

# Fukushima: Radioactivity Unsafety From March 11 Till Today

Sunday 19 June 2011, by [Asahi Shimbun](#), [Kyodo News](#), [Mainichi Shimbun](#), [NAGATA Kazuaki](#) (Date first published: 18 June 2011).

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## **TEPCO documents show problems encountered in venting, pumping water to damaged reactors**

Despite the orders of Masao Yoshida, head of the Fukushima No. 1 nuclear power plant, venting of reactors and injections of water did not proceed smoothly in the early stage of the crisis, documents showed.

Fearing reactor core damage could lead to a serious accident, Yoshida started issuing instructions to prepare pumping in water to the No. 1 and No. 2 reactors around 90 minutes after all power sources to the reactors were lost by 3:40 p.m. on March 11, according to the internal documents of Tokyo Electric Power Co.

His orders were in accordance with procedures prepared to deal with serious accidents. But the work ran into a number of problems, some of them unexplained in the documents.

The documents, obtained by *The Asahi Shimbun*, said an increase in radiation levels at the reactor buildings made it impossible for workers to enter those buildings. The papers also cited damage to equipment from hydrogen explosions at neighboring reactor buildings.

The documents provide a timeline of events from 2:46 p.m. on March 11 when the magnitude-9.0 Great East Japan Earthquake struck, and include the explosions that occurred at the No. 1 to No. 3 reactors until March 15.

The documents are believed to have been based on records kept by plant workers and subsequent questioning of those workers by TEPCO officials.

TEPCO officials analyzed data that remained in the central control rooms of the reactors and released their findings in May.

A report on the venting and water-pumping operations was supposed to have been released at a June 15 news conference after being submitted to the Nuclear and Industrial Safety Agency (NISA).

However, a number of sources said the release of the report was canceled shortly before the news

conference because approval from the Prime Minister's Official Residence could not be obtained.

The documents are expected to be submitted to the government-appointed panel established to investigate the causes and evaluate the measures taken to deal with the Fukushima nuclear accident.

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## **NO. 1 REACTOR**

At the No. 1 reactor, the water level and other conditions at the core could not be confirmed from about 4:30 p.m. on March 11.

Yoshida concluded there was the possibility of a serious accident occurring.

At 5:12 p.m., he gave instructions to consider methods for pumping in water, including the use of firefighting pipes and firefighting vehicles that had been installed to deal with serious accidents.

However, by the night of March 11, high levels of radiation prevented workers from entering the No. 1 reactor building. The increase was likely due to leakage of radiation from the core.

The pumping in of fresh water using the firefighting pipes only began at 5:46 a.m. on March 12, about 12 hours later.

After pumping in 80 tons of fresh water over nine hours, the water supply ran out. Yoshida then gave instructions to pump in seawater at 2:54 p.m.

At 3:36 p.m., a power source was restored from a generator vehicle and preparations were completed to begin pumping in water mixed with boric acid.

However, an explosion occurred at that time in the reactor building. As a result, the power source equipment that had been prepared and the hoses used to pump in seawater were rendered inoperable.

### **Timeline for No. 1 reactor**

March 11

3:37 p.m.: All AC power sources lost

5:12 p.m.: Yoshida gives instructions to consider methods for pumping in water to reactor core by using firefighting pipes and firefighting vehicles installed as measures to deal with serious accidents

9:51 p.m.: Rising radiation levels lead to ban on entering reactor building

March 12

12:06 a.m.: Yoshida gives instructions to prepare for venting because of increased pressure within containment vessel

5:46 a.m.: Work begins to pump in fresh water to reactor core through firefighting pipes using firefighting vehicles

9:04 a.m.: Workers head to plant site to operate vents

9:15 a.m.: Venting valves of containment vessel opened manually

10:17 a.m.: Venting valves operated from central control room

2:30 p.m.: Judgment made that venting worked because pressure within containment vessel decreased

3:36 p.m.: Explosion in reactor building

7:04 p.m.: Work begins to pump in seawater to reactor core through firefighting pipes using firefighting vehicles

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## **NO. 2 REACTOR**

Yoshida also gave instructions from an early stage for the No. 2 reactor.

At 5:12 p.m. on March 11, the same time for the No. 1 reactor, he gave instructions to begin considering methods for pumping in water because he determined there was a possibility of the situation escalating into a serious accident.

He told workers at 5:30 p.m. on March 12 to prepare venting operations. That instruction came after confirmation was made that all residents near the plant had completed their evacuation.

Yoshida gave the order to begin venting about 16 hours later on the morning of March 13. He also gave instructions to prepare for the pumping of seawater, rather than fresh water, and implemented measures to deal with the situation.

However, after 11 a.m. on March 14, one valve used in venting would not open due to a hydrogen explosion at the No. 3 reactor. Moreover, hoses to pump water using firefighting vehicles were damaged and could not be used.

