

June 9, 2011

Nuclear and Industrial Safety Agency

Regarding Evaluation and Directions of the Report Related to the Installation of Processing Facilities and Storage Facilities for the Accumulated Water with High Concentration of Radioactive Materials at Fukushima Dai-ichi Nuclear Power Station, Tokyo Electric Power Co, Inc.

As Tokyo Electric Power Co. Inc. (TEPCO) is planning to install processing facilities for water with high concentration of radioactive materials (hereinafter, “Contaminated Water”), storage facilities for the Contaminated Water, and storage facilities for the waste with high concentration of condensed radioactive materials caused by the processing of the Contaminated Water at the Fukushima Dai-ichi Nuclear Power Station, Nuclear and Industrial Safety Agency (NISA) requested TEPCO on June 1, 2011 to submit a report regarding the effect of reducing the Contaminated Water by the installation of these processing facilities, etc. and regarding the safety measures related to the installation. As a result, on June 8, 2011, NISA received the subject report from TEPCO.

This is to inform the public that NISA evaluated the content of the subject report and directed TEPCO to further respond about the installation of the processing facilities for the Contaminated Water, etc.

Attachment 1: Regarding the Installation of Processing Facilities and Storage Facilities for the Accumulated Water with High Concentration of Radioactive Materials in Fukushima Dai-ichi Nuclear Power Station, Tokyo Electric Power Co. Inc..

Attachment 2: Regarding the Installation of Processing Facilities and Storage Facilities for the Accumulated Water with High Concentration of Radioactive Materials in Fukushima Dai-ichi Nuclear Power Station, Tokyo Electric Power Co. Inc.. (Direction)

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Regarding the Installation of Processing Facilities and Storage Facilities for the Accumulated Water with High Concentration of Radioactive Materials in Fukushima Dai-ichi Nuclear Power Station, Tokyo Electric Power Co., Inc.

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1. Background

At the Fukushima Dai-ichi Nuclear Power Station (NPS), a great volume of water with concentration of radioactive materials due to the water injection for cooling the reactor core is now accumulated, and there is a risk for environmental contamination and exposure due to leakage.

Tokyo Electric Power Co. Inc. (TEPCO) is planning to install processing facilities for the accumulated water with high concentration of radioactive materials (hereinafter, “Contaminated Water”) and is planning to control the occurrence of Contaminated Water by injecting the reused processed water after removing the radioactive materials from the Contaminated Water to the reactor core.

Therefore, NISA requested TEPCO to submit a report pursuant to Article 67 of the Act on the Regulation of Nuclear Source Materials, Nuclear Fuel Materials and Reactors (hereinafter, the “Reactor Regulation Act”).

2. Outline of Plan

The outline of the report regarding the evaluation, etc. related to the necessity and safety of the installation of the processing facilities and the storage facilities for the Contaminated Water submitted by TEPCO is as follows.

(1) Processing Facilities

- The subject processing facilities are to be installed on an urgent and provisional basis, whereby the estimated operation period is about one year. The estimated approximately 250,000 m³ of Contaminated Water by the end of fiscal 2011, including the current accumulated water will require processing, which will take approximately one year. Thereafter, TEPCO hopes to connect the subject processing facilities to more permanent processing facilities.
- The processing facilities will comprise an oil separator, a Cesium adsorption device (Zeolite adsorption method), a decontamination apparatus (coagulation-sedimentation process), and a

desalination system, etc. The basic processing functions have been confirmed by trials, etc.

(2) Storage Facilities for Contaminated Water

- If processing is delayed, TEPCO plans to install storage facilities with capacity of 10,000 m³ sequentially from the beginning of August until the end of September.
- Regarding the safety of leakage and shielding, etc. related to the storage facilities for the Contaminated Water, as NISA intends to receive additional reports from TEPCO, NISA will evaluate the matters again after receiving these further reports.

(3) Storage Facilities for Waste with High Concentration of Radioactive Materials

- On one hand, purified processed water will be generated from the processing of the Contaminated Water, and simultaneously, removed waste with high concentration of radioactive materials will also be generated. Used Cesium stacks (about 400 bars) from the Cesium adsorption device, as well as highly concentrated waste sludge (about 2,000 m³), will also result.
- These secondary products will be stored in special provisional storage facilities. The cesium-adsorption bars will be stored in an outside concrete box culvert system, while the sludge will be stored in pellet storage tanks in the Process Main Building.

