Summary of Decommissioning and Contaminated Water Management

October 29, 2015

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

Main works and steps for decommissioning

Fuel removal from Unit 4 SFP had been completed. Preparatory works to remove fuel from Unit 1-3 SFP and fuel debris (Note 1) removal are ongoing.

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

Fuel Removal from SFP

Units 1&2 / Unit 3: Rubble removal & dose reduction → Installing a Fuel-Handling Machine → Fuel removal

Unit 4: Fuel removal → Storage and handling

Unit 1: Fuel removal to start in FY2020
Unit 2: Fuel removal to start in FY2020
Unit 3: Fuel removal to start in FY2017
Unit 4: Fuel removal completed in 2014

Fuel Debris Removal

Unit 1-3: Capturing the status inside PCV/ examination of fuel debris removal method, etc. (Note 2) → Fuel debris removal → Storage and handling

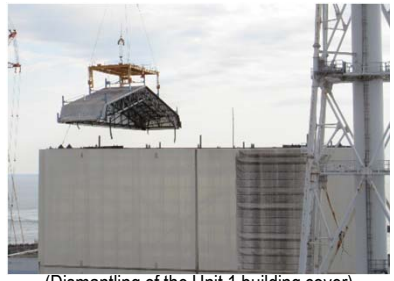
(Note 2)
The fuel debris removal method for each unit will be decided two years after revising the Mid-and-Long-term road map (June 2015). The method for the first unit will be confirmed in the first half of FY2018.

Dismantling Facilities

Scenario development & technology consideration → Design and manufacturing of devices/ equipment → Dismantling

Toward fuel removal from pool

Toward fuel removal from Unit 1 SFP, the building cover is being dismantled.
Dismantling of the building cover started in July 2015. The dismantling is being conducted steadily with anti-scattering measures fully implemented and radioactive materials monitored..



(Dismantling of the Unit 1 building cover)

Three principles behind contaminated water countermeasures

Water to cool fuel having melted in the accident is mixed with groundwater and approx. 300 tons of contaminated water is generated daily.
Countermeasures for contaminated water are implemented in accordance with the following three principles:

1. **Eliminate** contamination sources

① Multi-nuclide removal equipment, etc.

② Remove contaminated water in the trench (Note 3)

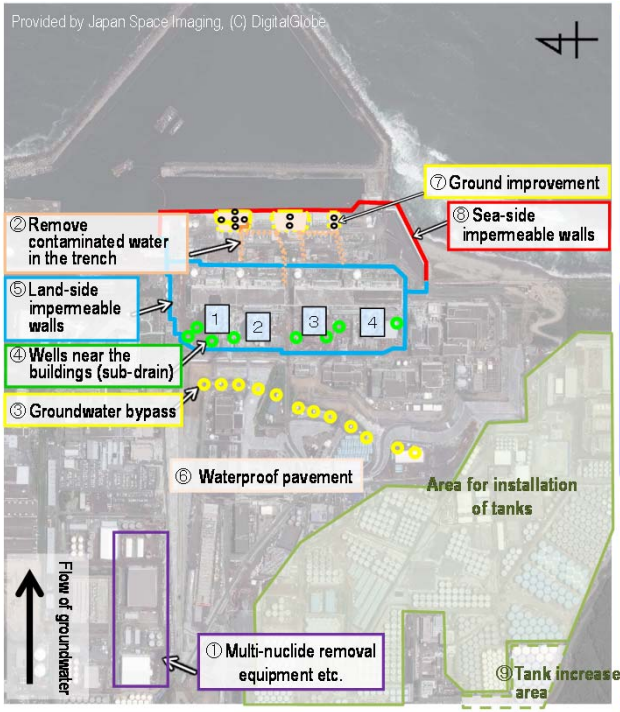
(Note 3) Underground tunnel containing pipes.

2. **Isolate** water from contamination

③ Pump up groundwater for bypassing
④ Pump up groundwater near buildings
⑤ Land-side impermeable walls
⑥ Waterproof pavement

3. **Prevent leakage** of contaminated water

⑦ Soil improvement by sodium silicate
⑧ Sea-side impermeable walls
⑨ Increase tanks (welded-joint tanks)



Multi-nuclide removal equipment (ALPS), etc.

- This equipment removes radionuclides from the contaminated water in tanks and reduces risks.
- Treatment of contaminated water (RO concentrated salt water) was completed in May 2015 via multi-nuclide removal equipment, additional multi-nuclide removal equipment installed by TEPCO (operation commenced in September 2014) and a subsidy project of the Japanese Government (operation commenced in October 2014).
- Strontium-treated water from equipment other than ALPS is being re-treated in ALPS.

(High-performance multi-nuclide removal equipment)

Land-side impermeable walls

- Land-side impermeable walls surround the buildings and reduce groundwater inflow into the same.
- Onsite tests have been conducted since August 2013. Construction work commenced in June 2014.
- Construction on the land side was completed in September 2015.
- On the sea side, drilling for freezing pipes was completed in October 2015.

(Installation of pipes for land-side impermeable walls)

Sea-side impermeable walls

- Impermeable walls are being installed on the sea side of Units 1-4, to prevent the flow of contaminated groundwater into the sea.
- The installation of steel pipe sheet piles was completed in September 2015 and they were connected in October 2015. These works completed the closure of sea-side impermeable walls.

(Installation status)

Progress status

◆ The temperatures of the Reactor Pressure Vessel (RPV) and the Primary Containment Vessel (PCV) of Units 1-3 have been maintained within the range of approx. 20-40°C[*1] for the past month. There was no significant change in the density of radioactive materials newly released from Reactor Buildings in the air[*2]. It was evaluated that the comprehensive cold shutdown condition had been maintained.

*1 The values vary somewhat depending on the unit and location of the thermometer.

*2 In September 2015, the radiation exposure dose due to the release of radioactive materials from the Unit 1-4 Reactor Buildings was evaluated as less than 0.0032 mSv/year at the site boundaries. The annual radiation dose by natural radiation is approx. 2.1 mSv/year (average in Japan).

Removal of roof panels from Unit 1 R/B cover completed

To facilitate rubble removal from the top of Unit 1 Reactor Building (R/B), removal of roof panels from the building cover started on July 28 and all panels had been removed by October 5.

During this work, no significant change was identified in the dust densities of radioactive materials at dust monitors within the site and monitoring posts at the site boundaries.

Following the removal, after regular spraying of anti-scattering agents and investigation into the status of rubble, removal of interfering steer frames will start for installing sprinklers as anti-scattering measures.

<Example of interfering steel frames to be removed>

Closure of sea-side impermeable walls completed

To prevent the outflow of contaminated water into the sea, sea-side impermeable walls have been installed.

Following the completed installation of steel pipe sheet piles on September 22, these piles were connected and connection of sea-side impermeable walls was completed on October 26.

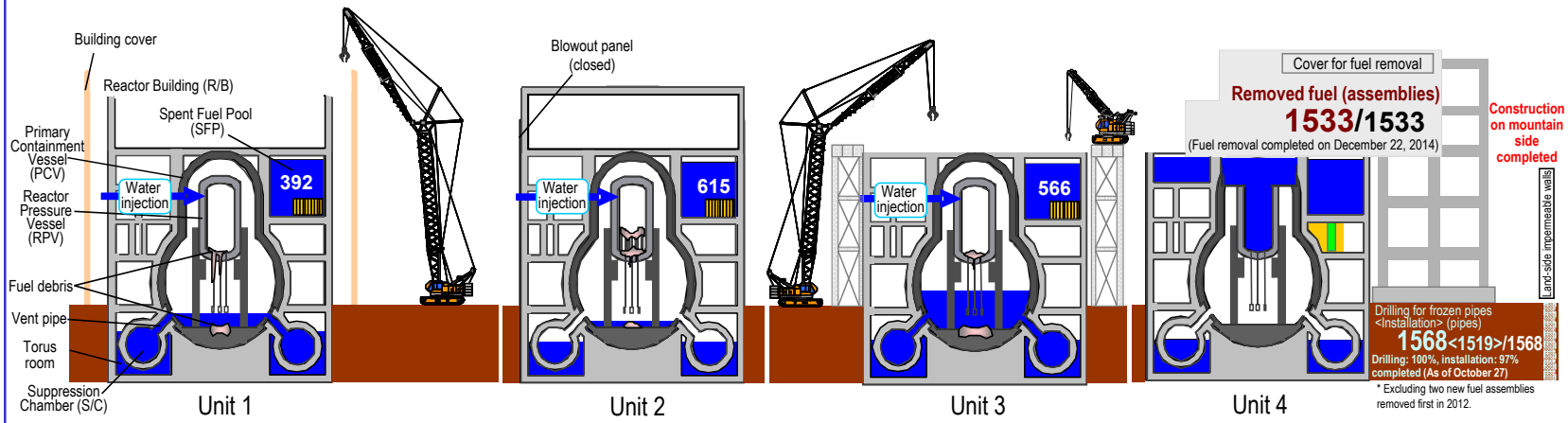
Through these works, closure of sea-side impermeable walls was finished and the contaminated water countermeasures have been greatly advanced.

Opening ceremony of the Naraha Remote Technology Development Center

To facilitate the decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station, the Japan Atomic Energy Agency (JAEA) is building a facility for development and verification tests of remote-control devices and equipment (Naraha Remote Technology Development Center).

On October 19, the opening ceremony was held celebrating the completed construction of the research management building for this center and the start of some operations. Construction of the test building continues, targeting operational launch for the following fiscal year.

<Unveiling>



* Excluding two new fuel assemblies removed first in 2012.

Drilling of land-side impermeable walls completed

Construction of land-side impermeable walls, for which freezing will start first, was completed on September 15.

On the sea side, drilling to install frozen and temperature-measurement pipes was completed on October 15. The next step will be starting to install frozen and other pipes on the sea side of the land-side impermeable walls.

Removal of large rubble inside the Unit 3 spent fuel pool

To facilitate fuel removal from Unit 3 spent fuel pool, removal of large rubble is underway.

On October 15, the hatch lid of the Reactor Water Clean-up System filtering desalination device (CUW F/D)(Note), a large piece of rubble inside the Unit 3 spent fuel pool, was removed, marking the removal of all large rubble on the fuel rack.

After the removal, among four spent fuel assemblies located under the hatch lid, a slight distortion of fuel handles was detected in two fuel assemblies. Treatment of these assemblies will be considered.

(Note): CUW F/D hatch lid is fix approx. 2.6t of underwater a concrete structure of approx. 1m x 1m x 2m

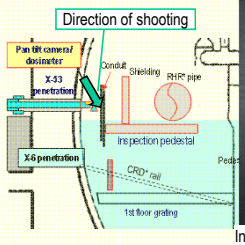
<Removal of CUW F/D hatch lid>

Investigation inside the Unit 3 PCV

To confirm the status inside Unit 3 PCV, an investigation device was inserted into the PCV on October 20 and 22 to obtain images, data of dose and temperature and sample accumulated water.

No damage was identified on the structure and walls inside the PCV and the water level was almost identical to the estimated value. In addition, the dose inside the PCV was confirmed as lower than in other Units.

