Summary of Decommissioning and Contaminated Water Management

October 1, 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: 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 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)

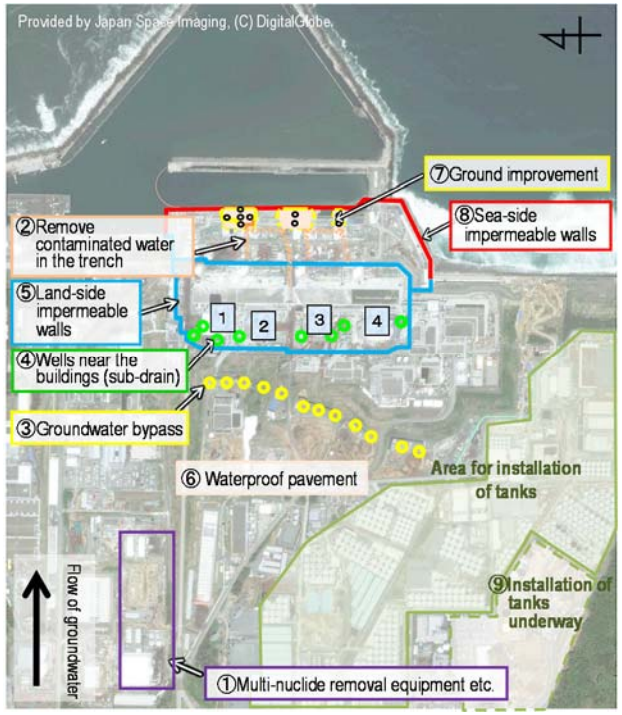
(Note 3) Underground tunnel containing pipes.

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.
- Freezing functioning test started at the end of April 2015.
- Regarding the mountain side, in which freezing will commence first, construction was completed on September 15.

(Land-side impermeable walls; example of freezing functioning test point)

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, which make up the impermeable walls, was completed in September 2015. Connection of these piles is underway.

(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. 20-45°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 August 2015, the radiation exposure dose due to the release of radioactive materials from the Unit 1-4 Reactor Buildings was evaluated as less than 0.0012 mSv/year at the site boundaries. The annual radiation dose by natural radiation is approx. 2.1 mSv/year (average in Japan).

Pumping-up and release from subdrains started

To reduce 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 after TEPCO and a third-party organization confirmed that its quality met operational targets. A total of 4,025 m³ was released including groundwater pumped up since September 3 (September 14-28).

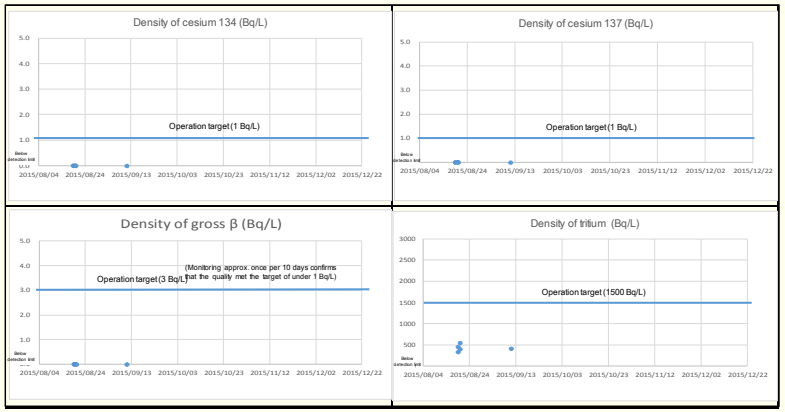
The release is managed so as to prevent both outflow of contaminated water from the buildings and decrease of groundwater levels around the buildings lower than those inside the buildings.

TEPCO is committed to continuously observing the operation targets firmly to improve water quality within the port and prevent contamination in the sea.

Unit: Bq/L

	Operation target	(Reference 1) Announcement density limit	(Reference 2) WHO Guidelines for Drinking Water Quality
Cesium 134	1	60	10
Cesium 137	1	90	10
Gross β	3 (1) *1	30 *2	10 *2
Tritium	1,500	60,000	10,000

* Monitoring approx. once per 10 days confirms that the quality met the target of under 1 Bq/L.
* Values against strontium 90.



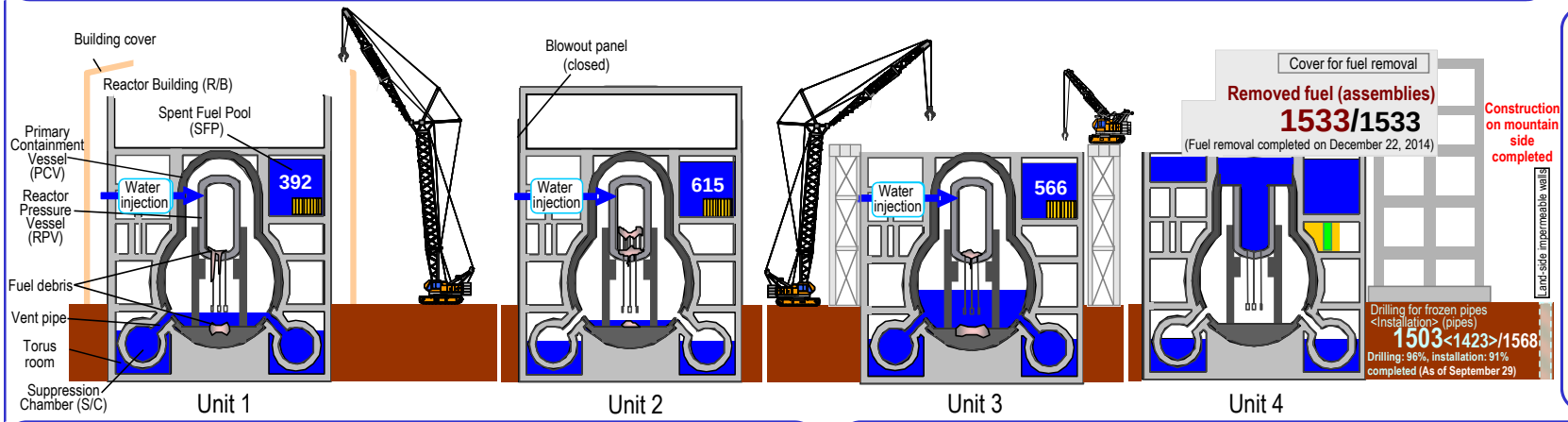
< Analytical results of temporary storage tanks (values of analysis by TEPCO)

Investigative results into Unit 3 PCV equipment hatch

Due to high-dose puddles identified around the Unit 3 PCV equipment hatch in the past, an investigation using a small camera was conducted on September 9

The investigation identified no leakage from nor distortion of the equipment hatch, although leakage was detected from the ceiling and a deposit of coating films on the floor.