3. NISA's Evaluation of Safety Measures

(1) Seismic Measures

- For the buildings installed as the processing equipment, NISA confirmed that their safety qualified as seismic S-class with respect to a standard seismic ground motion Ss according to the seismic response analysis.
- The processing facilities will be categorized as Class 2 equipment, but regular commercial products meeting JIS standard, etc. will be used. There is a possibility that some of the regulatory guide for reviewing seismic design might not be met in view of the need for the design and procurement in a short period for the products to have the required structural strength.
- Accordingly, NISA evaluated that safety measures to prevent overturning by making the structure have a low center of gravity and for the installation inside the seismic buildings, etc. were to be taken but there would be damage when an earthquake hit, as

well as, the occurrence of leakage. NISA confirmed that leakage could be prevented by making the buildings watertight.

(2) Measures for Tsunami

- Installation of an embankment about 14 m high along the sea coast.
- Installation of processing facilities that can handle highly radioactive contaminated water inside the buildings.
- Buildings whose above-ground doors and openings can be fully closed to the utmost, and if a large tsunami is predicted, operations will shutdown.
- Supporting the piping outside the buildings, etc. with H-steel beams, as well as installing isolation valves inside the buildings to prevent the spread of leakage.
- Considering all the above, NISA determined that TEPCO was implementing all the measures possible at this stage.

(3) Measures to prevent outflow

① Watertightness of Buildings

- In addition to implementing construction for watertightness, such as at the penetration parts, etc. regarding the buildings for installing the processing facilities (Process Main Building, Machine Tools Building, and Side Bunker Building), NISA determined that the buildings were watertight if only a small amount of underground water were to flow into the underground floor. NISA also confirmed that the watertightness was successful.

② Water and air tightness of processing facilities, etc.

- By conducting validation tests during operation and when the water was in a still condition (static head), NISA confirmed that there would be no leakage of the fluids with respect to the watertight feature of the facilities.
- Considering the corrosion by seawater, TEPCO implemented measures to accept some corrosion allowance, etc.
- As to the air tight feature for gases, a method to maintain negative pressure by ventilation via an iodine adsorbing filter has been secured. During the ventilation, the concentration of radioactivity will be monitored by dust samples.
- The pellet storage tanks for storing the sludge, which are the storage facilities for the waste with high concentration of

radioactive materials are buildings themselves and have a double-layered; the inner surface is coated with a protective concrete material while the outside is constructed to prevent leakage.

(4) Measures for shielding

- The facilities handling the high-concentrated Contamination Water and the radioactive waste are built with two sequences of active components, and they are executed by remote control to the furthest extent possible.
- If repairs are necessary, they will be conducted by reducing the radiation of contained waste water, through flushing, and decontamination, etc. In the facilities handling the high-concentrated Contamination Water and the radioactive waste, shielding is installed by flushing until the concentration is within the range of mSv/h.
- The Cesium adsorption bars must be changed at a rate of 2-4 bars per day; therefore, the shielding facilities will be internal. Even if there is still some processing capacity remaining, the Cesium bars are managed by replacing them when the surface dosage is a maximum of 40mSv/h, and the exposure at the time of replacement is controlled at a maximum of 4mSv/h.
- The waste sludge is shielded by a concrete wall surrounding the pellet storage tanks and the section which comes into direct contact with people at the top will have a dosage of less than 3mSv/h.
- NISA determined that TEPCO has considered reducing the workers' exposure as much as it can.

(5) Measures for decay heat

- NISA found that when the Cesium adsorption bars where the radioactive materials accumulate are placed under the most difficult conditions, they have a maximum rising temperature of 1°C per hour.
- Regarding the waste sludge of the decontamination apparatus where the radioactive materials accumulate, TEPCO will place a heat exchanger with multiple layers inside the pellet storage tanks (D), and will plans to remove the heat by this construction. NISA decided that this system was valid.

(6) Measures for hydrogen

- The pellet storage tanks prevent the build up of hydrogen in its gaseous phase by ventilating the multiple layered exhaust fan.

