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)
     (Note 2) Underground tunnel containing pipes.

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)

**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 FY2014.

**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. In the earliest case, the closure is scheduled for completion at the end of September 2014.

**Fuel removal from SFP**
Fuel removal from Unit 4 SFP has been underway since Nov. 18, 2013.
The work at Unit 4 will be accomplished around the end of 2014.

(Note 1) Fuel assemblies melted through in the accident.
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**

1. **Anti-scattering measures when dismantling R/B Unit 1 cover**
   - Prior to removing fuel from Unit 1, there is a need to dismantle the building cover and remove rubble on the upper part of the Reactor Building (R/B). To prevent scattering of radioactive materials as in last August, various new measures will be taken with the greatest care: (1) thoroughly spraying anti-scattering agents, (2) removing dust and dirt by suctioning devices, (3) preventing dust from being stirred up by a windbreak sheet and sprinkling water and (4) enhancing the dust monitoring system by installing additional monitors.

2. **Investigation of underground east-side walls of R/B Unit 2**
   - To prevent accumulated water flowing from R/Bs to Turbine Buildings in future, robots for checking the underwater flow at the points where pipes penetrate through building walls are developed. On the underground east side (Turbine Building side) of R/B Unit 2, tests on robots were conducted to confirm that they could check the situations. Other parts will be implemented based on the investigative results of these tests.

3. **Switch of release channels from outside to inside the port**
   - To prevent contaminated water from flowing directly outside the port, even in case it leaks and flows into a release channel, the release channel route is steadily switched to inside the port and the work is almost complete. The release route will be switched sequentially according to assessment results of the effect inside the port.

4. **Status of multi-nucleide removal equipment (ALPS)**
   - Regarding multi-nucleide removal equipment, 3-system operation has been maintained except for planned suspension from late June. Regarding System B, treatment will resume after replacing with improved filters, which are less degraded by radiation. Regarding Systems A and C, operation will be suspended for about one week to sequentially replace with improved filters.

5. **Covering started inside the port**
   - To prevent contaminated soil from being stirred up, covering over the sea bottom soil inside the port commenced from July 17, with completion scheduled within this fiscal year.

6. **Status of groundwater bypass**
   - To reduce the inflow of groundwater into the buildings and prevent any increase in contaminated water, the groundwater pumped up on the mountain side of the buildings has been released after ensuring the density is lower than the announcement level each time. It is estimated that months will be required to confirm any decrease of inflow into the buildings. The groundwater bypass continues to reduce the groundwater level around the buildings, which is gradually decreasing.

7. **Progress status of impermeable walls with frozen soil**
   - To reduce the inflow of groundwater into the buildings, there are plans to surround the buildings by impermeable walls with frozen soil. Aiming to start freezing at the end of this fiscal year, drilling of holes to install frozen pipes commenced from June 2. As of July 30, more than 10% of drilling had been completed.

8. **Tank construction plan to add 100,000 ton capacity**
   - The tank construction plan was reviewed to increase 800,000 tons of welded-joint tanks by adding 100,000 tons to the existing plan. Flange- (bolt-fixed) type tanks will be sequentially replaced with welded-joint tanks.
Major initiatives – Locations on site

- Covering started inside the port
- Investigation of underground east-side walls of R/B Unit 2
- Additional measures for removing contaminated water from seawater pipe trench
- Anti-scattering measures when dismantling R/B Unit 1 cover
- Progress status of impermeable walls with frozen soil
- Status of groundwater bypass
- Status of multi-nuclide removal equipment (ALPS)
- Tank construction plan to add 100,000 ton capacity
- Switch of release channels from outside to inside the port

- Site boundary
- Land-side impermeable walls with frozen soil
- Seawater pipe trench
- Release channel switch route
- Groundwater bypass well points
- Groundwater bypass temporary storage tank
- Multi-nuclide removal equipment

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

1. Temperatures inside the reactors

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. 25 to 45°C for the past month, though they vary depending on the unit and location of the thermometer.

- RPV bottom temperatures (recent quarter)
- PCV gas phase temperatures (recent quarter)

* The trend graphs show part of the temperature data measured at multiple points.

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 to pump up contaminated water.
  - The density of radioactive materials newly released from Reactor Building Units 1-4 in the air measured at site boundaries was evaluated at approx. 1.3 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.

II. Progress status by each plan

1. Reactor cooling plan

Reinstallation of supervisory instrumentation for Unit 2 PCV
- On June 5 and 6, the supervisory instrumentation (thermometer and water-level gauge) for PCV was reinstalled. Based on the temperature trend for approx. one month from the installation, it was judged that the thermometer indicated the true values to be presented.

- Replacement of the thermometer at the bottom of Unit 2 RPV
  - Attempts to remove and replace the thermometer installed at the bottom of the 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). The next step will involve conducting a full-scale mock-up test of the piping.

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. 1.3 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.

- To measure the variation in the airborne radiation rate of Monitoring Posts (MPs) measuring airborne radiation rate around site boundaries show 1.6 - 4.7 μSv/h (as of 2014/07/30 18:00)

Note: Different formulas and coefficients were used to evaluate the radiation dose in the facility operation plan and monthly report. The evaluation methods were integrated in September 2012. As the fuel removal from the spent fuel pool (SFP) commenced for Unit 4, the radiation exposure dose from Unit 4 was added to the items subject to evaluation since November 2013.

