Nuclear Regulatory Authority says there may be no choice but to seal in radioactive water with cement at the Fukushima Daiichi nuclear plant.

Acting chief Toyoshi Fuketa expressed his opinion at a news conference on Wednesday.

Highly radioactive water flowing into underground tunnels at the Fukushima Daiichi plant is believed to be mixing with groundwater and leaking into the ocean.

**Tokyo Electric Power Company initially planned to freeze some of the contaminated water to stop the flow and allow its removal. But the water is proving difficult to freeze.**

Fuketa said work to freeze the water has been unsuccessful and there may be no choice but to seal it in with concrete.

He said it is not desirable to see radioactive substances remaining, but the existence of liquefied radioactive substances would make the situation more difficult.

Fuketa said **it would be better to seal in the underground water with cement than allowing it to flow into the ocean.**

He also said failure to stop the flow of contaminated underground water would foil the plan to freeze soil and create a wall of ice.

Nuclear Regulatory Authority officials are expected to discuss TEPCO's idea of plugging the tunnels with cement and removing the radioactive water.

September 25, 2014

## Obuchi meets Governor Sato

### **Obuchi vows plant decommission, water management**

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

Japan's industry minister Yuko Obuchi says her government is strongly committed to containing radioactive wastewater at the Fukushima Daiichi plant, and to seeing decommissioning completed.

Obuchi met Fukushima Governor Yuhei Sato at his prefectural office on Thursday. It was their first meeting since Obuchi joined the cabinet last month.

Obuchi said her ministry is determined to make the plant's problems its top priority.

Sato said Fukushima is still suffering from post-accident rumors, with tourism and fisheries being especially hard-hit.

He asked the central government to do more to prevent problems, such as in the work to contain radioactive wastewater.

Sato also urged the government to decommission the Fukushima Daini Plant, which lies south of the ruined Daiichi plant.

Obuchi said scrapping the plant is a decision to be made by the operator. But she said she fully understands that Fukushima residents see the issue differently to others waiting for nuclear safety screenings elsewhere in Japan.

September 26, 2014

## **ALPS in trouble again**

### **Water treatment system in Fukushima fails again**

[http://www3.nhk.or.jp/nhkworld/english/news/20140927\\_03.html](http://www3.nhk.or.jp/nhkworld/english/news/20140927_03.html)

A water treatment system to decontaminate radioactive water at the crippled Fukushima Daiichi nuclear power plant has been partially shut down again.

Tokyo Electric Power Company suspects faulty filters caused the trouble.

One of the 3 lines of the Advanced Liquid Processing System, or ALPS, was turned off on Friday after the treated water in the line remained cloudy.

Engineers found that the water contained calcium, which hinders the elimination of radioactive strontium.

TEPCO officials are examining the cause of the failure. They say **faulty calcium filters may be to blame.**

The ALPS water treatment system has had a series of similar filter troubles since March that resulted in shutdowns.

TEPCO resumed the operations after replacing the filters with ones less likely to be affected by radioactive substances.

The operator installed a second ALPS system and began test-runs earlier this month to treat contaminated water stored in tanks at the Fukushima plant.

TEPCO also plans to set up another facility to treat the tainted water.

September 30, 2014

## ALPS...again

### **Water treatment facility at Fukushima plant suspended again**

<http://mainichi.jp/english/english/newsselect/news/20140930p2g00m0dm043000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear power plant said Monday its trouble-plagued radioactive water treatment system at the complex has been partially suspended again. One of three treatment lines of the multinuclide removal facility was halted last week after Tokyo Electric Power Co., the operator of the plant, found water passing through it was getting cloudy.

The line was hit by similar trouble in March due to filter gasket corrosion. TEPCO later changed the filters and resumed its test run in May.

The company said it does not know whether the latest problem has again been caused by the filters, and has yet to investigate.

On Monday, TEPCO also said the Nuclear Regulation Authority approved the utility's plan to build another radioactive water treatment system with higher performance, which is expected to be capable of processing 500 tons of toxic water per day.

The company aims to finish processing around 400,000 tons of toxic water at the Fukushima complex by the end of March next year, but whether it can achieve that goal is unclear as the existing facility has continued to face problems.

October 3, 2014

## New scrubber to reduce strontium contamination

### New radiation scrubber begins cleaning water at Fukushima plant

<http://www.japantimes.co.jp/news/2014/10/03/national/new-radiation-scrubber-begins-cleaning-water-at-fukushima-plant/#.VC7CJBanp1s>

Kyodo

The new, mobile facility filters radioactive strontium from water used to cool three reactors that partially melted down in March 2011, said operator Tokyo Electric Power Co., and can handle 300 tons of water a day.

The facility could help to “drastically reduce the risks of radioactive water,” said a Tepco official.

**The operator plans initially to process 23,000 tons of water from which radioactive cesium has already been removed.** That water is held in tanks at the plant.

**The procedure will reduce radioactive strontium in the water to about one-thousandth of its current level,** the utility said.

However, removing strontium will not in itself render the water safe. It then needs to be treated by another system at the plant which filters out around 60 kinds of radioactive materials.

**But there is an important reason why the strontium takes precedence. Removing that isotope before the others will make the water far less of a hazard in the event of a major leak into the ocean.**

Meanwhile, an estimated 400 tons of groundwater continues to seep into the reactor basements every day, forcing the utility to find ways to store it. **Tepco already has 400,000 tons of toxic water stored at the site, which will all need to be treated one day.**

## Revising estimates about quakes

### Nuclear operator raises possible quake strength

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The operator of the Fukushima Daiichi nuclear power plant in northeastern Japan has increased by 50% its estimate of the strength of an earthquake that could hit the plant.

The utility had so far estimated the maximum strength of an earthquake that might hit Fukushima Daiichi at 600 gals and the possible height of a tsunami at 14 meters.

But in the 2011 earthquake and tsunami in northeastern Japan, the plant's area registered strength of up to 675 gals and the tsunami height was 15.5 meters.

The Nuclear Regulation Authority had instructed the Fukushima Daiichi plant's operator to consider revising its estimates.

It made the suggestion to prevent the reactors' containment vessels from being damaged or contaminated water from leaking. The vessels house melted nuclear fuel as a result of the 2011 nuclear accident.

At a meeting of experts called by the authority on Friday, the operator of the Fukushima Daiichi suggested raising the estimated strength of a possible earthquake from 600 gals to 900 gals.

They also increased the height of a possible tsunami to 26 meters.

The authority will shortly decide whether it will approve the figures presented by the utility.

October 4, 2014

## **Double previous tsunami estimate**

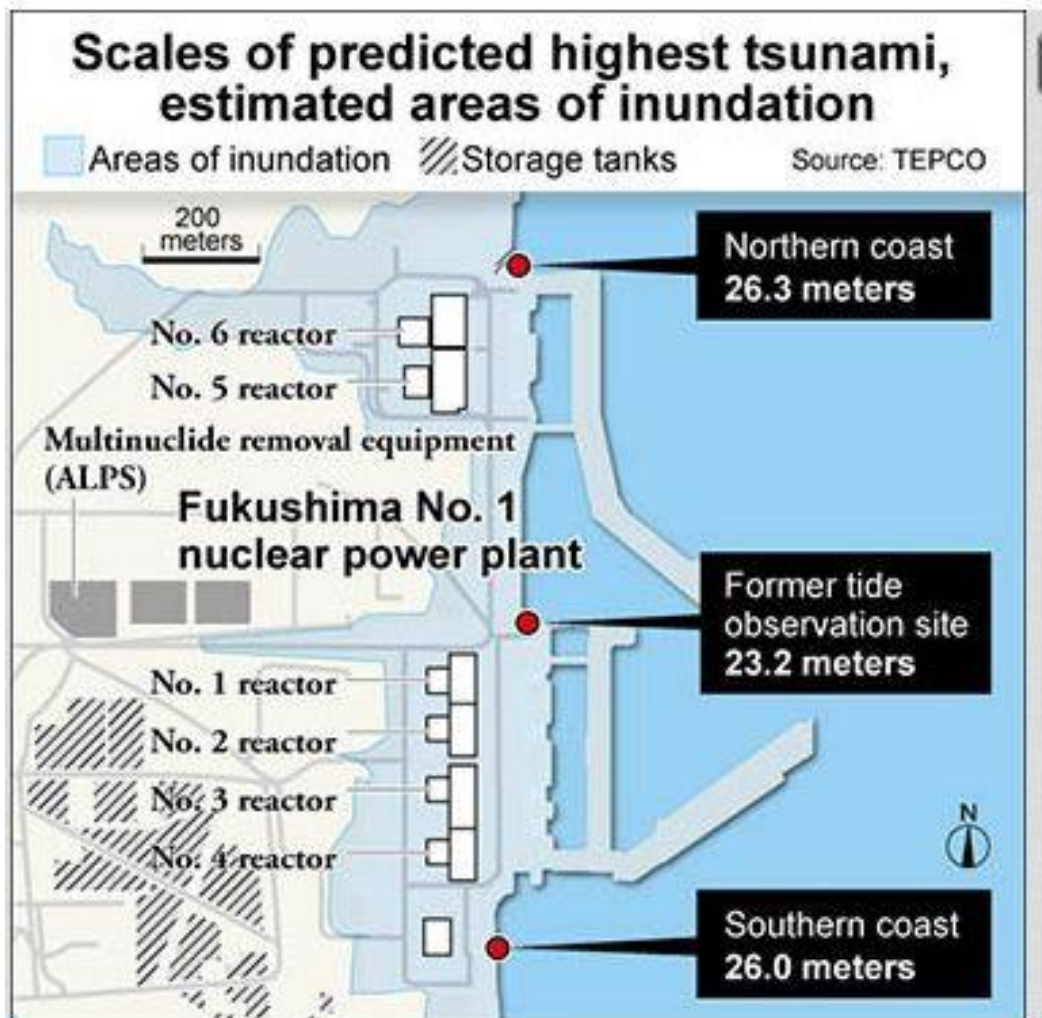
### **TEPCO doubles tsunami height in damage estimate for Fukushima plant**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201410040044>



A temporary levee constructed on the coastline at the Fukushima No. 1 nuclear power plant after the March 2011 Great East Japan Earthquake and tsunami (Asahi Shimbun file photo)





By TSUYOSHI NAGANO/ Staff Writer

A tsunami of 26 meters would inundate the already-stricken Fukushima No. 1 power plant, causing a huge amount of radioactive substances to spill into the sea, according to Tokyo Electric Power Co.'s updated estimates.

The crippled plant's operator told a Nuclear Regulation Authority commission Oct. 3 that **it raised its projected tsunami height to 26.3 meters--nearly double its previous estimate--**and increased the scale of the largest potential earthquake by 1.5 times.

According to the new estimate, if such a towering tsunami struck the facility, hundreds of trillions of becquerels of cesium-137 could be released into the ocean from the basements of reactor buildings. Currently, nuclear plant operators across Japan are making efforts to receive permission to resume operations of reactors that have remained or were put offline after the nuclear crisis started in March 2011.