These results will be utilized in future consideration of PCV investigation methods.



Leakage of rainwater from inner fence to outer fence in tank areas

On September 9, 11, 12 and 14, leakages of rainwater were detected from the inner fence, where rainwater accumulated due to heavy rainfall, to the inside of the outer fence in tank areas.

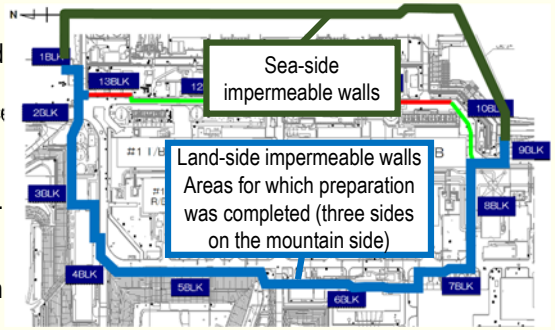
Both the repair of leakage points and collection of rainwater were completed and no outflow into the sea was identified.

To prevent recurrence, ongoing preservation activities such as inspection methods will be reviewed.

Construction of land-side impermeable walls completed

Regarding three sides on the mountain side of the land side impermeable walls, in which freezing will commence first, construction including filling of coolant was completed on September 15.

Through these works, preparation for freezing was completed for these sides on the mountain side.



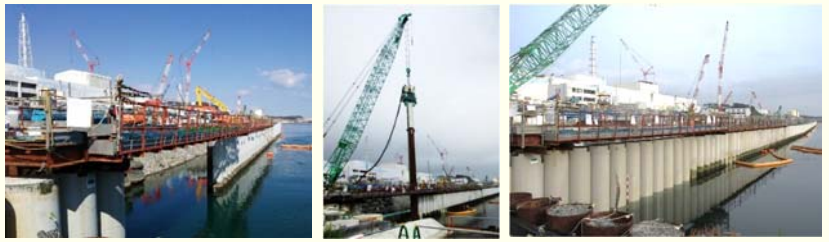
<Construction status of land-side impermeable walls>

Installation of steel pipe sheet piles for sea-side impermeable walls completed

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

Closure of these walls resumed on September 10 and installation of steel pipe sheet piles was completed on September 22.

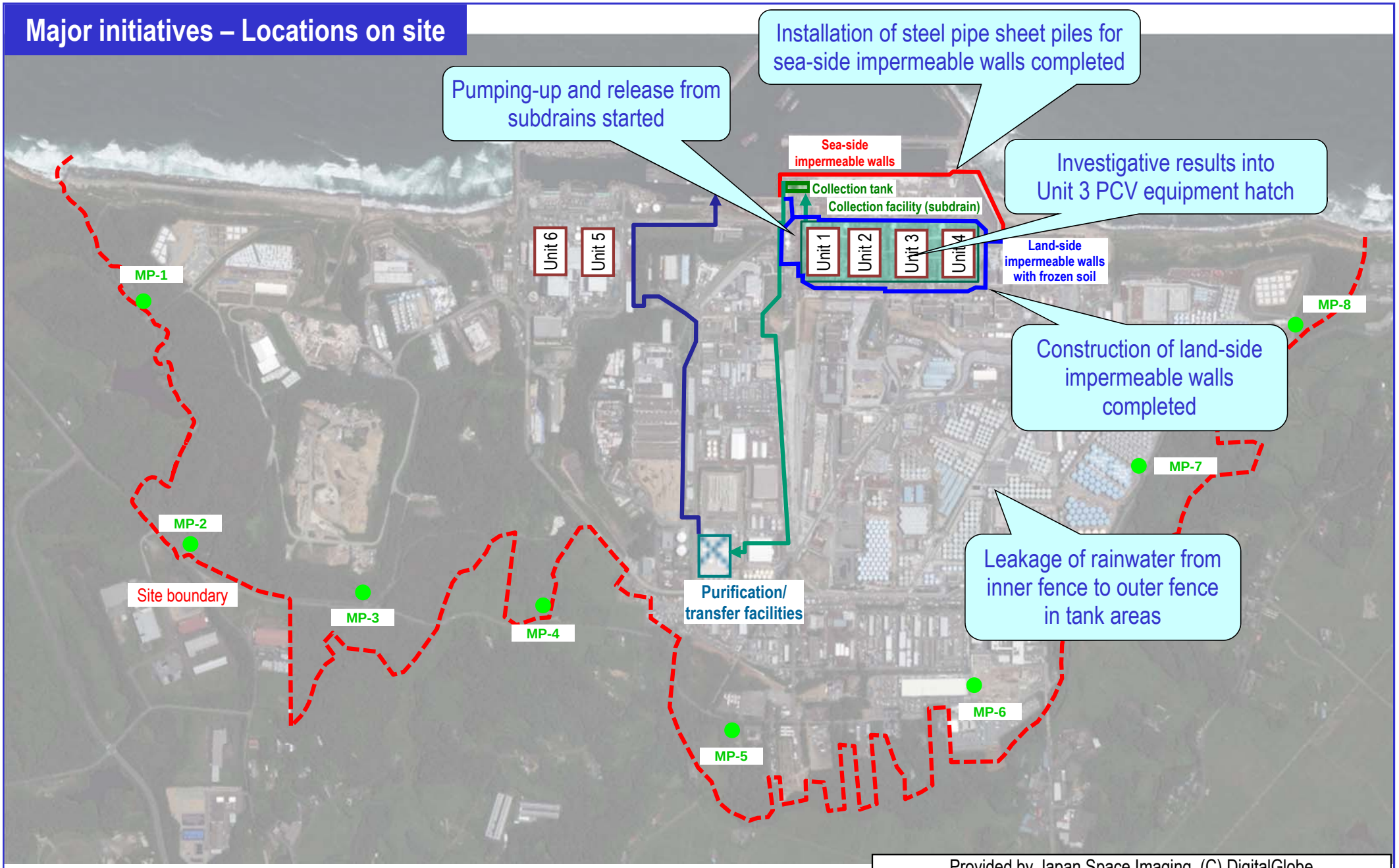
Following the installation, connection of these piles and landfill inside the sea-side impermeable walls started, which will prevent the outflow of groundwater into the sea.



