Summary of Decommissioning and Contaminated Water Management

June 27, 2014

Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment

Main works and steps for the decommissioning

Fuel removal from Unit 4 SFP is underway. Preparatory works for fuel removal from Unit 1-3 SFP and fuel debris (Note 1) removal are ongoing.

Three principles for contaminated water countermeasures

Contaminated water countermeasures are implemented with the following three principles:

1. **Eliminate** contamination sources
   - Multi-nuclide removal equipment
   - Remove contaminated water in the trench (Note 2)

2. **Isolate** water from contamination
   - Pump up ground water for bypassing
   - Pump up ground water near buildings
   - Land-side frozen walls
   - Waterproof pavement

3. **Prevent leakage** of contaminated water
   - Soil improvement by sodium silicate
   - Sea-side impermeable walls
   - Increase tanks (welded-joint tanks)

(Note 2) Underground tunnels containing pipes.

Multi-nuclide removal equipment (ALPS)

- This equipment removes radionuclides from the contaminated water in tanks, and reduces risks.
- It aims to reduce the levels of 62 nuclides in contaminated water to the legal release limit or lower (tritium cannot be removed).
- Furthermore, additional multi-nuclide removal equipment is installed by TEPCO as well as a subsidy project of the Japanese Government.

Land-side impermeable walls with frozen soil

- The walls surround the buildings with frozen soil and reduce groundwater inflow into the same.
- On-site tests have been conducted since last August. Construction work started in June and the freezing operation will start within FY 2014.

Sea-side impermeable walls

- The walls aim to prevent the flow of contaminated groundwater into the sea.
- Installation of steel sheet piles is almost (98%) complete. Operation is scheduled to commence from this September.
**Progress Status and Future Challenges of the Mid-and-Long-Term Roadmap toward the Decommissioning of TEPCO’s Fukushima Daiichi Nuclear Power Station Units 1-4 (Outline)**

**Progress Status**

- **Construction commenced for installing land-side impermeable walls with frozen soil**
  - To prevent the inflow of groundwater into the buildings, there are plans to install land-side impermeable walls with frozen soil surrounding the buildings. Aiming to commence freezing operation within FY2014, drilling for installing frozen pipes started in the Unit 1 northwest area from June 2.

- **Resumption of 3-system operation of multi-nuclide removal equipment (ALPS)**
  - Regarding Systems A and C, operation was suspended without expanding contamination within the systems by detecting filter degradation at an early stage. After replacing the filters as with System B, treatment resumed on June 9 in System A and June 22 in System C (treatment resumed in all Systems).
  - Efforts will continue to complete treatment of contaminated water accumulated in tanks within FY2014.

- **Dismantling of Unit 1 R/B cover will start from early July**
  - To facilitate fuel removal from Unit 1, there is a need to remove rubble in the upper part of the Reactor Building (R/B).
  - To facilitate rubble removal, dismantling of R/B cover will start from early July.
  - When dismantling the cover and removing rubble, sufficient measures will be taken to control scattering of radioactive materials, along with monitoring of these materials, to ensure the work progresses steadily.

- **Covering started for the whole area within the port**
  - To prevent the spread of contamination due to contaminated soil being stirred up, covering over the sea bottom soil commences from June 30. The whole area will be covered within FY2014.

- **Transfer to Temporary Administration Office Building near the field**
  - To share information with the field and expedite any response, a Temporary Administration Office Building is under construction on the site of the Fukushima Daiichi Nuclear Power Station.
  - To the completed part of the building, approx. 400 staff members, including those of TEPCO’s water treatment related sections, working at Fukushima Daini Nuclear Power Station, will transfer within July.

- **Installation of additional instrumentation in Unit 2 PCV**
  - Aiming at improved reliability of monitoring instrumentation, additional thermometers and water level gauges were installed in Unit 2 PCV on June 5 and 6.
  - Measurement during the installation confirmed that the water level inside the PCV was approx. 300mm from the bottom. The trend of added instrumentation will be monitored for approx. one month to evaluate the validity.

- **Status of groundwater bypass**
  - To reduce the inflow of groundwater into the buildings and prevent increase in contaminated water, the steady release of pumped-up groundwater on the mountain side of the buildings has continued from May 21 to gradually reduce the groundwater level.
  - Based on the strict operation target (for tritium, 1,500 Bq/L (legal announcement density: 60,000 Bq/L)), pumped-up groundwater is released after ensuring the density is lower than this operation target each time. As increased tritium density was detected at one of 12 wells, monitoring has been enhanced by increasing the frequency of analysis on this well based on a predefined method, and it was confirmed that water quality at the time of release was sufficiently below the operation target.
  - Through continued monitoring of the radioactive material density in seawater, it is confirmed that the density was monitored within the same range as previously.

- **Meeting of the Fukushima Advisory Board on Decommissioning and Contaminated Water Management**
  - On June 9, the 3rd meeting (in Fukushima City) was held, where based on feedback to date, efforts to provide information on Fukushima Daiichi Nuclear Power Station were introduced. Valuable opinions were also delivered to improve the provision of information.

- **Inspection of overhead crane of Unit 4 SFP**
  - Due to annual inspection of the overhead cranes for Unit 4 and the common pool, fuel removal will be suspended from July 1 to early September.
  - This is the planned inspection and there is no change to the scheduled removal completion within 2014 (to date, approx. 70% of removal has been completed).
Meeting of the Fukushima Advisory Board on Decommissioning and Contaminated Water Management (* Fukushima City)

- Dismantling of the Unit 1 R/B cover will start from early July
- Construction commenced for installing land-side impermeable walls with frozen soil
- Resumption of 3-system operation of multi-nuclide removal equipment (ALPS)
- Installation of additional instrumentation in Unit 2 PCV
- Inspection of the overhead crane of Unit 4 SFP
- Status of groundwater bypass
- Transfer to the Temporary Administration Office Building near the field
- Groundwater bypass well points
- Groundwater bypass temporary storage tank
- Multi-nuclide removal equipment
- Land-side impermeable walls with frozen soil
- No.12
- Outlet
- Covering started for the whole area within the port
- Site boundary

Provided by Japan Space Imaging, (C) DigitalGlobe
I. Confirmation of the reactor conditions

1. Temperature inside the reactor

Through continuous reactor cooling by water injection, the temperatures of the Reactor Pressure Vessel (RPV) bottom and the Primary Containment Vessel (PCV) gas phase have been maintained within the range of approx. 20 to 40°C for the past month, though they vary depending on the unit and location of the thermometer.

2. Release of radioactive materials from the Reactor Buildings

The density of radioactive materials newly released from Reactor Building Units 1-4 in the air measured at site boundaries was evaluated at approx. 1.2 x 10^6 Bq/cm^3 for both Cs-134 and -137. The radiation exposure dose due to the release of radioactive materials was 0.03 mSv/year (equivalent to approx. 1/70 of the annual radiation dose by natural radiation (annual average in Japan: approx. 2.1 mSv/year)) at the site boundaries.

Annual radiation dose at site boundaries by radioactive materials (cesium) released from Reactor Building Units 1-4

<table>
<thead>
<tr>
<th>Date</th>
<th>Radiation Dose (mSv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 11, 2012 – Mar 15, 2013</td>
<td>0.03 mSv/year</td>
</tr>
</tbody>
</table>

II. Progress status by each plan

1. Reactor cooling plan

The cold shutdown condition will be maintained by cooling the reactor by water injection and measures to complement status monitoring will continue to be implemented.