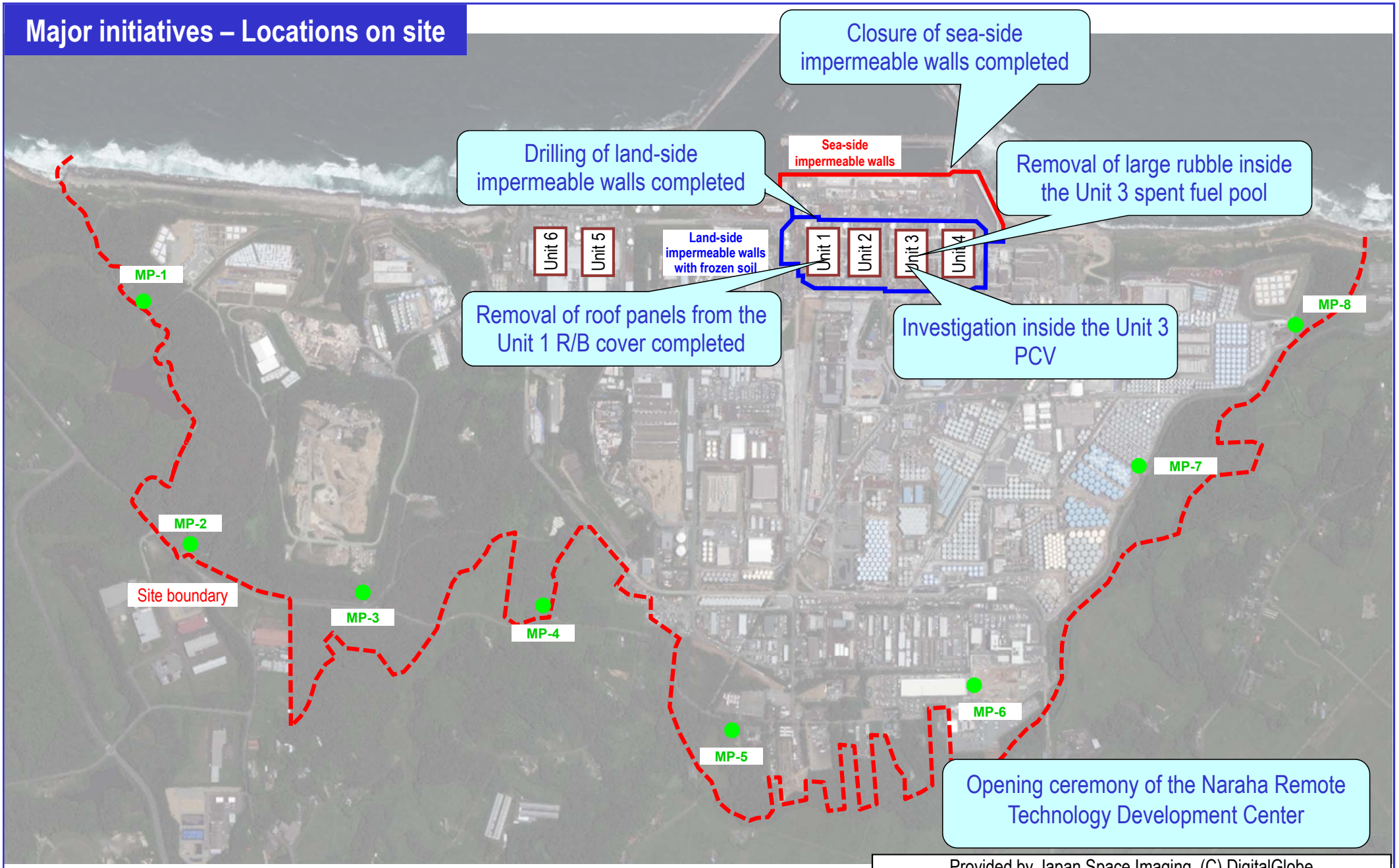
In the next step, the obtained information will be analyzed and utilized when considering the policy for future fuel debris removal.



Inspection pedestal and water surface

<Investigation inside the PCV>

Major initiatives – Locations on site



* Data of Monitoring Posts (MP1-MP8.)

Data (10-minute value) of Monitoring Posts (MPs) measuring airborne radiation rate around site boundaries show 0.910 - 3.508 μSv/h (September 30 – October 27, 2015).

We improved the measurement conditions of monitoring posts 2 to 8 for precise measurement of air dose rate. Construction works such as tree-clearing, surface soil removal and shield wall setting were implemented from Feb .10 to Apr. 18, 2012.

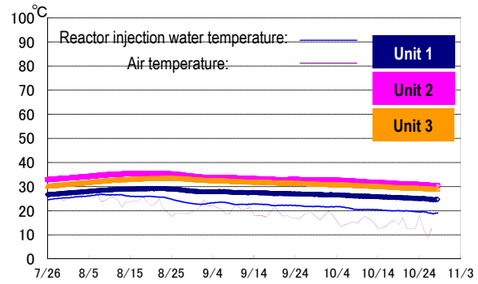
Therefore monitoring results at these points are lower than elsewhere in the power plant site.

The radiation shielding panel around monitoring post No. 6, which is one of the instruments used to measure the radiation dose of the power station site boundary, were taken off from July 10-11, 2013, since the surrounding radiation dose has largely fallen down due to further cutting down of the forests etc.

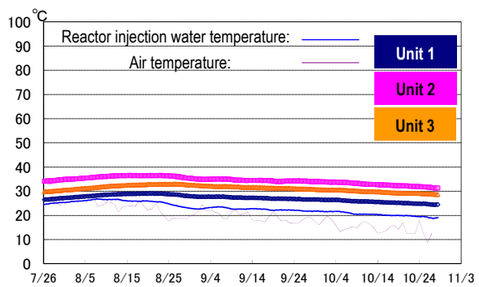
I. Confirmation of the reactor conditions

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. 20 to 40°C for the past month, though they vary depending on the unit and location of the thermometer.



RPV bottom temperatures (recent quarter)



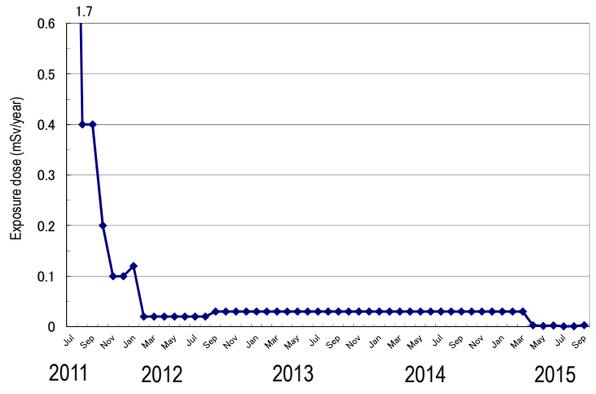
PCV gas phase temperatures (recent quarter)

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

2. Release of radioactive materials from the Reactor Buildings

As of September 2015, the density of radioactive materials newly released from Reactor Building Units 1-4 in the air and measured at the site boundaries was evaluated at approx. 1.0×10^{-10} Bq/cm^3 for Cs-134 and 2.5×10^{-10} Bq/cm^3 for Cs-137 respectively. The radiation exposure dose due to the release of radioactive materials was less than 0.0032 mSv/year at the site boundaries.

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



(Reference)

* The density limit of radioactive materials in the air outside the surrounding monitoring area:
[Cs-134]: 2 x 10^{-5} Bq/cm^3
[Cs-137]: 3 x 10^{-5} Bq/cm^3

* Dust density around the site boundaries of Fukushima Daiichi Nuclear Power Station (actual measured values):
[Cs-134]: ND (Detection limit: approx. 1 x 10^{-7} Bq/cm^3)
[Cs-137]: ND (Detection limit: approx. 2 x 10^{-7} Bq/cm^3)

* Data of Monitoring Posts (MP1-MP8).
Data of Monitoring Posts (MPs) measuring the airborne radiation rate around site boundaries showed 0.910 - 3.508 μSv/h (September 30 – October 27, 2015).
To measure the variation in the airborne radiation rate of MP2-MP8 more accurately, environmental improvement (tree trimming, removal of surface soil and shielding around the MPs) was completed.

3. Other indices

There was no significant change in indices, including the pressure in the PCV and the PCV radioactivity density (Xe-135) for monitoring criticality, nor was any abnormality in the cold shutdown condition or criticality sign detected.

Based on the above, it was confirmed that the comprehensive cold shutdown condition had been maintained and the reactors remained in a stabilized condition.

II. Progress status by each plan

1. Contaminated water countermeasures

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

➢ Operation of groundwater bypass

- From April 9, 2014, the operation of 12 groundwater bypass pumping wells commenced sequentially to pump up groundwater. The release commenced from May 21, 2014 in the presence of officials from the Intergovernmental Liaison Office for the Decommissioning and Contaminated Water Issue of the Cabinet Office. As of October 28, 2015, 142,351 m³ of groundwater had been released. The pumped-up groundwater has been temporarily stored in tanks and released after TEPCO and a third-party organization confirmed that its quality met operational targets.
- The release outlet was switched from the end of K drainage channel to the former C drainage channel (transferred approx. 160 m to the south) on October 21.
- For pumping well Nos. 1 and 9, pumping of groundwater was suspended for cleaning (No. 1: September 7 - October 2; No. 9: from October 6).

➢ Status of water treatment facilities including subdrains

- To reduce the groundwater flowing into the buildings, pumping-up of groundwater from wells (subdrains) around the buildings started on September 3. Pumped-up groundwater was purified at dedicated facilities and released from September 14. As of October 28, a total of 14,916 m³ had been drained after TEPCO and a third-party organization had confirmed that the quality of this purified groundwater met operational targets.

➢ Construction status of land-side impermeable walls

- To facilitate the installation of land-side impermeable walls surrounding Units 1-4 (a subsidy project of the Ministry of Economy, Trade and Industry), drilling to place frozen pipes commenced (from June 2, 2014).
- Regarding the mountain side, following the finished installation of frozen pipes on July 28, filling of brine also finished on September 15. Through these works, preparation for freezing was completed for three sides on the mountain side.
- From April 30, the freezing functioning test was underway at 18 points (58 frozen pipes, approx. 6% on the mountain side). Brine supply to freezing functioning test points was suspended from August 21 due to the filling of brine.
- Regarding the sea side, drilling has been completed on October 15 (for frozen pipes: 532 points, for temperature-measurement pipes: 131 points). As of October 27, installation of frozen pipes at 483 of 532 points (91%) had been completed (see Figure 2).