The pumping in of seawater using the firefighting vehicle started from that night after preparations were completed a second time.

Venting began after midnight March 14, but around 6 a.m. on March 15, an explosion was heard from near the suppression pool.

### **Timeline for No. 2 reactor**

March 11

3:41 p.m.: All AC power sources lost

4:36 p.m.: Water level within core cannot be confirmed and pumping conditions uncertain

5:12 p.m.: Yoshida gives instructions to consider methods for pumping in water to reactor core to deal with serious accidents

March 12

12:30 a.m.: Evacuation of nearby residents based on central government instructions confirmed

1:30 a.m.: Request made to prime minister and NISA for approval to begin venting

5:30 p.m.: Yoshida gives instruction to begin preparations for venting operation

March 13

10:15 a.m.: Yoshida gives instructions to begin venting

12:05 p.m.: Yoshida gives instructions to prepare use of seawater

March 14

11:01 a.m.: One venting valve does not open because of explosion at No. 3 reactor building. Firefighting vehicle hoses also damaged

7:54 p.m.: Work begins to pump in seawater using firefighting vehicle

March 15

Past 6 a.m.: Explosion heard near suppression pool

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### **NO. 3 REACTOR**

For the No. 3 reactor, Yoshida gave instructions to begin preparations for venting at 5:30 p.m. on March 12. That was two hours after an explosion in the No. 1 reactor building.

As part of efforts to minimize damage from the accident, Prime Minister Naoto Kan gave instructions at 6:25 p.m. to evacuate residents living within a 20-kilometer radius of the Fukushima plant.

However, Yoshida did not give instructions to complete the preparations for venting until 5:15 a.m. on March 13, about 12 hours later.

There are no records that specifically describe what type of work related to venting was conducted during that half-day period.

About an hour earlier, the water level in the reactor core fell and the top of the fuel rods likely became exposed.

The internal documents also describe the problems encountered in the unfamiliar venting process.

At 11:17 a.m. on March 13, the venting valve closed because the air cylinder that moves the valve lost pressure. The valve was only opened an hour or so later at 12:30 p.m. after the air cylinder was replaced.

### **Timeline for No. 3 reactor**

March 11

3:38 p.m.: All AC power sources lost

March 12

11:36 a.m.: Remote-controlled cooling system stops

5:30 p.m.: Yoshida gives instructions to begin preparations for venting operation

March 13

2:42 a.m.: High-pressure pumping cooling system stops

5:15 a.m.: Yoshida gives instructions to complete preparations for venting

8:41 a.m.: Venting begins

Around 9:20 a.m.: Pressure in upper part of containment vessel decreases due to venting

9:25 a.m.: Work begins to pump in fresh water to core from firefighting vehicles using firefighting pipes

10:30 a.m.: Yoshida gives instructions to also consider pumping in seawater

Around 1:10 p.m.: Work begins to pump in seawater to core from firefighting vehicles

March 14

5:20 a.m.: Venting begins

11:01 a.m.: Explosion in reactor building. Pumping of seawater stops due to damage to firefighting vehicles

Around 4:30 p.m.: Pumping of seawater to core resumes

***Asahi Shimbun*** , June 18, 2011

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### **TEPCO not to start stable Fukushima plant cooling till Mon.**

TOKYO (Kyodo) — Tokyo Electric Power Co. cannot begin work to cool the troubled reactors at the Fukushima Daiichi nuclear power plant until Monday at the earliest, the utility said Saturday, adding it is fixing a problem that forced it to suspend full operation of a new water decontamination system.

The system, which began full operation at 8 p.m. Friday, was halted at 12:54 a.m. Saturday as the radiation level of a component to absorb cesium had reached its limit and required replacement earlier than expected, the operator known as TEPCO said.

The operator earlier assumed it would have to replace the component once a month, it said.

TEPCO spokesman Junichi Matsumoto said Saturday it does not yet know exactly when it can resume the operation of the system, which puts water back into the heated reactors to cool them after decontaminating it.

But Matsumoto dismissed concerns that the toxic water accumulated in the plant may overflow to the outside, saying, "We can resolve the problem before our storage is filled up with the toxic water in a week's time."

The system is seen as a key step to containing the three-month-old nuclear crisis as it would clean highly radioactive water hazardously accumulating at the plant premises and preventing restoration work.

The contaminated water is a side effect of the current emergency step of injecting coolant water from outside, as the reactors' cooling functions were lost in the March 11 earthquake and tsunami.

**Kyodo**, June 18, 2011

<http://mdn.mainichi.jp/mdnnews/news/20110618p2g00m0dm048000c.html>

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### **Tepco begins work to clean coolant water—Month needed to make reactor circulation safe**

Tokyo Electric Power Co. confirmed Friday that the treatment facility to clean highly radioactive water accumulating at the crippled Fukushima No. 1 nuclear plant started full-scale operations at 8 p.m.