Other utilities have been raising the scale of the highest possible tsunami for individual plants to meet stricter safety standards introduced following the Fukushima disaster. But TEPCO had not revised its



height estimate for tsunami because the new safety standards do not apply to the Fukushima No. 1 plant reactors, which are scheduled to be decommissioned.

However, due to the unique risk factors at the plant, including destroyed reactor buildings and accumulating contaminated water, the NRA demanded that TEPCO review its tsunami forecast and countermeasures.

TEPCO's latest estimate assumed a scenario in which a tsunami of 26.3 meters triggered by an earthquake of 900 gals struck the coast at the north end of the facility. A gal is a unit of gravitational acceleration.

TEPCO's previous report assumed a strongest possible quake of 600 gals.

Some of the plant's reactors are at the southern part of the plant, where the elevation is 10 meters above sea level. Reactors in the north lie on land 13 meters above sea level.

Tsunami of 15.5 meters struck the southern coastal area following the magnitude-9.0 earthquake in 2011. Projecting a succession of smaller tsunami at a maximum height of 14 meters may inundate the nuclear power plant, TEPCO erected 14-meter-tall temporary levees at some areas in the south following the disaster.

**However, the latest estimate shows that the highest potential tsunami exceeds the height of the land and levees. Such a deluge would thus swamp the reactor buildings, where highly contaminated water has accumulated, causing the release of radioactive substances.**

In the new forecast, TEPCO said storage tanks for radioactive water would not be affected by such a tsunami because they are situated on higher ground. It also said damaged reactor buildings could withstand the potential strongest quake of 900 gals.

**To minimize the impact of the estimated 26.3-meter tsunami, TEPCO said it will reduce the vast quantity of radioactive water accumulating on site instead of raising the height of the levees to block tsunami.**

According to TEPCO officials, the amount of tainted water estimated to spill into the ocean could be reduced to 30 percent by filling in trenches near reactors, where a large quantity has accumulated.

The NRA is not expected to demand TEPCO raise the height of levees, as there is no equipment around the reactor buildings that could cause critical damage in the event of inundation. However, the nuclear watchdog plans to check the appropriateness of TEPCO's latest estimate and proposed countermeasures.

## **Fukushima No. 1 at risk of 26-meter tsunami: Tepco**

<http://www.japantimes.co.jp/news/2014/10/04/national/fukushima-no-1-at-risk-of-26-meter-tsunami-tepco/#.VC-9SRanp1s>

JJI

Tokyo Electric Power Co. has warned its stricken Fukushima No. 1 nuclear plant in Fukushima Prefecture could be hit by tsunami as high as 26.3 meters.

The deluge would likely cause seawater to mingle with the radiation-tainted water accumulating in the basements of the reactor buildings at the six-unit plant, allowing 100 trillion becquerels of cesium to escape, according to an estimate that the utility, known as Tepco, revealed Friday at a meeting of the Nuclear Regulation Authority.

Tepco said a tsunami of that size occurs once every 10,000 to 100,000 years.

The Fukushima No. 1 plant, more than 40 years old, was crippled by the March 2011 earthquake and tsunami after waves as high as 15.5 meters inundated the facility, knocking out all power and disabling the vital backup cooling systems for reactor Nos. 1 to 4, triggering three core meltdowns. Tepco also said the nearby Fukushima No. 2 nuclear plant, which is nearly as old as Fukushima No. 1, could be hit by tsunami of up to 27.5 meters, but that its idled reactors and fuel pools would not be damaged by the event.

October 6, 2014

## Typhoon rain flows into Fukushima Daiichi

### Rain flows into Fukushima nuclear plant

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The operator of the damaged Fukushima Daiichi nuclear power plant says rainwater has flowed into some of the buildings at the facility. A typhoon brought very heavy rain to Fukushima on Monday.

Tokyo Electric Power Company says an alarm on Monday morning warned of a water leak **in the turbine building of the No.1 reactor**. Workers found rainwater pouring into the building from an exterior pipe.

TEPCO officials say **a water leak was also detected at the No.3 reactor building**, adding that a camera captured images of rainwater pouring in.

The officials say no radioactive water has been leaked outside.

October 15, 2014

## High levels of cesium in groundwater after storm

### Cesium in groundwater rises at plant after storm

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The operator of the damaged Fukushima Daiichi nuclear power plant says it has detected high levels of radioactive cesium in groundwater after last week's heavy rainfall from a typhoon.

Officials of Tokyo Electric Power Company say water taken from a well near the coastal embankment on Monday contained 251,000 becquerels of cesium per liter.

**The level is the highest observed in well water near the embankment.** It was more than 3 times the level of the sample taken from the same well 4 days earlier.

**The well for observing groundwater is located on the coastal side of the No.2 reactor building.**

Highly contaminated water that flowed into an underground tunnel in the 2011 accident seeped into soil in the area.

Officials say the heavy rainfall from Typhoon Phanfone likely caused radioactive substances in the soil to flow into the groundwater. The typhoon passed off the coast of Fukushima Prefecture on October 6th.

**High levels of radioactive substances were found in groundwater at other locations in the plant on October 8th and 9th. The water samples were taken near tanks storing contaminated water and near the embankment.**

The officials plan to increase the frequency of water sample tests at 3 wells near the underground tunnel from twice weekly to every day to monitor the effects of the heavy rainfall.

But they say it will be difficult to take drastic steps because **they do not know how far the contaminated water seeped into the ground after the accident.**

## Spike in radioactivity

### Radioactivity spikes in No. 1 reactor well water

<http://www.japantimes.co.jp/news/2014/10/15/national/radioactivity-spikes-1-reactor-well-water/#.VD7YPRanrIU>

JJI

Tokyo Electric Power Co. said there has been a sharp spike in the radioactivity of water samples taken from an observation well built by the sea at the crippled Fukushima No. 1 nuclear power plant. Samples, collected from the well on Monday, contained a record 251,000 becquerels of radioactive cesium per liter — 3.7 times the amount recorded in a sample collected last Thursday.

The observation well, located to the east of the damaged No. 2 reactor, is one of several installed close to the seawall in the plant's port. Monday's reading was the highest recorded in water samples from any of the wells.

The samples also contained 7.8 million becquerels per liter of radioactive beta particle-emitting substances, such as strontium-90, an almost fourfold increase from Thursday's level.

The amount of gamma ray-emitting substances, such as cobalt-60 and manganese-54, included in the samples was also at a record high.

The well is positioned close to an underground trench by the sea that is connected to the No. 2 reactor building.

Speaking at a press conference on Tuesday, Tepco official Isao Shirai told reporters that the increased radioactivity in the water could be due to higher levels of groundwater caused by recent typhoons mixing with radioactive elements left in the soil after the triple reactor meltdowns at the plant.

## Inside No-entry Zone

### Inside No-entry zone from (Nuclear Watch NHK)

The nuclear accident at Fukushima Daiichi in 2011 caused a major dispersal of radioactive substances over many cities and villages around the plant. Three and a half years later, there are still many areas considered evacuation zones. Especially the highly contaminated "no-entry zones." Radiation exposure there exceeds 50 millisieverts a year. A level so high some evacuees face the prospect of never returning home. NHK WORLD's Ryo Asami has the story.

Akinori Shibata and his family once lived in Namie, a rural municipality not far from Fukushima Daiichi. The nuclear accident forced them to evacuate some 30 kilometers west to the city of Nihonmatsu, where they now live.

Shibata made a tough decision earlier this year. He gave up on the idea of returning to Namie, and decided to start a new life.

"This is my second hometown now. Over there is my real home, but we can't even enter that area."

*Akinori Shibata*

Still, Shibata is eager to follow the situation in Namie. So he's applied to enter the restricted zone with some radiation experts from Niigata University led by Professor Makoto Naito.

Since the nuclear accident, the group has been involved in regular surveys in Namie. They allowed me to follow them into the restricted area.



"We're right in front of the no-entry zone around Fukushima Daiichi. Access beyond this point is restricted. We need this two-day permit to get in."

*Ryo Asami / Namie, Fukushima*



**"Radiation levels are still extremely high  
in places covered by moss."**

According to Naito's research, average radiation levels went down in the no-entry zone. But they remain high in some areas.

Then we accompanied Shibata to his home. It's been about 6 months since he last visited.

Shibata finds some belongings that have a special meaning for the family -- his children's school diplomas. I think making a quick decision was the right thing to do. I want my aging parents to enjoy the rest of their lives, and my children still have a future.

That's why I want to give them a normal life in a normal house."

*Akinori Shibata*

Many evacuees like the Shibatas are weighing a similar decision.

They're torn between the hope of going back one day and giving up entirely to make a clean start.

October 16, 2014

## **Removing cover over reactor no.1**





The cover over the No. 1 reactor building of the Fukushima No. 1 nuclear power plant in June 2014 (Asahi Shimbun file photo)

## Plans to remove cover over damaged Fukushima reactor draws concern

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201410160049>

Amid local concerns of the further spread of radioactive materials, Tokyo Electric Power Co. announced plans to start dismantling the canopy installed over the destroyed Fukushima No. 1 nuclear plant's **No. 1 reactor building**.

The operation, announced by TEPCO on Oct. 15, will remove the cover that was erected in October 2011 over the building to prevent radioactive materials from entering the atmosphere.

The structure's walls and roof were destroyed in a hydrogen explosion that occurred after the plant was struck by the 2011 Great East Japan Earthquake and tsunami.

**The process, which will begin Oct. 22, is a necessary step in removing the vast amounts of highly contaminated debris, rubble and dust that remain inside the building.**

However, as the work to clear debris at the plant's No. 3 reactor building in August 2013 spread radioactive materials in the area, the Fukushima prefectural government and experts are calling for careful measures to be taken in the dismantling.

The utility plans to monitor closely the radioactivity levels and dust within the plant's grounds during the operation.

**According to TEPCO, the company has informed the prefectural government and 13 nearby municipalities that it will release the detailed schedule for the work before actually dismantling the canopy.**

In the removal, the utility will drill 48 holes in the roof of the cover, each 30-centimeter squares. From the holes, synthetic resin will be sprayed as anti-scattering agents inside the building to minimize the possibilities of radioactive materials rising.

Starting from the end of this month, two of the six roof panels will be removed to **install a camera to monitor the status of the debris inside.**

Once the condition of the rubble is better understood, a specific schedule for the dismantling process will be created. **The utility plans to begin major operations in March 2015 in hopes of starting the removal of debris in fiscal 2016.**

October 17, 2014

## TEPCO behind schedule

### **ANALYSIS: TEPCO behind schedule to eliminate contaminated water despite extra measures**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201410170042>

Tokyo Electric Power Co.'s goal of purifying all highly radioactive water stored at the Fukushima No. 1 nuclear power plant by the end of the fiscal year has proven to be increasingly difficult, despite additional steps implemented by the utility.

On Oct. 16, TEPCO demonstrated its contaminated water processing facilities that were newly introduced this fall.