- Data of Monitoring Posts (MPs) measuring airborne radiation rate
- Dust density around the site boundaries show 1.6 - 4.7 μSv/h (as of 2014/07/30 18:00)
• 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 July 30. Regarding the sub-drain treatment facility, construction of the building from March 12 and installation of equipment inside it from March 19 are underway. From July 8-17, water flow tests using filtered water were conducted.

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. 115,000 m³ has been treated (as of July 29, including approx. 9,500 m³ stored in J1(D) tank, which contained water with a high density of radioactive materials at the System B outlet).

• Regarding System A, operation was resumed from July 15. From August 3, operation will be suspended to replace the filters after iron coprecipitation treatment with improved filters (those improved based on slurry outflow due to degradation of filter parts after carbonate treatment).

• Regarding System B, operation has been suspended to implement additional anti-corrosion measures (from July 21). In parallel with the additional anti-corrosion measures, based on the slurry outflow due to degradation of filter parts after carbonate treatment, the filters after iron coprecipitation treatment were also replaced with improved filters. Treatment will be suspended from August 1.

• Regarding System C, after implementing additional anti-corrosion measures, operation has continued since June 22. Filters after iron coprecipitation treatment will be replaced with improved filters.

• As four nuclides such as iodine 129 were detected from treated water (excluding tritium), actual equipment tests on performance improvement measures are underway, using activated carbon adsorbent. It is estimated that by changing the two additional absorption vessels and absorbencies based on these tests, performance within the announcement density limit can be achieved.

• Regarding the additional multi-nuclide removal equipment, foundation steel frame building (from June 12) and equipment installation (from June 21) are underway (see Figure 3). The foundation construction was completed on July 8.

• To facilitate the installation of high-performance multi-nuclide removal equipment, a subsidy project of the Ministry of Economy, Trade and Industry, foundation construction is underway from May 10. In parallel, installation of equipment commenced from July 14 (see Figure 4).

• Regarding the verification equipment of high-performance multi-nuclide removal equipment, transportation and installation were underway from July 25.

Construction of tanks

• By creating new tank installation areas, there are plans to construct approx. 100,000 m³ of tanks.

Measures in Tank Areas

• To guard against accumulated water leaking from a tank, tank fences were duplicated and paint applied inside the fences for existing Tank Areas (completed on July 13). Regarding new areas, the tank fences will be duplicated and painting applied inside the fences in line with the installation of tanks.

• The release channel C route was switched from outside to inside the port from July 14. The volume released into the port will be steadily increased according to the assessment results on the effect inside the port.

• 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 July 28, a total of 4,040 m³).

Treatment and removal of contaminated water from the Main Trenches

• As for the Main Trench Unit 3, removal of cesium in contaminated water using mobile treatment equipment is underway (from 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. The freezing operation is underway (Vertical Shaft A: from April 28, open-cut duct: from June 13). As the temperature did not decrease sufficiently, additional measures such as injecting ice and dry ice are being conducted sequentially (see Figure 5).

• 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 pipes is underway (from May 5 and scheduled for completion in mid-August).

Steps for Accelerating Freezing

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[Coping of accumulated water] Injection of ice and dry ice</td>
</tr>
<tr>
<td>2</td>
<td>Change of existing temperature measurement pipes to horizontal frozen pipes</td>
</tr>
<tr>
<td>3</td>
<td>Installation of frozen pipe to outside the structure</td>
</tr>
</tbody>
</table>

Steps for Interfiling

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reducing of water flow</td>
</tr>
<tr>
<td>2</td>
<td>Injection of interfilers</td>
</tr>
<tr>
<td>3</td>
<td>Installation of additional packers</td>
</tr>
<tr>
<td>4</td>
<td>Under examination, including materials and construction method</td>
</tr>
</tbody>
</table>

Installation of additional packers

3. Plan to reduce radiation dose and mitigate contamination

Effective dose-reduction at site boundaries and purification of the port water to mitigate the impact of radiation on the external environment

Status of groundwater and seawater on the east side of Turbine Building Units 1 to 4

• Regarding the groundwater near the bank on the north side of the Unit 1 intake, the density of tritium decreased at all groundwater Observation Holes as in June. Pumping of 1 m³/day of water from Observation Hole No. 0-3 continues.

• Regarding the groundwater near the bank between the Unit 1 and 2 intakes, though the densities in water pumped from the well point had been maintained at around 90,000 Bq/L for tritium and 400,000 Bq/L for gross β radioactive materials until mid-May, they are currently decreasing. Though the gross β radioactive materials at groundwater Observation Hole No. 1-16 increased to 3.1 million Bq/L on January 30, the figure started decreasing from mid-February and has been maintained at around 700,000 Bq/L recently. From the added groundwater Observation Hole No. 1-15, water sampling commenced from July 10 and the same trend as No. 1-12, which is located near the new well, was confirmed. Water pumping from the well point (approx. 50 m³/day) and the pumping well No. 1-16 (P) (1 m³/day) installed near the Observation Hole No. 1-16 continues.

• Regarding the groundwater near the bank between the Unit 2 and 3 intakes, the density of gross β radioactive materials is high on the north (Unit 2) side as until June. Water pumping from north of the well point continues (4 m³/day).

• Regarding the groundwater near the bank between the Unit 3 and 4 intakes, a low density of radioactive materials has been maintained at all Observation Holes as until June.
Regarding the seawater inside the sea-side permeable walls, though densities of both gross $\beta$ radioactive materials and tritium have been increasing since March, they have been decreasing since July.

