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Agency for Natural Resources and Energy, METI of Japan

2<sup>nd</sup> Fact sheet: Overview of Contaminated Water Issue at TEPCO's Fukushima Daiichi NPS

On June 19, 2013, TEPCO announced that ground water in the area between the turbine buildings and plant port in Fukushima Daiichi NPS had been contaminated with radioactive materials. Furthermore, TEPCO announced that on July 22 a part of this contaminated ground water leaked into the plant port.

Radioactive influence in the sea water was only observed in the limited area of the plant, (smaller than 0.3 km<sup>2</sup>), for instance total beta activity in other points of the plant port and open sea was below the detection limit, or similar. Of course, no problem happens in the sea at Tokyo which is located about 200 km away from Fukushima Daiichi NPS (refer to Attachment 1 and 2).

Minister of Economy, Trade and Industry expressed that the immediate and fundamental countermeasures for contaminated water would be implemented in accordance with three principles, 1) removing the source of the contamination, 2) isolating ground water from the contamination source, and 3) preventing leakage of the contaminated water.

Under the principles, TEPCO took immediate countermeasures and planned fundamental countermeasures to be implemented within one to two years. The immediate countermeasures are i) enclosing contaminated soil with sodium silicate walls, ii) pumping out contaminated water from the trenches and isolating them, and iii) bypassing groundwater. The fundamental countermeasures are i) pumping out the ground water from the sub-drain before reaching to the reactor buildings, ii) installation of sea-side impermeable walls, iii) installation of land-side impermeable walls, and iv) installation of contaminated water treatment equipment with superior performance.

On August 19, TEPCO found that about 300 m<sup>3</sup> of highly contaminated water leaked from a bolted joint tank. The tank is located about 500 m away from the sea. While the Nuclear Regulation Authority evaluated this event on INES rating Level 3, most of the side ditch which connects to the sea was not contaminated. It is currently considered that there is the low possibility of that the leaked contaminated water flowed into the sea through the side ditch.

METI Minister, Motegi gave the following five directions to TEPCO during his visit to Fukushima Daiichi NPS on August 26, i) enhanced management of the tanks and the surrounding area, ii) reinforced patrol, iii) accelerated replacement from bolted joint tanks to welded joint tanks, iv) acceleration of the highly-contaminated water treatment and a decrease of radiation dose of the surrounding area by collecting the contaminated soil, and v) identification of the risks of storing highly-contaminated water and taking actions against the risks.

The Government of Japan itself has determined to play a proactive role, such as providing financial support, in TEPCO's implementing these countermeasures, including reinforcement of monitoring activities, in order for the earliest and fundamental settlement of the contaminated water issue.

(This document is intended to provide a series of factual information regarding the contaminated ground water leakage situation and the countermeasures dealing with this issue.)

1. On June 19, 2013, TEPCO announced that it had detected contaminated ground water in Observation Well No. 1 at the eastward (seaward) area between the turbine buildings and plant port in Fukushima Daiichi NPS. The contaminated ground water was found during the following investigations. TEPCO conducted investigations to identify the cause of the fact that a few points of the plant port contamination remained at a certain level by setting up an external Expert Group this April. Against this backdrop, TEPCO dug observation wells in the eastward area of the turbine buildings and conducted radioactive analyses of the ground water in the wells.

2. Furthermore, TEPCO announced on July 22 that the contaminated ground water was leaking to a zone of near the plant port. There were a few points which indicated significant changes in radioactive material concentrations in the near plant zone (0.3 km<sup>2</sup>), and that a significant change was not observed at the other parts inside or outside of the port. The radioactive material concentrations near the port boundary have been, at most, a low level becquerels per liter or below detection limit. It is considered that no meaningful influence to the surrounding environment can be assumed to have occurred outside the port, according to the observations made. Attachment 2 illustrates the radioactive material concentrations of seawater both inside and outside the port. According to TEPCO, the amount of tritium leaked in 2 years and 2 months, from May 2011 to July 2013, is estimated to range from 20 trillion to 40 trillion becquerels. For reference, the maximum allowed annual release of tritium during the normal operation phase of Fukushima Daiichi is 22 trillion becquerels per year. If TEPCO's estimation is correct, the amount of leaked tritium is within the maximum allowed annual release.

3. While investigating other possibilities of paths and root causes, TEPCO currently estimates that the source of the contamination is the remaining contaminated water in the power supply cable trenches connecting the turbine building of Unit 2 and the sea water circulation pumps near the sea shore, where highly contaminated water from the reactor building intruded during the aftermath of the accident in April 2011, and that this water is leaking and contaminating part of the ground water which flows into the plant area from the mountain side of the facilities, and is flowing into the sea port water. TEPCO estimates that the whole plant area of Units 1 to 4 has approx. 1000 m<sup>3</sup> of ground water flow every day and 400 m<sup>3</sup> of this flows into the basement of the facility buildings. Some part of the other ground water is considered to be contaminated by the remaining water in the trench and flows into the port through the soil.

4. Minister of Economy, Trade and Industry expressed that the immediate and fundamental countermeasures for contaminated water would be implemented in accordance with three principles, 1) removing the source of the contamination, 2) isolating ground water from the contamination source, and 3) preventing leakage of the contaminated water. The followings are countermeasures either being, or to be taken against the contaminated ground water leakage (refer to Attachment 3).