- Reinstallation of supervisory instrumentation for Unit 2 PCV
  - Some of the supervisory instrumentation (thermometer and water-level gauge) for PCV could not be installed in the planned locations during the work in August 2013 due to interference with existing grating. The instrumentation was removed on May 27, 2014 and new instruments were reinstalled on June 5 and 6. The measurement during the installation confirmed that the water level inside the PCV was approx. 300mm, which is almost the same as the overflow height of the vent pipe (see Figure 1). Regarding the instrument reading, variation will be monitored for about one month to verify the validity.

- Replacement of the thermometer at the bottom of Unit 2 RPV
  - Removal and replacement of the thermometer installed at the bottom of RPV, which was broken in February 2014, failed in April and the operation was suspended. The estimated cause was fixing or added friction due to rust having formed. To help remove the thermometer, tests to check rust formation and fixing are underway (from May 12).

2. Accumulated water-treatment plan

To tackle the increase in accumulated water due to groundwater inflow, fundamental measures to prevent such inflow into the Reactor Buildings will be implemented, while improving the decontamination capability of water-treatment and preparing facilities to control the contaminated water.

- Preventing groundwater inflow to the Reactor Buildings
  - From April 9, the operation of 12 groundwater bypass pumping wells commenced sequentially and pumping of groundwater commenced. Release commenced from May 21 in the presence of officials from the Intergovernmental Liaison Office for the Decommissioning and Contaminated Water Issue of the Cabinet Office. As of June 26, 8,635 m^3 of groundwater had been released. The pumped up groundwater has been temporarily stored in tanks and released after TEPCO and the third-party organization (Japan Chemical Analysis Center) confirms that its quality meets operational targets.
  - The volume of pumped groundwater has been steadily increased to deliberately decrease the groundwater level.
  - As tritium exceeding the operation target was detected from the sampled water from the groundwater bypass pumping well No. 12 on May 26, water pumping from that well was suspended on May 27. From the assessment results on the temporary storage tank side based on monitoring results (including third-party analysis), it was confirmed that the tritium density would not exceed the operation target. Water pumping resumed on June 12.
  - To facilitate the installation of the sub-drain facility (by the end of September), drilling in 12 of 15 new pits was completed (as of June 26). To date, approx. 96,000 m^3 has been treated (as of June 24, including approx. 9,500 m^3 stored in J1(D) tank, which contained water with a high density of radioactive materials at the System B outlet).

- Operation of multi-nuclide removal equipment
  - Hot tests using radioactive water are underway (System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013). To date, approx. 96,000 m^3 has been treated (as of June 24, including approx. 9,500 m^3 stored in J1(D) tank, which contained water with a high density of radioactive materials at the System B outlet).
Regarding Systems A, as the calcium density at the absorption vessel outlet increased (to 11ppm) on May 17, the early detection of carbonate slurry outflow from the filter meant operation was suspended. After replacing with improved filters, operation resumed from June 9.

Regarding System B, after replacing with improved filters, the operation continued from May 23.

Regarding Systems C, as the calcium density at the absorption vessel outlet increased (to 6.2ppm) on May 20, the early detection of carbonate slurry outflow from the filter meant operation was suspended. After replacing with improved filters and inspecting to verify the effectiveness of anti-corrosion measures, corrosion was detected in previously unaffected areas. After implementing additional measures, the operation resumed from June 22.

To facilitate the installation of additional multi-nuclide removal equipment, foundation construction and steel frame building are underway. The attached electric equipment room building was completed (May 27). Installation of equipment commenced from June 21.

To facilitate the installation of high-performance multi-nuclide removal equipment, a subsidy project of the Ministry of Economy, Trade and Industry, ground improvement was completed on June 4. Drilling, foundation construction and preparation for equipment installation are underway. The attached electric equipment room building was completed (June 12).

Leakage from 4,000-ton notch tanks

- Leakage (gross β: 72,000Bq/L) was identified from near bolts on the upper side of some 4,000-ton notch tanks storing rainwater under the temporary release standard, which is accumulated inside the fences in the contaminated water tank area (June 2). The water level of the tanks was decreased to terminate the leakage (June 2). The estimated leakage volume from the tanks was 4.0m³. Approx. 4.0m³ of accumulated water inside the surrounding fences (gross β: 9,800Bq/L) was collected (June 3). Based on the radiation density inside the surrounding fences, it was estimated that 0.6m³ of water having leaked from the tanks was collected. For the range of water leakage outside the fences (approx. 5 × 40m), soil recovery was conducted (approx. 31m³).
  - It is estimated that rainwater ingress from the opening on the tank top steadily increased the water level of the tank, which consequently leaked from the bolt hole located 11cm below the tank top. Daily patrol commenced (from June 4). Countermeasures for rainwater ingress from the tank top opening were implemented (June 5).

Plan to install additional tanks

- In addition to the plan to increase the tank storage capacity to approx. 800,000 m³ by the end of FY2014, there are plans to install additional tanks of approx. 30,000 m³ by creating a new tank area.

Measures in Tank Areas

- In case accumulated water leaks from a tank, duplication of tank fences and painting inside the fences are underway (see Figure 2). There are plans to reroute the release channel from outside to inside the port (installation of one of two channels was completed on June 14) (see Figure 3).

Leakage from 4,000-ton notch tanks

The layout (approx. 80m) for implementing the ground improvement using improvement materials (apatite + zeolite + crushed stone) was decided (see Figure 4) as an additional and redundant measure to prevent outflow of radioactive strontium included in contaminated water of the tank at H4 Area, from which a leak was identified in August 2013, to the ocean. The ground improvement will be completed by the end of September.

Rainwater under the temporary release standard, which is accumulated inside the fences in the contaminated water tank area, was sprinkled on site after removing radioactive materials using rainwater treatment equipment since May 21 (as of June 23, a total of 1,707m³).

Treatment and removal of contaminated water from the Main Trenches

- As for the Main Trench Unit 2, treatment of contaminated water using mobile treatment equipment is underway (cesium: from November 14, 2013 to April 10, 2014, strontium: from April 10 to 25).
- As for the Main Trench Unit 3, removal of cesium in contaminated water using mobile treatment equipment is underway (November 15, 2013). It was confirmed that the density of radioactive cesium had declined.
- To facilitate the removal of contaminated water in the Main Trench Unit 2, water stoppage by freezing two connections between the trench and Reactor Building is scheduled. Regarding Vertical Shaft A, the freezing of all frozen pipes commenced from April 28. As the temperature did not decline sufficiently, additional frozen pipes were installed (two ducts were completed on June 4) and the water level in the building was adjusted to decrease the water flow rate around the frozen pipes. Injection of grout between the building and packer and freezing of the ground outside the trench are being examined. Regarding the other open-cut duct, installation of frozen pipes and temperature measurement ducts were completed (June 11) and the freezing operation by all frozen pipes commenced from June 13. Positional adjustment of the pump for pumping up contaminated water is underway.
- To facilitate the removal of contaminated water from the Main Trench Unit 3, water stoppage by freezing two connections between the trench and building is scheduled. Drilling of holes to install frozen pipes and temperature measurement ducts is underway (from May 5 and scheduled for completion in July).

Figure 2: Status of duplication of tank fences and painting inside the fences

Figure 3: Status of rerouting of release channel

Figure 4: Collection of strontium collection from the soil – Scope of ground improvement

Figure 5: Image of contaminated water treatment in main trench and frozen water stoppage
The density of radioactive materials in seawater within the port has been declining slightly.

The radioactive material density in seawater at the port entrance and outside has been maintained within the same range as previously.