- The density of radioactive materials in seawater inside the open channels of Units 1-4 has been declining slightly since last autumn. The density of radioactive materials in seawater at the additional sampling point installed outside the sea-side permeable walls after March was equivalent to that at the point on the north side of the east breakwater.
- The density of radioactive materials in seawater within the port has been declining slightly as until June.
- The radioactive material density in seawater at and outside the port entrance has been maintained within the same range as previously.
- To prevent contamination spreading due to soil being stirred up from under the sea, covering over the sea bottom soil inside the port commenced from July 17.
- As an additional investigation on the Unit 1-3 release channels where contamination had been detected, an inflow of water into the release channel vertical shaft was investigated during rain on June 12. The result showed that the density of radioactive materials was high in the inflow water from around the Turbine Building Unit 3. The cause and measures are currently being examined.

Regarding 32 samples for which radioactive materials had been analyzed within the Fukushima Daiichi Nuclear Power Station, errors were identified in the calculation of detection limit densities. These are attributable to mistakes in the sample amount used for the calculation. Checking for any similar error is underway.

- The water pumped from the groundwater drain, which is pumping groundwater inside the seaside impermeable walls, was analyzed. The result showed that it was at a level equivalent to the seawater density before the landfill.
- Aiming to monitor any leakage from tanks, a monitor for radioactive materials in side ditches was installed in the upper stream, near the switch of the release channel C, operation of which commenced from July 14.
4. Plan to remove fuel from the spent fuel pool

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.
  - 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.

- Check of soundness of Reactor Building Unit 4
  - To check the soundness of the Reactor Building and the spent fuel pool, the 9th periodical inspection was conducted (from June 19 to July 24) in the presence of external experts. The result showed that the "Reactor Building" and the "spent fuel pool" were in a sound condition.

- Main work to help remove spent fuel at Unit 3
  - The removal of fuel inside the SFP was suspended due to failure of the brake on 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 31). Operation will resume from late August after preparation is completed.

- Main work to help remove spent fuel at Unit 1
  - To facilitate the removal of rubble on the Reactor Building (R/B) 5th floor (operating floor) prior to fuel removal, dismantling of the R/B cover was scheduled to start from early July, but postponed due to the typhoon and failure of the crane. It will be restarted after coordinating with other construction work and when preparation is complete. When dismantling the building cover and removing rubble, sufficient measures to reduce the spread of radioactive materials will be implemented along with monitoring of radioactive material densities.

5. 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).

Demonstration on the east-side wall of the Unit 2 torus room
- Regarding the torus room wall, investigative equipment is being developed in a project subsidized by the Ministry of Economy, Trade and Industry "Development of technology to identify and repair leakage points of Primary Containment Vessels (PCVs)," and a demonstration on the walls (on the north side of east-side walls) of the Unit 2 torus room was conducted (from July 16-25). Two types of equipment (a swimming robot and a floor traveling robot) were developed to investigate the torus room wall. The result showed that the equipment was able to check the status of penetrations (see Figure 10).

6. Plan to store, process and dispose of solid waste and decommission reactor facilities

Promoting efforts to reduce and store waste generated appropriately and R&D to facilitate adequate and safe storage, processing and disposal of radioactive waste

- Management status of rubble and trimmed trees
  - As of the end of June, the total storage volume of concrete and metal rubble was approx. 103,900m$^3$ (+400m$^3$ compared to the end of May, area occupation rate: 60%). The total storage volume of trimmed trees was approx. 77,200m$^3$ (+700m$^3$ compared to the end of May, area occupation rate: 56%). The increase in rubble was mainly attributable to arrange of rubble stored in the area and construction related to the installation of impermeable walls with frozen soil. The increase in trimmed trees was mainly attributable to arrange of trimmed trees stored in the area and collection of chipped branches and leaves.

- Management status of secondary waste from water treatment
  - As of July 29, the total storage volume of waste sludge was 597 m$^3$ (area occupation rate: 85%). The total number of stored spent vessels and high-integrity containers (HIC) of multi-nuclide removable equipment was 1,012 (area occupation rate: 40%).

7. 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 total people registered for at least one day per month to work on site during the past quarter from March to May was approx. 11,000 (TEPCO and partner company workers), which exceeds the monthly average number of actual workers (approx. 8,500). 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 August (approx. 5,800 per day: TEPCO and partner company workers) would be secured at present. The average numbers of workers per day for each month of the last fiscal year (actual value) were maintained with approx. 3,000 to 5,500 per month since the last fiscal year (See Figure 11).
  - The number of workers is increasing, both those from within and outside Fukushima prefecture. However, as the growth rate of workers from outside exceeds that of those from within the prefecture, the local employment ratio (TEPCO and partner company workers) as of June decreased to approx. 45%.

Figure 11: Changes in the average number of workers per weekday for each month since fiscal 2013 (actual values)

- The average exposure dose of workers was maintained at approx. 1 mSv/month by implementing measures to reduce the exposure dose and relocation of workers based on the forecast dose for each work. (Reference: annual average exposure dose 20mSv/year ≈ 1.7mSv/month)

- For most workers, the exposure dose is sufficiently within the limit and at a level which allows them to continue engaging in radiation work.
Efforts to improve the labor environment
- The 1st phase construction of the Temporary Administration Office Building was completed on June 30. Approx. 400 staff members, including those of water treatment-related sections of the Fukushima Daiichi D & D Engineering Company, who had worked at Fukushima Daini Nuclear Power Station, started working at the new Administration Office Building from July 22 (see Figure 14).