#### Immediate Countermeasures

1) Enclosing contaminated soil with sodium silicate walls

In the eastwards area from the turbine building where the contamination of ground water was detected, preparation is underway to enclose the soil for preventing contaminated ground water leakage to the sea, to pave the land surface with asphalt to prevent rain water inflow, and to pump out the dammed up ground water. TEPCO estimates the amount of pumping to be around 140 m<sup>3</sup> per day.

The injection of sodium silicate started from July 8 for enclosing the soil between Units 1 and 2 and the enclosure was completed on August 10. The contaminated ground water dammed up by the sodium silicate walls has been being pumped out since August 9. Consequently, the ground water level has been lower than the top of the sodium silicate walls since August 18. In addition, TEPCO started preparation for isolating the contaminated area to be completed in October. TEPCO started the enclosure of the soil between Units 2 and 3 as well as between Units 3 and 4.

2) Pumping out contaminated water from the trenches and isolating them

For the countermeasures against the highly contaminated water in the trenches, TEPCO plans to pump out the contaminated water from a part of the trenches and isolate them by the end of October.

Furthermore, TEPCO will start pumping out water from other trenches in September. TEPCO will examine a freezing method to block the water flow between the turbine buildings and the trenches as soon as possible in order to confirm technical problems. If the freezing method is feasible, TEPCO will start isolating the trenches by the freezing method. It is planned to be completed around April 2014.

3) Bypassing groundwater

This countermeasure is to pump out groundwater at the mountainside area from the reactor buildings in order to reduce the amount of ground water inflow into this area. The facilities have been installed already. The current status is the explanation process to the local stakeholders.

#### Fundamental Countermeasures

- 4) Pumping out the ground water from the sub-drain before reaching to the reactor buildings (currently under planning)

This countermeasure is discussed under the Committee on Countermeasures for Contaminated Water Treatment of the Council for the Decommissioning of TEPCO's Fukushima Daiichi NPS.

- 5) Installation of sea-side impermeable walls (under construction)

The sea-side impermeable walls have been under construction since FY 2012 (e.g. digging holes from June 2012 and placing steel pipe sheet piles from April 2013.) The estimated completion date is around September 2014.

- 6) Installation of land-side impermeable walls

Installation of land-side impermeable walls which enclose the area of Units 1 to 4 is being considered. This measure is being prepared in case the other measures (e.g. bypassing ground water and pumping out water from sub-drains adjacent to the reactor buildings) to control ground water level do not work sufficiently. The land-side impermeable walls will be constructed by the frozen soil method, which is evaluated to have good impermeability and on-site workability, and are aimed to be operational as soon as possible. The feasibility study for the land-side impermeable walls by the frozen soil method will be implemented by the end of FY 2013. The land-side impermeable walls will be installed in the first half of FY 2015.

- 7) Installation of high performance contaminated water treatment equipment

This countermeasure is to install the high performance decontamination equipment for highly-contaminated water.

5. On August 2, the Nuclear Regulation Authority settled the Working Group for Review on Contaminated Water Countermeasures of the Supervision and Evaluation Committee for the Specified Nuclear Power Facilities and started offering technical support to TEPCO.

6. At the Nuclear Emergency Response Headquarters meeting held on August 7, Prime Minister Abe stated that the Government of Japan itself would play a proactive role in TEPCO's implementing the countermeasures for the contaminated water leakage issue. On August 8, the Committee on Countermeasures for Contaminated Water Treatment of the Council for Decommissioning TEPCO's Fukushima Daiichi NPS decided to establish procedures and methodologies for each activity to completely settle the contaminated ground water leakage issue with both immediate and fundamental countermeasures by the end of the coming September based on the above mentioned three principles (refer to Attachment 3).

7. On August 19, TEPCO announced that it discovered a water leak from a drain valve of a tank dike in the H4 area, which is located about 500 m away from the sea and at one of the installation locations of the contaminated water tanks in Fukushima Daiichi NPS. Because high radiation doses were detected in a puddle of water that had leaked outside the dike, TEPCO determined that the water had leaked from the contaminated water tank. TEPCO found water spread in the neighborhood of the No.5 tank in the H4 area and confirmed that the water level of the No. 5 tank was 3 m lower than its normal level. TEPCO estimated that the amount of the leaked contaminated water was 300 m<sup>3</sup>. A high radiation dose point (5.8 mSv/h) was identified at the dike connecting from the near tank area to the sea, according to TEPCO's survey. At the same time, however, any meaningful increase in radioactive concentration was not observed in the sea, including at the outlet of the dike. The radioactive concentration at the outlet was extremely low level or below the detection limit. In cooperation with the Government of Japan, TEPCO is working to prevent any spread of contamination, investigating the cause of this issue, and prevent similar events (refer to Attachments 4 - 6).

8. METI Minister, Motegi gave five directions (e.g., enhancement of tank management and reinforcement of patrols) to TEPCO regarding the contaminated water leakage from the bolted joint tank during his visit to the Fukushima Daiichi NPS on August 26 (refer to Attachment 6). In addition, he stated that it was one of the most urgent challenges for the Government of Japan to address the contaminated water issue at Fukushima Daiichi NPS and that METI had prepared financial measures, in cooperation with financial authorities, including the use of reserve funds, to urgently support the R&D challenges and high technical difficulties faced.

9. The Government of Japan itself has determined to play a proactive role, such as providing financial support, in TEPCO's implementing these countermeasures, including reinforcement of monitoring activities, in order for the earliest and fundamental settlement of the contaminated water issue..

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