The additional multi-nuclide removal equipment ALPS (advanced liquid processing system), which was installed to help make up for lost time after delays in the utility's contaminated water processing plan, has so far been working as expected since it started trial operations in September, according to TEPCO.

In the water purifying process, cesium is first removed from the water. Then 62 additional radioactive substances, including strontium, are eliminated using ALPS. The first units of ALPS were set up in March last year.

As of Oct. 14, 355,000 tons of highly radioactive water from which just cesium has been removed is stored in tanks on the plant site.

To reduce risks in the event of contaminated water leaks from the storage tanks, TEPCO also plans to begin operations of an improved version of ALPS in the near future.

Thanks to the newly set up ALPS units and the improved model to be introduced, it is estimated that the radioactive water processing ability of the plant will rise from the current maximum of 750 tons per day to 1,960 tons, according to TEPCO.

**But many problems have been reported with ALPS since it first became operational, repeatedly forcing the plant operator to halt its operations. The utilization rate for the system between January and August was just 35 to 61 percent.**

Although TEPCO replaced some components of ALPS with improved parts, problems occurred with some replaced components in late September, forcing the utility to suspend operations of some units of the system.

Whereas TEPCO has set a goal of completing the purification of all highly radioactive water stored on site, it would still be difficult to achieve that goal even if TEPCO could operate all the processing systems day and night.

**According to a TEPCO estimate made in February, the amount of highly contaminated water should have been reduced to 300,000 tons by about now, but the water cleaning procedure is currently a month behind the original schedule.**

To make up for lost time after delays in its water processing plan, TEPCO has worked out a series of additional countermeasures.

Earlier this month, TEPCO introduced new mobile equipment that can eliminate strontium from 300 tons of water a day. The company also announced Oct. 16 that it will start operations by the end of the year of an additional strontium removal system with a daily processing capability of 500 to 900 tons.

**Although the water treated with those strontium removal systems alone still needs to be processed with ALPS to eliminate additional radioactive substances, TEPCO officials said the company will temporarily deem such water as being “purified” to achieve its initial goal of completing the processing work by the end of the fiscal year.**

Another problem is that the influx of groundwater into reactor buildings is adding 400 tons of highly radioactive water a day.

In June, TEPCO began construction of a 1,500-meter frozen soil wall that will surround the basements of the reactor buildings. The utility intends to start the soil freezing procedure next spring after draining all the radioactive water accumulating in trenches around the reactors.

TEPCO originally planned to drain all 11,000 tons of contaminated water in the trenches, which are directly connected to the reactor buildings, and fill them in by June. But the planned procedures have yet to be completed.

As the trench water draining operation is behind schedule, the Nuclear Regulation Authority has called on TEPCO to seek an alternative way to fill in the trenches as soon as possible.

**Whether to use another method or continue the current draining procedure is expected to be determined in early November. To start soil freezing operations next spring, the trenches have to be filled in by January, TEPCO said.**

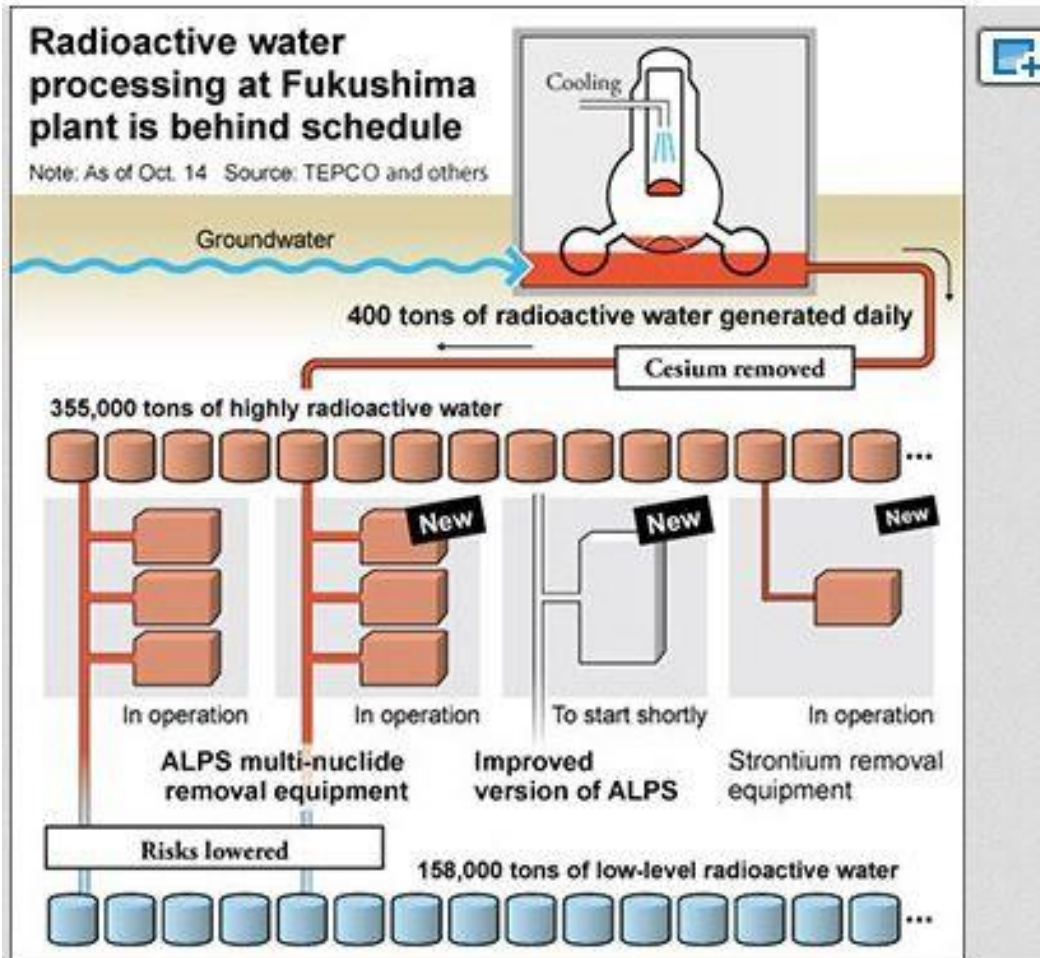
In May, the plant operator began releasing groundwater into the ocean pumped from wells on the mountain side of the nuclear plant before the groundwater can reach the reactor buildings and become contaminated.

**Although TEPCO insists that its various countermeasures, including the underground water bypass project, have succeeded in reducing the influx of groundwater by up to 130 tons daily, the estimate lacks a solid basis.**



The utility is also considering releasing contaminated underground water accumulating near the reactor buildings into the Pacific after purifying it, but it remains unclear when the company will be able to carry out the plan.

(This article was written by Tsuyoshi Nagano and Hiromi Kumai.)



October 22, 2014

## Work starts at reactor no.1

### Fukushima reactor cover dismantling begins

[http://www3.nhk.or.jp/nhkworld/english/news/20141022\\_16.html](http://www3.nhk.or.jp/nhkworld/english/news/20141022_16.html)

The operator of the Fukushima Daiichi nuclear power plant has begun dismantling the cover of a reactor building to remove debris as part of preparations for removing the nuclear fuel from a spent fuel storage pool.

Tokyo Electric Power Company started the work on Wednesday at the No. 1 reactor building. The cover was installed after the 2011 accident to prevent the dispersal of radioactive materials.

Using a remote-controlled crane, workers made holes in the ceiling and sprayed chemicals to prevent dust from spreading. The utility plans to make a total of 48 holes and to spray chemicals for about a week.

Then, starting around October 30th, they will remove part of the ceiling to see whether any dust comes off.

The operator hopes to begin full-scale dismantling of the cover in March and complete the task in about a year.

It expects to start clearing the debris in 2016.

**The operator says it will monitor the possible spread of radioactive materials and post the data on its website.**

The dismantling of the cover was initially due to start in July of this year. But the utility deferred the work to come up with ways to ensure that radioactive materials do not spread.

When debris from another reactor building was removed last year, some feared that radioactive materials might have dispersed and contaminated nearby rice paddies.

**The operator hopes to begin taking the fuel out of the storage pool at the No. 1 reactor building in fiscal 2017.**

## **Starting to remove cover at No.1**



Workers drill into a panel of a canopy covering the damaged No. 1 reactor building at the Fukushima No. 1 nuclear power plant on Oct. 22. (Provided by Tokyo Electric Power Co.)

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## **TEPCO starts removal work of cover over damaged Fukushima reactor building**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201410220043>

The operator of the crippled Fukushima No. 1 nuclear power plant started dismantling a canopy on Oct. 22 installed over the damaged No. 1 reactor building to prevent radioactive substances from entering the atmosphere.

Workers at the Tokyo Electric Power Co. plant started the operation shortly after 7 a.m. They used a crane-mounted drill to make eight 30-square-centimeter holes in one of the canopy's six massive panels. After drilling into the 40-meter-by-7-meter panel, the workers sprayed synthetic, anti-scattering resin inside the building to minimize the possibility of radioactive substances being stirred up into the air. Cameras will also be inserted into the building to survey the vast amount of debris inside.

The structure's walls and roof were severely damaged in a hydrogen explosion on March 12, 2011, after the plant was struck by the Great East Japan Earthquake and tsunami. The cover was erected in October 2011.

After dismantling the canopy, TEPCO plans to remove a large amount of the highly contaminated debris, rubble and dust that remain inside in fiscal 2016 and spent nuclear fuel rods stored in pools in fiscal 2017. The canopy-removal operation will go into full swing after March 2015, as TEPCO is currently placing priority on the construction of frozen soil walls near the No. 1 reactor building to prevent groundwater from seeping in.

During work to clear debris from the plant's No. 3 reactor building in August 2013, radioactive substances spread and contaminated plant workers on site about 500 meters away.

To obtain consent from local governments for the project, the utility promised to closely monitor radiation levels during the canopy-removal work and provide them with such data.

### **Work begins toward dismantling building cover at Fukushima plant**

<http://mainichi.jp/english/english/newsselect/news/20141022p2g00m0dm072000c.html>

TOKYO (Kyodo) -- The operator of the crippled Fukushima Daiichi nuclear plant began preparatory work to dismantle the No. 1 reactor building's cover Wednesday as a first step toward removing melted fuel. The cover shrouding the building, damaged by a hydrogen explosion in the 2011 nuclear crisis, was installed following the accident to keep radioactive materials from dispersing.

Tokyo Electric Power Co. plans to finish removing the cover around March 2016. It will then aim to begin cleaning up the debris from the hydrogen explosion and removing spent fuel stored in a pool in the building by the end of March 2018.

TEPCO said the work of removing the melted fuel inside the crippled reactor would begin in 2020 at the earliest, but said it has yet to gain a detailed grasp of the situation inside the reactor and consider the specifics of how the fuel is to be extracted.