In response to the progress in constructing impermeable walls on the sea side, placement of concrete in water and landfill are underway inside the impermeable walls. Alongside these works, sampling points inside the impermeable walls (“Between Unit 1 and 2 intakes” and “Between Unit 2 and 3 intakes”) were abolished and a new sampling point (“Unit 2 intake (in front of impermeable walls)”) was added (see Figure 8).

To prevent contamination spreading due to soil being stirred up from under the sea, covering over the sea bottom soil inside the port will commence from June 30. Composition tests for covering materials, hull outfitting and bathymetry are currently underway as preparation.

The Unit 1-3 release channels* were additionally investigated after contamination had been detected. As the densities of tritium and salt exceeded those on the upstream, the release channels may be affected by seawater or groundwater.

* Release channel: A channel for releasing seawater used for cooling during normal operation, where rainwater is currently mixed with existing seawater.
Work to help remove spent fuel from the pool is progressing steadily while ensuring seismic capacity and safety. The removal of spent fuel from the Unit 4 pool commenced on November 18, 2013 and efforts are being made to complete the process by around the end of 2014.

Fuel removal from the Unit 4 spent fuel pool
- Fuel removal from the spent fuel pool (SFP) commenced on November 18, 2013.
- As of June 26, 1144 of 1331 spent fuel assemblies and 22 of 202 non-irradiated fuel assemblies had been transferred to the common pool. More than 76% of the fuel removal was completed.
- For the annual inspection of overhead cranes of Unit 4 and the SFP, fuel removal will be suspended from July 1 to early September. During this period, racks for distorted/damaged fuel assemblies will be installed in the common pool.
- As some of the procurement of storage casks was prolonged, the common pool run out of space. The plan was therefore revised to include transferring new fuel assemblies (all remaining 180 fuel assemblies) in the Unit 4 spent fuel pool to Unit 6.

Main work to help remove spent fuel at Unit 3
- The removal of rubble inside the SFP was suspended due to failure of the brake for the crawler crane rotary (May 19). The brake for the rotary will be replaced during the annual inspection of the crawler crane (from June 16 to the end of July).
- Measures to reduce the radiation dose (decontamination and shielding) on the Reactor Building 5th floor (operating floor) have been underway since October 15, 2013. In some areas where planned decontamination was completed, the radiation dose was reduced to approx. 1/3. Given the large gap between the planned value (reduction to 1/100) and this actual value, additional decontamination and shielding measures are being examined.
- To facilitate fuel removal efforts inside the SFP, a new cover for fuel removal, fuel handling machine and transportation container will all be installed. The implementation plan to “prevent fuel drop and the occurrence of criticality,” “monitor radioactivity,” “transportation container” and “structure strength and quake resistance of fuel handling machine” was submitted (June 25).

Main works to help remove spent fuel at Unit 1
- To help remove rubble from the Reactor Building 5th floor (operating floor) prior to fuel removal, dismantling of the building cover will commence. When dismantling the building cover and removing rubble, sufficient measures to reduce radioactive materials will be implemented along with monitoring of radioactive materials.

Fuel debris removal plan
In addition to decontamination and shield installation to improve PCV accessibility, technology was developed and data gathered as required to prepare to remove fuel debris (such as investigating and repairing PCV leak locations)

Contamination status survey and decontamination of Reactor Building Units 1 to 3
- To examine methods to reduce the radiation dose on the 2nd and 3rd floors of the Reactor Building Units 1 to 3, measurement of the radiation dose rates and investigation using gamma cameras with remote-control robots are underway on the 2nd and 3rd floors of Units 1 and 2, and the 2nd floor of Unit 3. (Unit 1: from April 28 to May 22, Unit 2: from May 28 to June 11, Unit 3: measurement unavailable due to rubble on the steps).
- To investigate areas significantly contributing to radiation dose rates (hot spots) on the 1st floor of the Reactor Building Units 1 to 3, an investigation using gamma cameras mounted on the remote-control robot is underway in the upper areas of the relevant floors. (Unit 1: May 9-29, June 13 and 14, Unit 2: June 19 and 20, Unit 3: June 4-10, from June 24 and scheduled for completion on July 2)

Investigation of Unit 1 Suppression Chamber (S/C) upper part
- To check for any leakage from the structure around the upper part of the point where water flow outside S/C was detected when investigating using a surface boat in November 2013, the leak points of the upper part of S/C were investigated from the outer catwalk (passage for investigation) of the upper part of the S/C where the demonstration of the S/C upper part investigative equipment and the torus room wall investigative equipment being developed in the subsidy project of the Ministry of Economy, Trade and Industry “Investigation and development of repair (water-stoppage) technology to facilitate water filling of primary containment vessels” is underway (May 27, 29 and June 10). However, the investigative scope revealed no leakage except from the expansion joint cover of the vacuum break line identified on May 27. An insulation plate dropped on the catwalk was detected. The radiation dose on the catwalk is approx. 200 – 2400 mSv/h.

Management status of rubble and trimmed trees
- As of the end of May, the total storage volume of concrete and metal rubble was approx. 103,500m³ (-1,800m³ compared to the end of April, area occupation rate: 78%). The total storage volume of trimmed trees was approx. 76,500m³ (-5,400m³ compared to the end of April, area occupation rate: 55%). The decrease in rubble was mainly attributable to removing things stored in the area and construction when installing frozen impermeable walls.
The increase in trimmed trees was mainly attributable to construction related to installing additional multi-nuclide removal equipment and tanks.

- **Management status of secondary waste from water treatment**
  - As of June 24, the total storage volume of waste sludge was 597 m³ (area occupation rate: 85%). The total number of stored spent vessels and high-integrity containers (HIC) of multi-nuclide removable equipment was 973 (area occupation rate: 38%).

**Plan for staffing and ensuring work safety**

Securing appropriate staff long-term while thoroughly implementing workers’ exposure dose control. Improving the work environment and labor conditions continuously based on an understanding of workers’ on-site needs

- **Staff management**
  - The monthly average number of people registered for at least one day per month to work on site during the past quarter from February to April was approx. 10,400 (TEPCO and partner company workers), which exceeds the monthly average number of workers (approx. 8,000). Accordingly, sufficient people are registered to work on site.
  - It was confirmed with the prime contractors that the estimated manpower necessary for the work in July (approx. 5,080 per day: TEPCO and partner company workers) would be secured at present. The average numbers of workers per day for each month of last fiscal year (actual value) were maintained with approx. 3,000 to 5,000 per month since August (See Figure 11). *Workers with whom contract procedures had not yet been completed were excluded from the total for each month.
  - As of May, the local employment ratio (TEPCO and partner company workers) was approx. 50%.

![Figure 11: Changes in the average number of workers per day for each month since fiscal 2013 (actual values)](image)

- The average exposure dose of workers was maintained at approx. 1mSv/month by implementing measures to reduce exposure dose for each work and relocation of workers based on the dose forecast. (Reference: annual average exposure dose 20mSv/year≒1.7mSv/month)
  - Regarding most workers, the exposure dose is sufficiently within the dose limit and at a level which allows them to continue engaging in radiation work.

![Figure 12: Change of monthly individual worker exposure dose (monthly average dose) (monthly average exposure dose since March 2011)](image)

- Efforts to improve the labor environment
  - The 1st phase construction of the Temporary Administration Office Building will be completed on June 30. Approx. 400 staff members, including those of TEPCO’s water treatment related sections, working at Fukushima Daini Nuclear Power Station, will transfer within July.