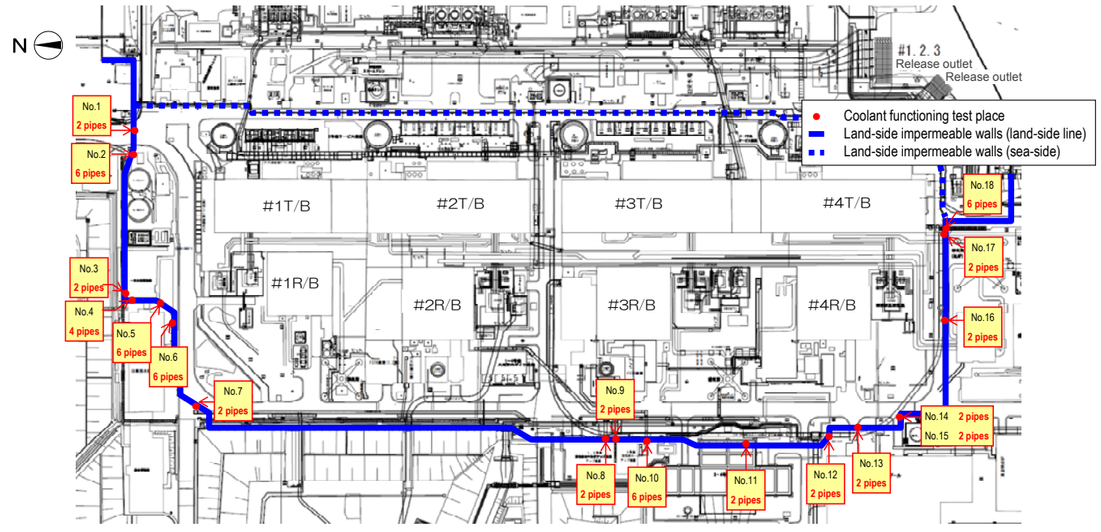


Figure 1: Freezing functioning test place on land-side impermeable walls

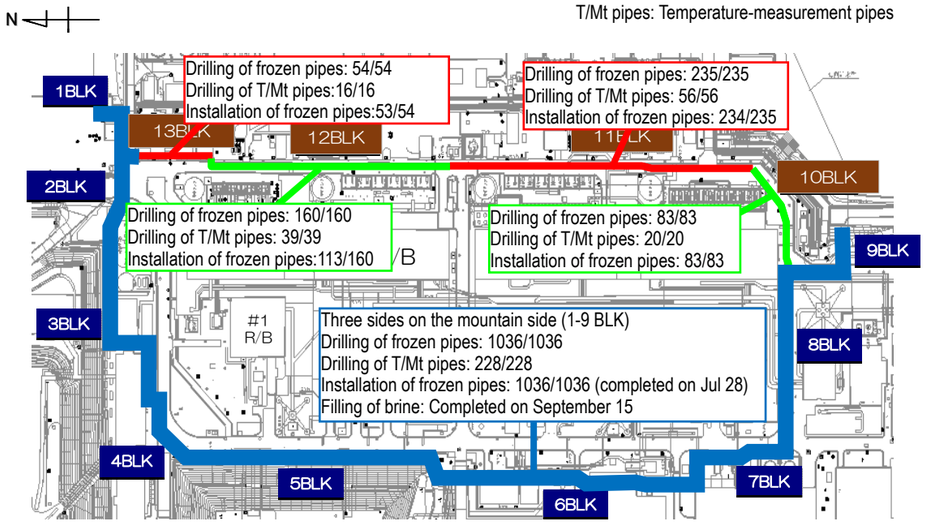
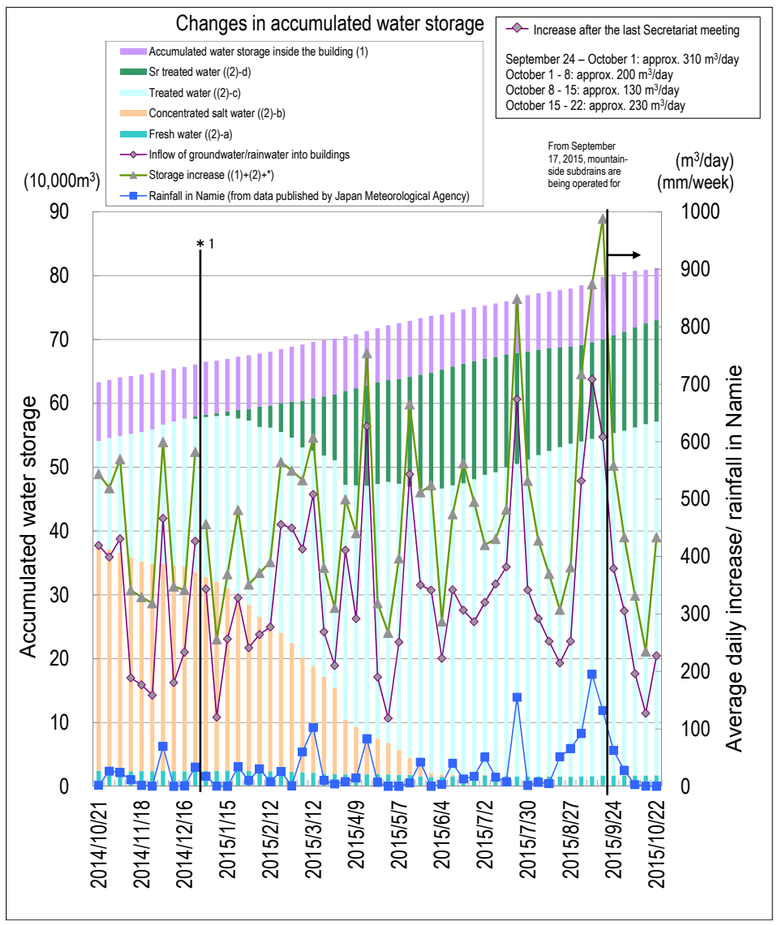
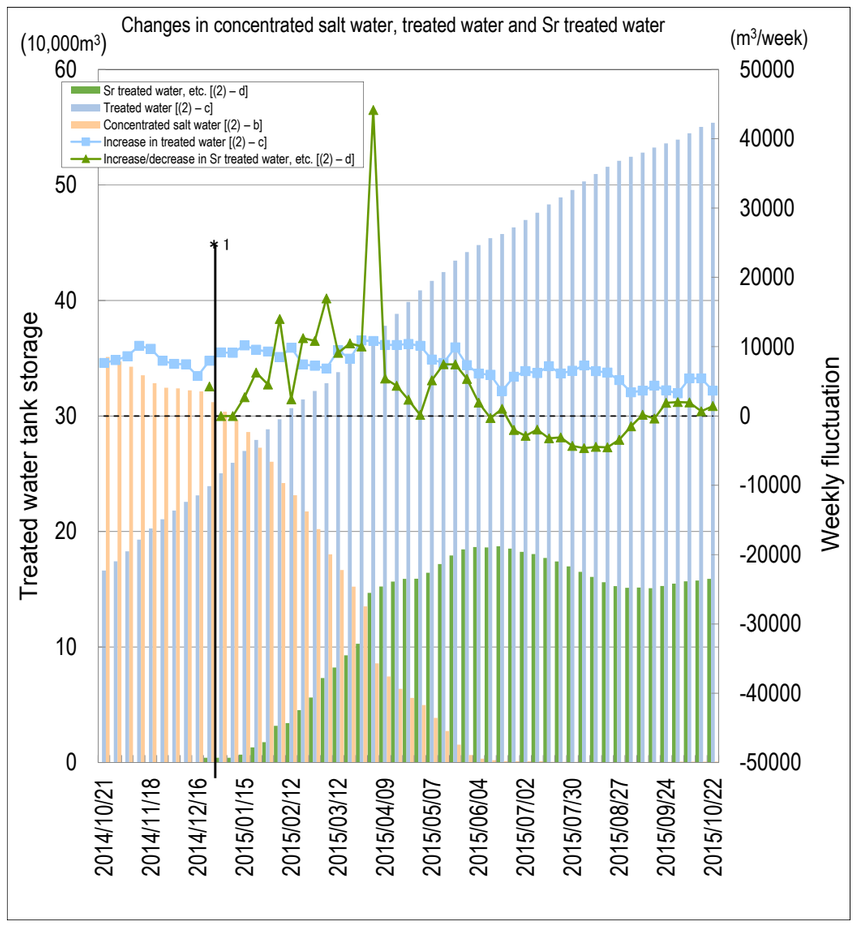


Figure 2: Drilling status for frozen-soil impermeable walls and installation of frozen pipes

➢ Operation of multi-nuclide removal equipment

- Regarding multi-nuclide removal equipment (existing, additional and high-performance), hot tests using radioactive water are underway (for existing equipment, System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013; for additional equipment, System A: from September 17, 2014, System B: from September 27, 2014, System C: from October 9, 2014; for high-performance equipment, from October 18, 2014).
- As of October 22, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 254,000, 213,000 and 89,000 m³ respectively (including approx. 9,500 m³ stored in the J1(D) tank, which contained water with a high density of radioactive materials at the System B outlet of existing multi-nuclide removal equipment).
- For Systems A and C of existing multi-nuclide removal equipment, facility inspections are underway and additional absorption vessels are being installed to improve their performance (from May 24). System B will be operated as required to treat wastewater generated in association with inspections, remaining RO-concentrated salt water, etc. An inspection for System B will be conducted after Systems A and C have been inspected.
- To reduce the risks of strontium-treated water, treatment by additional and high-performance multi-nuclide removal equipment is underway (additional: from May 27, high-performance: from April 15). As of October 22, approx. 118,000 m³ had been treated.





As of October 22, 2015

*1: Since January 1, 2015, the data collection days have been changed (Tuesdays → Thursdays)
*2: Water amount with which water-level gauge indicates 0% or more
*3: Since September 10, 2015, the data collection method has been changed (Evaluation based on increased in storage: in buildings and tanks → Evaluation based on increase/decrease in storage in buildings)
"Inflow of groundwater/rainwater into buildings" =
"Increase/decrease of water held in buildings"
+ "Transfer from buildings to tanks"
- "Transfer into buildings (water injection into reactors and transfer from well points, etc.)
4: Since April 23, 2015, the data collection method has been changed (Increase in storage ((1)+(2) → (1)+(2)+))

Figure 3: Status of accumulated water storage

➢ Toward reducing the risk of contaminated water stored in tanks

- Treatment measures comprising the removal of strontium by cesium absorption apparatus (KURION) (from January 6) and secondary cesium absorption apparatus (SARRY) (from December 26, 2014) are underway. As of October 22, approx. 132,000 m³ had been treated.

➢ Measures in Tank Areas

- Rainwater, under the release standard and having accumulated inside the fences in the contaminated water tank area, was sprinkled on site after eliminating radioactive materials using rainwater-treatment equipment since May 21, 2014 (as of October 26, 2015 a total of 38,700 m³).

➢ Leakage from desalination equipment (RO2)

- On October 16, a leakage from RO-treated water (fresh water) was detected at a damaged reserve pipe for injecting chemicals into the desalination equipment (RO2). The leakage (up to approx. 1m³) remained within the fences and no leakage outside the fences was identified.
- Based on the visual inspection results of the damaged pipe, the cause is assumed to be repeated weight applied due to vibration associated with operation and pulsation of pipes on the structure susceptible to stress concentration and cantilever pipes, and the resulting fatigue generating cracks and damage. The relevant reserve pipe will be removed and closed because it will not be needed in future. A visual inspection will also be conducted for PVC pipes of the desalination equipment.

➢ Investigative results of the leakage from desalination equipment (RO3) and countermeasures

- Regarding the leakage from the desalination equipment (RO3-3) on August 12, liquid penetrant, radiation transmission and visual inspections were conducted for the leakage point. Based on these results, the assumed cause is repeated weight due to vibration associated with high-pressure pump operation applied to a structural discrete site made from a lack of penetration at a pipe joint, and the resulting fatigue generating cracks and developing into damage. Pipes of the damaged joint and other joints of the desalination equipment for which a lack of penetration was identified will be replaced.

2. Fuel removal from the spent fuel pools

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 was completed on December 22, 2014

➢ Main work to help remove spent fuel at Unit 1

- On July 28, work started to remove the roof panels of the building cover. As of October 5, all six roof panels had been removed. During this work, no significant change was identified in the dust densities at dust monitors and monitoring posts, etc. Following the removal of roof panels, an investigation on the operating floor is underway. From November, removal of steel frames, which will interfere with the installation of sprinklers, will start.
- The dismantling of the building cover is being conducted with anti-scattering measures steadily implemented and safety prioritized above all.

➢ Main work to help remove spent fuel at Unit 2

- To help remove spent fuel from the pool of Unit 2 Reactor Building, dismantling of interfering buildings around the Reactor Building has been underway since September 7 to clear a work area for installing large heavy-duty machines, etc.

➢ Main work to help remove spent fuel at Unit 3

- The hatch lid of CUW F/D, a large area of rubble inside the spent fuel pool, was removed (September 22 – October 15), which completed the removal of all large rubble on the fuel rack. Among four spent fuel assemblies newly identified after the removal, slight distortion of the fuel handles of two fuel assemblies was detected. A detailed investigation into these fuel assemblies will be conducted while considering fuel removal. Removal of other rubble is underway (scheduled for completion in November).

3. Fuel debris removal

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)

➢ Investigation into TIP Room on Unit 1 Reactor Building 1st floor

- To confirm the need for a dose reduction that may facilitate future investigations inside PCV and repair, an investigation was conducted from September 24 to October 2 at the TIP Room. The results identified high dose at X-31 to 33 penetrations (instrumentation penetration) on the PCV side and a low dose elsewhere parts and confirmed that work inside the TIP room would be available (see Figure 4).

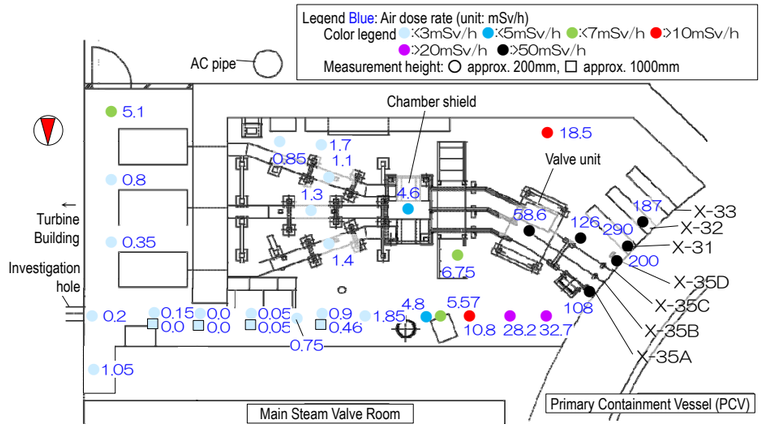
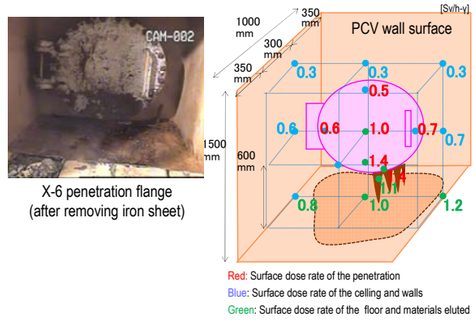


Figure 4: Investigation at Unit 1 TIP Room (air dose rate)

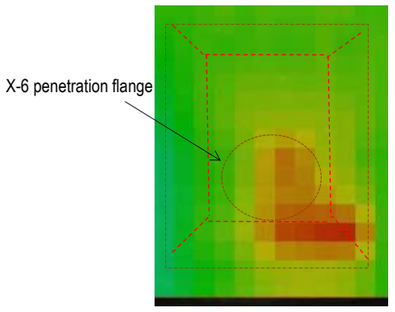
➢ Investigative results of contamination at Unit 2 X-6 penetration

- To facilitate the investigation into the status of the platform inside the Unit 2 PCV pedestal (A2 investigation), an investigation was conducted into the contamination in front of X-6 penetration.
- The results confirmed that dose contribution from the inside of X-6 penetration was up to 1 Sv/h, contamination was formed around materials eluted from X-6 penetration, and the materials were solid and easily removable by spatula (see Figure 5).



X-6 penetration flange (after removing iron sheet)

(Results of surface dose rate measurement using dosimeter with collimator)



(Contamination distribution investigation using gamma camera))

Figure 5: Investigation around Unit 2 X-6 penetration

➢ Investigation into the Unit 3 PCV equipment hatch

- Based on the investigation into the status of the Unit 3 PCV equipment hatch on September 9, an investigation will be conducted using self-traveling decontamination equipment from November.