On Wednesday morning, TEPCO started making holes in the roof of the building cover in order to insert antidispersal agents to prevent radioactive dust from being scattered. The actual dismantling of the cover will start in March 2015, the utility said.

TEPCO had initially sought to begin preparations to dismantle the building cover by last March, but the plan was delayed due to equipment failure. The plan was delayed again after local residents voiced concern that the company's debris cleanup work at the Fukushima plant may have contaminated rice crops in nearby areas.

See also:

### **Tepco gets ready to dismantle building cover at crippled Fukushima No. 1 reactor**

<http://www.japantimes.co.jp/news/2014/10/22/national/tepco-gets-ready-to-dismantle-building-cover-at-crippled-fukushima-no-1-reactor/#.VEe0yRanp1s>

Kyodo

Tepco began preparatory work on Wednesday to dismantle the cover on the reactor 1 building at the crippled Fukushima No. 1 nuclear plant, as a step toward eventually removing the melted fuel inside. [...]

## Tepco takes off cover

### Tepco taking off cover (Nuclear Watch)

[http://www3.nhk.or.jp/nhkworld/english/news/20141022\\_31.html](http://www3.nhk.or.jp/nhkworld/english/news/20141022_31.html)

October 25, 2014

## 460,000 Bq of cesium per liter of groundwater

### High levels of radiation found at Fukushima plant

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The operator of the crippled Fukushima Daiichi nuclear plant says it has found high levels of radioactive cesium in groundwater in the compound.

Officials of Tokyo Electric Power Company say water taken on Wednesday from a monitoring well contained **460,000 becquerels of cesium per liter**. Water from another well contained 424,000 becquerels.

The wells are several meters west of the No. 2 reactor building. There are about 40 around the reactor buildings.

**Officials say the levels are 800 to 900 times the previous peak level of 500 becquerels per liter.**

TEPCO officials say they don't know what caused the rise. They speculate a recent typhoon may be to blame.

They have stopped pumping water from the 2 wells to conduct an investigation.

**TEPCO began pumping up groundwater from the wells on a trial basis in August. They started full-scale operations last week.**

The utility plans to treat the tainted groundwater and discharge it into the ocean to deal with the buildup of contaminated water.

But local people strongly oppose the plan. TEPCO has yet to discharge water into the ocean.

October 28, 2014

## Bad start

### Wind gust damages cover at Fukushima reactor

[http://www3.nhk.or.jp/nhkworld/english/news/20141028\\_20.html](http://www3.nhk.or.jp/nhkworld/english/news/20141028_20.html)

The operator of the Fukushima Daiichi nuclear power plant says the cover of a building housing the No.1 reactor has been damaged.

Tokyo Electric Power Company says a strong gust of wind moved a machine at around 8:30 AM Tuesday, creating **a triangular shaped hole about 1 meter wide and 2 meters long.**

TEPCO has been using machinery suspended from a crane to spray chemicals into holes. This is to prevent the dispersal of radioactive dust when dismantling the cover.

The operator says **no significant changes in radiation levels were seen at the compound, but work has been suspended.**

Officials say the wind speed at the time was about 7 kilometers per hour, which is well below the 36-kilometer-per-hour standard required to suspend work. They say a sudden gust may have moved the machinery.

TEPCO has notified the central and local governments and is considering what steps to take. **Officials say they don't know when work can resume, or whether this problem will affect Thursday's plan to remove part of the cover on a trial basis.**

## Fluctuating cesium: problem can't be solved, says TEPCO

### Fukushima cesium levels fluctuating

[http://www3.nhk.or.jp/nhkworld/english/news/20141028\\_13.html](http://www3.nhk.or.jp/nhkworld/english/news/20141028_13.html)

Tokyo Electric Power Company, or TEPCO, says the levels of radioactive cesium in the compound's groundwater at the damaged Fukushima Daiichi nuclear plant fluctuated greatly last week.

TEPCO detected the highest concentration of cesium in samples of water taken from 2 monitoring wells near a reactor building on Wednesday.

One well had 428,000 becquerels of cesium per liter of water, while the other contained 458,000 becquerels.

But only 2 days later, the reading in the first well had dropped to 5,200 becquerels, or one-eightieth of the level detected on Wednesday. The concentration in the other well stood at 470 becquerels, or about one-one-thousandth of the previous quantity.

TEPCO says these wells are connected underground with other wells that are highly contaminated. So the operator believes cesium poured into them with this month's heavy rains and then flowed out with the underground water.

**The utility says this problem cannot be fundamentally solved because the area around the wells thought to be the source of the contamination has extremely high radiation levels and cannot be decontaminated.**

**The 2 wells are among those from which tainted groundwater is pumped and discharged into the sea after being decontaminated.**

But TEPCO has suspended the operation and is considering whether to resume the work.

October 30, 2014

## **No1 decommissioning timetable delayed**

### **Fuel removal from Fukushima reactor to be delayed**

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The Japanese government and Tokyo Electric Power Company are to revise the timetable for decommissioning the No.1 reactor at the Fukushima Daiichi nuclear plant.

The current timetable calls for the process of removing spent fuel assemblies from the storage pool to begin in fiscal 2017, and removing melted fuel to begin 3 years later.

**Government and TEPCO officials are now planning to delay the start of removing spent fuel units**

**until fiscal 2019, or by 2 years, and the start of removing melted fuel till 2025, or by 5 years.**

Radioactive rubble which has accumulated inside the No.1 reactor building is hampering fuel removal efforts.

Workers began dismantling the cover of the building this month to remove the debris.

But full-fledged work to dismantle the cover will not take place until March of next year, already resulting in a delay of more than 6 months.

To remove the spent fuel and melted fuel, separate facilities, such as cranes, must be set up on top of the reactor building. This would take more time.

The current timetable says complete decommissioning of the Fukushima Daiichi plant with 4 damaged reactors will take 30 to 40 years.

### **Fukushima Reactor 1 dismantling to be delayed**

<http://www.japantimes.co.jp/news/2014/10/30/national/reactor-1-dismantling-delayed/#.VFH13RZ5B1s>

Staff Report

In the first-ever delay in the plans to dismantle reactor 1 at Tokyo Electric Power Co.'s stricken Fukushima No. 1 nuclear power plant, the government and the utility have agreed to postpone the removal of fuel rods from the spent-fuel pool by two years from the initial plans, NHK reported Thursday.

The date of extracting the melted fuel rods from the reactor core, which suffered a meltdown in the 2011 earthquake and tsunami disaster, will also be delayed by five years, the network said, without naming the source.

NHK attributed the delays to an unexpectedly time-consuming process of removal, which was to start in 2017 for fuel rods that are intact and in 2020 for melted ones.

In the ongoing plant dismantling process, removal of rubble, a necessary step to get at the spent-fuel pools, has taken longer than expected, with the plan to start full-fledged work to expose the reactor building by removing its covering delayed by half a year from the originally planned start in March.

### **Fuel removal delayed at No.1**

### **TEPCO to postpone nuclear fuel removal at Fukushima No. 1 reactor**

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201410300071>



A series of delays will push back by years the start of operations to remove spent and melted nuclear fuel from the No. 1 reactor building at the Fukushima No. 1 nuclear plant, sources said.

Tokyo Electric Power Co. and the central government were expected to announce the new schedule at an Oct. 30 meeting of the team in charge of handling the decommissioning process and the radioactive water accumulating at the plant.

Under the original plan, TEPCO was to start removing spent fuel from the No. 1 reactor building in fiscal 2017 and begin lifting out the melted fuel as early as fiscal 2020.

Under the new schedule, spent fuel removal will start in fiscal 2019, while the melted fuel operations will begin in fiscal 2025, according to the sources.

Shortly after the March 2011 Great East Japan Earthquake and tsunami struck the Fukushima plant, nuclear fuel in the No. 1 reactor melted and an explosion rocked the building.

**Currently, 392 fuel assemblies remain in the spent fuel pool in the damaged reactor building.**

TEPCO earlier this month began dismantling the canopy that was installed over the No. 1 reactor building to prevent the escape of radioactive materials.

But work on the canopy was delayed. TEPCO is now unable to begin full-scale work on dismantling the canopy until March 2015 because other related operations must be completed first, the sources said.

That delay, in turn, will push back the scheduled completion of debris removal work around the No. 1 reactor building to at least fiscal 2016.

**The debris stands in the way of installing additional devices, such as cranes, to remove the nuclear fuel.**

TEPCO and the government also intend to review plans to remove the nuclear fuel at the No. 2 reactor building.

**The utility is currently surveying the inside of the No. 2 reactor building, but high radiation levels have hindered progress of the investigation.**

**Debris removal work has been suspended at the other damaged reactor, No. 3, since August, when some equipment accidentally fell into the fuel storage pool.**

The No. 4 reactor was not operating during the earthquake and tsunami. The removal of spent nuclear fuel from the No. 4 reactor building is expected to be completed by the end of the year as scheduled.

October 31, 2014

## Removing part of no.1 cover to test antidispersal agents

### TEPCO removes part of reactor building cover at Fukushima plant

<http://mainichi.jp/english/english/newsselect/news/20141031p2g00m0dm064000c.html>



Part of the cover over No. 1 reactor of Fukushima No. 1 Nuclear Power Plant is removed, revealing massive debris inside the reactor on Oct. 31. (Mainichi)

TOKYO (Kyodo) -- The operator of the disaster-hit Fukushima Daiichi nuclear plant on Friday tentatively removed part of the cover shrouding the No.1 reactor building installed in the wake of the 2011 disaster to keep radioactive materials from dispersing.

Dismantling the cover is a first step toward removing spent fuel rods stored in a cooling pool sitting above the reactor, which suffered a meltdown in the disaster, and eventually extracting the melted fuel, Tokyo Electric Power Co said.

A crane removes part of the cover over No. 1 reactor of Fukushima No. 1 Nuclear Power Plant on Oct. 31. (Mainichi)

On Friday morning, plant workers removed a huge panel using a crane to see whether antidispersal agents, inserted last week to prevent radioactive dust from being scattered, are taking effect. No changes in radiation levels have been observed around the plant so far, the company said.

**TEPCO will continue observing for a month to make sure radioactive materials are not dispersing and put the panel back again. The utility plans to begin full-fledged work on dismantling the cover next March.**

Once the whole cover is removed, TEPCO hopes to first clean debris covering the upper side of the building resulting from a hydrogen explosion in 2011. The company then plans to begin taking out spent fuel rods from the pool in the first half of 2019 at the earliest, which is to be followed by the challenging work of extracting melted fuel inside the reactor.

The No. 1 reactor building cover was installed in October 2011 as an emergency measure to keep radioactive dust from scattering. TEPCO initially planned to begin preparatory work for removing it by the end of last March, but the company was forced to delay the schedule after local residents voiced concern that the decommissioning work at the plant may have contaminated rice crops in nearby areas.

October 31, 2014(Mainichi Japan)

### **Part of cover removed from Fukushima reactor bldg.**

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

Oct. 31, 2014 - Updated 03:46 UTC+1

The operator of the Fukushima Daiichi nuclear plant has removed part of the cover of a reactor building on a trial basis.