Before resuming installation | Installation work | After installation

<Installation of steel pipe sheet piles for sea-side impermeable walls>

Major initiatives – Locations on site



Provided by Japan Space Imaging, (C) DigitalGlobe

* Data of Monitoring Posts (MP1-MP8.)

Data (10-minute value) of Monitoring Posts (MPs) measuring airborne radiation rate around site boundaries show 0.845 - 3.347 μSv/h (August 26 – September 29, 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.

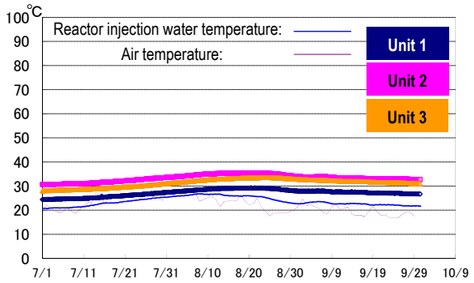
Therefore monitoring results at these points are lower than elsewhere in the power plant site.

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.

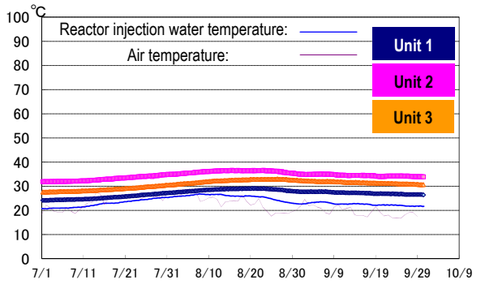
I. Confirmation of the reactor conditions

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



RPV bottom temperatures (recent quarter)



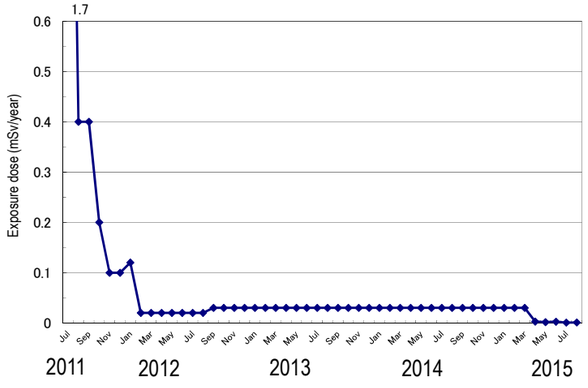
PCV gas phase temperatures (recent quarter)

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

2. Release of radioactive materials from the Reactor Buildings

As of August 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. 4.0×10^{-11} Bq/cm³ for Cs-134 and 6.9×10^{-11} Bq/cm³ for Cs-137 respectively. The radiation exposure dose due to the release of radioactive materials was less than 0.0012 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/cm³
[Cs-137]: 3 x 10^{-5} Bq/cm³

* 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/cm³)
[Cs-137]: ND (Detection limit: approx. 2 x 10^{-7} Bq/cm³)

* Data of Monitoring Posts (MP1-MP8).
Data of Monitoring Posts (MPs) measuring the airborne radiation rate around site boundaries showed 0.845 - 3.347 μSv/h (August 26 – September 29, 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.

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. The evaluation has been changed to a method considering the values of continuous dust monitors since FY2015, with data to be evaluated monthly and announced the following month.

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.

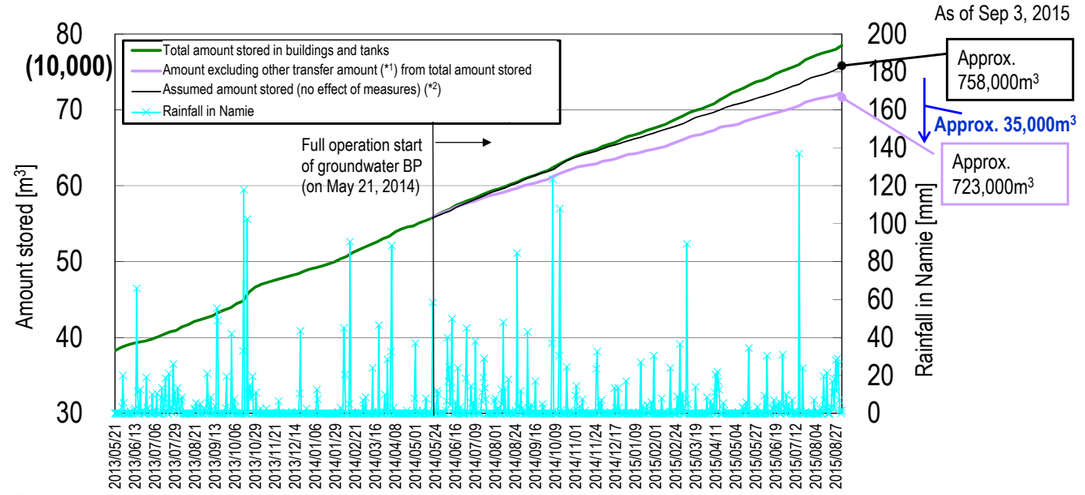
II. Progress status by each plan

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 September 30, 2015, 134,296 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 (Japan Chemical Analysis Center) confirmed that its quality met operational targets.
- It was evaluated that the groundwater inflow had decreased by approx. 80 m³/day and a total of approx. 35,000 m³ by September 3, 2015 since the full-operation start of the groundwater bypass on May 21, 2014, through measures such as this bypass and water stoppage of the High Temperature Incinerator Building (HTI) (see Figure 1). After operation start of water treatment facilities including subdrains, went into operation (from September 3) given the difficulty in distinguishing between the effect of these facilities and that of previous inflow control measures, evaluation via the ongoing method was terminated.
- For pumping well Nos. 1, 2, 3 and 6, water pumping was suspended for cleaning (No. 1: from September 7; No. 2: August 5 – September 4; No. 3: July 28 – September 1; No. 6: July 21 – August 27).