➢ Preparation status for applying actual dry-ice blast decontamination equipment at elevation

- Dry-ice blast decontamination equipment at elevation is being developed in the subsidiary project by the government named “Development of Remote Decontamination Technology inside Reactor Building”. As modification to facilitate application of the actual equipment was finished, there are plans to install it southwest of the Unit 3 Reactor Building 1st floor after mid-November following necessary coordination and training for learning the operation.

4. Plans to store, process and dispose of solid waste and decommission of 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 September, the total storage volume of concrete and metal rubble was approx. 161,000 m³ (+3,200 m³ compared to at the end of August, with an area-occupation rate of 61%). The total storage volume of trimmed trees was approx. 82,100 m³ (±0 m³ compared to at the end of August, with an area-occupation rate of 64%). The increase in rubble was mainly attributable to construction related to facing and the installation of tanks.

➢ Management status of secondary waste from water treatment

- As of October 22, 2015, the total storage volume of waste sludge was 597 m³ (area-occupation rate: 85%) and that of concentrated waste fluid was 9,315 m³ (area-occupation rate: 47%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment, etc. was 2,834 (area-occupation rate: 47%).

5. Reactor cooling

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

➢ Purification of water in the Unit 1 spent fuel pool

- For water in the Unit 1 spent fuel pool, decontamination was conducted from September 24 to October 19, to prepare for future desalination needs due to potential weather damage after removal of the building cover.

➢ Investigation inside Unit 3 PCV and installation of a permanent monitor

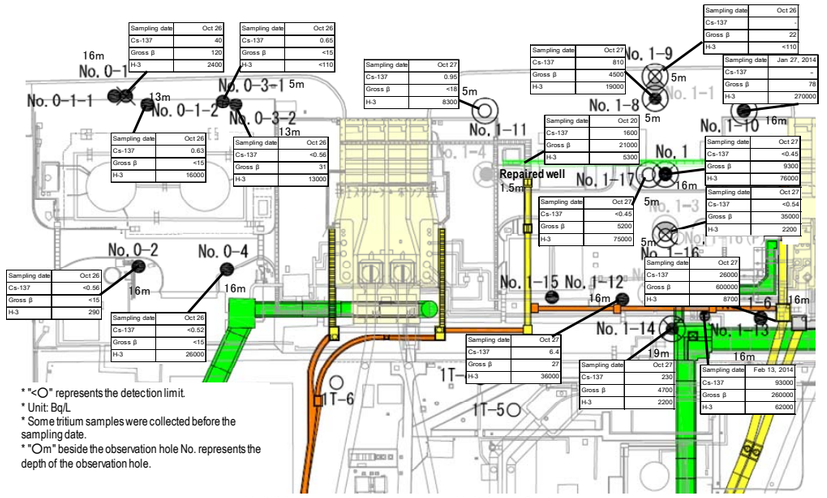
- To confirm the cooling status inside Unit 3 PCV and acquire information to help consideration of future investigation, an investigation device was inserted from the PCV penetration (X-53 penetration) to obtain images, data of dose and temperature and sample accumulated water inside the PCV (October 20 and 22). No damage was identified on the structure and walls inside the PCV and the water level was almost identical to the estimated value (OP. approx. 11,970). In addition, the dose inside the PCV was confirmed to be lower than in other Units. In the next step, the information obtained will be analyzed and utilized when considering policy for future fuel debris removal.
- Following preparation for installation, thermometers and a water-level gage will be installed from the X-53 in December.

6. Reduction in radiation dose and mitigation of contamination

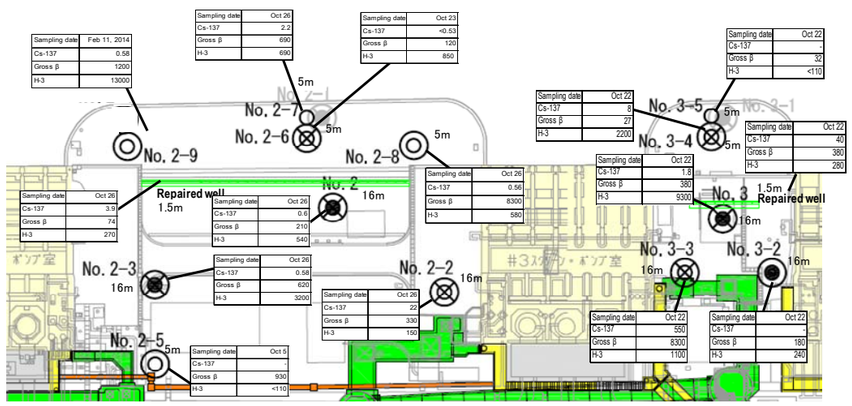
Effective dose-reduction at site boundaries and purification of port water to mitigate the impact of radiation on the external environment

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

- Regarding the radioactive materials in groundwater near the bank on the north side of the Unit 1 intake, the tritium density has been increasing in groundwater Observation Hole No. 0-4 since September 2014 and currently stands at around 30,000 Bq/L. Pumping of 1 m³/day of water from Observation Hole No. 0-3-2 continues.
- Regarding the groundwater near the bank between the Unit 1 and 2 intakes, the tritium density at groundwater Observation Hole Nos. 1 and 1-17 has remained constant at around 80,000 Bq/L since March 2015. Since February 2015, the density of gross β radioactive materials at groundwater Observation Hole No. 1 has been increasing and currently stands at around 8,000 Bq/L while that at groundwater Observation Hole No. 1-17 has been decreasing and currently stands at around 5,000 Bq/L. Water pumping from the repaired well point started (from October 14).
- Regarding radioactive materials in the groundwater near the bank between the Unit 2 and 3 intakes, though the density of gross β radioactive materials increased to 10,000 Bq/L in September, it has been decreasing since water pumping started at the repaired well point on October 14.
- Regarding the radioactive materials in groundwater near the bank between the Unit 3 and 4 intakes, a low density was maintained at all observation holes. Water pumping from the repaired well point started (from September 17).
- Regarding the radioactive materials in seawater outside the sea-side impermeable walls and within the open channels of Units 1-4, the density was decreasing due to the effect of the completed installation of steel pipe sheet piles for the sea-side impermeable walls and progress in connecting these piles.
- Regarding the radioactive materials in seawater outside the port, the densities of cesium 137 and tritium have remained within the same range previously recorded. Though the density of gross β radioactive materials remained below the detection limit (15 – 18 Bq/L), it has been at a level equivalent to the detection limit since late March 2015. Though the density of gross β radioactive materials was 24 Bq/L on the northeast side of the port entrance on June 15, the densities of strontium 90 at the port entrance, on the north side of Unit 5 and 6 outlets and near the south outlet have remained low. No change was identified in the density of gross β radioactive materials on the north side of Unit 5 and 6 outlets and near the south outlet.
- Regarding the sea-side impermeable walls, following the installation of steel pipe sheet piles, which resumed on September 10 and was completed on September 22, connection of these piles was completed on October 26. Landfill and pavement will start inside the sea-side impermeable walls.



<Unit 1 intake north side, between Unit 1 and 2 intakes>



<Between Unit 2 and 3 intakes, between Unit 3 and 4 intakes>

Figure 6: Groundwater density on the Turbine Building east side

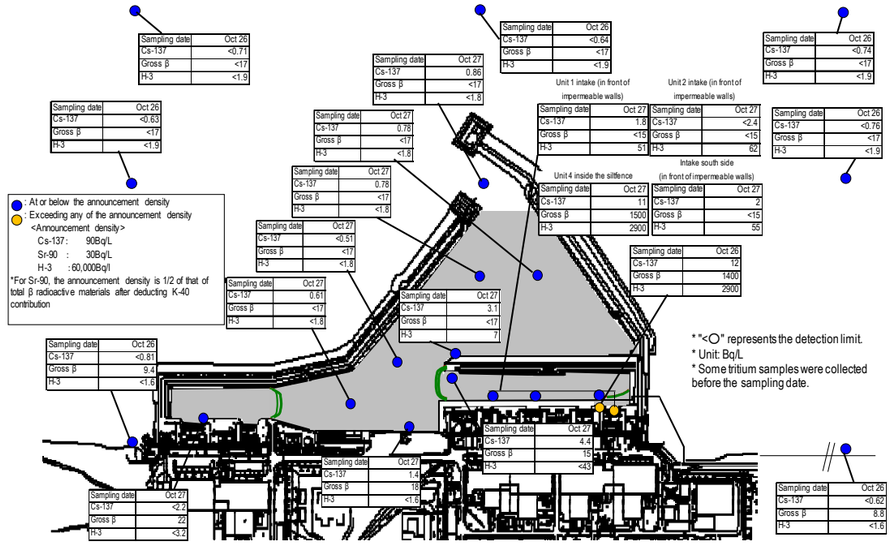


Figure 7: Seawater density around the port

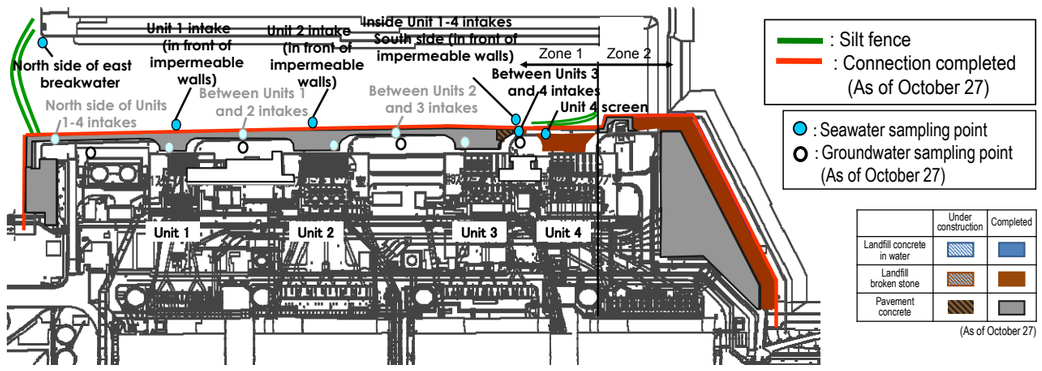


Figure 8: Progress status of impermeable walls on the sea side

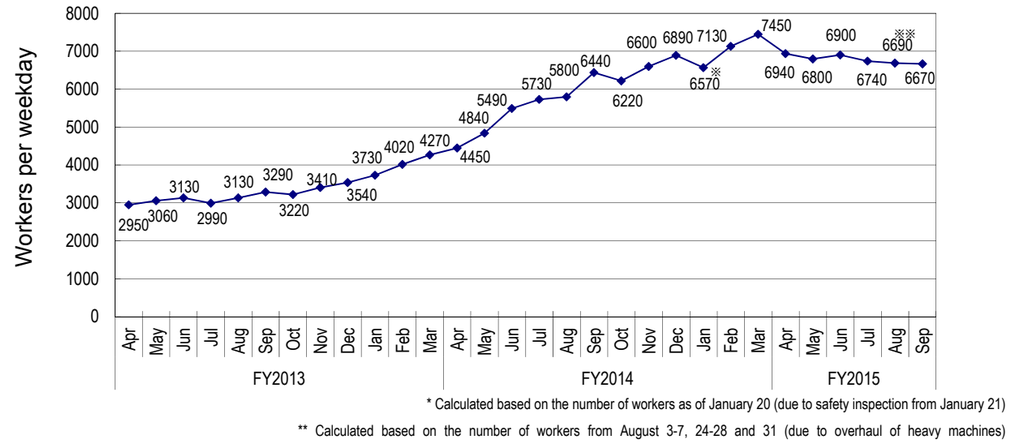
7. Review of the number of staff required and efforts to improve the labor environment and conditions

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 of people registered for at least one day per month to work on site during the past quarter from June to August 2015 was approx. 13,900 (TEPCO and partner company workers), which exceeded the monthly average number of actual workers (approx. 10.900). Accordingly, sufficient people are registered to work on site.
- It was confirmed with prime contractors that the estimated manpower necessary for the work in November (approx. 6,740 per day: TEPCO and partner company workers)* would be secured at present. The average numbers of workers per day for each month (actual values) were maintained, with approx. 3,000 to 7,500 since FY2014 (see Figure 9).

  * Some works for which contractual procedures have yet to be completed are excluded from the November estimate.
- The number of workers from Fukushima Prefecture has remained the same but the number from outside the prefecture has increased slightly. Accordingly, the local employment ratio (TEPCO and partner company workers) as of September remained at around 50% with a slight decline.
- The average exposure dose of workers remained at approx. 1 mSv/month during FY2013, FY2014 and FY2015. (Reference: Annual average exposure dose 20 mSv/year ≒ 1.7 mSv/month).
- For most workers, the exposure dose was sufficiently within the limit and allowed them to continue engaging in radiation work.