- **Outbreak status of heat stroke**
  - This fiscal year, a total of five workers got heat stroke as of June 26, including one attributable to work and potential patients. Continued measures will be taken to prevent heat stroke. (Last year, no worker got heat stroke as of June end with no patient or potential patient attributable to work)

**8. Others**

- Results of assessment of candidate sites to locate Radioactive Material Analysis and Research Facility (report)
  - Based on the “basic concept of the Radioactive Material Analysis and Research Facility and technical requirements for location” approved at the Council for the Decommissioning of TEPCO’s Fukushima Daiichi Nuclear Power Station (the 6th meeting) held in November 14, 2013, the Japan Atomic Energy Agency, which is the organization constructing and operating the facilities, assessed the candidate sites, and submitted a report to the Minister of Economy, Trade and Industry, which chairs the Team for Countermeasures for Decommissioning and Contaminated Water Treatment (June 27).

- The 3rd meeting of the Fukushima Advisory Board on Decommissioning and Contaminated Water Management
  - On June 9, the 3rd meeting (in Fukushima City) was held, where the newsletter from the on-site office created based on the feedback to date to show the efforts to provide information on Fukushima Daiichi Nuclear Power Station and views from the fields was introduced. Valuable opinions were also delivered to improve the provision of information.

- Implementers of projects for contaminated water treatment (METI FY2013 supplementary budget) were decided
  - Public offerings was made for (1) seawater purification technology verification project, (2) soil radioactive materials collection technology verification project, (3) contaminated water storage tank decontamination technology verification project and (4) unmanned boring technology verification project (offering period: March 24 - May 19, 2014).
  - Through screening by the review board comprising exerts within and outside Japan, a total of 11 proposals were adopted on June 19 (three of which were related to overseas companies).

- Public offering for the decommissioning project (METI FY2013 supplementary budget) started
  - Based on 194 items of technological information provided in January 2014, public offering started for the project to examine the concept for the method (alternative) to remove fuel debris in the air without filling the Reactor Buildings with water and the feasibility of element technology necessary for the alternative method (June 27).
### Status of seawater monitoring within the port

(Comparison between the highest values in 2013 and the latest values)

"The highest value → the latest value (sampled during June 16-23);
unit (Bq/L); ND represents a value below the detection limit.

#### Source:
TEPCO website
Analysis results on nuclides of radioactive materials around Fukushima Daiichi Nuclear Power Station

#### Summary of TEPCO data as of June 26

<table>
<thead>
<tr>
<th>Location</th>
<th>Cesium-134</th>
<th>Cesium-137</th>
<th>Gross β</th>
<th>Tritium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port entrance</td>
<td>3.3 (2013/10/17) → ND (1.1)</td>
<td>9.0 (2013/10/17) → ND (1.0)</td>
<td>74 (2013/ 8/19) → ND (16)</td>
<td>67 (2013/ 8/19) → 3.9</td>
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<tr>
<td>South side in the port</td>
<td>4.4 (2013/12/24) → ND (1.2)</td>
<td>10 (2013/12/24) → ND (1.4)</td>
<td>60 (2013/ 7/ 4) → ND (16)</td>
<td>59 (2013/ 8/19) → 3.7</td>
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<tr>
<td>West side in the port</td>
<td>5.0 (2013/12/ 2) → ND (1.3)</td>
<td>8.4 (2013/12/ 2) → ND (0.92)</td>
<td>69 (2013/ 8/19) → ND (16)</td>
<td>52 (2013/ 8/19) → 12</td>
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<tr>
<td>In front of shallow draft quay</td>
<td>2.8 (2013/12/ 2) → ND (2.0)</td>
<td>5.8 (2013/12/ 2) → ND (1.8)</td>
<td>46 (2013/ 8/19) → ND (19)</td>
<td>24 (2013/ 8/19) → 4.8</td>
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<td>In front of Unit 6 intake</td>
<td>3.3 (2013/12/24) → ND (0.81)</td>
<td>7.3 (2013/10/11) → ND (1.4)</td>
<td>69 (2013/ 8/19) → ND (16)</td>
<td>68 (2013/ 8/19) → ND (1.7)</td>
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<td>East side in the port</td>
<td>3.5 (2013/10/17) → ND (1.3)</td>
<td>7.8 (2013/10/17) → ND (1.0)</td>
<td>79 (2013/ 8/19) → ND (16)</td>
<td>60 (2013/ 8/19) → ND (1.7)</td>
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<td>North side in the port</td>
<td>5.3 (2013/10/11) → 7.5</td>
<td>73 (2013/10/11) → 18</td>
<td>320 (2013/ 8/12) → ND (19)</td>
<td>510 (2013/ 9/ 2) → ND (110)</td>
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<td>South side in the port</td>
<td>89 (2013/10/10) → 14</td>
<td>190 (2013/10/10) → 41</td>
<td>1,400 (2013/11/ 7) → 200</td>
<td>4,800 (2013/11/ 7) → 630</td>
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<td>Sea side impermeable wall</td>
<td>Below 1/3</td>
<td>Below 1/7</td>
<td>Below 1/4</td>
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<td>Silt fence</td>
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<td>Unit 5</td>
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<tr>
<td>North side in the port</td>
<td>5.3 (2013/ 8/ 5) → ND (1.9)</td>
<td>8.6 (2013/ 8/ 5) → 2.3</td>
<td>40 (2013/ 7/ 3) → ND (19)</td>
<td>340 (2013/ 6/26) → ND (1.9)</td>
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#### Legal discharge limit

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<th>Nuclide</th>
<th>Limit</th>
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<td>Tritium</td>
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</table>

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Appendix 1

Text content is not directly transcribed here.
### Status of seawater monitoring around outside of the port

**Comparison between the highest values in 2013 and the latest values**

Unit (Bq/L); ND represents a value below the detection limit; values in ( ) represent the detection limit; ND (2013) represents ND throughout 2013

#### (The latest values sampled during June 17-24)

<table>
<thead>
<tr>
<th>Nuclide</th>
<th>ND (2013) → ND</th>
<th>Cesium-134:</th>
<th>Cesium-137:</th>
<th>Gross β:</th>
<th>Tritium:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ND (0.62)</td>
<td>ND (0.58)</td>
<td>ND (17)</td>
<td>ND (1.9)</td>
</tr>
<tr>
<td>Cesium-134:</td>
<td></td>
<td>ND (1.6)</td>
<td>ND (1.10)</td>
<td>ND (17)</td>
<td>ND (1.9)</td>
</tr>
<tr>
<td>Cesium-137:</td>
<td></td>
<td>ND (1.6)</td>
<td>ND (1.10)</td>
<td>ND (17)</td>
<td>ND (1.9)</td>
</tr>
<tr>
<td>Gross β:</td>
<td></td>
<td>ND (6.4)</td>
<td>ND (6.0)</td>
<td>ND (17)</td>
<td>ND (1.9)</td>
</tr>
<tr>
<td>Tritium:</td>
<td></td>
<td>ND (4.7)</td>
<td>ND (4.0)</td>
<td>ND (17)</td>
<td>ND (1.9)</td>
</tr>
</tbody>
</table>

#### Summary of TEPCO data as of June 26

**Source:** TEPCO website, Analysis results on nuclides of radioactive materials around Fukushima Daiichi Nuclear Power Station, [http://www.tepco.co.jp/nu/fukushima-np/f1/smp/index-j.html](http://www.tepco.co.jp/nu/fukushima-np/f1/smp/index-j.html)
### Status of efforts on various plans (Part 1)