- As to the Cesium adsorption bars, the hydrogen flows downward together with the processing water during operation, but the hydrogen arising from the water radiolysis after the water flow has been discontinued is allowed to discharge by the “open” setting of the hydrogen vents at the top of the adsorption towers.
- (7) Measures to prevent criticality
 - The results of the radionuclide analysis found that there is no risk to reach criticality because the Contaminated Water does not contain neither uranium nor plutonium.
- (8) Measures for chemicals (Measures against explosion due to a chemical reaction among the chemical compounds or measures against poisonous gas)
 - In the subject processing facilities, chemicals are used in the ① decontamination apparatus and in the ② desalination apparatus.
 - Neither of the chemicals used is combustible, but because some of the chemicals may cause harm to humans due to its exposure, etc., they will be handled by wearing proper protective gear, and they will be stored in a location that is not fire hazardous inside a special container.
 - As neither reaction heat nor reaction gas arises inside the apparatus, it was confirmed to be safe from the perspective of fires and with respect to humans.
 - TEPCO was able to comprehend the impact the used chemicals would have on humans, and then planned the necessary measures. NISA determined that they were valid.
- (9) Plan regarding long-term storage of the waste with high concentration of radioactive materials
 - After being stored in the pellet storage tanks, the waste sludge arising from the decontamination apparatus is planned to be stored in temporary storage tank facilities, which are to be installed close to the high-level tank area with a goal of December.
 - After being stored in outside storage facilities, the spent Cesium adsorption bars is planned to be stored in temporary storage facilities for the spent Cesium adsorption device to be installed close to the high-level tank area with a goal of September
 - As only the above guidelines for installation of storage facilities were presented, when TEPCO submits additional reports, NISA will evaluate the situation again after receiving them.
 - Any of the waste materials need to be safely stored until their final disposal, and TEPCO will thus start to consider the facilities

for this purpose, while NISA will continue to confirm TEPCO's progress for its decisions.

Considering all the above, on the condition that NISA will reevaluate the situation when TEPCO submits additional reports, in the meantime, NISA determined that TEPCO's installation of processing facilities for Contaminated Water and their operation are the necessary measures to prevent radiation hazards, regarding the implemented emergency measures pursuant to Article 64, Paragraph 1 of the Reactor Regulation Act.

4. Future Action

In addition to NISA directing TEPCO about the following points, NISA will confirm the installation of the processing facilities for the Contaminated Water and their state of operation by, if necessary, an onsite inspection of Nuclear Safety Inspectors. Furthermore, regarding the matters reported separately to the present report, NISA will reevaluate the situation once it received a report from TEPCO.

- Considering the situation for the storage and processing of the Contaminated Water within the facilities, after the operations are started for the processing facilities of the Contaminated Water, request TEPCO to report to NISA promptly the future predictions. In addition, thereafter, request TEPCO to submit reports at a pace of once per week until the processing of the Contaminated Water inside the Radioactive Waste Treatment Facilities is completed.

Ministry of Economy, Trade and Industry

06.08.2011 NA No. 6

June 9, 2011

Tokyo Electric Power Co., Inc.
President Masataka Shimizu

Director-General, Nuclear and Industrial Safety Agency
Ministry of Economy, Trade and Industry
Nobuaki Terasaka
NISA-151d-11-20

Regarding the Installation of Processing Facilities and Storage Facilities
for the Accumulated Water with High Concentration of Radioactive
Materials in Fukushima Dai-ichi Nuclear Power Station, the Tokyo
Electric Power Co. Inc. (Direction)

On June 8, 2011, the Nuclear and Industrial Safety Agency (NISA) received a report from your company in relation to the installation of processing facilities for the accumulated water with high concentration of radioactive materials (hereinafter, "Contaminated Water") in Dai-ichi Nuclear Power Station (NPS), storage facilities for the Contaminated Water, as well as storage facilities for the waste with high concentration with condensed radioactive materials caused by the processing of the Contaminated Water.

According to this report, along with securing 10,000 m³ for the storage capacity of the storage facilities for the Contaminated Water, regarding the processing facilities for the Contaminated Water, the storage facilities for the Contaminated Water as well as the storage facilities for the waste with high concentration of radioactive materials, TEPCO will also secure the seismic safety, etc. by undertaking measures to prevent leakage by confirming operations for watertightness, as well as, seismic response analysis and measures to prevent overturning, etc. Therefore, NISA determined that these measures might be implemented as emergency measures.

For the installation of the specified facilities, in order to further decrease the Contaminated Water and to further reduce the impact on the environment and the possibility of radioactive exposure due to the unexpected leakage, in addition to your company implementing the indicated measures, NISA requests your company to implement the following.

Required Items

Soon after the operations have started for the processing facilities for the Contaminated Water, report to NISA the situation with respect to the storage of the Contaminated Water in the NPS, the state of the processing, as well as in consideration of both situations, the future predictions. In addition, thereafter, submit a similar report to NISA once a week until the processing of the Contaminated Water in the Radioactive Waste Treatment Facilities is complete.