* Calculated based on the number of workers as of January 20 (due to safety inspection from January 21)

** Calculated based on the number of workers from August 3-7, 24-28 and 31 (due to overhaul of heavy machines)

Figure 9: Changes in the average number of workers per weekday for each month since FY2013

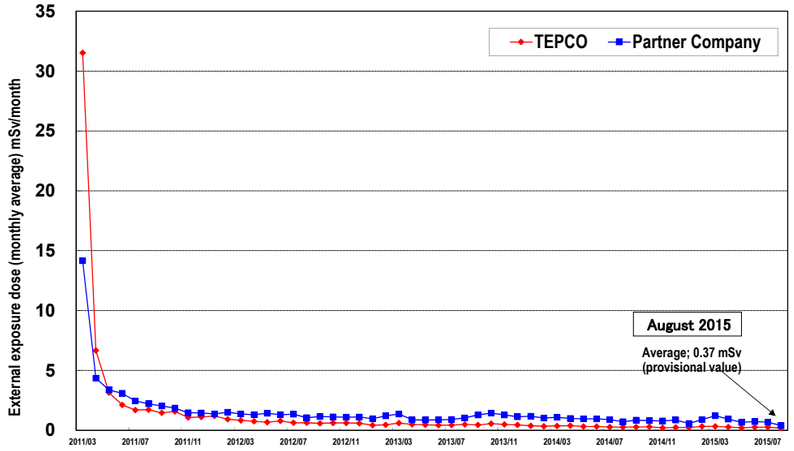


Figure 10: Changes in monthly individual worker exposure dose (monthly average exposure dose since March 2011)

➢ Status of heat stroke cases

- As of October 28 in FY2015, there were a total of 15 heat stroke cases, 12 of which were attributable to work and three alleged cases (slight heat stroke). Thorough preventive measures for heat stroke continue to be taken. (As of the end of October FY2014, there were a total of 32 heat stroke cases, 15 of which attributable to work and seventeen alleged cases.)
- Compared to the previous fiscal year, the number of heat stroke cases attributable to work decreased and the total number, including alleged cases, was halved.
- As measures to prevent heat stroke, unified rules were implemented including ongoing rules (using WBGT*, prohibiting outdoor work from 14:00 to 17:00, and wearing cool vests) and new rules from last fiscal year (limiting continuous work at WBGT 25°C or higher for up to two hours in principle, and prohibiting work at WBGT 30°C or higher in principle). These unified rules were reviewed and further clarified.
- The next fiscal year, the unified rules will continue to be implemented to thoroughly enforce them and prevent future heat stroke cases.

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

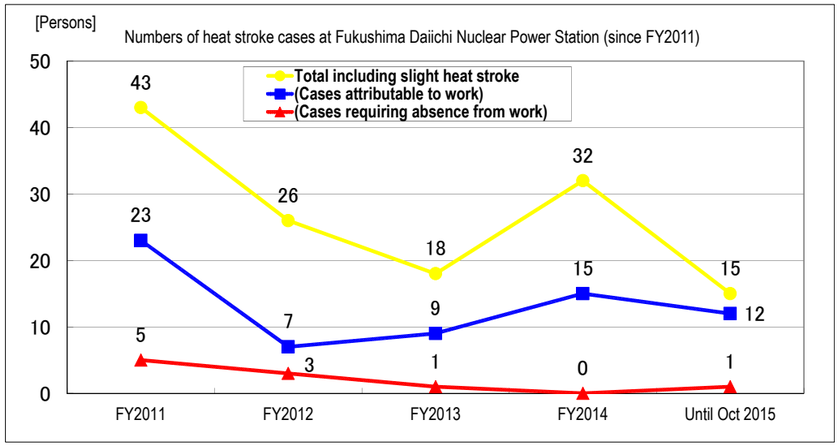


Figure 11: Changes in numbers of heat stroke cases

➢ Installation of shower facilities at the large rest house

- To improve the environment for workers, 30 shower facilities will be installed at the large rest house. Construction will start in December 2015 and installation will be completed in March 2016.

➢ Response to the guidelines of Ministry of Health, Labour and Welfare

- In response to guidelines issued by the Ministry of Health, Labour and Welfare, TEPCO will continue to strictly observe the ongoing notice, appropriately fulfill new requirements (risk assessment, measures to efficiently reduce exposure from the construction order phase, etc.), and further improve safety and health management measures.

8. Other

➢ Opening ceremony of the Naraha Remote Technology Development Center

- To facilitate the decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station, the Japan Atomic Energy Agency (JAEA) is building a facility for development and verification tests of remote-control devices and equipment (Naraha Remote Technology Development Center).
- On October 19, the opening ceremony was held celebrating the completed construction of the research management building for this center and the start of some operations.
- Construction of the test building continues, targeting a full operational launch in the following fiscal year.

➢ Inspection results of Unit 1 and 2 exhaust pipes

- Regarding Unit 1 and 2 exhaust pipes on site, as a break was identified at bends around 66m above ground by the (initial) inspection in August 2013, an annual visual inspection has been conducted.
- The inspection in September 2015 identified no new damage other than distortion and break detected during the first inspection. Moreover, no significant change was identified in the distortion and break points.

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 October 19-27)"; 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 http://www.tepco.jp/nu/fukushima-np/f1/smp/index-j.html

Sea side impermeable wall

Silt fence

Cesium-134: 3.3 (2013/10/17) → ND(0.53) Below 1/6
Cesium-137: 9.0 (2013/10/17) → 0.78 Below 1/10
Gross β: 74 (2013/ 8/19) → ND(17) Below 1/4
Tritium: 67 (2013/ 8/19) → ND(1.8) Below 1/30

Cesium-134: 4.4 (2013/12/24) → ND(0.57) Below 1/7
Cesium-137: 10 (2013/12/24) → ND(0.51) Below 1/10
Gross β: 60 (2013/ 7/ 4) → ND(17) Below 1/3
Tritium: 59 (2013/ 8/19) → ND(1.8) Below 1/30

Cesium-134: 5.0 (2013/12/2) → ND(0.65) Below 1/7
Cesium-137: 8.4 (2013/12/2) → 0.61 Below 1/10
Gross β: 69 (2013/8/19) → ND(17) Below 1/3
Tritium: 52 (2013/8/19) → ND(1.8) Below 1/20

Cesium-134: 2.8 (2013/12/2) → ND(1.8) Below 7/10
Cesium-137: 5.8 (2013/12/2) → ND(2.2) Below 1/2
Gross β: 46 (2013/8/19) → 22 Below 1/2
Tritium: 24 (2013/8/19) → ND(3.2) Below 1/7

	Legal discharge limit	WHO Guidelines for Drinking Water Quality
Cesium-134	60	10
Cesium-137	90	10
Strontium-90 (strongly correlate with Gross β)	30	10
Tritium	60,000	10,000

Cesium-134: 0.64
Cesium-137: 3.1
Gross β: ND(17)
Tritium: 7.0 *

Cesium-134: 3.3 (2013/12/24) → ND(0.46) Below 1/7
Cesium-137: 7.3 (2013/10/11) → 0.86 Below 1/8
Gross β: 69 (2013/ 8/19) → ND(17) Below 1/4
Tritium: 68 (2013/ 8/19) → ND(1.8) Below 1/30

Cesium-134: 3.5 (2013/10/17) → ND(0.69) Below 1/5
Cesium-137: 7.8 (2013/10/17) → 0.78 Below 1/10
Gross β: 79 (2013/ 8/19) → ND(17) Below 1/4
Tritium: 60 (2013/ 8/19) → ND(1.8) Below 1/30

Cesium-134: 32 (2013/10/11) → ND(1.9) Below 1/10
Cesium-137: 73 (2013/10/11) → 4.4 Below 1/10
Gross β: 320 (2013/ 8/12) → 15 Below 1/20
Tritium: 510 (2013/ 9/ 2) → ND(43) Below 1/10

【Port entrance】
【South side in the port】
【East side in the port】
【Port center】
【West side in the port】
【North side in the port】
【In front of Unit 6 intake】
【In front of shallow draft quay】

Cesium-134: ND(2.1)
Cesium-137: 1.8
Gross β: ND(15)
Tritium: 51 *

Cesium-134: ND(1.8)
Cesium-137: ND(2.4)
Gross β: ND(15)
Tritium: 62 *

Cesium-134: ND(1.5)
Cesium-137: 2.0
Gross β: ND(15)
Tritium: 55 *

* Monitoring commenced in or after March 2014

Cesium-134: 62 (2013/ 9/16)→ ND(2.7) Below 1/20
Cesium-137: 140 (2013/ 9/16)→ 11 Below 1/10
Gross β: 360 (2013/ 8/12)→ 1,500
Tritium: 400 (2013/ 8/12)→ 2,900

Cesium-134: 5.3 (2013/8/ 5) → ND(0.84) Below 1/6
Cesium-137: 8.6 (2013/8/ 5) → 1.4 Below 1/6
Gross β: 40 (2013/7/ 3) → 18 Below 1/2
Tritium: 340 (2013/6/26) → ND(1.6) Below 1/200

Cesium-134: 28 (2013/ 9/16)→ 2.7 Below 1/10
Cesium-137: 53 (2013/12/16)→ 12 Below 1/4
Gross β: 390 (2013/ 8/12)→ 1,400
Tritium: 650 (2013/ 8/12)→ 2,900

Summary of TEPCO data as of October 28

Note: The gross β measurement values include natural potassium 40 (approx. 12 Bq/L). They also include the contribution of yttrium 90, which radioactively balance strontium 90.

Status of seawater monitoring around outside of the port
(comparison between the highest values in 2013 and the latest values)

(The latest values sampled during October 19-27)

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

	Legal discharge limit	WHO Guidelines for Drinking Water Quality
Cesium-134	60	10
Cesium-137	90	10
Strontium-90 (strongly correlate with Gross β)	30	10
Tritium	60,000	10,000

【Northeast side of port entrance(offshore 1km)】

Cesium-134: ND (2013) → ND (0.68)
Cesium-137: ND (2013) → ND (0.71)
Gross β: ND (2013) → ND (17)
Tritium: ND (2013) → ND (1.9)

【East side of port entrance (offshore 1km)】

Cesium-134: ND (2013) → ND (0.56)
Cesium-137: 1.6 (2013/10/18) → ND (0.64) Below 1/2
Gross β: ND (2013) → ND (17)
Tritium: 6.4 (2013/10/18) → ND (1.9) Below 1/3

【Southeast side of port entrance(offshore 1km)】

Cesium-134: ND (2013) → ND (0.74)
Cesium-137: ND (2013) → ND (0.74)
Gross β: ND (2013) → ND (17)
Tritium: ND (2013) → ND (1.9)

Cesium-134: ND (2013) → ND (0.54)
Cesium-137: ND (2013) → ND (0.63)
Gross β: ND (2013) → ND (17)
Tritium: 4.7 (2013/ 8/18) → ND (1.9) Below 1/2

【North side of north breakwater(offshore 0.5km)】

【Port entrance】

【South side of south breakwater(offshore 0.5km)】

Cesium-134: ND (2013) → ND (0.73)
Cesium-137: ND (2013) → ND (0.76)
Gross β: ND (2013) → ND (17)
Tritium: ND (2013) → ND (1.9)