The work is aimed at clearing debris as part of preparations for removing nuclear fuel from a spent fuel storage pool. The debris was left by a hydrogen explosion after the 2011 nuclear accident.

Tokyo Electric Power Company began the procedure on Friday morning at the No. 1 reactor building. Using a remote-controlled crane, workers lifted one of the 6 panels of the ceiling, taking about 20 minutes. The procedure is aimed at checking whether any dust is stirred up.

TEPCO plans to remove another panel as early as next week, while monitoring the spread of radioactive materials for about a month.

The utility hopes to begin the full-scale dismantling of the cover in March and start removing the debris in the first half of fiscal 2016.

The dismantling of the cover was initially due to start in July. But the utility delayed the operation

following the spread of nuclear materials during the removal of debris at the No. 3 reactor building last year.

TEPCO officials now plan to postpone starting the removal of the spent fuel units by 2 years, to fiscal 2019, and the start of removing melted fuel by 5 years, until 2025.

## TEPCO removes part of canopy



Workers drill into a panel of a canopy covering the damaged No. 1 reactor building at the Fukushima No. 1 nuclear power plant on Oct. 22. (Provided by Tokyo Electric Power Co.)

November 1, 2014

## TEPCO removes section of radiation cover above Fukushima reactor building

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201411010028>

OKUMA, Fukushima Prefecture--Tokyo Electric Power Co. has removed part of the canopy above a reactor building at the crippled Fukushima No. 1 nuclear power plant to gauge the effects of anti-scattering agents pumped inside.

It was the first time in three years that debris inside the No. 1 reactor building was visible from the outside. The structure, which was destroyed in a hydrogen explosion a day after the Great East Japan Earthquake and tsunami on March 11, 2011, was covered with the canopy in October of that year.

The removal on Oct. 31 of one of six panels that make up the canopy is the initial stage in work to remove debris and nuclear fuel from inside the structure.

TEPCO drilled holes into the panel, which measures 42 meters by 7 meters and weighs 32 tons, on Oct. 22. It then sprayed anti-scattering resin inside to prevent radioactive substances from stirring up into the air. The panel was removed to survey the effects of the resin.

The work was performed by a large crane that slowly hoisted the panel and lowered it to the ground, taking about one hour and 40 minutes.

The panel is scheduled to be returned by the end of November. TEPCO plans to start dismantling the entire canopy on a full-fledged basis in March 2015.

## **METI chief at Fukushima Daiichi**

### **Miyazawa visits Fukushima Daiichi nuclear plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20141101\\_21.html](http://www3.nhk.or.jp/nhkworld/english/news/20141101_21.html)

Economy, Trade and Industry Minister Yoichi Miyazawa has visited the damaged nuclear plant in Fukushima for the first time since taking office less than 2 weeks ago.

Miyazawa met workers at the Fukushima Daiichi plant, including those working to decommission the reactors. He said he would like to express his heart-felt respect to them for carrying out the tough and important work. He also said the government will steadily implement plans to decommission the reactors.

Miyazawa also emphasized his resolve to do all he can to address the issue of water contaminated with radioactive substances. He said there will be no revival for Japan without the restoration of Fukushima Prefecture.

Miyazawa inspected equipment to remove radioactive substances from contaminated water and a construction site where the plant's operator Tokyo Electric Power Company planned to freeze soil and create a wall of ice to prevent the inflow of underground water.

Miyazawa told reporters that he saw the site of an accident that should have never happened. He also said reactors at the nuclear plant in Satsuma Sendai, in Kagoshima Prefecture, will be restarted after full measures are in place to prevent an accident.

November 2, 2014

## **METI chief Miyazawa pays first visit to Fukushima No. 1 plant**

<http://www.japantimes.co.jp/news/2014/11/02/national/medi-chief-miyazawa-pays-first-visit-fukushima-1-plant/#.VFYoo8l5B1s>

Kyodo

FUKUSHIMA – New trade and industry minister Yoichi Miyazawa paid a visit to the disaster-hit Fukushima No. 1 nuclear plant over the weekend, his first since replacing Yuko Obuchi, who resigned in October over a funding scandal.

Miyazawa visited the wrecked plant on Saturday before going to Kagoshima Prefecture to push for the restart of idled reactors there, apparently to fend off criticism that he places greater importance on promoting restarts than dealing with the societal fallout from the triple meltdown in Fukushima.

“There are difficult issues, but we see things proceeding steadily so far,” the economy, trade and industry minister said, referring to efforts to scrap the stricken reactors and deal with the massive amount of radioactive water accumulating at the plant.

Miyazawa said the reactors at the Fukushima plant, run by Tokyo Electric Power Co., and the Sendai plant run by Kyushu Electric Power Co. in Kagoshima are different because the safety of the latter has been confirmed by new safety tests introduced as a result of the Fukushima disaster.

“It is going to be a restart after preparing all we can think of right now to avoid such an accident,” he said. All of the nation’s 48 commercial reactors remain offline, and must pass the new Nuclear Regulation Authority’s safety assessments before going online again.

The central government and Kyushu Electric are trying to win local consent to restart the two Sendai reactors because they were the first to clear the new safety regime.

He will visit Kagoshima Monday to promote the issue.

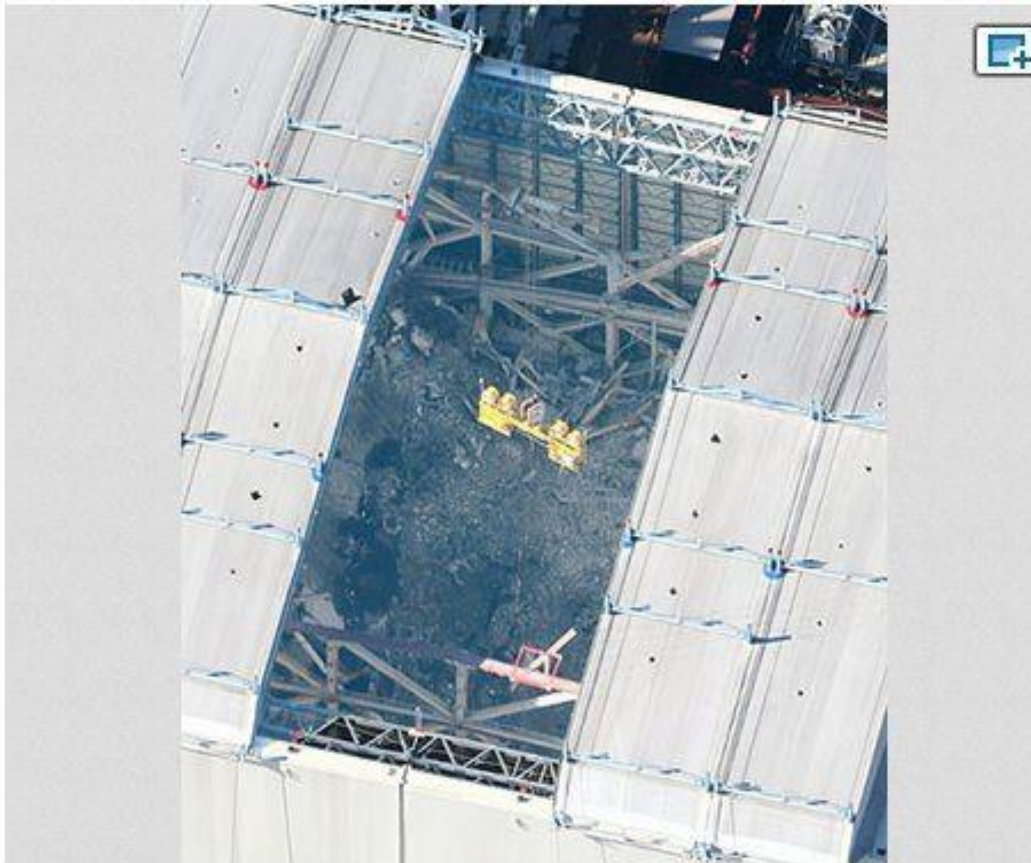
Since filling the hole left by Obuchi last month, the new METI chief has been hit by political fund scandals of his own. Last month, he admitted that his fundraising body had booked a ¥18,230 expense for a visit to a sadomasochism sex show bar in Hiroshima that he denied attending.

The Liberal Democratic Party chapter he heads has been accused of receiving an illegal donation from a foreign-owned firm, and the media jumped on his 600-share stake in Tepco as soon as he filled Obuchi’s place. He has since moved the shares to a trust bank, he said.

November 10, 2014

## **Second part of reactor cover removed**





The damaged interior of the No. 1 reactor building of the Fukushima No. 1 nuclear power plant can be seen from above, with two of the six panels of a canopy over the reactor building removed, on Nov. 10. (Shiro Nishihata)

## TEPCO removes 2nd canopy panel covering Fukushima reactor building

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201411100047>

OKUMA, Fukushima Prefecture--**In preparation for clearing debris and eventually removing nuclear fuel from inside**, Tokyo Electric Power Co. on Nov. 10 temporarily removed another panel from the canopy covering a damaged reactor building at the crippled Fukushima No. 1 nuclear power plant. The removal opened a large hole in the canopy covering the No. 1 reactor building. Debris inside the building were visible from the opening, which is 40 meters long and 14 meters wide, equivalent to one-third the size of the entire roof.

The first of the six canopy panels was removed on Oct. 31.

**The utility has been spraying the inside of the reactor building with liquid anti-scattering resin since Oct. 22 to prevent radioactive materials from being stirred up during the dismantling work.**

The interior of the building will be checked throughout this month.

TEPCO also plans to keep a close eye on radioactivity levels inside the plant grounds and will notify local municipalities if any abnormalities are recorded.

The removed roof panels will be reinstalled as early as within this month, and their full-scale removal is expected to begin in March 2015.

The original roof of the No. 1 reactor building was blown off by a hydrogen explosion that occurred on March 12, 2011, a day after the Great East Japan Earthquake and tsunami struck, triggering the crisis at the nuclear plant. The canopy was installed in October 2011 to contain the spread of radioactive materials.

### **Another part of cover removed from reactor bldg.**

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The operator of the Fukushima Daiichi nuclear power plant removed the second panel from the cover of a reactor building on Monday morning.

Tokyo Electric Power Company is testing to see whether radioactive materials will spread from the building during removal work.

Workers used a remote-controlled crane to lift the second of 6 panels from the top of the No. 1 reactor building.

The first panel was removed last month.

Earlier, workers injected chemicals into holes made in the cover to prevent dust from spreading.

TEPCO says that so far, no monitoring device within the plant compound has detected anything unusual.

The utility says it will continue monitoring for about a month. If no problems are detected, the company plans to begin full-scale dismantling of the cover in March.

TEPCO says that after removing all the panels, it will begin removing debris from inside the No. 1 reactor building. The work is part of preparations for taking out about 400 units of nuclear fuel from a spent fuel storage pool.