#### Reactor cooling plan

<table>
<thead>
<tr>
<th>Challenges</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance and monitoring of the cold shutdown condition of nuclear reactor (by continuous monitoring on the continuation of water injection and parameters including temperature etc., preservation and improvement of reliability through maintenance and management)</td>
<td>Unit 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrowing-down of candidate systems for inserting alternative thermometer in Unit 1 RPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review on the method for inserting alternative thermometer in Unit 1 RPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation of thermometer in Unit 2 RPV (including inspection in nuclear reactor)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrowing-down of candidate systems for inserting alternative thermometer in Unit 3 RPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review on the method for inserting alternative thermometer in Unit 3 RPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial observation of the PCV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote visual check of the PCV, direct measurement/evaluation of temperature etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvement of the reliability of the circulating water injection cooling system (water intake from the turbine building) (Review/implement measures to strengthen some materials for pipes, etc./improve earthquake resistance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water source: Treated water buffer tank</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water source: Condensate water storage tank for Units 1 to 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reliability improvement measures for the lines taking water supplies from the condensate water storage tanks of Units 1 to 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review on water take from reactor building (or from the bottom of the PCV) - Construction work</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection/review for early construction of the circulation loop in the building</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction of circulation loop in the building (for Units 1 to 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Unit 1

- Review on fuel removing method
- Dismantling of building cover
- Pool circulation cooling (preservation/improvement of reliability by maintenance management and facility update etc.)

#### Unit 2

- Consideration/preparation for the decontamination and shielding in the building
- Pool circulation cooling (preservation/improvement of reliability by maintenance management and facility update etc.)

#### Unit 3

- Preparatory work/debris removing work
- Removal of debris, decontamination and shielding
- Design and manufacturing of fuel removal cover
- Design and manufacturing of crane/fuel handling machines
- Consideration, design and manufacturing of on-site shipping containers
- Pool circulation cooling (preservation/improvement of reliability by maintenance management and facility update etc.)

#### Unit 4

- Construction of fuel removal cover.Installation of fuel handling equipment
- Fuel removal
- Pool circulation cooling (preservation/improvement of reliability by maintenance management and facility update etc.)
- Removal of debris in the pool/fuel check etc.
### Status of efforts on various plans (Part 2)

#### Fuel debris removal plan

<table>
<thead>
<tr>
<th>Challenges</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decontamination of the building</td>
<td>Review on decontamination technology/development of remote decontamination equipment</td>
<td>Development of remote contamination investigation technologies (1)</td>
<td>Development of remote decontamination technologies (1)</td>
<td>Decontamination, shielding, etc. in the building (Work environment improvement (1))</td>
</tr>
<tr>
<td>Measures to reduce overall dose</td>
<td>Formulation of a comprehensive plan for exposure reduction</td>
<td>First floor of the reactor building</td>
<td>To be continued</td>
<td></td>
</tr>
<tr>
<td>Inspection/repair of leaking locations of the PCV</td>
<td>R&amp;D for inspection/repair of leaking locations of the PCV (including slip leakage between buildings)</td>
<td>Design, manufacturing and testing etc. of equipment for inspecting the PCV (2)</td>
<td>Design, manufacturing and testing etc. of equipment for inspecting the PCV (3, 6)</td>
<td>Formulation of work plan on the floor with damage from explosion</td>
</tr>
<tr>
<td>Fuel debris removal</td>
<td>R&amp;D toward the removal of fuel debris (to be continued to address long-term challenges including internal R&amp;D of equipment etc.)</td>
<td>Design, manufacturing and testing etc. of equipment for inspecting the inside of the PCV (5)</td>
<td>Design, manufacturing and testing etc. of equipment for inspecting the inside of the PCV (5)</td>
<td>Inspection from outside the PCV (including on-site demonstration of development results)</td>
</tr>
<tr>
<td>Stable storage, processing/disposal of fuel debris after removal</td>
<td>Development of storage cans (surveys on existing technologies, review on storage systems/development of safety evaluation technique etc.)</td>
<td>Research on development of mock-up processing/disposal technologies</td>
<td>Establishment of nuclear material accountability and control measures for the fuel debris</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Development of criticality evaluation and detection technologies</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Objective:** Establish decontamination robot technology

**Units 1 and 3**
- Inspection of the basement of the nuclear reactor building
- Inspection of leaking locations
- First floor of the reactor building

**Unit 2**
- Inspection of the basement of the nuclear reactor building
- Inspection of leaking locations

☆ Including on-site demonstration

---

As of June 27, 2014

![Diagram showing status of efforts on various plans](image-url)
### Status of efforts on various plans (Part 3)

<table>
<thead>
<tr>
<th>Challenges</th>
<th>The Phase 1 (no later than 2 years after the completion of the current efforts)</th>
<th>The Phase 2 (Early period)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2012</strong></td>
<td><strong>2013</strong></td>
<td><strong>2014</strong></td>
</tr>
<tr>
<td>Retained water treatment plan</td>
<td><em>Objective: Implement the measures to improve the reliability of the current facilities</em></td>
<td><em>Objective: Retain water by water treatment facilities with improved reliability</em></td>
</tr>
<tr>
<td>Retained water treatment plan</td>
<td><em>Objective: Implement the measures to improve the reliability of the current facilities</em></td>
<td><em>Objective: Retain water by water treatment facilities with improved reliability</em></td>
</tr>
</tbody>
</table>

#### Plan for preventing the spread of marine pollution

- **2012**: Plan for maintaining and continuing the steady state of plant.
- **2013**: Plan for preventing the spread of marine pollution.
- **2014**: Plan for maintaining and continuing the steady state of plant.

#### Plan for maintaining and continuing the steady state of plant

- **2012**: Plan for maintaining and continuing the steady state of plant.
- **2013**: Plan for maintaining and continuing the steady state of plant.
- **2014**: Plan for maintaining and continuing the steady state of plant.

### As of June 27, 2014

#### Retained water treatment plan

- **2012**: Retained water treatment by means of existing treatment facilities.
- **2013**: Improvement of the reliability of the current facilities.
- **2014**: Replacement of branch pipe pressure hoses with PE pipes.

#### Retained water treatment plan

- **2012**: Retained water treatment by means of existing treatment facilities.
- **2013**: Improvement of the reliability of the current facilities.
- **2014**: Replacement of branch pipe pressure hoses with PE pipes.

### 2015

#### Challenges

- **2013-2014**: Plan for maintaining and continuing the steady state of plant.
- **2015**: Plan for maintaining and continuing the steady state of plant.

### Conclusion

- **2012**: Implementation of measures to improve the reliability of the current facilities.
- **2013**: Improvement of the reliability of the current facilities, etc.
- **2014**: Replacement of branch pipe pressure hoses with PE pipes.