Outbreak status of heat stroke
- This fiscal year, a total of 16 workers got heat stroke as of July 30, including eight attributable to work and potential patients. Continued measures will be taken to prevent heat stroke. (Last year, five workers got heat stroke as of the end of July, with causes for two persons attributable to work and potential patients)
- Continued from last year, measures to prevent heat stroke were implemented from May to cope with the hottest season.
  - Using WBGT (*), work time, the frequency and timing of breaks, and work intensity were altered.
  - Work under the blazing sun is prohibited in principle from 14:00 to 17:00 in July and August.
  - Appropriate rest and frequent intake of water and salt are encouraged.
  - Physical management using check sheets and wearing cool vests.
  - A workplace environment where workers are allowed to claim poorly conditions is established and early diagnosis at the emergency medical room.

WBGT: Index using three perspectives of humidity, radiation heat, and temperature, which significantly impact on the heat balance of human bodies

Implementers of the decommissioning project (METI FY2013 supplementary budget) were decided
- Public offerings were made regarding full-scale technology tests for (1) removal of fuel debris and structures in the reactors, (2) investigation inside the reactor pressure vessels (RPVs), (3) soundness assessment of RPVs/PCVs, (4) repair and water stoppage of leakage points of RPVs and (5) repair and water stoppage of leakage points of PCVs (offering period: May 23 – Jun 23 for (1) - (3), June 13 -27 for (4) and (5)).
- Following screening by the review board, comprising exerts within and outside Japan, the above five proposals were adopted on June 30.
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

| ![Cesium-134] 3.3 (2013/10/17) → ND(0.98) | Below 1/3 | Sea side impermeable wall
| ![Cesium-137] 9.0 (2013/10/17) → ND(1.1) | Below 1/8 |
| ![Gross β] 74 (2013/8/19) → ND(16) | Below 1/4 |
| ![Tritium] 67 (2013/8/19) → 34 | Below 6/10 |
| ![Cesium-134] 4.4 (2013/12/24) → ND(0.79) | Below 1/5 |
| ![Cesium-137] 10 (2013/12/24) → ND(0.90) | Below 1/10 |
| ![Gross β] 60 (2013/7/4) → ND(16) | Below 1/3 |
| ![Tritium] 59 (2013/8/19) → 13 | Below 1/4 |
| ![Cesium-134] 5.0 (2013/12/2) → ND(1.2) | Below 1/4 |
| ![Cesium-137] 8.4 (2013/12/2) → ND(1.1) | Below 1/7 |
| ![Gross β] 69 (2013/8/19) → ND(16) | Below 1/4 |
| ![Tritium] 52 (2013/8/19) → 13 | Below 1/4 |
| ![Cesium-134] 2.8 (2013/12/2) → ND(1.8) | Below 7/10 |
| ![Cesium-137] 5.8 (2013/12/2) → ND(1.7) | Below 1/3 |
| ![Gross β] 46 (2013/8/19) → ND(18) | Below 1/2 |
| ![Tritium] 24 (2013/8/19) → ND(3.5) | Below 1/6 |

Summary of TEPCO data as of July 30

Cesium-134: 60
Cesium-137: 90
Strontium-90 (strongly correlate with Gross β): 30
Tritium: 60,000

Port entrance

South side in the port

East side in the port

West side in the port

North side in the port

In front of Unit 6 intake

In front of shallow draft quay

Sea side

Below

1/3

3.3

→

ND(1.1)