TEPCO initially planned to dismantle the cover from July. But it postponed the operation after radioactive dust spread during the removal of debris from the No. 3 reactor building last year.

November 13, 2014

## **Highly contaminated water still in tunnels?**



## Radioactive water may still be entering tunnels

[http://www3.nhk.or.jp/nhkworld/english/news/20141114\\_05.html](http://www3.nhk.or.jp/nhkworld/english/news/20141114_05.html)

The operator of the crippled Fukushima Daiichi nuclear power plant faces another challenge in its effort to address radioactive water at the complex.

It says highly contaminated water may still be flowing from reactor buildings into adjacent underground tunnels even after a work to stem the flow ended.

**The water in the tunnels is believed to be leaking into the sea.** Tokyo Electric Power Company plans to pump the tainted water out of the tunnels and fill them with cement.

To prepare for the process, the firm began work in April to stem the flow of radioactive water between the reactor buildings and the tunnels. It involved freezing some of the water as well as plugging the gaps with filler materials.

**TEPCO finished the work on November 6th. But workers found that water levels in the reactor buildings and the tunnels are still linked. They note this suggests that the flow of radioactive water between them may not have been stopped.**

**TEPCO officials say that if the situation doesn't improve, they may start filling the tunnels with cement even before they finish removing contaminated water.**

## Nuclear cleanup at Fukushima plant stymied by water woes

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201411130092>



Tanks storing contaminated water are seen at the Fukushima No. 1 nuclear power plant in Fukushima Prefecture on Nov. 12. (AP Photo/ Pool)

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November 16, 2014

## **Water: "An enormously distracting problem"**

### **Contaminated water swamps Fukushima No. 1 cleanup**

<http://www.japantimes.co.jp/news/2014/11/16/national/contaminated-water-swamps-fukushima-no-1-cleanup/#.VGiircl5B1s>

AP

More than three years into the massive cleanup of the Fukushima No. 1 power plant, only a tiny fraction of the workers are focused on key tasks such as preparing for the dismantling of the wrecked reactors and removing radioactive fuel rods.

Instead, nearly all the workers at Fukushima No. 1 are devoted to a single, enormously distracting problem: coping with the vast amount of contaminated water, a mixture of groundwater running into recycled water that becomes contaminated and leaks after being pumped into the reactors to keep their melted cores from overheating.

A number of buildings housing water treatment machines and hundreds of huge blue and gray industrial storage tanks to store the excess water are rapidly taking over the grounds at the plant, which saw three of its six reactor cores suffer meltdowns from the 3/11 quake and tsunami. Workers were still building more tanks during a visit to the complex Wednesday by a group of foreign media.

“The contaminated water is a most pressing issue that we must tackle. There is no doubt about that,” said Akira Ono, head of the plant. “Our effort to mitigate the problem is at its peak now. Though I cannot say exactly when, I hope things start getting better when the measures start taking effect.”

The numbers tell the story:

### **6,000 workers**

**Every day, about 6,000 workers pass through the guarded gate of Fukushima No. 1, located on the Pacific coast, two to three times more than when it was actually generating electricity.**

On a recent workday, about 100 workers were dismantling a makeshift roof over one of the reactor buildings, while about a dozen others were removing fuel rods from a cooling pool. Most of the rest were dealing with contaminated water-related work, said Tatsuhiro Yamagishi, a spokesman for plant operator Tokyo Electric Power Co.

**The work threatens to exhaust the supply of workers for other tasks, since they must stop working when they reach annual radiation exposure limits.** Experts say it is crucial to reduce the amount and radioactivity of the contaminated water to decrease the risk of exposure to workers and the environmental impact before the decommissioning work gets closer to the highly contaminated core area.

### **40 years**

The plant has six reactors, three of which were offline when disaster struck on March 11, 2011, a magnitude-9.0 earthquake that triggered huge tsunami that swept into the plant and knocked out its backup power and cooling systems, leading to core meltdowns in the three active reactors.

Decommissioning and dismantling all six of the reactors is a delicate, time-consuming process that includes removing the melted fuel from a highly radioactive environment as well as all the extra fuel rods, which sit in cooling pools situated at the top of the reactor buildings.

The entire job still requires finding out the exact conditions of the melted fuel debris and developing remote-controlled and radiation-resistant robotics to deal with them, and the work is expected to take at least 40 years.

### **500,000 tons**

The main problem is an abundant inflow of groundwater into the contaminated water that doubles the volume and spreads it to vast areas of the compound. Workers have jury-rigged a pipe-and-hose system to continuously pump water into the reactors to cool the clumps of melted fuel inside.

**The water becomes contaminated upon exposure to the radioactive fuel, and much of it pours into the reactor and turbine basements, and maintenance trenches that extend to the Pacific Ocean. The plant recycles some of the contaminated water as cooling water after partially treating it, but groundwater is**

also flowing into the damaged reactor buildings and mixing with contaminated water, creating a huge excess that needs to be pumped out.

So far, more than 500,000 tons of radioactive water have been stored in nearly 1,000 large tanks that workers have built, which now cover most of the sprawling plant premises. After a series of leaks from the storage tanks last year, they are now being replaced with costlier welded tanks.

That dwarfs the 9,000 tons of contaminated water produced during the 1979 partial meltdown at Three Mile Island in the United States. In that incident, it took 14 years for the water to evaporate, said Lake Barrett, a retired U.S. nuclear regulatory official who was part of the early mitigation team there and has visited Fukushima No. 1.

“This is a much more complex, much more difficult water management problem,” Barrett said.

### **¥10 trillion**

An estimated ¥2 trillion will be needed just for decontamination and other mitigation of the water problem. Altogether, the entire decommissioning process, including compensation for area residents, reportedly will cost about ¥10 trillion.

All this for a plant that will never produce a kilowatt of energy again.

The work threatens to exhaust the supply of workers for other tasks, since they must stop working when they reach annual radiation exposure limits. About 500 workers are digging deep holes in preparation to build a taxpayer-funded ¥32 billion underground “frozen wall” around the four reactors and their turbine buildings to try to keep the contaminated water from seeping out.

Tepco is developing systems to try to remove most radioactive elements from the water. One, the Advanced Liquid Processing System (ALPS), has been trouble-plagued, but utility officials hope to achieve a daily capacity of 2,000 tons when it enters full operation next month. Officials hope to be able to treat all contaminated water by the end of March, but that is far from certain.

November 17, 2014

### **Radioactive water to tunnels unlikely stopped**

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The officials overseeing the decommissioning of the Fukushima Daiichi nuclear power plant say a barrier designed to prevent radioactive water from entering underground tunnels is likely not doing its job.

The decommissioning work includes a plan to remove highly-radioactive water from tunnels under the facility grounds and then fill them with concrete to prevent leaks to surrounding soil.

A barrier to hold out water during this process was under construction until November 6th.

On Monday, workers removed 200,000 liters of water, estimating that water levels in the tunnels would drop by 80 centimeters.

However, the levels went down by only 20 centimeters. This led officials to conclude that more water was likely entering the tunnels from the reactor building while water was being pumped out.

The officials considered the effects of radioactive water on ground water, and decided on a plan to fill tunnels in with cement before they are completely drained.

They say the operation will require carefully handling to prevent any overflow of contaminated water.

November 18, 2014

## New failing in halting water

### Attempt to stop water flowing into trench at Fukushima plant fails

<http://mainichi.jp/english/english/newsselect/news/20141118p2a00m0na005000c.html>

**An effort to stop contaminated water from flowing into a trench** at the crippled Fukushima No. 1 Nuclear Power Plant failed to completely halt the flow, announced Tokyo Electric Power Co. (TEPCO), the plant's operator, on Nov. 17.

A TEPCO representative said, "We believe we have not completely stopped the water. Groundwater may also be entering the trench. We will closely analyze the changes in water level in the trench."

TEPCO says that when around 200 tons of contaminated water was removed from the trench, the water level in the trench should have fallen by around 80 centimeters if the point of leakage between the plant's No. 2 reactor turbine building and the trench had been fully sealed. However, **the water level only fell by 21 centimeters, so TEPCO determined that the leak must be continuing.**

Around 5,000 tons of contaminated water from the turbine building is in the trench, and critics have pointed out the possibility of it escaping into the ocean. Originally TEPCO planned to freeze the water at the point where the turbine building and the trench meet in order to stop the flow of water, after which it planned to remove the water from the trench. However, the water was insufficiently frozen to stop the flow, and while an effort continued until Nov. 6 to fill in the gaps in the ice with special cement, this effort also failed to provide a complete seal.

**While the water remains in the trench, TEPCO cannot create a planned underground wall of frozen soil around the No. 1 through 4 reactor buildings to stop water leakages.** TEPCO is considering filling in the trench by pouring in cement as it removes the built up water. Discussion on the particulars of this strategy is to be held at a meeting of the Nuclear Regulation Authority on Nov. 21.

November 21, 2014

## Giving up on freezing water

### TEPCO gives up on freezing tainted water

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The operator of the Fukushima Daiichi nuclear plant is drastically changing its plan to remove highly radioactive water from underground tunnels at the facility.

The tunnels have been inundated with water from the plant's heavily contaminated reactor buildings.

Tokyo Electric Power Company, or TEPCO, this year began work to freeze water at the ends of the tunnels to block the inflow. The firm finished the work early this month.

But TEPCO officials found that **water levels in the tunnels were still changing in sync with volumes in the reactor buildings.**

The officials admitted to the Nuclear Regulation Authority on Friday that the tunnels hadn't been plugged.

They said they're giving up on the plan, and proposed pouring cement into the flooded tunnels while removing water from them. They said they want this done from late November.