---

*Objective: Reduction of the risk of spreading marine contamination during the leakage of contaminated water.*

*Objective: Reduction of radioactive substances contained in the seawater of the harbor (to less than the notified concentration).*

*Objective: Control the radiation dose at the site boundaries caused by radioactive substances etc. additionally released from the entire power plant at 1 mSv/year or less.*

*Objective: Reduction to average 5 Sβ/hr in the South side area on site except for around Units 1-4.*

---

**Main processes**

- Field work
- Sub-main processes
- R&D
- Review

**Plan until last month**

- Green frame: Change from last month
- Field work
- Sub-main processes
- R&D
- Review

**Plan until last month**

- Green frame: Change from last month
- Field work
- Sub-main processes
- R&D
- Review

**Plan until last month**

- Green frame: Change from last month
- Field work
- Sub-main processes
- R&D
- Review
### Status of efforts on various plans (Part 4)

<table>
<thead>
<tr>
<th>Challenges</th>
<th>The Phase 1 (no later than 2 years after the completion of the current efforts)</th>
<th>The Phase 2 (Early period)</th>
<th>As of June 27, 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cask for both transport and storage</td>
<td>Cask manufacturing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry storage cask</td>
<td>Cask manufacturing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harbor</td>
<td>Cask manufacturing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common pool</td>
<td>Inspection of checking dry storage casks (9 pieces)</td>
<td>Retrieval of fuel from the common pool</td>
<td></td>
</tr>
<tr>
<td>Temporary cask storage facility</td>
<td>Design and manufacturing of damaged fuel racks</td>
<td>Storage of fuel retrieved from spent fuel pool (storage and management).</td>
<td></td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Evaluation of long-term integrity of fuel retrieved from spent fuel pool</td>
<td>Examination of the processing method of damaged fuel etc. retrieved from spent fuel pool</td>
<td></td>
</tr>
<tr>
<td>Installation of reactor building</td>
<td>Development of evaluation technology for integrity against corrosion of RPV/PCV</td>
<td>Improvement of waste reducing management policy</td>
<td></td>
</tr>
<tr>
<td>Preservation of the integrity of RPV/PCV</td>
<td>Corrosion protection (Reduction in dissolved oxygen contained in reactor cooling water by means of nitrogen bubbling)</td>
<td>Improvement of waste storage management policy</td>
<td></td>
</tr>
<tr>
<td>Storage and management plans for solid wastes</td>
<td>Establishment of storage facility</td>
<td>Improvement of waste reducing management policy</td>
<td></td>
</tr>
<tr>
<td>Processing/disposal plans for solid wastes</td>
<td>Design and manufacturing of incineration plants for miscellaneous solid wastes</td>
<td>Improvement of waste reducing management policy</td>
<td></td>
</tr>
<tr>
<td>Decommissioning plans for reactor facilities</td>
<td>Establishment of drum storage facility</td>
<td>Improvement of waste reducing management policy</td>
<td></td>
</tr>
<tr>
<td>Implementation system and personal procurement plan</td>
<td>Systematic cultivation/deployment of personnel, including the cooperative companies, and implementation of measures to stimulate motivation etc.</td>
<td>Establishment of decommissioning scenarios</td>
<td></td>
</tr>
<tr>
<td>Plan to ensure the safety of work</td>
<td>Continuation of safety activities, maintenance and enhancement of radiation management, continuous assurance of medical services, etc.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Key Points:
- **Cask manufacturing**: Development and production activities.
- **Dry storage cask**: Inspection and maintenance of existing casks.
- **Common pool**: Retrieval and storage of fuel.
- **Temporary cask storage facility**: Design and acceptance of interim storage casks.
- **R&D**: Evaluation and development of technologies.
- **Installation of reactor building**: Development of evaluation technology.
- **Preservation of the integrity of RPV/PCV**: Corrosion protection measures.
- **Storage and management plans for solid wastes**: Design and installation of incineration plants.
- **Processing/disposal plans for solid wastes**: Development of waste disposal plans.
- **Decommissioning plans for reactor facilities**: Development of decommissioning scenarios.
- **Implementation system and personal procurement plan**: Systematic deployment of personnel.
- **Plan to ensure the safety of work**: Continuation of safety assurance and radiation management activities.
Progress toward decommissioning: Fuel removal from the spent fuel pool (SFP)

Unit 4
Commence fuel removal from the Spent Fuel Pool (Unit 4, November 2013)

In the Mid- and Long-Term Roadmap, the target of Phase 1 involved commencing fuel removal from inside the spent fuel pool (SFP) of the 1st Unit within two years of completion of Step 2 (by December 2013). On November 18, 2013, fuel removal from Unit 4, or the 1st Unit, commenced and Phase 2 of the roadmap started. As of June 28, 1,144/1,331 of spent fuel assemblies and 22/222 new fuel assemblies had been transferred to the common pool. To date, 76% of removal has been completed. Due to annual inspection of the overhead cranes for Unit 4 and the common pool, fuel removal will be suspended from July 1 to early September. There is no change in the scheduled removal completion within 2014.

Since the procurement of storage casks was partially prolonged, the common pool run out of space. The plan was changed to transferring new fuel assemblies (all remaining 180 fuel assemblies) in the Unit 4 spent fuel pool to Unit 6.

Immediate target
Commence fuel removal from the Spent Fuel Pool (Unit 4, November 2013)

Work is proceeding with appropriate risk countermeasures, careful checks and safety first

Steps toward fuel removal

1. Removal of rubble from the roof of the Reactor Building
2. Installation of cover for fuel removal
3. Removal of fuel from the Unit 4 spent fuel pool began to be received (November 2013)

Units 1 and 2

Regarding Unit 1, to remove rubble from the top of the operating floor, there are plans to dismantle the cover over the Reactor Building as planned. Prior to dismantling, the ventilation system of the cover was suspended (September 17, 2013). Dismantling of the R/B cover will start from early July, 2014. When dismantling the cover and removing rubble, enough measures will be taken to control scattering of radioactive materials, along with monitoring of these materials.

- Regarding Unit 2, based on the progress of decontamination and shielding within the Reactor Building, the facilities will be inspected and a concrete plan examined and prepared.

Check of the soundness of the Reactor Building
Since May 2012, regular quarterly inspections have been conducted, which have confirmed that the soundness of the Reactor Building has been maintained.

- Check for tilt (measurement of the water level)
- Check for tilt (measurement of the external wall)

Commence fuel removal from the Spent Fuel Pool (November 2013)

Check of the soundness of the Reactor Building
Since May 2012, regular quarterly inspections have been conducted, which have confirmed that the soundness of the Reactor Building has been maintained.

- Check for tilt (measurement of the water level)
- Check for tilt (measurement of the external wall)

Measure to reduce release

(Glossary)
- (1) Operating floor: During regular inspection, the roof over the reactor is opened while on the operating floor, fuel inside the core is replaced and the core internals are inspected.
- (2) Equipment hatch: A through-hole used to carry equipment in and out of the PCV.
- (3) Cask: Transportation container for samples and equipment, including radioactive materials.
**Progress toward decommissioning: Works to identify the plant status and toward fuel debris removal**

**Immediate target**
Identify the plant status and commence R&D and decontamination toward fuel debris removal

---

**Demonstration of decontamination equipment**

1. **Demonstration of suction and blast decontamination equipment**
   - Demonstration was conducted on the 1st floor of Unit 1 Reactor Building (from January 30 to February 4). The result showed that the β-ray dose rate was reduced by removing dust through aspiration decontamination and the coated surface was shaved by the subsequent blast decontamination.

2. **Dry ice-blast decontamination equipment**
   - A demonstration was conducted on the 1st floor of the Unit 2 Reactor Building (from April 15-21). The result showed that the surface was shaved by the subsequent blast decontamination.

3. **High-pressure water decontamination equipment**
   - A demonstration was conducted on the 1st floor of Unit 1 Reactor Building (from April 23-29). The result showed that water flow was confirmed from above the vent pipe (1) and from the S/C side surface.

**Investigation in the leak point detected in the upper part of Unit 1 Suppression Chamber (S/C)**

- Investigation in the leak point detected in the upper part of Unit 1 S/C from May 27 from one expansion joint cover among the lines installed there. As no leakage was identified from other parts, specific methods will be examined to halt the flow of water and repair the PCV.

---

**Status of equipment development toward investigating inside the PCV**

Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigation inside the PCV is scheduled. For Unit 1, where fuel debris may spread outside the pedestal, an investigation of the external side will commence.

**[Investigative outline]**
- Inserting equipment from Unit 1 X-100B penetration (*5) to investigate in clockwise and counter-clockwise directions.