Below 1/4

Cesium-134: 3.3 (2013/10/17) → ND(0.98) | Below 1/3 |

Cesium-137: 9.0 (2013/10/17) → ND(1.1) | Below 1/8 |

Gross β: 74 (2013/8/19) → ND(16) | Below 1/4 |

Tritium: 67 (2013/8/19) → 34 | Below 6/10 |

Cesium-134: 4.4 (2013/12/24) → ND(0.79) | Below 1/5 |

Cesium-137: 10 (2013/12/24) → ND(0.90) | Below 1/10 |

Gross β: 60 (2013/7/4) → ND(16) | Below 1/3 |

Tritium: 59 (2013/8/19) → 13 | Below 1/4 |

Cesium-134: 5.0 (2013/12/2) → ND(1.2) | Below 1/4 |

Cesium-137: 8.4 (2013/12/2) → ND(1.1) | Below 1/7 |

Gross β: 69 (2013/8/19) → ND(16) | Below 1/4 |

Tritium: 52 (2013/8/19) → 13 | Below 1/4 |

Cesium-134: 2.8 (2013/12/2) → ND(1.8) | Below 7/10 |

Cesium-137: 5.8 (2013/12/2) → ND(1.7) | Below 1/3 |

Gross β: 46 (2013/8/19) → ND(18) | Below 1/2 |

Tritium: 24 (2013/8/19) → ND(3.5) | Below 1/6 |

Cesium-134: 3.5 (2013/10/17) → ND(0.98) | Below 1/3 |

Cesium-137: 7.8 (2013/10/17) → ND(0.98) | Below 1/7 |

Gross β: 79 (2013/8/19) → ND(16) | Below 1/4 |

Tritium: 60 (2013/8/19) → 21 | Below 1/2 |

Cesium-134: 32 (2013/10/17) → ND(2.0) | Below 1/10 |

Cesium-137: 73 (2013/10/17) → 8.6 | Below 1/8 |

Gross β: 320 (2013/8/12) → 31 | Below 1/10 |

Tritium: 510 (2013/9/2) → ND(110) | Below 1/4 |

Cesium-134: 4.8
Cesium-137: 12
Gross β: 71
Tritium: 220 *

Cesium-134: 5.8
Cesium-137: 20
Gross β: 96
Tritium: 280 *

Cesium-134: 12
Cesium-137: 29
Gross β: 170
Tritium: 780 *

Cesium-134: 62 (2013/9/16) → 14 | Below 1/4 |

Cesium-137: 140 (2013/9/16) → 44 | Below 1/3 |

Gross β: 360 (2013/8/12) → 480
Tritium: 400 (2013/8/12) → 2,200

Cesium-134: 28 (2013/9/16) → 16 | Below 6/10 |

Cesium-137: 53 (2013/12/16) → 51
Gross β: 390 (2013/8/12) → 550
Tritium: 650 (2013/8/12) → 1,900

Monitoring commenced in or after March 2014

Source: TEPCO website
Analysis results on nuclides of radioactive materials around Fukushima Daiichi Nuclear Power Station
http://www.tepco.co.jp/en/fukushima-np/1f/smp/index-e.html

As of July 30
### 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.

### Summary of TEPCO data as of July 30


<table>
<thead>
<tr>
<th>Location Description</th>
<th>Cesium-134</th>
<th>Cesium-137</th>
<th>Gross β (strongly correlate with Gross β)</th>
<th>Tritium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast side of port entrance (offshore 1km)</td>
<td>ND (2013) → ND (0.68)</td>
<td>ND (2013) → ND (0.71)</td>
<td>ND (2013) → ND (16)</td>
<td>ND (2013) → ND (1.9) Below 1/2</td>
</tr>
<tr>
<td>South side of south breakwater (offshore 0.5km)</td>
<td>Cesium-134: ND (2013) → ND (0.67)</td>
<td>Cesium-137: ND (2013) → ND (0.66)</td>
<td>Gross β: ND (2013) → ND (16)</td>
<td>Tritium: ND (2013) → ND (1.9)</td>
</tr>
<tr>
<td>North side of north breakwater (offshore 0.5km)</td>
<td>Cesium-134: 3.3 (2013/12/24) → ND (1.1) Below 1/3</td>
<td>Cesium-137: 7.3 (2013/10/11) → ND (1.1) Below 1/6</td>
<td>Gross β: 69 (2013/8/19) → ND (16) Below 1/4</td>
<td>Tritium: 68 (2013/8/19) → 5.7 Below 1/10</td>
</tr>
<tr>
<td>North side of Units 5 and 6 discharge channel</td>
<td>Cesium-134: 1.8 (2013/6/21) → ND (0.69) Below 1/2</td>
<td>Cesium-137: 4.5 (2013/3/17) → ND (1.7) Below 1/7</td>
<td>Gross β: 12 (2013/12/23) → ND (15)</td>
<td>Tritium: 8.6 (2013/6/26) → ND (2.6) Below 1/4</td>
</tr>
<tr>
<td>Sea side impermeable wall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silt fence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Legal discharge limits

- **Cesium-134**: 60 Bq/L
- **Cesium-137**: 90 Bq/L
- **Strontium-90** (strongly correlate with Gross β): 30 Bq/L
- **Tritium**: 60,000 Bq/L

### Legal limits

- **Cesium-134**: Below 1/3
- **Cesium-137**: Below 1/6
- **Gross β** (strongly correlate with Gross β): Below 1/4
- **Tritium**: Below 1/10

### Monitoring around south discharge channel

- **Cesium-134**: ND (2013) → ND (0.74)
- **Cesium-137**: ND (2013) → ND (0.58)
- **Gross β** (strongly correlate with Gross β): 15 (2013/12/23) → ND (below 9/10)
- **Tritium**: 1.9 (2013/11/25) → 4.1
### Status of efforts on various plans (Part 1)

#### Reactor cooling plan

- **Maintenance and monitoring of the cold shut down condition of nuclear reactor** (by continuous monitoring on the condition of water injection and parameters including temperature, etc., preservation and improvement of reliability through maintenance and management)
- **Narrowing-down and development of candidate systems for inserting alternative thermometer in Unit 1 RPV**
- **Review on the method for inserting alternative thermometer in Unit 2 RPV (including inspection in nuclear reactor)**
- **Narrowing-down of candidate systems for inserting alternative thermometer in Unit 3 RPV**
- **Review on the method for inserting alternative thermometer in Unit 3 RPV**

#### Partial observation of the PCV

- **Remote visual check of the PCV, direct measurement/evaluation of temperature etc.**

#### Improvement of the reliability of the circulating water injection cooling system (water intake from the turbine building)**

- **Water source: Condensate water storage tank for Units 1 to 3**
- **Reliability improvement measures for the lines taking water supplies from the condensate water storage tanks of Units 1 to 3**
- **Review on water take from reactor building (or from the bottom of the PCV) - Construction work**

#### Review on water intake from reactor building (or from the bottom of the PCV)

- **Construction of circulation loop in the building (for Units 1 to 3)**

#### Phase 1 (no later than 2 years after the completion of the current efforts)

- **As of July 31, 2014**

#### Phase 2 (Early period)

- **Selection of a fuel/fuel debris removing plan**
- **Selection of a fuel/fuel debris removing plan**
- **Selection of a fuel/fuel debris removing plan**
- **Selection of a fuel/fuel debris removing plan**
- **Selection of a fuel/fuel debris removing plan**
- **Selection of a fuel/fuel debris removing plan**