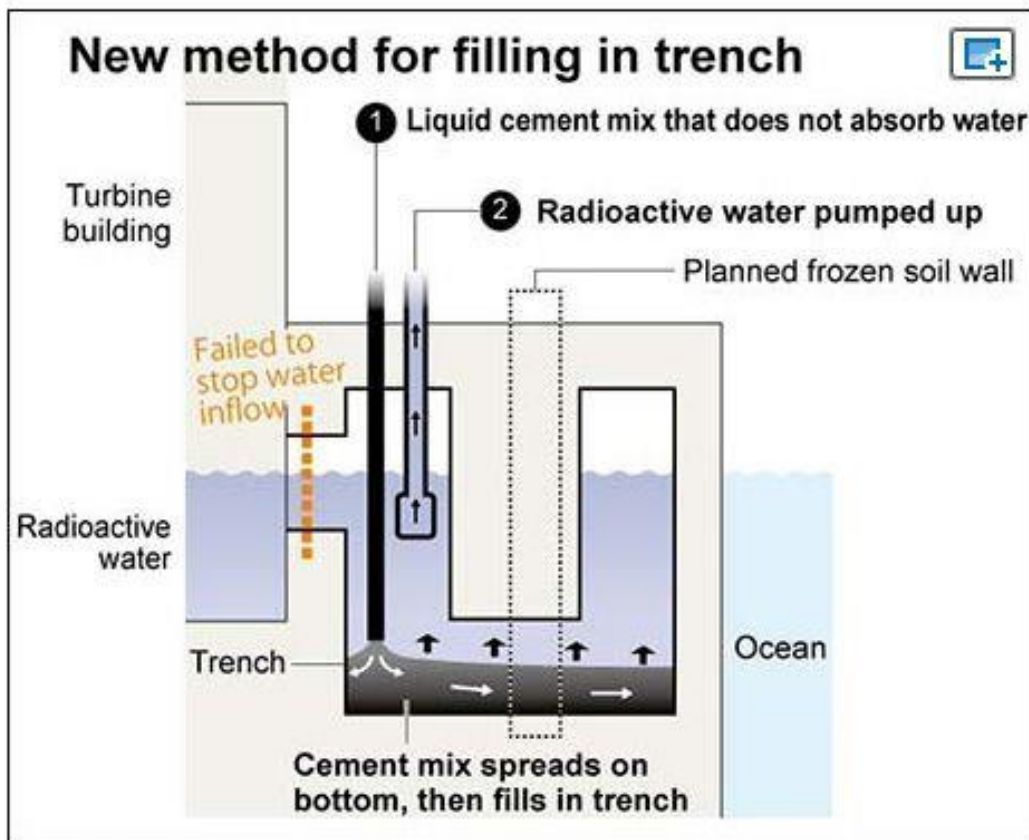
The authority's commissioners asked whether the new method can really halt the inflow. They also spoke of the risk of cracks forming in cement.

The authority approved TEPCO's plan in the end, on condition that the procedure be halted in late December to see whether it's working.

Commenting on the change, one commissioner asked what all the trouble over the past months was for.

November 22, 2014

## Concrete No.2 and No.3 seaside trenches



The Asahi Shimbun

## After failures, TEPCO to use special cement to prevent contaminated water leaks

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201411220029>

The operator of the crippled Fukushima nuclear plant plans to fill in trenches on the coastline in yet another attempt to prevent highly contaminated water from pouring into the sea.

Under the plan, approved by the Nuclear Regulation Authority on Nov. 21, Tokyo Electric Power Co. **will inject a special cement mixture into the seaside trenches of the No. 2 and No. 3 reactors while pumping up radioactive water accumulating in them.**

**The special mixture does not absorb water so it can spread more easily along the bottom of the trenches, displacing the tainted water.**

The new method will allow radioactive materials to remain in the surrounding soil, but TEPCO decided to employ the technique because **it puts high priority on preventing massive amounts of highly contaminated water from leaking into the ocean.**

This spring, TEPCO tried to stop the water influx at the trench for the No. 2 reactor by freezing the junction of the turbine building and the trench, but the operation was tough-going.



The company then attempted to stop the water inflow with a cement mixture, but was unable to do so completely.

(This article was written by Tsuyoshi Nagano and Hiromi Kumai.)

## **TEPCO to bury Fukushima plant trench with concrete to control radioactive water**

<http://mainichi.jp/english/english/newsselect/news/20141122p2a00m0na015000c.html>

Tokyo Electric Power Co. (TEPCO) has decided to bury a trench at the crippled Fukushima No. 1 Nuclear Power Plant using concrete after an effort to completely stop the flow of radiation contaminated water failed, it has been learned.

TEPCO reported its plan to the Nuclear Regulation Authority (NRA) on Nov. 21, and the NRA approved it, saying that **the plan can at least reduce the amount of contaminated water remaining in the trench.** Around 5,000 metric tons of contaminated water is standing in the ocean-side trench of the Fukushima plant's No. 2 reactor. TEPCO initially had planned to stop the flow by freezing the contaminated water at the point where the reactor building and the trench meet, after which it hoped to remove the water from the trench. However, the plan failed as the water was insufficiently frozen, and the company gave up on completely removing the contaminated water.

According to the new plan, TEPCO will begin pouring concrete that can be used under water at the end of November while draining contaminated water inside the trench. It will see if the flow of the water stops after burying the deepest part of the underground tunnel.

**It is concerned that this process may leave some contaminated water in the concrete, but TEPCO has estimated that only 1-3 percent of the water will remain in the material.**

**The length of the underground tunnel is about 60 meters.** A TEPCO representative said that the company has never buried a tunnel that long, but it will carry out the plan with great care.

Meanwhile, there are some 6,000 tons of contaminated water in the seaside trench of the No. 3 reactor. TEPCO plans to bury it with concrete like the No. 2 reactor trench by January next year, and then freeze soil around the basement areas of the Nos. 1 to 4 reactor buildings as part of efforts to prevent ground water from flowing onto the premises of these structures.

## **Tepeco fails to halt toxic water inflow at Fukushima No. 1 trenches**

<http://www.japantimes.co.jp/news/2014/11/22/national/tepeco-fails-to-halt-toxic-water-inflow-at-fukushima-no-1-trenches/#.VHCmDsl5B1s>

Kyodo

Tokyo Electric Power Co. admitted failure Friday in its bid to halt the flow of toxic water into underground tunnels alongside the ocean at the Fukushima No. 1 plant and said that it will try using a specially developed cement instead.



,000 tons of highly radioactive water have accumulated in the tunnels, trenches dug to house pipes and cables that are connected to the reactor 2 and 3 turbine buildings of the wrecked facility, according to Tepco.

There are fears that this toxic buildup, which is being caused by the jury-rigged cooling system and groundwater seepage in the reactor basements, could pour into the Pacific, which is already being polluted by other radioactive leaks. Groundwater is entering the complex at 400 tons a day.

Extracting the toxic water is a critical step in Tepco's plan to build a huge underground ice wall around the four destroyed reactors to keep groundwater out.

Initially, Tepco sought to freeze the water in a section of tunnel connected to the No. 2 reactor building.

This was intended to stop the inflow and allow the accumulated water to be pumped out. The utility said it took additional measures that also failed.

On Friday, Tepco proposed a new technique for the tunnels: injection of a cement filler especially developed for the task while pumping out as much of the accumulated water as possible.

Under the new method, however, it would be difficult to drain all of this water and some of it would be left behind, endangering plant workers, Tepco acknowledged.

Nevertheless, a Nuclear Regulation Authority panel of experts green-lighted the new strategy at a recent meeting. Some of the experts argued that Tepco should stick to the original plan and draw out all of the water. Others said giving up on it may hamper the construction of the ice wall.

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## **NRA's translation of interim report on 3/11**

Interim report published in October 2014 by the NRA

### **Analysis of the TEPCO Fukushima Daiichi NPS accident**

[http://www.nsr.go.jp/english/library/data/special-report\\_20141104.pdf](http://www.nsr.go.jp/english/library/data/special-report_20141104.pdf)

Interim report by the NRA, 137 pages

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November 25, 2014

## **Start of new plan for tunnels**

### **Work starts to fill tainted underground tunnels**

[http://www3.nhk.or.jp/nhkworld/english/news/20141125\\_28.html](http://www3.nhk.or.jp/nhkworld/english/news/20141125_28.html)

Workers at the Fukushima Daiichi nuclear power plant have started pouring cement into underground tunnels filled with highly radioactive water.

The effort is aimed at replacing the water with cement. The water is believed to be leaking into the nearby sea after mixing with groundwater.

Workers on Tuesday poured into the tunnels 80 cubic meters of cement that can solidify in water. The plant's operator, Tokyo Electric Power Company, said the water did not overflow during the work.

The operator says it plans to check the effectiveness of the measure in about a month after suspending the work temporarily. It says if there are no problems, it will resume the work to finish it by March.

The firm initially planned to freeze water at the ends of the tunnels to stop inflow from reactor buildings, and remove the contaminated water. But the plan did not work. By last week, the utility had decided to adopt the new method.

**Workers using the method are likely exposed to more radiation than under the original plan.**

## What will happen if water changes route?

### TEPCO's Trench Saga Could Have Unintended Consequences

<http://www.fukuleaks.org/web/?p=14165>

TEPCO has made multiple attempts to deal with the unit 2 trench full of highly contaminated water. In 2011 they tried to block leaking water in the area. After it was admitted in 2013 that the tunnel still contained highly radioactive water, plans were put in place to empty the tunnel of water.

First TEPCO tried to freeze it, then they dumped in ice when the freezing didn't completely work. The next attempt was to dump concrete in the end near the turbine building. As they tried to empty the trench they realized it was still somehow filling back up with water. They also cited that the water going back in must also be contaminated as radiation levels were not going down.

The latest attempt began today. They are dumping in a hydro-cement to try to fill the trench with concrete while pumping out contaminated water. TEPCO said this work would result in considerable worker exposures. TEPCO now plans to do the same tactic to the trench for the unit 3 reactor that they admit has the same problem.

TEPCO also admitted this highly contaminated water in the trench is mixing with groundwater and making it out to sea. This is the first really clear admission of this mechanism by TEPCO. They also now admit to the NRA that all the efforts at the unit 2 trench earlier this year were not necessary and were unlikely to work. They did not say why they didn't advocate for the concrete filling of the trench back then and instead did two rounds of considerable work they knew wouldn't work.

Currently the mechanism for more highly contaminated water to reach the trench and refill it either isn't understood or isn't admitted by TEPCO. This makes the work to fill the trench even more risky. **The**

concrete filling of the trench could have new consequences if it forces this flow of highly contaminated water to take a different route rather than stopping it from flowing. Without knowing the exact source of the water and the exact route it takes to the trench, what happens next is anyone's guess.

December 1, 2014

## Detecting radioactive strontium in less than 30 minutes

### New technology to speed up detection of radioactive strontium tenfold

<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201412010027>

New updated equipment that is scheduled to go into operation at the Fukushima No. 1 nuclear power plant in December will detect radioactive strontium 90 in contaminated water **in less than 30 minutes, compared to the seven to 10 days it now takes.**

The advanced detection equipment was developed as part of a group effort centered on the work of Yoshitaka Takagai, an associate professor of analytical chemistry in the Faculty of Symbiotic Systems Science at Fukushima University. Researchers from PerkinElmer Japan Co., based in Yokohama, were also involved in the research.

University officials discussed the plan to deploy one of the new devices Nov. 27.

"We want to reduce the burden on the small number of people working at the plant site," said Takagai.

"We also hope that improved efficiency in analysis will, in the long run, lead to a shortening of the time it takes to decommission the reactors."

The improved technology involved making changes to **an analytical device so that it automatically separates strontium 90 in order to analyze it in a shorter period of time.**

Tokyo Electric Power Co., the operator of the Fukushima No. 1 plant that was damaged by the 2011 Great East Japan Earthquake and tsunami, will use the equipment to test rainwater that has accumulated within containment barriers set up around tanks that store radioactive contaminated water.

The university first announced the completion of the new equipment in September 2013. Further improvements were made after consulting with officials from the plant with an eye toward actual operations. As a result, the accuracy of the analysis has improved tenfold from the first version.