*1: Pumping-up from well points, chemical injection into multi-nuclide removal equipment, injection of ice into trenches, transfer from buildings with connections with other buildings to buildings without connections with other buildings, treated residual water from the tank bottom to water-level gauge 0% in association with treatment of residual RO concentrated salt water (after April 23, 2015)

*2: Based on the assumption that daily inflow after May 21, 2014, was the amount calculated by the following regression formula used before taking measures:
[Inflow] = 2.8356 x [Total 10-day rainfall] + 291.62

Figure 1: Analytical results of inflow into buildings

➢ Status of water treatment facilities including subdrains

- To reduce 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 after TEPCO and a third-party organization had confirmed that its quality met operational targets (cesium 134: 1 Bq/L, cesium 137: 1 Bq/L, gross β*: 3 Bq/L, tritium: 1,500 Bq/L) (see Figure 2). From September 14, a total of 4,025 m³ was drained in five releases. Groundwater pumped up from groundwater drains since September 3 was also released from September 28 after being purified.

  * Monitoring around once every 10 days confirms that the quality met the target of under 1 Bq/L.

- The water level of subdrains located on the mountain side of the buildings will be gradually reduced, while avoiding any significant variations in water levels of subdrains located on the sea side (see Figure 3).

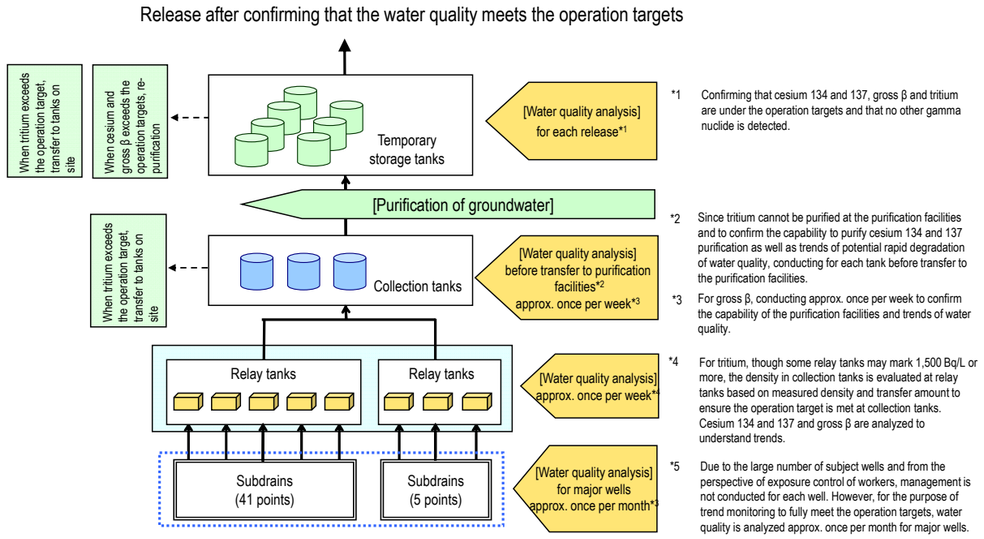


Figure 2: Method to manage the water quality of subdrains and groundwater drains

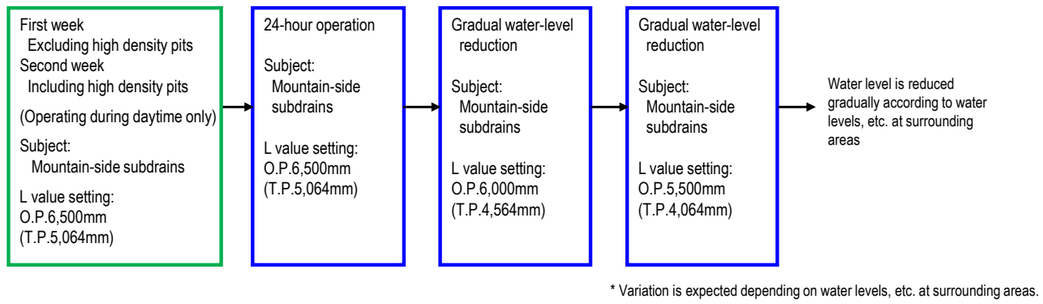


Figure 3: Concept of subdrain operations

➢ 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, in which freezing will commence first, following the installation of frozen pipes, which finished on July 28, filling of brine also finished on September 15. Through these works, preparation for freezing was completed for these 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, as of September 29, 2015, drilling at 592 points (89%, for frozen pipes: 467 of 532 points, for temperature-measurement pipes: 125 of 131 points) and installation of frozen pipes at 387 of 532 points (73%) had been completed (see Figure 5).