Tepco also revealed its updated road map to bring the Fukushima nuclear crisis under control, saying it aims to cool the stricken reactors with a circulating coolant system through processed contaminated water in a month as well as to improve the medical care and mitigate the radiation exposure of its workers.

The latest plan does not appear to deviate from the goals of cooling the reactors and still aims to effect a cold shutdown in which the temperature of the reactor-core coolants is brought below 100 degrees, by mid-January.

In the short term, the utility hopes to be able to cool down the reactors in a month by circulating the decontaminated water and avoid adding to the current massive amount of radioactive water in the turbine buildings.

Pipes for the circulating cooling systems have already been installed, so the system can start when the water treatment facility begins operations, according to Tepco.

The utility resumed the trial run of the system and commenced full-scale operations Friday, after dealing with water leakage a day before.

"This is a quite big step, although we have to closely watch as troubles may occur. But operating this water treatment system should bring about stable cooling," said Goshi Hosono, a special aide to Prime Minister Naoto Kan in charge of overseeing the accident.

Meanwhile, the updated road map also highlighted the need to improve medical care and mitigate the radiation exposure of workers at the site, as the utility found out recently that several exceeded the 250-millisievert limit.

Tepco plans to set up more whole-body radiation counters that can check internal exposure, more decontamination facilities and an automated record system of each worker's exposure.

Tepco also said it will increase medical offices and doctors with help from the government. They also raised concern about the heat stroke threat workers face this summer that will aggravate their efforts.

“There are more than 2,000 people working at the site, and securing their safety and limiting their radiation exposure are key goals of the road map,” said Muto.

New elements include plans to build underground walls near the reactors and turbine buildings to prevent groundwater contamination.

The full-scale operation of the new water treatment system is seen as a key step to containing the crisis because it would not only help reduce the polluted water but would create clean water that can be injected into the reactors, whose cooling systems were knocked out by the March 11 earthquake and tsunami.

Tepco has pumped water into the reactors from outside as an emergency measure to keep the nuclear fuel inside cool, but one side effect has been that the contaminated water has filled up the reactor turbine buildings and nearby areas, and spilled into the sea.

With the system, composed of equipment developed by Kurion Inc. of the United States and France’s Areva SA, some of the polluted water transferred to a facility on the plant’s premises would be cleaned through several processes, including removing oil and reducing the amount of cesium and other radioactive substances.

Tepco announced its first plan on April 17, and the utility has been giving monthly updates on its progress and strategy.

Looking back the past few months, Tepco Vice President Sakae Muto said some things went well, including cooling spent-fuel pools, while others did not, such as pouring nitrogen into reactors 2 and 3 to prevent hydrogen explosions. Tepco has also not been able to pinpoint holes and cracks in the containment vessels of reactors 1 to 3.

By **KAZUAKI NAGATA**, Japan Times Staff writer, June 18, 2011  
<http://search.japantimes.co.jp/cgi-bin/nn20110618a1.html>

INFORMATION FROM KYODO ADDED

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## **Fukui Pref. gives priority to safety over resuming nuclear power operations**

Fukui Gov. Issei Nishikawa is seen during an interview with the Mainichi at his office in the city of Fukui on June 16. (Mainichi)

Fukui Gov. Issei Nishikawa is seen during an interview with the Mainichi at his office in the city of Fukui on June 16. (Mainichi)

With the ongoing crisis at the Fukushima No. 1 Nuclear Power Plant sending shockwaves throughout the Japanese nuclear power industry, Fukui Gov. Issei Nishikawa has told the Mainichi that safety will take top priority in any resumption of reactor operations in his jurisdiction.

Nishikawa made the comments in a June 16 interview, as a probable summer power shortage approaches and Kansai Electric Power Co. awaits the nod from the prefecture to restart nuclear reactors in the prefecture — now undergoing regular inspections.

“Electric power supply and demand and the safety of nuclear power plants are totally different,” Nishikawa said. “We would lose everything if municipalities here (hosting nuclear power plants) became like Fukushima.”

The Fukui governor called on the central government to draw up new safety guidelines for restarting nuclear power plants, saying, “The Japanese people will not be convinced unless the government takes appropriate measures” in the aftermath of the nuclear disaster at the Fukushima nuclear complex, run by Tokyo Electric Power Co. (TEPCO).

“There has to be some sort of knowledge by now, more than three months after the nuclear accident,” Nishikawa said, suggesting a set of nuclear emergency measures including steps to deal with tsunami that the central government presented to TEPCO and other utilities in March is insufficient.