#### Plan to retrieve fuel from spent fuel pool

- **Removal of debris, decontamination and shielding**
- **Modification/recovery of building cover**
- **Decontamination/shielding, restoration of fuel handling equipment**

#### Unit 1

- **Review on fuel removing method**
- **Dismantling of building cover**

#### Unit 2

- **Consideration/preparation for the decontamination and shielding in the building**

#### Unit 3

- **Preparatory work/debris removing work**
- **Removal of debris, decontamination and shielding in the building**
- **Construction of fuel removal cover/Installation of fuel handling equipment**

#### Unit 4

- **Construction of fuel removal cover/Installation of fuel handling equipment**
- **Removal of debris in the pool/fuel check etc.**
- **Fuel removal**

---

**Objective:** Completion of switching to the equipment for water intake from the reactor building (or from the bottom of the PCV).
### Status of efforts on various plans (Part 2)

#### Challenges
- **2012**
  - Decontamination of the inside of the building
  - Establishment of a comprehensive plan for exposure reduction
  - R&D toward the removal of fuel debris (to be continued to address long-term challenges including internal R&D of equipment etc.)

#### 2013
- **Decontamination of the inside of the building**
  - Review on decontamination technology/development of remote decontamination equipment
  - Development of remote contamination investigation technologies (1)
  - Development of remote decontamination technologies (1)
- **Measures to reduce overall dose**
  - Development of storage cans (surveys on existing technologies, review on storage system/development of safety evaluation technique etc.)
- **Fuel debris removal**
  - R&D for inspection/repair of leaking locations of the PCV (including on-site demonstration)
  - Design, manufacturing and testing etc. of the equipment for inspecting the inside of the PCV (5)
- **Stable storage, processing/disposal of fuel debris after removal**
  - Research on/development of mock-up processing/disposal technologies
  - Establishment of nuclear material accountability and control measures for the fuel debris
- **Others**
  - Development of criticality evaluation and detection technologies

#### 2014
- **Decontamination of the inside of the building**
  - Decontamination, shielding, etc. in the building (Work environment improvement (1))
  - First floor of the reactor building
- **Measures to reduce overall dose**
  - Formulation of a comprehensive plan for exposure reduction
  - Design, manufacturing and testing etc. of the equipment for inspecting the PCV (3), (6)
- **Fuel debris removal**
  - Inspection from outside the PCV (including on-site demonstration of development results)
  - Inspection of the basement of the nuclear reactor building, inspection of leaking locations
- **Stable storage, processing/disposal of fuel debris after removal**
  - Development of mock-up processing/disposal technologies
  - Establishment of nuclear material accountability and control measures for the fuel debris
- **Others**
  - Development of criticality evaluation and detection technologies

#### 2015
- **To be continued**
  - Decontamination, shielding, etc. in the building (Work environment improvement (1))
  - Formulation of a comprehensive plan for exposure reduction
  - R&D toward the removal of fuel debris (to be continued to address long-term challenges including internal R&D of equipment etc.)

#### As of July 31, 2014
- **Objective:** Establish decontamination robot technology
- **Phase 1 (no later than 2 years after the completion of the current efforts)**
  - First floor of the reactor building
  - Formulation of work plan in the reactor building
  - Formulation of work plan on the floor with damage from explosion
- **Phase 2 (Early period)**
  - First floor of the reactor building
  - Inspection of leaking locations

---

*Reviewed based on the actual situation*
### Status of efforts on various plans (Part 3)

#### Challenges

<table>
<thead>
<tr>
<th>Year</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Retained water treatment plan</td>
</tr>
<tr>
<td>2013</td>
<td>Gas/liquid waste</td>
</tr>
<tr>
<td>2014</td>
<td>Plan for preventing the spread of marine pollution</td>
</tr>
<tr>
<td>2015</td>
<td>Site decontamination plan</td>
</tr>
</tbody>
</table>

#### Retained water treatment plan

- **Treatment of retained water by water treatment facilities with improved reliability**
- **Reduction in radiation dose at the site boundary**
- **Reduction in groundwater inflow**

#### Gas/liquid waste

- **Operation of the gas management system of Units 1 to 3 PCVs**
- **Installation of ventillation equipment/closure of the opening of blow-out panel for Unit 2**
- **Measurement of dust concentration at the opening of buildings etc., on-site survey**

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

- **Construction of sea side water barrier wall**
- **Installation of steel pipe sheet pile**
- **Seawater circulation purification**

#### Site decontamination plan

- **Systematic implementation of decontamination in the site of power generation plant**

#### Objectives

- **Reduce groundwater inflow rate (Reduce accumulated water)**
- **Objective: Reduction of the risk of spreading marine contamination during the leakage of contaminated water**
- **Objective: Reduction of the concentration of radioactive substances contained in the seawater of the harbor (to less than the notified concentration)**

#### As of July 31, 2014

- **Launched**

---

**Note:** The table and diagram provide a visual representation of the various plans and their objectives, showing the progress and implementation status as of July 31, 2014.
### Status of efforts on various plans (Part 4)