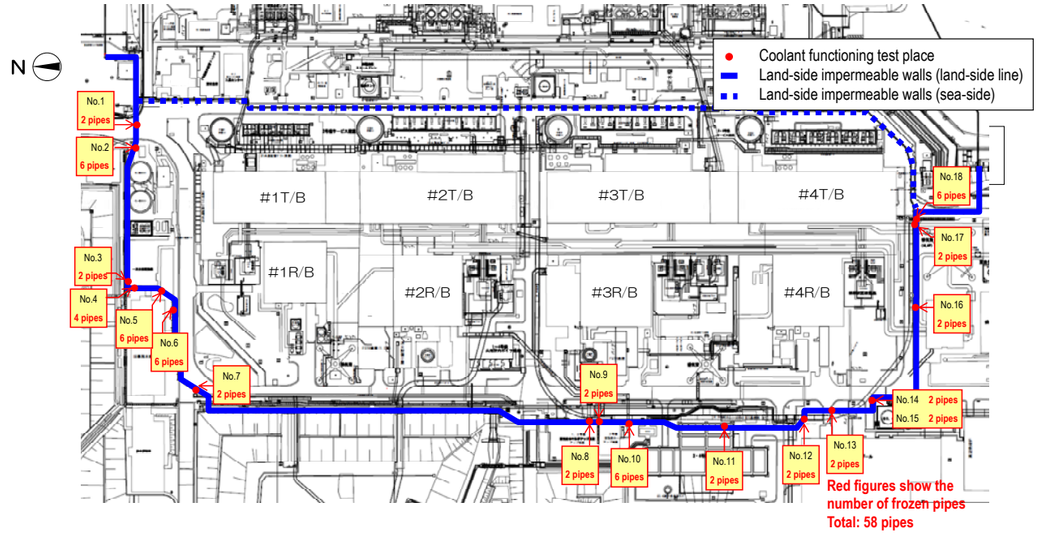


Figure 4: Freezing functioning test place on land-side impermeable walls

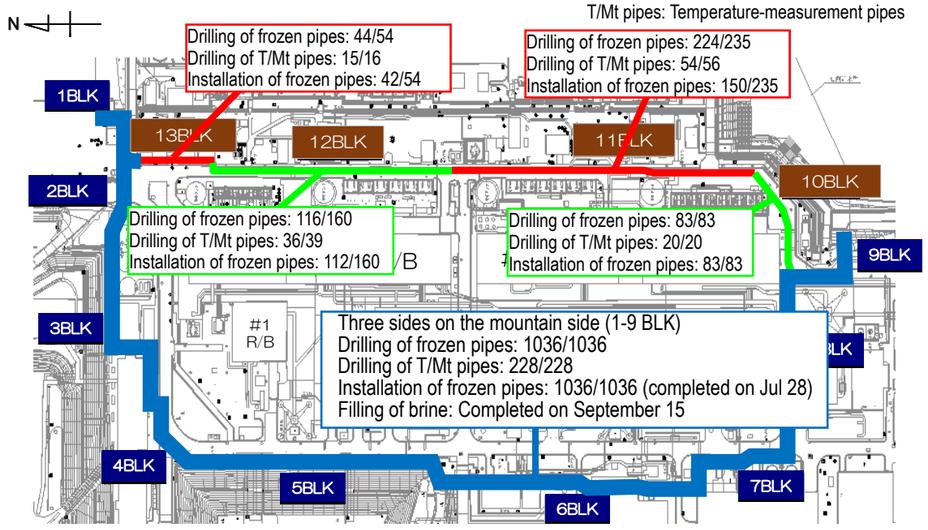


Figure 5: Drilling status for frozen-soil impermeable walls and installation of frozen pipes

➢ 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 September 24, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 254,000, 203,000 and 85,000 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 September 24, approx. 100,000 m³ had been treated.

➢ 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 September 24, approx. 108,000 m³ had been treated.

➢ Measures in Tank Areas

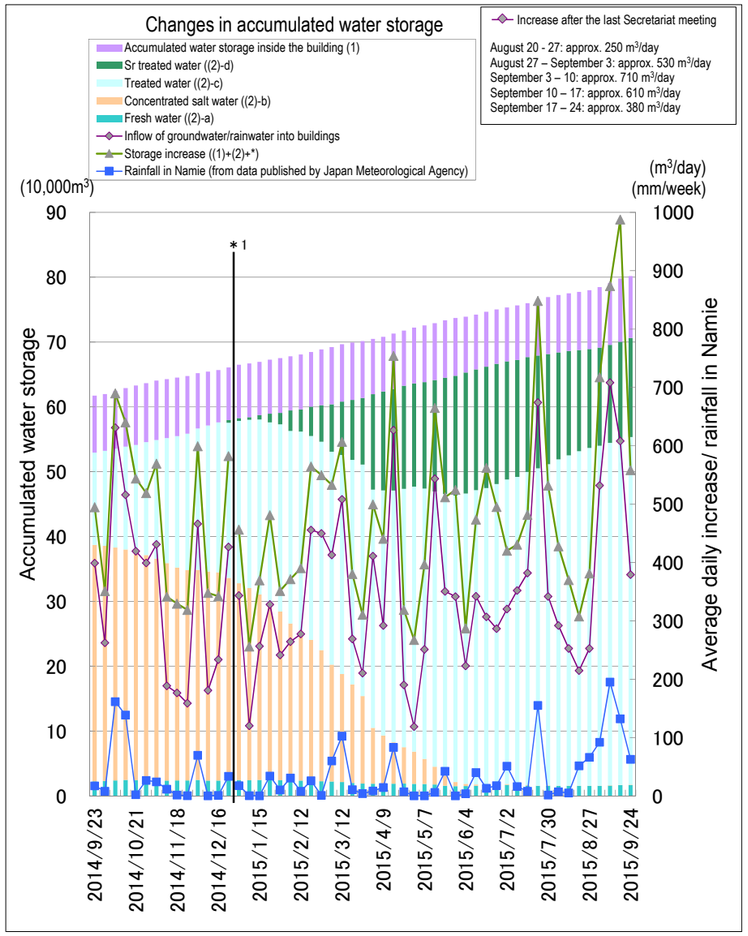
- Rainwater, under the release standard and having accumulated inside the fences in the contaminated water tank area, was sprinkled on site after eliminating radioactive materials using rainwater-treatment equipment since May 21, 2014 (as of September 28, 2015 a total of 35,180 m³).