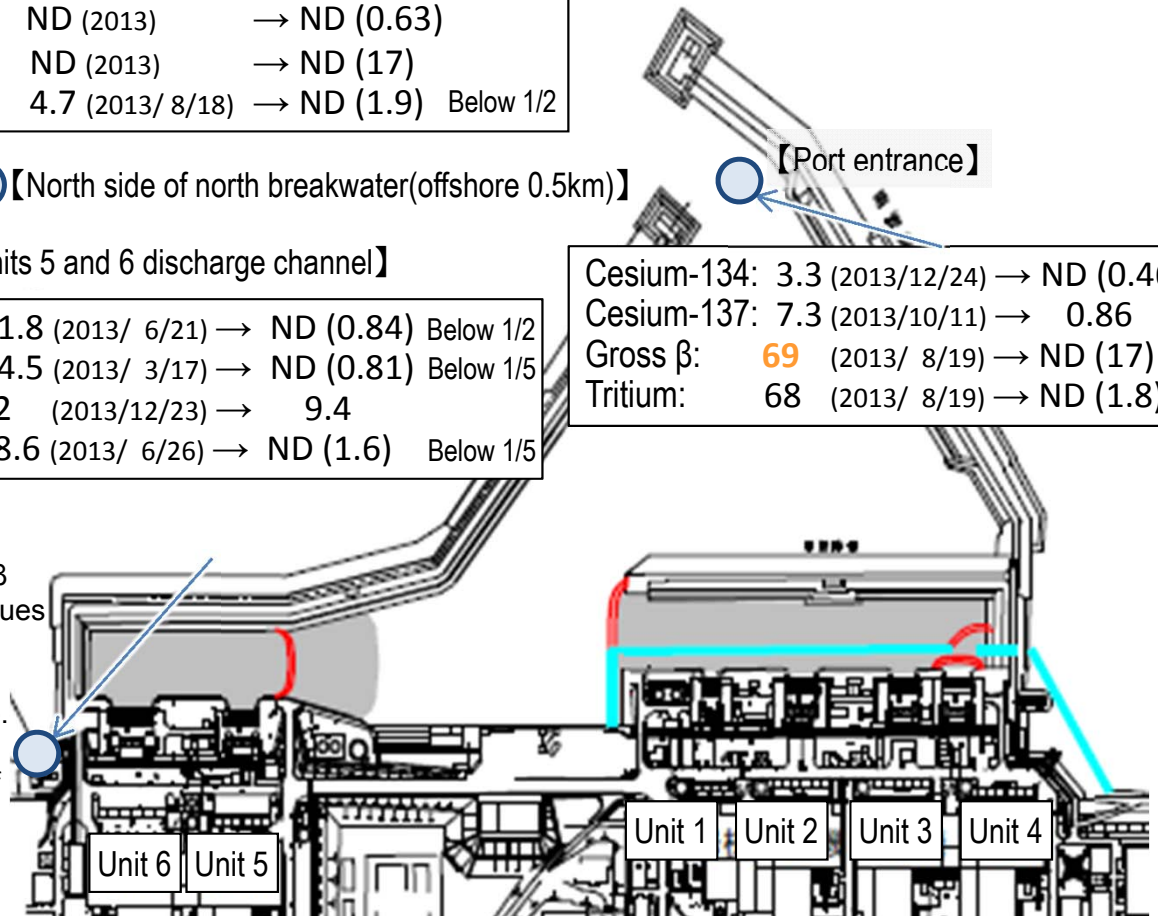
【North side of Units 5 and 6 discharge channel】

Cesium-134: 1.8 (2013/ 6/21) → ND (0.84) Below 1/2
Cesium-137: 4.5 (2013/ 3/17) → ND (0.81) Below 1/5
Gross β: 12 (2013/12/23) → 9.4
Tritium: 8.6 (2013/ 6/26) → ND (1.6) Below 1/5

Cesium-134: 3.3 (2013/12/24) → ND (0.46) Below 1/7
Cesium-137: 7.3 (2013/10/11) → 0.86 Below 1/8
Gross β: 69 (2013/ 8/19) → ND (17) Below 1/4
Tritium: 68 (2013/ 8/19) → ND (1.8) Below 1/30

Cesium-134: ND (2013) → ND (0.76)
Cesium-137: 3.0 (2013/ 7/15) → ND (0.62) Below 1/4
Gross β: 15 (2013/12/23) → 8.8
Tritium: 1.9 (2013/11/25) → ND (1.6)

【Around south discharge channel】



Sea side impermeable wall

Silt fence

Note: The gross β measurement values include natural potassium 40 (approx. 12 Bq/L). They also include the contribution of yttrium 90, which radioactively balance strontium 90.

Summary of TEPCO data as of October 28

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

Appendix 2
October 29, 2015

TEPCO Fukushima Daiichi Nuclear Power Station Site Layout

Rubble storage area
Rubble storage area (planned)
Trimmed trees area
Trimmed trees area (planned)
Mid-/ low-level contaminated water tank
Mid-/ low-level contaminated water tank (planned)
High-level contaminated water tank
High-level contaminated water tank (planned)
Secondary waste from water treatment
Secondary waste from water treatment (planned)
Multi-nuclide removal equipment
Subdrain-purification system
Dry cask temporary storage facility


Rubble storage tent


Temporary soil cover type


Rubble


Inside the rubble


Rubble (container storage)

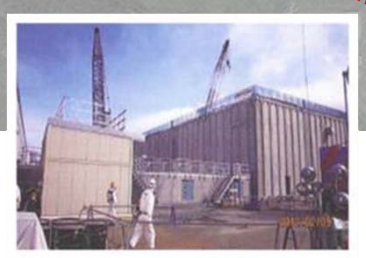

Solid waste storage facility


Rubble (outdoor accumulation)


Temporary trimmed trees


Trimmed trees (outdoor accumulation)

Tank installation status


Temporary waste sludge storage

Futaba town
Ohkuma town
Unit 1
Unit 2
Unit 3
Unit 4
Unit 5
Unit 6
MP-1
MP-2
MP-3
MP-4
MP-5
MP-6
MP-7
MP-8
Radioactive Waste Incinerator (Installation underway)
Vehicles maintenance site
Periodical inspection material storage (cut of flange tank)
Town boundary
Mega float
Chiller for reactor water injection facility
RO concentrated water treatment facility
Dry cask temporary storage facility
Subdrain-purification system
Main Anti-Earthquake
Multi-nuclide removal equipment
High-performance multi-nuclide removal equipment
Additional multi-nuclide removal equipment
Vehicle screening and decontamination site
Pipe route
Spent absorption vessel temporary storage
Underground reservoirs
Land-side impermeable walls freezing plant
Land-side impermeable walls with frozen soil (Installation
Sea side impermeable wall
Temporary trimmed trees storage pool
Administration Office Building
Groundwater bypass temporary storage tank
Temporary rest house outside the site
Administration Office Building (planned)
Large rest house
Access control facility
Common pool
Underground
2nd cesium absorption apparatus (HTI
Cesium absorption apparatus (Incineration Workshop Building)
Decontamination instruments (Process Building)
Cesium absorption vessel temporary storage
Temporary waste sludge storage
High-level accumulated water reception tank (emergency reception)
Fresh water tank
Spent absorption vessel temporary storage (multi-nuclide removal equipment, etc.)
Spent absorption vessel temporary storage
Site boundary
Water desalinations (evaporative concentration)
Water desalinations (RO)
Trimmed
Rubble
Temporary trimmed trees
H1
H2
H3
H4
H5
H6
H8
H9
D
E
J1
J2
J3
J4
J5
J6
J7
J8
K1
K2
K3
G
G6
G7
G3・G4・G5
F
B
C

Provided by Japan Space Imaging Corporation, (C)DigitalGlobe

0m 100m 500m 1000m

Progress toward decommissioning: Fuel removal from the spent fuel pool (SFP)

Immediate target	Commence fuel removal from the Unit 1-3 Spent Fuel Pools

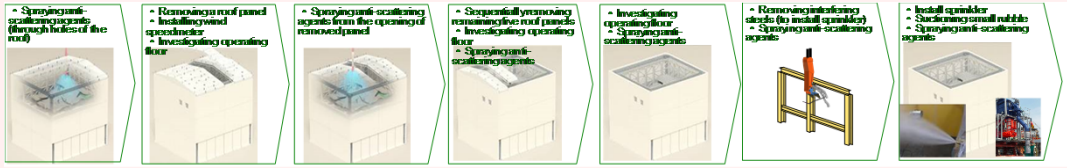
Unit 1

Regarding fuel removal from Unit 1 spent fuel pool, there is a plan to install a dedicated cover for fuel removal over the operating floor(*1).

Before starting this plan, the building cover will be dismantled to remove rubble from the top of the operating floor, with anti-scattering measures steadily implemented.

Removal of roof panels from the building cover started on July 28 and all panels were removed on October 5. Dismantling of the building cover will proceed with radioactive materials thoroughly monitored.

Status of removal of roof panels



Flow of building cover dismantling

Unit 2

Regarding fuel removal for Unit 2 spent fuel pool, two plans are being considered: Plan 1 to share a container for removing fuel assemblies and debris from the pool; and Plan 2 to install a dedicated cover for fuel removal.

As both plans require work areas of large heavy machines, etc. to install a structure for fuel removal and a fuel handling machine, dismantling of interfering buildings around the Reactor Building has been underway since September 2015.

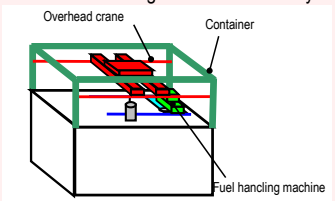


Image of Plan 1

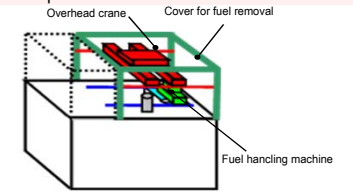


Image of Plan 2

Unit 3

To facilitate the installation of a cover for fuel removal, measures to reduce dose (decontamination and shielding) and rubble removal from the spent fuel pool are underway.
(Decontamination and shielding: from October 15, 2013, rubble removal from the pool: from December 17, 2013)

On August 2, 2015, the fuel-handling machine, the largest rubble which fell in the Unit 3 spent fuel pool (approx. 20t), was removed.

To facilitate fuel removal, rubble removal from the spent fuel pool and dose reduction on the top floor of the Reactor Building will continue.

In tandem with these works, training of fuel removal by remote control is underway.

Removal of fuel-handling machine on August 2

Fuel handling machine removed from the pool

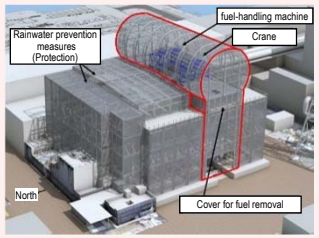


Image of the cover for fuel removal

Unit 4

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.

Fuel removal status

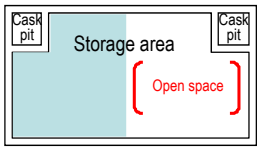
On November 5, 2014, within a year of commencing work to remove the fuel, all 1,331 spent fuel assemblies in the pool had been transferred. The transfer of the remaining non-irradiated fuel assemblies to the Unit 6 SFP was completed on December 22, 2014. (2 of the non-irradiated fuel assemblies were removed in advance in July 2012 for fuel checks)

This marks the completion of fuel removal from the Unit 4 Reactor Building.

Based on this experience, fuel assemblies will be removed from Unit 1-3 pools.

* A part of the photo is corrected because it includes sensitive information related to physical protection.

Common pool

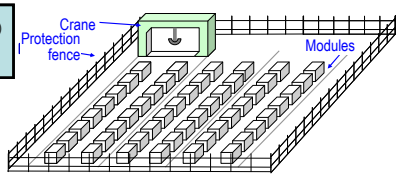


An open space will be maintained in the common pool (Transfer to the temporary dry cask storage facility)

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)

Temporary dry cask (*3) storage facility



Spent fuel is accepted from the common pool

Operation commenced on April 12, 2013; from the cask-storage building, transfer of 9 existing dry casks completed (May 21, 2013); fuel stored in the common pool sequentially transferred.

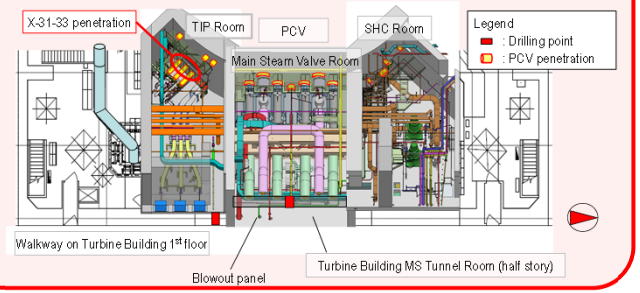
<Glossary>
(*1) Operating floor: During regular inspection, the roof over the reactor is opened while on the operating floor, fuel inside the core is replaced and the core internals are inspected.
(*2) Cask: Transportation container for samples and equipment, including radioactive materials.

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

Investigation into TIP Room of the Unit 1 Reactor Building

- To improve the environment for future investigations inside the PCV, etc., an investigation was conducted from September 24 to October 2 at the TIP Room(*1). (Due to high dose around the entrance in to the TIP Room, the investigation of dose rate and contamination distribution was conducted through a hole drilled from the walkway of the Turbine Building, where the dose was low)
- The investigative results identified high dose at X-31 to 33 penetrations(*2) (instrumentation penetration) and low dose at other parts.
- As it was confirmed that work inside the TIP room would be available, the next step will include identification of obstacles which will interfere the work inside the TIP Room and formulation of a plan for dose reduction.



Investigation in the leak point detected in the upper part of the Unit 1 Suppression Chamber (S/C(*3))

Investigation in the leak point detected in the upper part of Unit 1 S/C from May 27, 2014 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.