**As of July 31, 2014**

<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>
</table>
| 2012       | Cask for both transport and storage  
Dry storage cask  
Harbor  
Common pool  
Temporary cask storage facility  
R&D  
Installation of reactor building  
Preservation of the integrity of RPV/PCV  
Storage and management plans for solid wastes  
Processing/disposal plans for solid wastes  
Decommissioning plans for reactor facilities  
Implementation system and personnel procurement plan  
Plan to ensure the safety of work | 2013 | 2014 | 2015 |
| 2014       | Plan for retrieving fuel from spent fuel pool  
Design/manufacturing of damaged fuel racks  
Retrieval of fuel from the common pool  
Storage of fuel retrieved from spent fuel pool (storage and management)  
Verification of applicability of processing/disposal technologies in Japan and foreign countries  
Development of feasible and rational decommissioning scenarios  
Systematic cultivation/deployment of personnel, including the cooperative companies, and implementation of measures to stimulate motivation etc.  
Continuation of safety activities, maintenance enhancement of radiation management, continuous enforcement of medical services, etc.  
Reduction of radiation dose in the near area of the main office building, rest area in front of the important quake-proof building, and the important quake-proof building | Plan for management of recommissioned fuel pool  
Implementation of effective procedures for hands-on work  
Implementation of personnel measures, including the cooperative companies, and implementation of measures to stimulate motivation etc.  
Implementation of measures for strengthening the safety activities, including the cooperative companies, and implementation of measures to stimulate motivation etc.  
Implementation of measures for strengthening the safety activities, including the cooperative companies, and implementation of measures to stimulate motivation etc.  
Implementation of measures for strengthening the safety activities, including the cooperative companies, and implementation of measures to stimulate motivation etc. | |

**Plan for retrieving fuel from spent fuel pool**
- Cask manufacturing
- Inspection of existing dry storage casks (9 pieces)
- Design/manufacturing of damaged fuel racks
- Retrieval of fuel from the common pool
- Storage of fuel retrieved from spent fuel pool (storage and management)
- Fixation

**Preservation of the integrity of RPV/PCV**
- Development of evaluation technology for integrity against corrosion of RPV/PCV
- Corrosion protection (Reduction in dissolved oxygen contained in reactor cooling water by means of nitrogen bubbling)

**Storage and management plans for solid wastes**
- Design and manufacturing of incineration plants for miscellaneous solid wastes
- Establishment of incineration plants for miscellaneous solid wastes
- Transfer of solid wastes to incineration plants by means of temporary storage facility
- Soil covering work
- Reduction of radioactive and stored secondary wastes from water treatment through shielding etc.
- Evaluation of secondary wastes from water treatment and lifespan of storage containers
- Establishment of drum storage facility
- Development of evaluation technology for stabilization of secondary wastes
- Update the storage management plan

**Processing/disposal plans for solid wastes**
- Development of safety processing/disposal plan
- Verification of applicability of processing/disposal technologies in Japan and foreign countries
- Waste characterization (radiochemistry analysis, assessment of volume etc.)

**Decommissioning plans for reactor facilities**
- Development of feasible and rational decommissioning scenarios
- Establishment of decommissioning scenarios

**Implementation system and personnel procurement plan**
- Systematic cultivation/deployment of personnel, including the cooperative companies, and implementation of measures to stimulate motivation etc.

**Plan to ensure the safety of work**
- Continuation of safety activities, maintenance enhancement of radiation management, continuous enforcement of medical services, etc.
- Reduction of radiation dose in the near area of the main office building, rest area in front of the important quake-proof building, and the important quake-proof building
Progress toward decommissioning: Fuel removal from the spent fuel pool (SFP)

**Immediate target**

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

**Steps toward fuel removal**
- Removal of rubble from the roof of the Reactor Building
- Installation of cover for fuel removal

<table>
<thead>
<tr>
<th>Step</th>
<th>Timeframe</th>
</tr>
</thead>
</table>

**Common pool**

An open space will be maintained in the common pool (Transfer to the temporary dry cask storage facility)

**Progress to date**
- The common pool has been restored to a condition allowing it to re-accommodate fuel to be handled (November 2012)
- Loading of spent fuel stored in the common pool to dry casks commenced (June 2013)
- Fuel removed 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 is planned.
- Prior to dismantling, the ventilation system of the cover was suspended (September 17, 2013).
- Dismantling will be launched once preparation is complete.
- When the building cover is dismantled and the rubble is removed, sufficient measures to prevent radioactive materials from scattering will be taken and monitoring will be conducted.
- 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.

**Units 4**

- Commenced fuel removal from the Spent Fuel Pool (Unit 4, November 2013)
- Work is proceeding with appropriate risk countermeasures, careful checks and safety first

**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)**

Measures for rainwater infiltration

**Legend**

- Measurement points
- Spent fuel pool
- Fuel exchange
- Reactor building
- North
- Overhead crane
- Rain gutter
- Partitions

**Steps toward fuel removal**

- To facilitate the installation of a cover for fuel removal, installation of the gantry was completed (March 13, 2013). Removal of rubble from the roof of the Reactor Building was completed (October 11, 2013). Currently, toward the installation of a cover for fuel removal and the fuel-handling machine on the operating floor (*1), measures to reduce the radiation dose (decontamination and shielding) are underway (from October 15, 2013). Removal of large rubble from the SFP is also underway (from December 17, 2013).

**Crane equipment**

- The common pool has been restored to the condition allowing it to re-accommodate fuel to be handled (November 2012)
- Loading of spent fuel stored in the common pool to dry casks commenced (June 2013)
- Fuel removed from the Unit 4 spent fuel pool began to be received (November 2013)

**Reference**

July 31, 2014
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
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 (April 15-21). The result showed that the β ray from other parts, specific methods will be examined to halt the flow of water and repair the PCV.
(3) High-pressure water decontamination equipment
   - A demonstration was conducted on the 1st floor of Unit 1 Reactor Building (April 23-29). Blast decontamination: A method to shave the surface by injecting polygonal steel grains into the object to be decontaminated (floor 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.