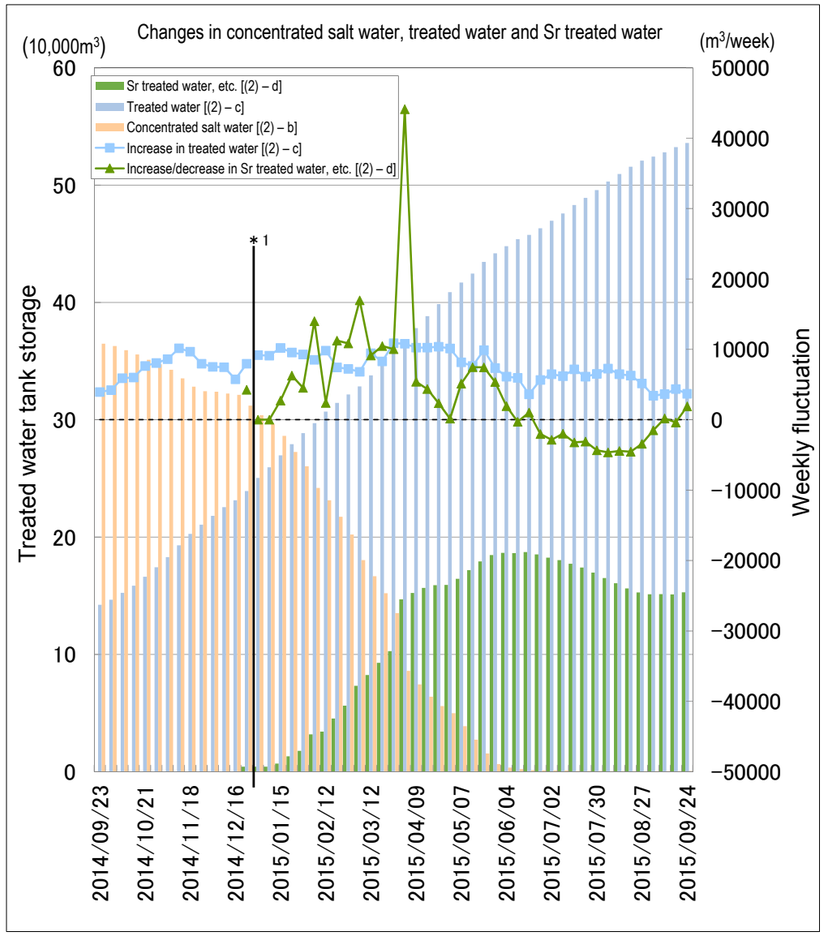
➢ Leakage of rainwater from pipe penetrations of the inner fence to inside the outer fence in tank areas

- On September 9, a leakage of rainwater (approx. 63L) was detected from an inner fence connection to the inside of the outer fence on the north side of the H5 area. The leakage was terminated by water stoppage treatment (as an emergency measure) for the relevant connection and the rainwater was collected on the same day. No outflow into the sea was identified. As additional measures for this point, water stoppage treatment was provided for the existing fences and pipe penetrations by September 14.
- On September 9, leakages of rainwater (peaking at approx. 3,200L) were detected from two pipe penetrations of the inner fence to the inside of the outer fence in the C area. The leakages were terminated by water stoppage treatment (as an emergency measure) for the relevant penetrations and the rainwater was collected the same day. No outflow into the sea was identified. As additional measures for these points, pipe penetrations and both the inner and outer surfaces of fences will be filled with water stoppage materials and caulked.
- On September 11, a leakage of rainwater (approx. 924L) was detected from a bolt hole of an inner fence connection to the inside of the outer fence in the H4 north area. The leakage was terminated by water stoppage treatment (as an emergency measure) for the relevant connection and the rainwater was collected the same day. On September 12, further leakage was detected from a point 10m away from the leakage point of September 11, for which water stoppage treatment was provided. No outflow into the sea was identified. As additional measures for these points, water stoppage treatment by spraying polyurea was provided by September 25.
- On September 14, a leakage of rainwater (approx. 320L) was detected from a pipe penetration and two connections of the inner fence to the inside of the outer fence in the H6 area. Water stoppage treatment (emergency measure) was provided for the relevant points from the same day and the leakage was terminated on September 15. The rainwater was collected by water-absorbing mats on September 14. No outflow into the sea was identified. As additional measures for these points, the pipe connections were re-caulked and polyurea was sprayed by September 17.
- To prevent recurrence, the ongoing preservation activities (inspection method, contents and frequency) will be reexamined and reviewed.

➢ Overflow from the sampling rack of the 2nd cesium absorption apparatus (Sarry)

- On September 29, an overflow (approx. 210L) was detected from a sampling rack of the 2nd cesium absorption apparatus (Sarry). No leakage outside the building was identified. It is thought likely that a drain hose was brought up and fixed in the middle, which hampered the flow of water through the hose and the outflow from the sink. As countermeasures, caution signs will be displayed, the hose will be replaced and the new hose will be installed in a manner to minimize up-and-down fluctuation.





As of September 24, 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 6: Status of accumulated water storage

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 roof panels of the building cover. As of September 30, five of six roof panels had been removed. During these works, no significant change was identified in the dust densities at dust monitors and monitoring posts, etc. The sixth panel will be removed around October 5.
- It was confirmed that the wind speed within the building cover with two panels removed decreased to "one-28th – one-7th" of that outside the building during strong wind.
- 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 is underway from September 7 to clear a work area for installing large heavy-duty machines, etc.

➢ Main work to help remove spent fuel at Unit 3

- On September 3, oil leaked onto the water surface of the spent fuel pool during preparation to remove rubble within the pool, which involved a hydraulic hose of the steel cutter coming into contact with protective materials. The leakage was terminated by shutting down the steel cutter and an alternative cooling system for the spent fuel pool was suspended to collect the oil. Work resumed on September 21.

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, Main Steam Valve and Airlock Rooms on Unit 1 Reactor Building 1st floor

- To confirm the need for dose reduction that may facilitate future investigations inside PCV and repair, an investigation commenced on September 24, at the TIP and Main Steam Valve Rooms, which have not yet been investigated and the Airlock Room, in part of which a high dose was identified.