As for Kansai Electric’s request for a 15 percent cut in electricity consumption due to possible power shortages should the utility be unable to resume nuclear power operations in the prefecture, the governor said the regions covered by TEPCO and Kansai are different.

“It is important to save electricity, but Kansai Electric should reveal more figures” such as demand and supply, the Fukui governor said.

Nishikawa said he will make a decision on the idled reactors once the central government maps out new safety standards, pointing to concerns that trouble will erupt if the reactors remain under inspection and out of operation in the autumn and winter.

After the outbreak of the Fukushima crisis, none of the nuclear reactors which had been in shut-down for regular checkups has resumed operations, and governors of prefectures hosting nuclear power plants have the power to authorize reactor restarts.

Nishikawa’s response has been closely watched because his prefecture is home to 13 commercial nuclear reactors — the most of any prefecture in the nation.

**Mainichi Shimbun** , June 17, 2011

<http://mdn.mainichi.jp/mdnnews/news/20110617p2a00m0na019000c.html>

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## **TEPCO starts up water treatment system, but massive radioactive waste feared**

Tokyo Electric Power Co. (TEPCO) began a trial run of a radioactive water treatment system at the crippled Fukushima No. 1 Nuclear Power Plant on June 15 in a desperate effort to break away from the vicious cycle of injecting water into reactors to cool them and ending up with more contaminated water.

But even if the system, developed by France’s Areva SA, were to operate smoothly, it would produce a massive amount of high-level radioactive waste that could affect TEPCO’s roadmap to bring the troubled nuclear reactors under control by early next year.

“The water treatment system is moving along as scheduled, although contaminated water leaked from a pipe,” Hidehiko Nishiyama, spokesman for the Nuclear and Industrial Safety Agency, told a



news conference on June 15.

TEPCO, the operator of the troubled Fukushima No. 1 Nuclear Power Plant, will try to reach “Step 1” of the roadmap, in which radiation emissions are steadily declining, by mid-July. It hopes to reach “Step 2,” in which leakages of radiation are controlled and amounts of radiation are drastically reduced, within three to six months.

But while contaminated water is treated, the system developed by Areva is expected to produce about 2,000 cubic meters of radioactive sludge by the end of this year. The sludge is likely to be highly radioactive with 100 million becquerels per cubic centimeter. In addition, about two to four 2.3-meter-tall cesium-absorbing containers are expected to be needed each day, but the roadmap does not take into account work to dispose of the containers.

In this June 9, 2011 photo released Saturday, June 11, 2011 by Tokyo Electric Power Co. (TEPCO), equipment inside the cesium absorption tower, part of the newly-built radioactive water processing facilities at Fukushima No. 1 nuclear power plant in Okuma, Fukushima prefecture, is shown. (AP Photo/Tokyo Electric Power Co.)

In this June 9, 2011 photo released Saturday, June 11, 2011 by Tokyo Electric Power Co. (TEPCO), equipment inside the cesium absorption tower, part of the newly-built radioactive water processing facilities at Fukushima No. 1 nuclear power plant in Okuma, Fukushima prefecture, is shown. (AP Photo/Tokyo Electric Power Co.)

“Massive amounts of extremely high levels of radioactive waste will be produced and our work to deal with the crisis at the No. 1 Nuclear Plant will enter unknown territory. It could affect the roadmap,” said a senior official of the Ministry of Economy, Trade and Industry. The ministry and the Nuclear and Industrial Safety Agency are considering measures, including revising laws or enacting new laws, to deal with massive amounts of radioactive waste.

In the roadmap revised in May, TEPCO included the operation of circulatory cooling systems using water that had had radioactive substances removed.

At the No. 2 reactor, a hydrogen explosion damaged the pressure suppression pool. According to analysis by the Nuclear and Industrial Safety Agency, there is a hole of about 300 square meters there. Therefore, in order to circulate cooling water through the reactor, either damaged parts would need to be repaired or the pool would need to be covered with something like a huge concrete structure. But it is difficult for workers to approach the reactor because radiation levels in the reactor building are so high. As a result, TEPCO has not even been able to confirm damaged spots.

The situation is the same at the No. 1 and 3 reactors. The buildings housing the two reactors sustained serious damage in the hydrogen explosions that hit them. Massive repair work could therefore be required to ensure that water circulates through the cooling systems. It is not clear when the circulatory cooling systems will be made operational, and therefore contaminated water will be kept in a temporary tank after being treated.

“This work has not been carried out anywhere else in the world. While keeping the worst-case-scenarios in mind, they should quickly work out measures to treat contaminated water,” said Teruyuki Honda, professor of nuclear environmental engineering at Tokyo City University.

**Mainichi Shimbun**, June 16, 2011

<http://mdn.mainichi.jp/mdnnews/news/20110616p2a00m0na015000c.html>