- Inserting equipment from Unit 1 X-100B penetration(*5) to investigate in clockwise and counter-clockwise directions.
- Crawler-type equipment with a shape-changing structure which allows it to enter the PCV from the narrow access entrance (bore: 100mm) and stably move on the grating is currently under development. A field demonstration is scheduled for the 2nd half of FY2014.

**Investigative route inside the PCV (draft plan)**

- * Indices related to the plant are values as of 11:00, July 30, 2014
- *OP* represents the water level in the respective building or area.
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

July 31, 2014
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
3/6

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 7, removal of the broken thermometer failed and was suspended. To facilitate removal, tests to check rust formation and fixing were underway (May 12).
(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.
- The measurement during the installation confirmed that the water level inside the PCV was approx. 300mm from the bottom.

Investigative results on torus room walls
- The torus room walls were investigated (on the north side of the east-side walls) using equipment specially developed for that purpose (a swimming robot and a floor traveling robot).
- At the east-side wall pipe penetrations (five points), “the status” and “existence of flow” were checked.
- A demonstration using the above two types of undersea wall investigational equipment showed how the equipment could check the status of penetration.
  - Regarding Penetration 1 - 5, checking by camera and spraying tracer (*6) showed no flow around the penetrations. (investigation by the swimming robot)
  - Regarding Penetration 3, a sonar check showed no flow around the penetrations. (investigation by the floor traveling robot)

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(*1) 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)>

* Indices related to plant are values as of 11:00, July 30, 2014

<Diagram>
(1) Penetration: Through-hole of the PCV (2) SFP (Spent Fuel Pool)
(3) RPV (Reactor Pressure Vessel) (4) PCV (Primary Containment Vessel)
(5) S/C (Suppression Chamber) Suppression pool: used as the water source for the emergency core cooling system.
(6) Tracer: Material used to trace the fluid flow. Clay particles
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**

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.

---

**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).

---

**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.

---

**Outline of the water-flow status**

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

Stably continue reactor cooling and accumulated water treatment, and improve reliability

**Work to improve the reliability of the circulation water injection cooling 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 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**

- To prevent contaminated water from flowing directly outside the port, even in case it leaks and flows into a release channel, the release channel route is steadily switched to inside the port. The release channel C route was switched from outside the port to inside it from July 14. The release route will be switched sequentially according to the results assessing the effect inside the port.

**Status of multi-nuclide removal equipment**

- Regarding multi-nuclide removal equipment, three-system operation has been maintained, except for planned suspension from late June.
- Regarding System B, operation has been suspended to implement additional anti-corrosion measures. In parallel with the latter, treatment will resume after replacing with improved filters which are less degraded by radiation.
- Regarding Systems A and C, operation will be suspended for about one week to sequentially replace with improved filters.

**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 examination of the sub-drain recovery method.

**Reduce 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. The pumped up groundwater is temporarily stored in tanks and released after TEPCO and a third-party organization have confirmed that its quality meets operational targets. Through periodical monitoring, pumping of wells and tanks is operated appropriately. At the observation holes installed at a height equivalent to the buildings, the trend showing a decline in groundwater levels is checked.

**To prevent the inflow of groundwater into the Reactor Buildings, installation of impermeable walls surrounding the buildings on the land side is planned.** Targeting efforts to commence freezing at the end of this fiscal year, drilling holes to install frozen pipes commenced from June 2.

**Installing frozen impermeable walls around Units 1-4 to prevent the inflow of groundwater into R/B**

**About Water pumping**

- Via a groundwater bypass, reduce the groundwater level around the Building and groundwater inflow into the Building

**Hole drilling for groundwater measurement**

- To prevent contaminated water from flowing directly outside the port, even in case it leaks and flows into a release channel, the release channel route is steadily switched to inside the port. The release channel C route was switched from outside the port to inside it from July 14. The release route will be switched sequentially according to the results assessing the effect inside the port.

---

* Image 99x317 to 255x467
* Image 141x519 to 208x608
* Image 141x645 to 208x738
* Image 356x209 to 394x212
* Image 402x440 to 470x532
* Image 413x285 to 435x306
* Image 467x134 to 478x138
* Image 479x90 to 551x588
* Image 489x182 to 509x186
* Image 492x263 to 509x267
* Image 498x161 to 509x165

---

*1 Unit 4 T/B operation floor is one of the installation proposals, which will be determined after further examination based on the work environment

*2 A detailed line configuration will be determined after further examination

---

**July 31, 2014**

Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
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 1 mSv/year at the site boundaries.
- Prevent contamination expansion in sea, decontamination within the site

**Expansion of full-face mask unnecessary area**

Operation based on the rules for mask wearing according to radioactive material density in air and decontamination/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.

**Installation of impermeable walls on the sea side**

To prevent contamination expansion into the sea where contaminated water had leaked 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.

**Reduction of 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
  2. Isolate water from contamination

**Transfer to New Administrative Office Building near the field**

To share information with the field and expedite the response to issues, a New Administrative Office Building is under construction on the site of Fukushima Daiichi Nuclear Power Station.

For the portion completed on June 30, approx. 400 staff members, including those of TEPCO’s water treatment related sections who had worked at Fukushima Daini Nuclear Power Station, transferred and started work from July 22.