Leak point

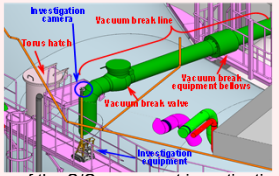
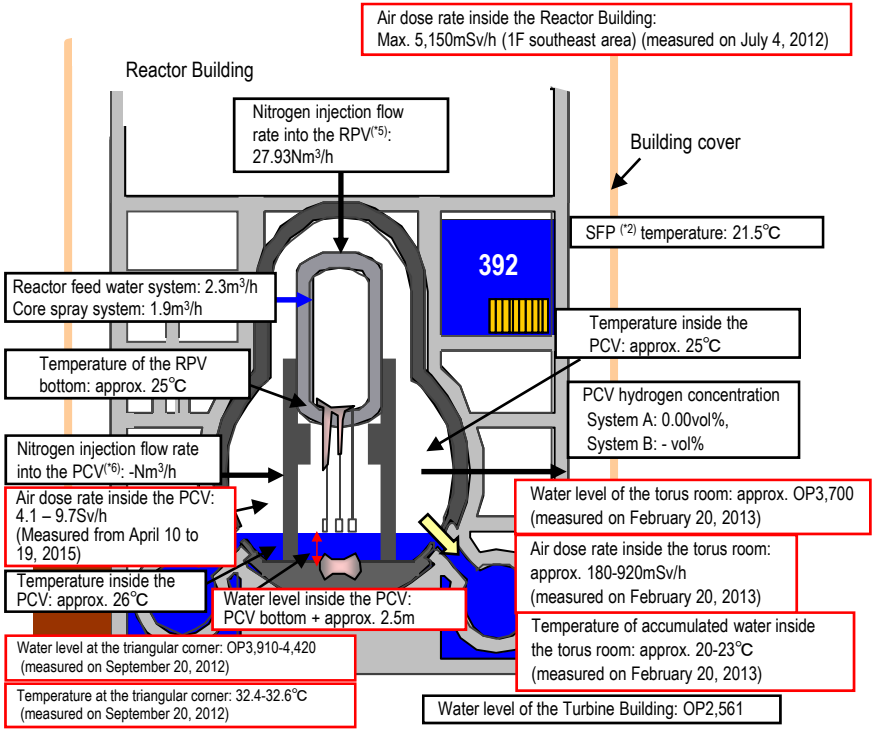


Image of the S/C upper part investigation

Unit 1



* Indices related to the plant are values as of 11:00, October 28, 2015

Status of equipment development toward investigating inside the PCV

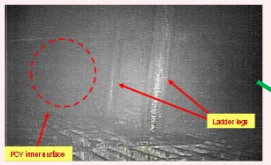
Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigation inside the PCV is scheduled.

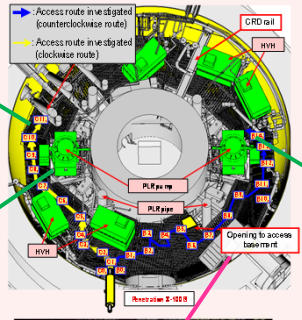
[Investigative outline]

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

[Status of investigation equipment development]

- Using the 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, a field demonstration was implemented from April 10 to 20, 2015.
- Through this investigation, information including images inside the PCV 1st floor and airborne radiation was obtained. The investigation also confirmed the absence of obstacles around the access aperture leading to the basement floor, which will be used in the next investigation. These results will be considered in next investigation of the PCV basement floor.





Investigation inside PCV


Investigative equipment

<Glossary>
(*1) TIP (Traversing In-core Probe)
(*2) Penetration: Through-hole of the PCV
(*3) S/C (Suppression Chamber): Suppression pool, used as the water source for the emergent core cooling system.
(*4) SFP (Spent Fuel Pool):
(*5) RPV (Reactor Pressure Vessel)
(*6) PCV (Primary Containment Vessel)

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

October 29, 2015
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
3/6

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

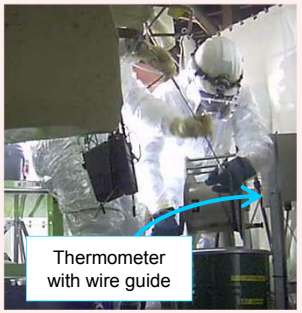
Installation of an RPV thermometer and permanent PCV supervisory instrumentation

(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, 2014).
- On April 17, 2014, removal of the broken thermometer failed and was suspended. Rust-stripping chemicals were injected and the broken thermometer was removed on January 19, 2015. A new thermometer was reinstalled on March 13, 2015. The thermometer has been used as a part of permanent supervisory instrumentation since April 23.

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

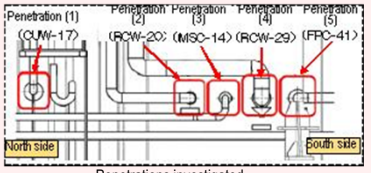
- Some of the permanent supervisory instrumentation for PCV could not be installed in the planned locations due to interference with existing grating (August 13, 2013).
- The instrumentation was removed on May 27, 2014 and new instruments were reinstalled on June 5 and 6, 2014. The trend of added instrumentation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



Removal situation of broken thermometer inside the Unit 2 RPV

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 underwater wall investigative equipment showed how the equipment could check the status of penetration.
- Regarding Penetrations 1 - 5, the results of checking the sprayed tracer (*5) by camera 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)



Penetrations investigated

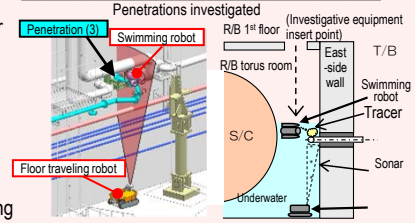
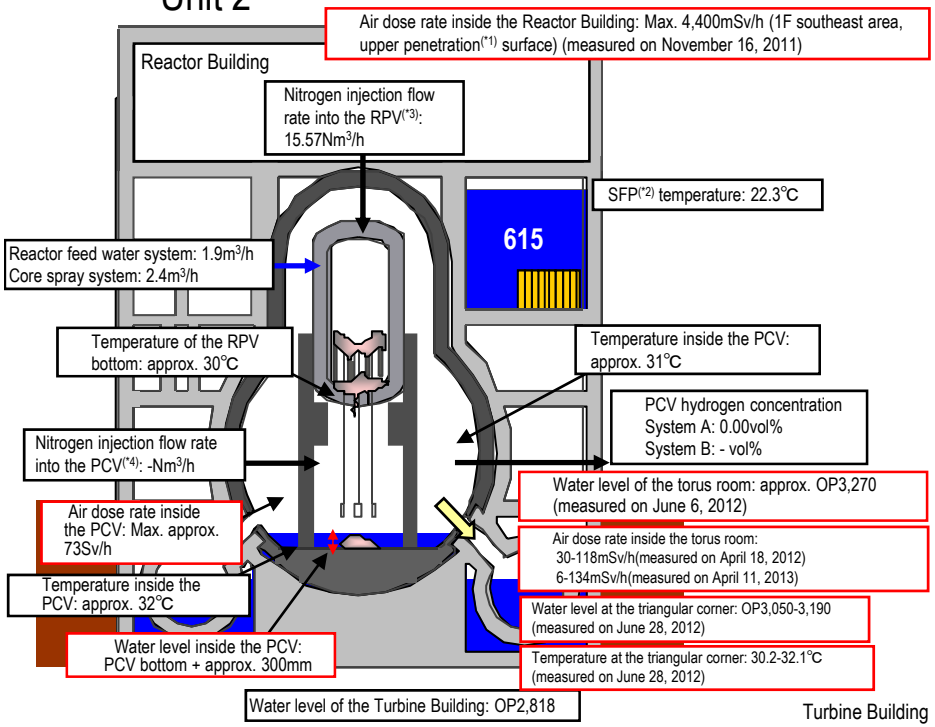


Image of the torus room east-side cross-sectional investigation

Unit 2



* Indices related to plant are values as of 11:00, October 28, 2015

Status of equipment development toward investigating inside the PCV

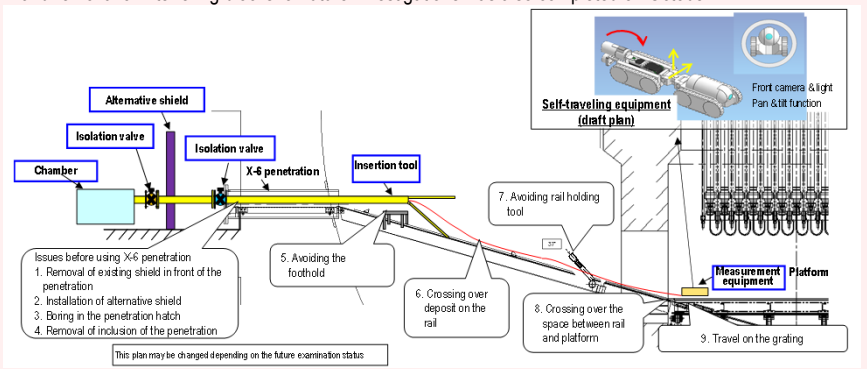
Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigations inside the PCV are scheduled.

[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.
- As a portion of shielding blocks installed in front of X-6 penetration could not be moved, a removal method using small heavy machines was planned. The work for removing these blocks resumed on September 28 and removal of interfering blocks for future investigations was also completed on October 1.



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

<Glossary>
(*1) Penetration: Through-hole of the PCV (*2) SFP (Spent Fuel Pool)
(*3) RPV (Reactor Pressure Vessel) (*4) PCV (Primary Containment Vessel)
(*5) Tracer: Material used to trace the fluid flow. Clay particles

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

October 29, 2015
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
4/6

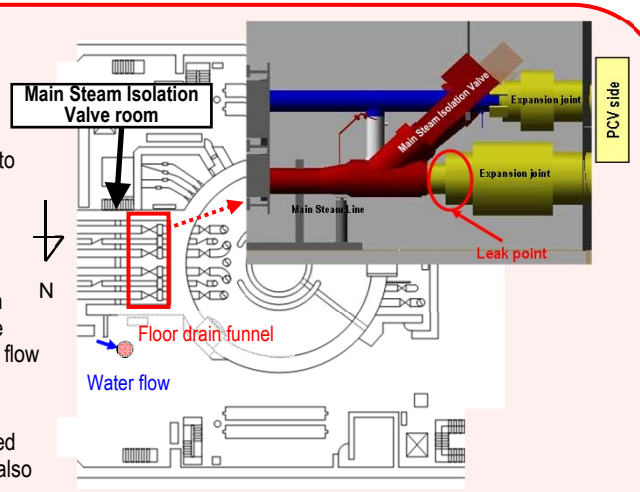
Immediate target	Identify the plant status and commence R&D and decontamination toward fuel debris removal

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

On January 18, 2014, 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, 2014, 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, 2014, water flow from the expansion joint of one Main Steam Line was detected.

This is the first leak from PCV detected in the 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.

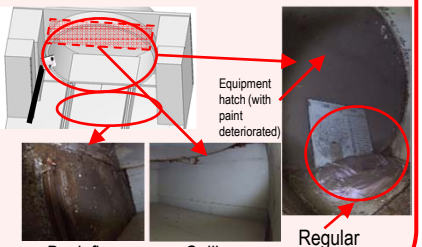


Outline of the water-flow status

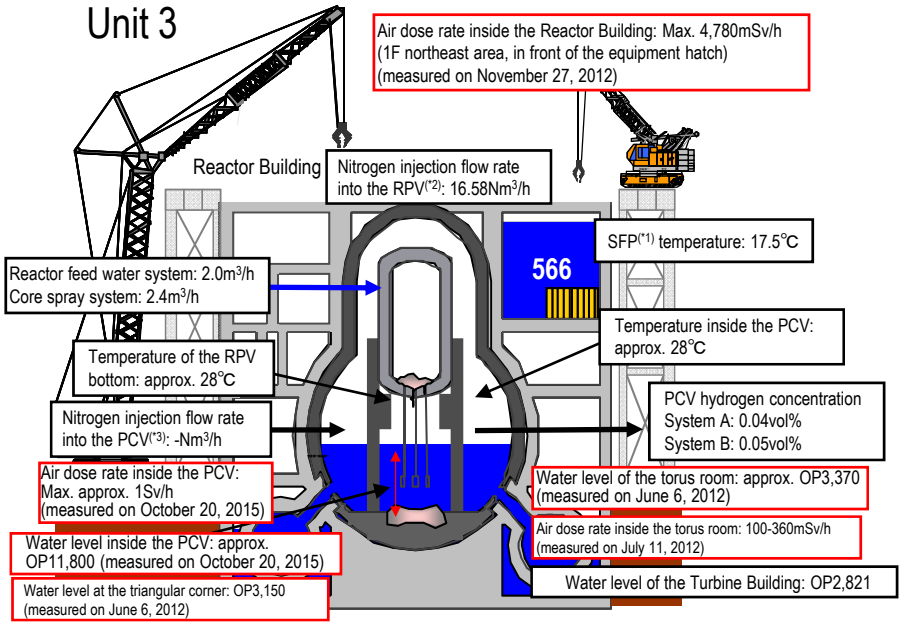
* Main Steam Isolation Valve: A valve to shut off the steam generated from the Reactor in an emergency

Investigative results into PCV equipment hatch

- High-dose puddles were identified around PCV equipment hatch in the past. Due to the possibility of leakage from the equipment hatch seal, an investigation using a small camera was conducted on September 9
- The investigation identified no leakage from nor distortion of the equipment hatch, while detecting leakage from the ceiling and a deposit of coating films on the floor.