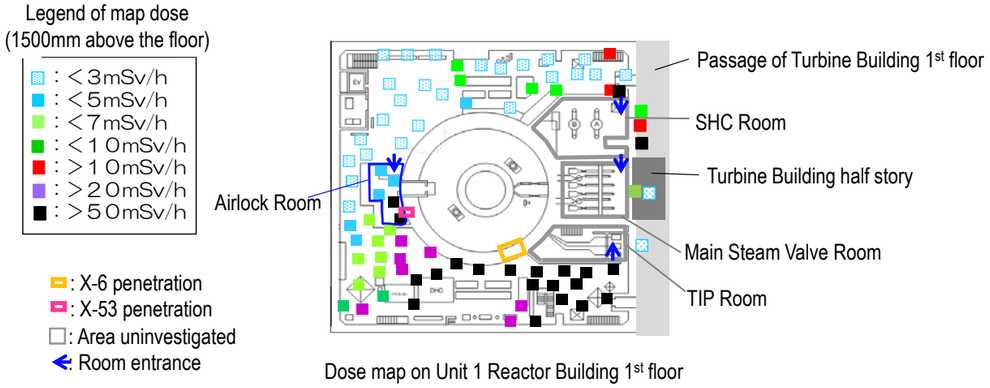


Figure 7: Dose status and investigation points on Unit 1 Reactor Building 1st floor

➢ Removal of shielding blocks in front of Unit 2 X-6 penetration

- Regarding the removal of shielding blocks in front of Unit 2 X-6 penetration, which was suspended since July 8 to facilitate earlier removal, a method using small heavy machines was planned. As the mock-up test confirmed its feasibility, work to remove these blocks resumed on September 28. On September 30, the removal of iron sheets installed behind the blocks was completed, while on October 1, removal of interfering blocks for future investigations was also completed.

➢ Investigation into the Unit 3 PCV equipment hatch

- In 2011, high-dose puddles were identified in and around grooves of the shield-plug transfer rail of Unit 3 PCV equipment hatch. Due to potential leakage from the equipment hatch seal, an investigation into the status of this seal, etc. using a small camera was conducted on September 9, to examine leakage prevention measures of contaminated materials from the equipment hatch during fuel debris removal. The investigation identified no leakage from nor any distortion of the equipment hatch, while detecting a deposit of coating films on the floor inside the shield plug, puddles in the transfer rail grooves and leakage, presumably rainwater or dew condensation, from the upper part inside the shield plug. Based on these investigative results, the insertion of a small investigative device will be planned.

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 August, the total storage volume of concrete and metal rubble was approx. 157,800 m³ (+ 2,500 m³ compared to at the end of July, with an area-occupation rate of 62%). The total storage volume of trimmed trees was approx. 8,200 m³ (-900 m³ compared to at the end of July, with an area-occupation rate of 64%). The increase in rubble was mainly attributable to construction related to facing and the installation of tanks. The decrease in trimmed trees was mainly attributable to the arrangement of areas.

➢ Management status of secondary waste from water treatment

- As of September 24, 2015, the total storage volume of waste sludge was 597 m³ (area-occupation rate: 85%) and that of concentrated waste fluid was 9,326 m³ (area-occupation rate: 47%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment, etc. was 2,770 (area-occupation rate: 46%).

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

➢ Sharing of circulating cooling facilities of Unit 1-3 spent fuel pools

- Regarding the circulating cooling facilities of Unit 1-3 spent fuel pools, for the following purpose, a plan to shift the secondary cooling facilities installed for each Unit, to a common secondary cooling facilities shared among Units 1-3 will be implemented. From October, preparatory construction will commence.
  (1) Reducing the number of installations by sharing facilities to streamline facility maintenance and operations
  (2) Installing the facilities in a low-dose areas to reduce exposure during maintenance and operation management

➢ Purification of water in the Unit 1 spent fuel pool

- For water in the Unit 1 spent fuel pool, decontamination is underway from September 24, 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

- An investigation inside Unit 3 PCV will be conducted in October, in which an investigation device will be inserted from the PCV penetration (X-53) to check the status inside the PCV, measure the dose and temperature and sample accumulated water.
- Following the internal investigation, thermometers and a water-level gauge will be installed from the X-53.
- As preparation for the internal inspection, following the drilling at X-53 penetration during September 14-18, a mock-up test of this investigation device is underway.

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

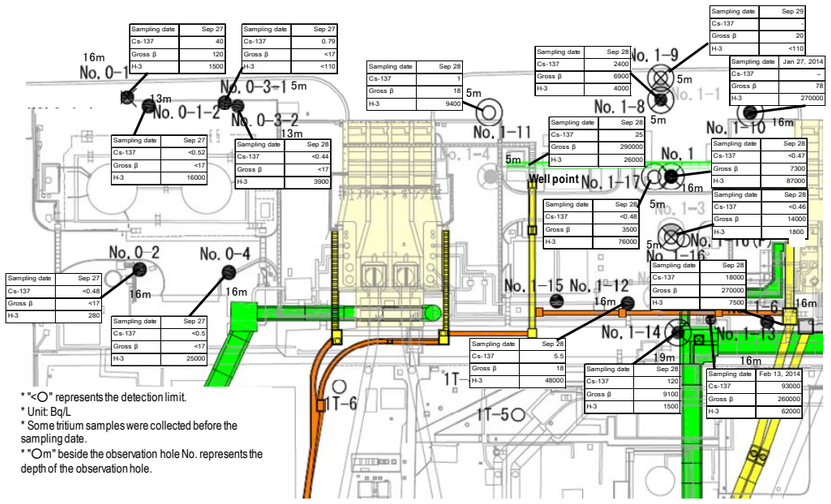
➢ Status of groundwater and seawater on the east side of Turbine Building Units 1 to 4

- To check the effect of contaminated water countermeasures on the density of radioactive materials in seawater within the port, the number of nuclides to be measured will be added and the measurement frequency and detection limits will be reviewed.
- 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 25,000 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 100,000 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 7,000 Bq/L while that at groundwater Observation Hole No. 1-17 has been decreasing and currently stands at around 4,000 Bq/L. Water pumping from the repaired well point will start from early October.
- Regarding radioactive materials in the groundwater near the bank between the Unit 2 and 3 intakes, the density of tritium has been increasing since July and currently stands at around 1,000 Bq/L, while that of gross β radioactive materials increased to 10,000 Bq/L in September. Water pumping from the repaired well point will start from early October.
- 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, a low density equivalent to that at the point north of the east breakwater was maintained as up to August.
- The density of radioactive materials in seawater within the port has remained low at the same level as up to August.