**[Status of investigation equipment development]**
- Crawler-type equipment with a shape-changing structure which allows it to enter the PCV from the narrow access entrance (bore: φ100mm) and stably move on the grating is currently under development. A field demonstration is scheduled for the 2nd half of FY2014.
Progress toward decommissioning: Works to identify the plant status and toward fuel debris removal

**Immediate target**

**Identify the plant status and commence R&D and decontamination toward fuel debris removal**

**Works to identify the plant status and toward fuel debris removal**

- Identify the plant status and commence R&D and decontamination toward fuel debris removal (target: 3/6)

**Investigation of the contamination status of the Reactor Building 5th floor**

- To investigate the contamination status of the Reactor Building 5th floor, investigative equipment (gamma camera, radiation dose gauge, optical camera) will be suspended through holes drilled in the building roof. In addition, core samples on the 5th floor are collected using a remote-control robot.
- To ensure the operation route of the robot used to collect floor core samples, fences on the operating floor are suspended. To facilitate removal, tests to check rust formation and fixing are underway (from May 13).

**Investigative outline**

- Inserting the equipment from Unit 2 X-6 penetration and accessing inside the pedestal using the CRD rail to conduct investigation.

**Status of investigative equipment development**

- Based on issues confirmed by the CRD rail status investigation conducted in August 2013, the investigation method and equipment design are being examined. A demonstration is scheduled for FY2014.

**Status of equipment development toward investigating inside the PCV**

Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigations inside the PCV are scheduled. For Unit 2, where fuel debris is unlikely to have spread outside the pedestal, the focus will be placed on investigating the inside.

**Investigative issues inside the PCV and equipment configuration (draft plan)**

- Temperature inside the PCV: approx. 34°C
- Temperature at the triangular corner: 30.2-32.1°C (measured on June 28, 2012)
- Water level at the triangular corner: OP3,050-3,190 (measured on June 28, 2012)
- Temperature inside the Probe press structure: approx. 50°C
- PCV hydrogen concentration: System A: 0.05vol%, System B: 0.04vol%
- Nitrogen injection flow rate into the PCV: 15.41Nm³/h
- Temperature of the RPV bottom: approx. 34°C
- Temperature inside the PCV: approx. 34°C
- Water level inside the PCV: approx. 300mm
- Water level at the triangular corner: OP3,050-3,190 (measured on June 28, 2012)

**Glossary**

- SFP: Temperature: 24°C
- SFP temperature: 24°C
- Water level inside the PCV: approx. 300mm
- PCV bottom + approx. 300mm
- Water level of the torus room: approx. OP3,270 (measured on June 6, 2012)
- Water level of the Turbine Building: OP2,830
- Reactor Building
- Reactor feed water system: 1.7m³/h
- Core spray system: 2.5m³/h
- Temperature of the RPV bottom: approx. 34°C
- Nitrogen injection flow rate into the PCV: 15.41Nm³/h
- Temperature inside the PCV: approx. 34°C
- Water level inside the PCV: approx. 300mm
- Water level at the triangular corner: OP3,050-3,190 (measured on June 28, 2012)
- Temperature at the triangular corner: 30.2-32.1°C (measured on June 28, 2012)

* Indices related to plant are values as of 11:00, June 26, 2014

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**Installation of an RPV thermometer and permanent PCV supervisory instrumentation**

(1) Replacement of the RPV thermometer

- As the thermometer installed at the Unit 2 RPV bottom after the earthquake had broken, it was excluded from the monitoring thermometers (February 19).
- On April 17, removal of the broken thermometer failed and was suspended. To facilitate removal, tests to check rust formation and fixing are underway (from May 12).
- The instrumentation was removed on May 27, 2014 and new instruments were reinstalled on June 5 and 6. The trend of added instrumentation will be monitored for approx. one month to evaluate its validity.

(2) Reinstallation of the PCV thermometer and water-level gauge

- Some of the permanent supervisory instrumentation for PCV could not be installed in the planned locations due to interference with existing grating (August 13, 2013).
- The instrumentation was removed on May 27, 2014 and new instruments were reinstalled on June 5 and 6. The trend of added instrumentation will be monitored for approx. one month to evaluate its validity.

**Status of remote-control robot falling down**

- Status of remote-control robot falling down

---

**Unit 2**

- Air dose rate inside the Reactor Building: Max. 4,400mSv/h (1F southeast area, upper penetration surface) (measured on November 16, 2011)
- SFP temperature: 24°C
- Water level inside the PCV: approx. 300mm
- Water level at the triangular corner: OP3,050-3,190 (measured on June 28, 2012)
- Temperature at the triangular corner: 30.2-32.1°C (measured on June 28, 2012)
- Water level of the Turbine Building: OP2,830

---

**Investigation of the contamination status of the Reactor Building 5th floor**

- To investigate the contamination status of the Reactor Building 5th floor, investigative equipment (gamma camera, radiation dose gauge, optical camera) will be suspended through holes drilled in the building roof. In addition, core samples on the 5th floor are collected using a remote-control robot.
- To ensure the operation route of the robot used to collect floor core samples, fences on the operating floor are suspended. To facilitate removal, tests to check rust formation and fixing are underway (from May 13).

**Status of remote-control robot falling down**

- Status of remote-control robot falling down

---

**Status of equipment development toward investigating inside the PCV**

Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigations inside the PCV are scheduled. For Unit 2, where fuel debris is unlikely to have spread outside the pedestal, the focus will be placed on investigating the inside.

**Investigative outline**

- Inserting the equipment from Unit 2 X-6 penetration and accessing inside the pedestal using the CRD rail to conduct investigation.

**Status of investigative equipment development**

- Based on issues confirmed by the CRD rail status investigation conducted in August 2013, the investigation method and equipment design are currently being examined. A demonstration is scheduled in the field in the 2nd half of FY2014.

**Investigative issues inside the PCV and equipment configuration (draft plan)**

- Temperature inside the PCV: approx. 34°C
- Temperature at the triangular corner: 30.2-32.1°C (measured on June 28, 2012)
- Water level at the triangular corner: OP3,050-3,190 (measured on June 28, 2012)
- Temperature inside the Probe press structure: approx. 50°C
- PCV hydrogen concentration: System A: 0.05vol%, System B: 0.04vol%
- Nitrogen injection flow rate into the PCV: 15.41Nm³/h
- Temperature inside the PCV: approx. 34°C
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- Temperature at the triangular corner: 30.2-32.1°C (measured on June 28, 2012)

---

**Glossary**

- SFP: Temperature: 24°C
- SFP temperature: 24°C
- Water level inside the PCV: approx. 300mm
- PCV bottom + approx. 300mm
- Water level of the torus room: approx. OP3,270 (measured on June 6, 2012)
- Water level of the Turbine Building: OP2,830

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**June 27, 2014**

**Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment**

**Page 6**
Progress toward decommissioning: Works to identify the plant status and toward fuel debris removal

**Immediate target**
Identify the plant status and commence R&D and decontamination toward fuel debris removal

Water flow was detected from the Main Steam Isolation Valve* room

On January 18, a flow of water from around the door of the Steam Isolation Valve room in the Reactor Building Unit 3 1st floor northeast area to the nearby floor drain funnel (drain outlet) was detected. As the drain outlet connects with the underground part of the Reactor Building, there is no possibility of outflow from the building.

From April 23, image data has been acquired by camera and the radiation dose measured via pipes for measurement instrumentation, which connect the air-conditioning room on the Reactor Building 2nd floor with the Main Steam Isolation Valve Room on the 1st floor. On May 15, water flow from the expansion joint of one Main Steam Line was detected.