Unit 3



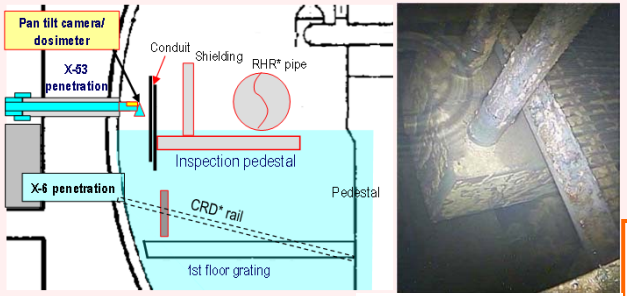
* Indices related to plant are values as of 11:00, October 28, 2015

Investigation 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 was conducted.

[Steps for investigation and equipment development]
Investigation from X-53 penetration(*4)

- From October 22-24, the status of X-53 penetration, which may be under the water and which is scheduled for use to investigate the inside of the PCV, was investigated using remote-controlled ultrasonic test equipment. Results showed that the penetration is not under the water.
- For the purpose of confirming the status inside the PCV, an investigation device was inserted into the PCV from X-53 penetration on October 20 and 22, 2015 to obtain images, data of dose and temperature and sample accumulated water. No damage was identified on the structure and walls inside the PCV and the water level was almost identical with the estimated value. In addition, the dose inside the PCV was confirmed to be lower than in other Units.
- In the next step, the obtained information will be analyzed to be utilized in the consideration about the policy for future fuel debris removal.



Inspection pedestal and water surface

<Glossary>
(*1) SFP (Spent Fuel Pool)
(*2) RPV (Reactor Pressure Vessel)
(*3) PCV (Primary Containment Vessel)
(*4) Penetration: Through-hole of the PCV

Progress toward decommissioning: Work related to circulation cooling and accumulated water treatment line

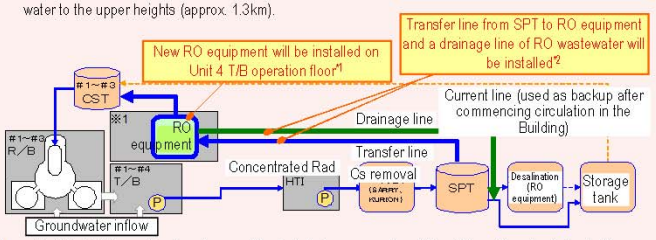
October 29, 2015
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
5/6

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

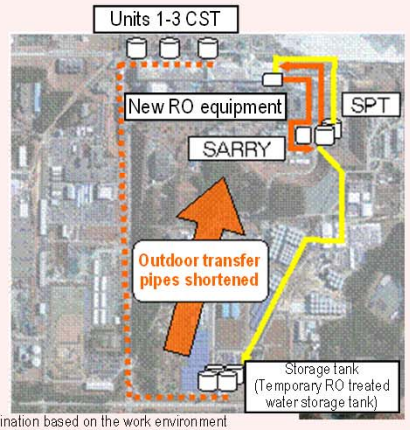
Work to improve the reliability of the circulation water injection cooling system and pipes to transfer accumulated water.

- 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, 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).



*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



Typhoon measures improved for Tank Area

- Enhanced rainwater measures were implemented, including increasing the height of fences to increase the capacity to receive rainwater and installing rain gutters and fence cover to prevent rainwater inflow. Though a total of 300mm of rainfall was recorded by typhoon Nos. 18 and 19 in 2014, no outflow of contaminated rainwater from inside the fences was detected.

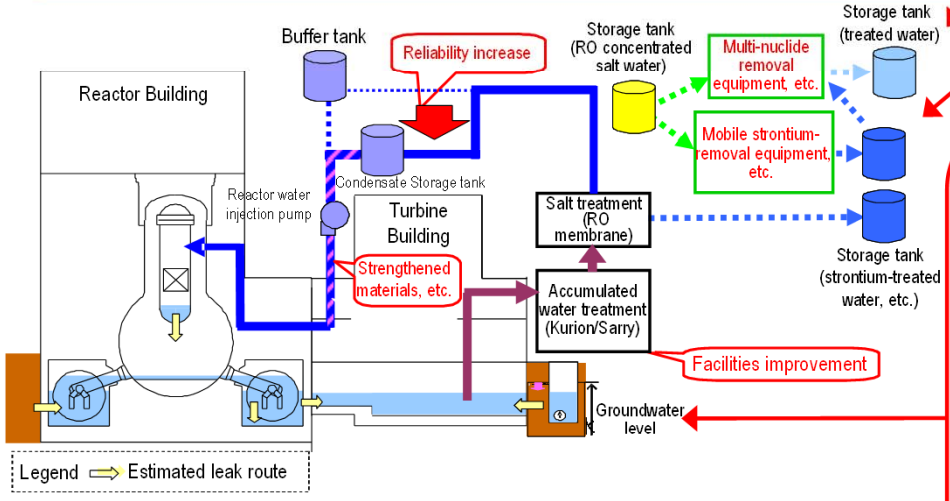
Before installing the fence cover

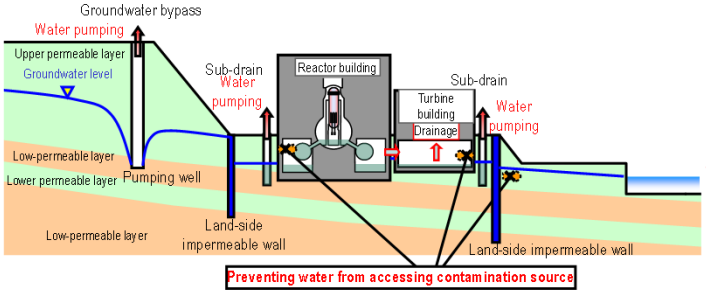
After installing the fence cover

Completion of purification of contaminated water (RO concentrated salt water)

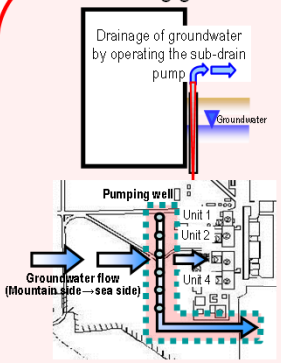
Contaminated water (RO concentrated salt water) is being treated using seven types of equipment including the multi-nuclide removal equipment (ALPS). Treatment of the RO concentrated salt water was completed on May 27, with the exception of the remaining water at the tank bottom. The remaining water will be treated sequentially toward dismantling the tanks.

The strontium-treated water from other facilities than the multi-nuclide removal equipment will be re-purified in the multi-nuclide removal equipment to further reduce risks.





Preventing groundwater from flowing into the Reactor Buildings



Reducing groundwater inflow by pumping sub-drain water

To reduce groundwater flowing into the buildings, pumping-up of groundwater from wells (subdrains) around the buildings started on September 3, 2015. Pumped-up groundwater was purified at dedicated facilities and released after TEPCO and a third-party organization confirmed that its quality met operational targets.

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

Measures to pump up groundwater flowing from the mountain side upstream of the Building to reduce the groundwater inflow (groundwater bypass) have been implemented.

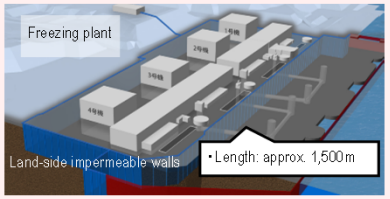
The pumped up groundwater is temporarily stored in tanks and released after TEPCO and a third-party organization have confirmed that its quality meets operational targets.

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.

The analytical results on groundwater inflow into the buildings based on existing data showed a declining trend.

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



To prevent the inflow of groundwater into the Reactor Buildings, installation of impermeable walls on the land side is planned.
Drilling holes to install frozen pipes commenced from June 2, 2014.
On the mountain side, construction was completed in September 2015.
On the sea side, drilling for frozen pipes was completed in October.

<Glossary>
(*1) CST (Condensate Storage Tank)
Tank for temporarily storing water used in the plant.

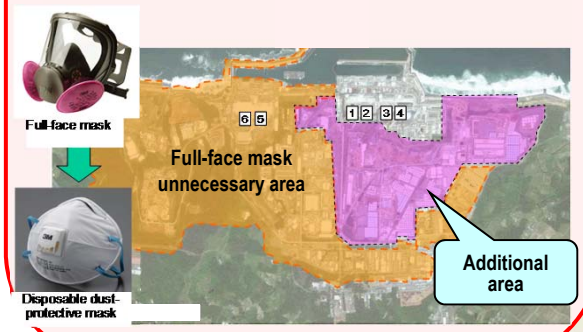
Progress toward decommissioning: Work to improve the environment within the site

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

Expansion of full-face mask unnecessary area

The number of dust monitors has increased to ten with additional monitors installed in Units 3 and 4 slopes and tank areas, the full-face mask unnecessary area will be expanded to approx. 90% of the site from May 29.

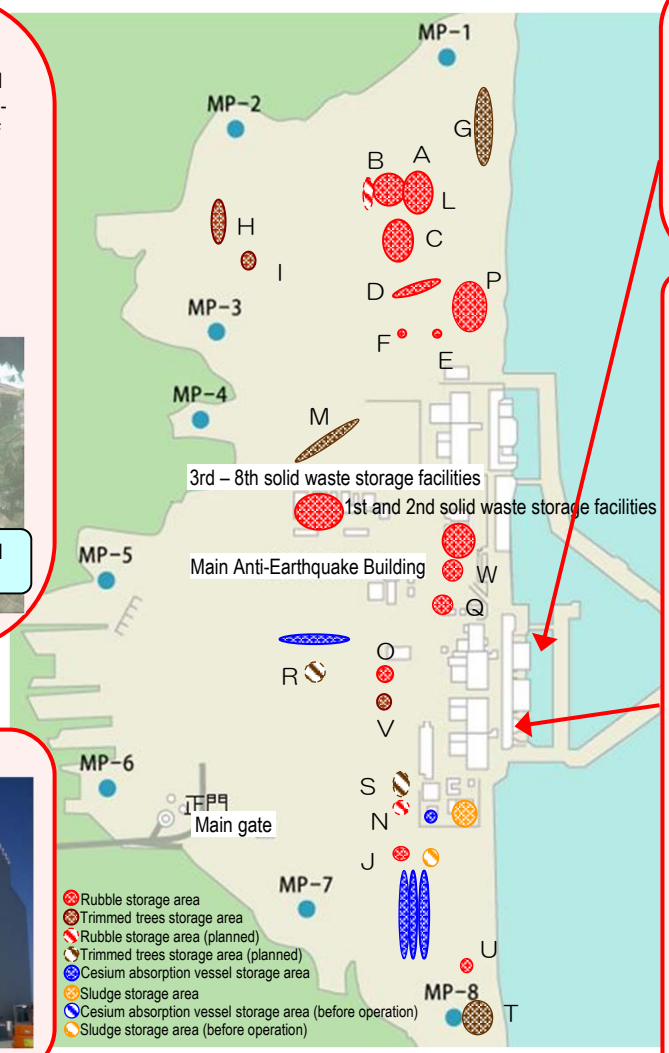
However, wearing full- or half-face mask is required for works exposed to highly concentrated dust; and full-face masks, for works involving a risk of ingesting concentrated salt water, etc.



Full-face mask unnecessary area

Operation start of the large rest house

A large rest house for workers was established and its operation commenced on May 31.
Spaces in the large rest house are also installed for office work and collective worker safety checks as well as taking rest.
Meal service at the dining space, which had been temporarily suspended due to the construction to ensure further improvement from a hygiene perspective, resumed on August 3.



Installation of sea-side impermeable walls

To prevent the outflow of contaminated water into the sea, sea-side impermeable walls have been installed.

Following the completed installation of steel pipe sheet piles on September 22, 2015, connection of these piles was conducted and connection of sea-side impermeable walls was completed on October 26, 2015. Through these works, closure of sea-side impermeable walls was finished and the contaminated water countermeasures have been greatly advanced.

Installation of steel pipe sheet piles for sea-side impermeable wall

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, 2014)

(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 seawater pipe trench
  Unit 2: November 25 to December 18, 2014 - tunnel sections were filled.
  February 24 to July 10, 2015 - Vertical Shafts were filled. Removal of contaminated water was completed on June 30.
  Unit 3: February 5 to April 8, 2015 - tunnel sections were filled.
  May 2 to August 27, 2015 – Vertical Shafts were filled. Removal of contaminated water was completed on July 30.
  Unit 4: February 14 – March 21, 2015 - tunnel sections were filled.
  April 15 to 28, 2015 - opening apertures II and III were filled.

Overview of measures