The equipment is now also capable of **measuring even lower concentrations of strontium.** The minimum level it can detect is 0.3 becquerels per liter. That analysis can be completed in as little as 23 minutes.

Two more of the devices are scheduled for installation in the next fiscal year. **The new equipment is designed to screen fresh water, but further efforts will be made to develop the technology so it can also analyze seawater.**

December 4, 2014

## Nothing "unusual" at Fukushima Daiichi

### Cover put back over Fukushima reactor

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The operator of Fukushima Daiichi nuclear power plant says the temporary removal of part of the cover of a reactor building over the past month did not cause a significant rise in radiation levels nearby.

Tokyo Electric Power Company used a remote-controlled crane to put 2 of the 6 panels from the ceiling of the No.1 reactor building back in place on Thursday.

TEPCO removed them in late October and early November to see if this would cause radioactive substances from the debris inside the building to drift out into the environment. Before starting the work, it injected chemicals through openings made in the cover to prevent dust from spreading.

The debris was left by a hydrogen explosion in the 2011 nuclear accident.

**TEPCO says no monitoring device within the plant compound detected anything unusual over the past month.**

The work was part of preparations for taking nuclear fuel out of a spent fuel storage pool, starting in 2019.

TEPCO says it hopes to start dismantling the ceiling in March, and start clearing the debris in 2016.

December 12, 2014

## Cementing tunnels "biggest concern"?

### NRA chief: Cementing tunnels will stop inflow

<http://www3.nhk.or.jp/nhkworld/english/news/nuclear.html>

The chief of Japan's nuclear overseer has inspected the Fukushima Daiichi plant where decommissioning work is underway.

Nuclear Regulation Authority Chairman Shunichi Tanaka visited the plant on Friday for the third time in 2 years.

He toured the plant for about 4 hours, inspecting each facility at the nuclear complex.

In a plant building which serves as a base for decommissioning work, Tanaka said he thinks the safety of the plant has gradually improved.

Tanaka inspected barriers around tanks storing contaminated water. Multiple barriers have been added to prevent a recurrence of the incident last year in which more than 300 tons of tainted water leaked away.

He also checked whether the new method to remove highly radioactive water from underground tunnels is working.

The plant operator, Tokyo Electric Power Company, is trying to stop the inflow of contaminated water from a reactor building by pouring cement into the flooded tunnels while removing water from them.

Tanaka said the tunnels have been his biggest concern, but the ongoing work seems to be successful.

**He said people need to understand that contaminated water cannot be stored at the plant forever, and that it should be treated and disposed of.**

December 13, 2014

## "We have to dispose of the water"

### **NRA head signals massive release of tainted water to help decommission Fukushima site**

<http://mainichi.jp/english/english/newsselect/news/20141213p2a00m0na012000c.html>

By HIROMI KUMAI/ Staff Writer

The head of Japan's nuclear watchdog said **contaminated water stored at the crippled Fukushima No. 1 nuclear power plant should be released into the ocean to ensure safe decommissioning of the reactors.**

Shunichi Tanaka, the chairman of the Nuclear Regulation Authority, made the comment Dec. 12 after visiting the facility to observe progress in dismantling the six reactors. The site was severely damaged in the tsunami generated by the 2011 earthquake.

"I was overwhelmed by the sheer number of tanks (holding water tainted with radioactive substances)," Tanaka told reporters, indicating they pose a danger to decommissioning work. "We have to dispose of the water."

With regard to expected protests by local fishermen over the discharge, Tanaka said, "We also have to obtain the consent of local residents in carrying out the work, so we can somehow mitigate (the increase in tainted water)."

Tanaka has said previously that to proceed with decommissioning, tainted water stored on the site would need to be released into the sea so long as it had been decontaminated to accepted safety standards.

"While (the idea) may upset people, we must do our utmost to satisfy residents of Fukushima," Tanaka said, adding that the NRA would provide information to local residents based on continuing studies of radioactive elements in local waters.

The inspection tour was Tanaka's second since he became NRA chief in September 2012. He last visited in April 2013.

During his visit, Tanaka observed work at a trench on the ocean side of the No. 2 reactor building, where highly contaminated water is being pumped out. He also inspected barriers set up around the storage tanks to prevent leaks of tainted water.

Tanaka praised the completion in November of work to remove all spent nuclear fuel from the No. 4 reactor building, as well as changes to work procedures that he said allows for the completion of the work at the No. 2 reactor trench.

## **On the Brink**

# ON THE BRINK: The Inside Story of Fukushima Daiichi



**Ryūshō Kadota**  
Translation: Simon Varnam  
Technical supervision: Akira Tokuhira

## **On the Brink: The Inside Story of Fukushima Daiichi**

<http://www.japantimes.co.jp/culture/2014/12/13/books/book-reviews/brink-inside-story-fukushima-daiichi/#.VI1Gont1>

by Catherina Depaz

Special To The Japan Times

### **On the Brink, by Ryusho Kadota, Translated by Simon Varnam.**

**Kurodahan Press, Nonfiction.**

The personal testimonials from “On the Brink: The Inside Story of Fukushima Daiichi” are riveting and heartbreaking. Compiled by Ryusho Kadota, each chapter recounts the aftermath of the Great East Japan Earthquake and the ensuing meltdowns at the Fukushima No. 1 nuclear power plant. Kadota has carefully collected the stories of those who were affected and shares the experiences of the courageous workers who stayed in the plant to prevent total destruction of the overheating reactors. The interviews contained in “On the Brink” show another side to the earthquake and the political and environmental clean up, with each section exposing the realities of a disaster that has forever marred the landscape.

December 17, 2014

## **South Korean experts at Fukushima Daiichi**

### **S.Korean experts visit Fukushima Daiichi plant**

[http://www3.nhk.or.jp/nhkworld/english/news/20141217\\_41.html](http://www3.nhk.or.jp/nhkworld/english/news/20141217_41.html)

South Korean experts have visited the Fukushima Daiichi nuclear plant to study the possible resumption of seafood imports from Fukushima and other prefectures.

The 7 experts toured the plant for about 2 hours on Wednesday. They were accompanied by officials from the Japanese government and plant operator Tokyo Electric Power Company.

They studied the contaminated water processing system known as ALPS and other facilities.

A Japan fisheries ministry official said he believes the tour helped show the experts that substantive measures have been taken to prevent contaminated water leaks.

South Korea banned seafood imports from Fukushima and 7 other prefectures in September of last year.



December 18, 2014

## Another leak... during Korean experts' visit

### Six tons of tainted water leak at Fukushima No. 1 during Korean safety tour

[http://www.japantimes.co.jp/news/2014/12/18/national/six-tons-of-tainted-water-leak-at-fukushima-no-1-during-korean-safety-tour/#.VJML3\\_cJA](http://www.japantimes.co.jp/news/2014/12/18/national/six-tons-of-tainted-water-leak-at-fukushima-no-1-during-korean-safety-tour/#.VJML3_cJA)

JJI

FUKUSHIMA – Up to 6 tons of radioactive water has leaked into the ground at the crippled Fukushima No. 1 nuclear power plant, according to Tokyo Electric Power Co.

The water, which had been scrubbed by Units A and C of the advanced liquid processing system (ALPS), **leaked from pipes while being transported to storage tanks** on Wednesday afternoon, the utility said. The water seeped into the ground, officials said, adding that it did not flow into the sea because there was no drainage ditch nearby.

The ALPS system can remove all radioactive substances except tritium. **It wasn't clear how radioactive the water was before the spill.**

Wednesday's incident came on the same day that a team of experts from South Korea visited the heavily damaged plant to examine the safety of Japanese fishery products.

The South Korean experts spent about three hours inspecting facilities at the plant, including ALPS. **They were told about measures to keep the nuclear crisis under control, but not apparently about the latest water leak.**

The experts asked questions about the types of radioactive materials contained in the water and the results of radiation checks on local seawater, according to the Fisheries Agency.

In September last year, South Korea banned imports of fishery products from Fukushima and seven other prefectures due to the recurring water leaks at the Fukushima No. 1 plant.

Tepco said Wednesday it will cut business costs by ¥837 billion in fiscal 2014, up sharply from the previously planned ¥576 billion. The deeper cuts will allow Tepco to forego another rate hike for households through 2015, company officials said.

In a special business plan approved by the government in January, Tepco said it would slash business costs by ¥4.8 trillion over the 10 years to fiscal 2022. Tepco Chairman Fumio Sudo said the utility hopes to increase that to about ¥6 trillion.

The plant is in the final stages of removing fuel rods from storage at the heavily damaged No. 4 reactor building.

December 20, 2014

## Earthquake strikes Fukushima

### Earthquake strikes off Fukushima Prefecture; no tsunami warning issued

<http://www.japantimes.co.jp/news/2014/12/20/national/science-health/moderate-quake-rattles-eastern-fukushima-prefecture/>

Staff Report

An earthquake with an **intensity of 4 on the Japanese scale to 7** rattled the Hamadori area of eastern Fukushima Prefecture at 6:31 p.m. Saturday, the Meteorological Agency said.

The earthquake measured 3 in the Nakadori district of Fukushima as well as in northern, central and southern areas of adjacent Miyagi Prefecture, and in parts of Ibaraki Prefecture further to the north, the agency said on its website.

No tsunami warning was issued.

The quake's epicenter was off the coast of Fukushima Prefecture at a depth of 40 km below the seabed, the agency reported.

**No damage was detected by an initial check of the Fukushima No. 1 and No. 2 nuclear plants,** operator Tokyo Electric Power Co. said on its website shortly after the temblor.

December 26, 2014

## Gaps in cement-filled tunnels

### New method for contaminated water may be failing

[http://www3.nhk.or.jp/nhkworld/english/news/20141226\\_37.html](http://www3.nhk.or.jp/nhkworld/english/news/20141226_37.html)

Tokyo Electric Power Company has indicated that a new method aimed at tackling a large volume of highly radioactive wastewater at the Fukushima Daiichi nuclear power plant has not been entirely successful.

TEPCO gave a progress report on its work to a panel of experts at the Nuclear Regulation Authority on Friday.

The utility last month began pouring cement into underground tunnels filled with the contaminated water from the reactor buildings to stop the water inflow. The water is believed to be leaking into the sea.

TEPCO officials told the panel that workers have completely filled the U-shaped tunnels except for 4 vertical pits that connect the tunnels to the ground surface. They removed 2,500 tons of radioactive water.

But the officials said that when they pumped water up from one of the pits, the water level at another pit changed. That suggests that gaps exist in the concrete-filled tunnels.

The officials argued that they can stop the water from flowing into the tunnels once the 4 vertical pits are filled. But panel members and authority commissioners said more thorough inspections are needed.

TEPCO plans to monitor water levels for a month, look for gaps, and study more effective ways to block the water.

The utility initially planned to freeze wastewater at the end of the tunnel to stop inflow from the reactor buildings and remove the water. But the plan did not work.

*Éditions de Fukushima*

## Livres numériques édités

en téléchargement à cette adresse : <https://editionsdefukushima.fr/>

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