This is the first leak from PCV detected in Unit 3. Based on the images collected in this investigation, the leak volume will be estimated and the need for additional investigations will be examined. The investigative results will also be utilized to examine water stoppage and PCV repair methods.

* Main Steam Isolation Valve: A valve to shut off the steam generated from the Reactor in an emergency

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**Decontamination inside R/B**

- The contamination status inside the Reactor Building (R/B) was investigated by a robot (June 11-15, 2012).
- To select an optimal decontamination method, decontamination samples were collected (June 29 to July 3, 2012).
- To facilitate decontamination inside the Reactor Building, removal of obstacles on the 1st floor was conducted (from November 18, 2013 to March 20, 2014).

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**Status of equipment development toward investigating inside the PCV**

Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigation inside the PCV is scheduled. For Unit 3, where there is little possibility of fuel debris spreading outside the pedestal, the focus will be placed on investigating the inside. As the water level inside the PCV is high and the penetration scheduled for use in Units 1 and 2 may decline in the water, another method needs to be examined.

**Steps for investigation and equipment development**

1. **Investigation from X-53 penetration**
   - Following decontamination, a field investigation is scheduled in the areas around X-53 penetration to determine the plan for conducting the inside investigation and equipment specifications.

2. **Investigation plan following the investigation of X-53 penetration**
   - Based on the measurement values of hydraulic head pressure inside the PCV, X-6 penetration may decline. It is estimated that access to X-6 penetration is difficult.
   - For access from another penetration, approaches such as “further downsizing the equipment” or “moving in water to access the pedestal” are necessary and will be examined.

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**Glossary**

1. SFP (Spent Fuel Pool)
2. RPV (Reactor Pressure Vessel)
3. PCV (Primary Containment Vessel)
4. TIP (Traversing Incore Probe System)
Progress toward decommissioning: Work related to circulation cooling and accumulated water treatment line

**Immediate target:**
Stably continue reactor cooling and accumulated water treatment, and improve reliability

Work to improve the reliability of the circulation water injection system and pipes to transfer accumulated water:
- Operation of the reactor water injection system using Unit 3 CST as a water source commenced (from July 5, 2013). Compared to the previous systems, in addition to the shortened outdoor line, the reliability of the reactor water injection system was enhanced, e.g. by increasing the amount of water-source storage and enhancing durability.
- By newly installing RO equipment inside the Reactor Building by the end of FY2014, the reliability of the reactor water injection loop (circulation loop) will be shortened from approx. 3km to approx. 0.8km.
- The entire length of contaminated water transfer pipes is approx. 2.1km, including the transfer line of surplus water to the upper heights (approx. 1.3km).

### Measures in Tank Areas
- In case accumulated water leaks from Tank Areas, duplication of tank fences and painting inside the fences is underway.
- There are plans to reroute the release channel from outside to inside the port (installation of one of two channels was completed on June 14).

### Status of multi-nuclide removal equipment
- Hot tests using radioactive water are underway (System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013).
- Regarding Systems A and C, operation was suspended without expanding contamination within the systems by detecting filter degradation at an early stage. After replacing the filters as with System B, treatment resumed (System A: June 9, System C: June 22).
- Regarding Systems C, a second inspection to verify the effectiveness of anti-corrosion measures was conducted. As corrosion was detected at places in previously unaffected areas, additional measures were implemented.

### Preventing groundwater from flowing into the Reactor Buildings

To reduce groundwater level by sub-drain water pumping, treatment tests were conducted for some sub-drain pits of Units 1-4. The next stage will involve scheduled operation of the sub-drain recovery method.

#### Reducing groundwater inflow by pumping sub-drain water

- Measures to pump up groundwater flowing from the mountain side upstream of the Building to reduce the groundwater inflow (groundwater bypass) have been implemented. Release of pumped groundwater began from May 21.
- The pumped up groundwater is temporarily stored in tanks and released after TEPCO and the third-party organization confirm that its quality meets operational targets.
- Through periodical monitoring, pumping of wells and tanks is operated appropriately.

#### Preventing water from accessing contamination source

- To prevent the inflow of groundwater into the Reactor Buildings, installation of impermeable walls surrounding the buildings on the land side is planned. The freezing test of small-scale impermeable walls on site confirmed the feasibility of freezing.
- Placement of frozen ducts will begin after preparation is complete.

<Glossary>
- (*1) CST (Condensate Storage Tank)
  Tank for temporarily storing water used in the plant.
Progress toward decommissioning: Work to improve the environment within the site

Immediate targets

- Reduce the effect of additional release from the entire power station and radiation from radioactive waste (secondary water treatment waste, rubble, etc.) generated after the accident, to limit the effective radiation dose to below 1mSv/year at the site boundaries.
- Prevent contamination expansion in sea, decontamination within the site

Installation of impermeable walls on the sea side

To prevent contamination expansion into the sea when contaminated water leaks into groundwater, impermeable walls are being installed (scheduled for completion in September 2014).

Installation of steel pipe sheet piles temporarily completed by December 4, 2013 except for 9 pipes.
The next stage will involve installing steel pipe sheet piles outside the port, landfilling within the port, and installing a pumping facility to close before the construction completion.

Expansion of full-face mask unnecessary area

Operation based on the rules for mask wearing according to radioactive material density in air and groundwater/ ionization rules was defined, and the area is being expanded.

In the J tank installation area on the south side of the site, as decontamination was completed, the area will be set as full-face mask unnecessary area (from May 30), where for works not handling contaminated water, wearing disposable dust-protective masks will be deemed sufficient.

Transfer to Temporary Administration Office Building near the field

To share information with the field and expedite the response to issues, a Temporary Administration Office Building is under construction on the site of Fukushima Daiichi Nuclear Power Station. For the part completed on June 30, approx. 400 staff members, including those of TEPCO’s water treatment related sections, working at Fukushima Daiichi Nuclear Power Station, will transfer within July.

Reducing radioactive materials in seawater within the harbor

- The analytical result for data such as the density and level of groundwater on the east (sea) side of the Building identified that contaminated groundwater was leaking into seawater.
- No significant change has been detected in seawater within the harbor for the past month, nor was any significant change detected in offshore measurement results as of last month.
- To prevent contamination expansion into the sea, the following measures are being implemented:
  1. Prevent leakage of contaminated water
     - Ground improvement behind the bank to prevent the expansion of radioactive materials.
     - Between Units 1 and 2: completed on August 9, 2013; between Units 2 and 3: from August 29 and completed on December 12, 2013; between Units 3 and 4: from August 23, 2013 and completed on January 23, 2014
     - Pumping groundwater (in contaminated areas) from August 9, 2013, scheduled to commence sequentially
  2. Isolate water from contamination
     - Enclosure by ground improvement on the mountain side
     - Between Units 1 and 2: from August 13, 2013 and completed on March 25, 2014; between Units 2 and 3: from October 1, 2013 and completed on February 6, 2014; between Units 3 and 4: from October 19, 2013 and completed on March 5, 2014
     - To prevent the ingress of rainwater, the ground surface was paved with concrete (commenced on November 25, 2013 and completed on May 2)
  3. Eliminate contamination sources
     - Removing contaminated water in branch trenches and closing them (completed on September 19, 2013)
     - Treatment and removal of contaminated water in the main trench
     - Unit 2: Treatment commenced on November 14, 2013, freezing toward water stoppage commenced on April 2
     - Unit 3: Treatment commenced on November 15, 2013

To prevent the ingress of rainwater, the ground surface was paved with concrete (commenced on November 25, 2013 and completed on May 2)