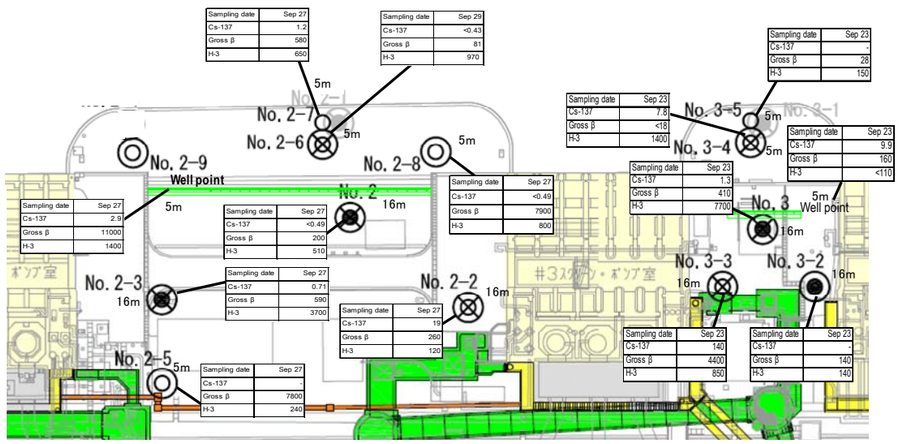
- Regarding the radioactive materials in seawater outside the port, the densities of cesium 137 and tritium have remained within the same range previously recorded. Though the density of gross β radioactive materials remained below the detection limit (15 – 18 Bq/L), it has been at a level equivalent 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 is underway.
- On September 5, coating on fishery works of the north breakwater commenced.
- For release to the K drainage channel, temporary fences and transfer pumps were installed to transfer to C drainage channel, which leads to the port. On September 7, 9, 11, 17 and 18, it was confirmed that rainwater overflowed from the temporary fences, some of which was released into the sea. Cleaning and installation of purification materials continues at K drainage channel while steadily continuing to switch to the port within FY2015.

➢ Investigation into the contamination status on Unit 3 and 4 Turbine Building roofs

- To investigate the contamination status on the roofs of Unit 3 and 4 Turbine Buildings, additional inspection using a multi-copter has been underway from September 16.



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



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

Figure 8: Groundwater density on the Turbine Building east side

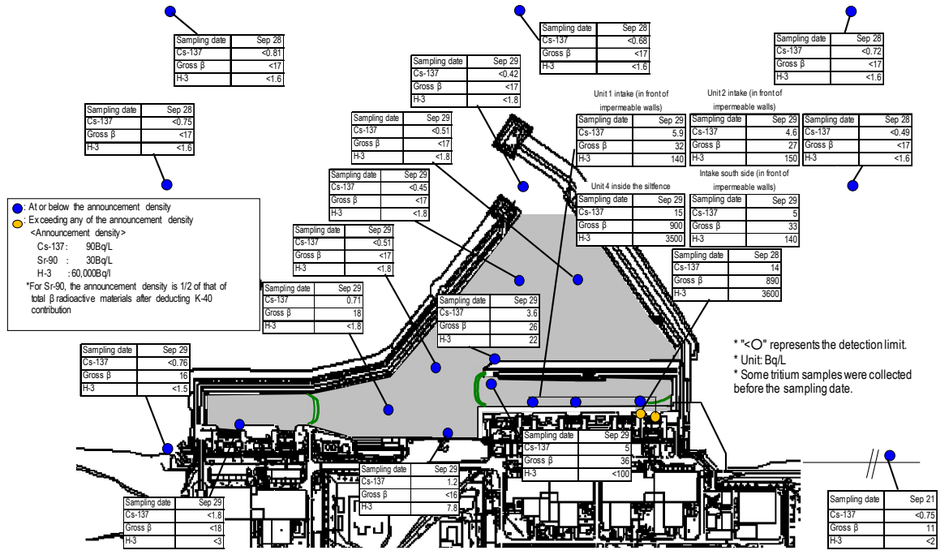


Figure 9: Seawater density around the port

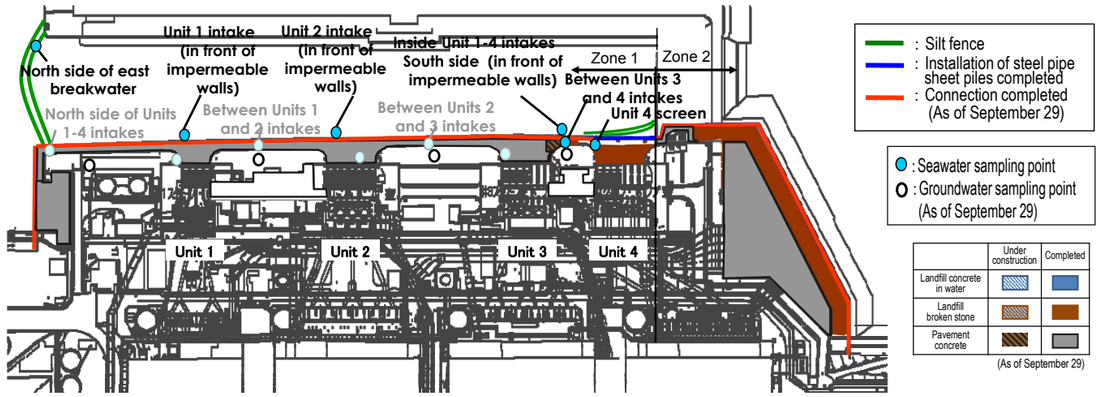


Figure 10: Progress status of impermeable walls on the sea side

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

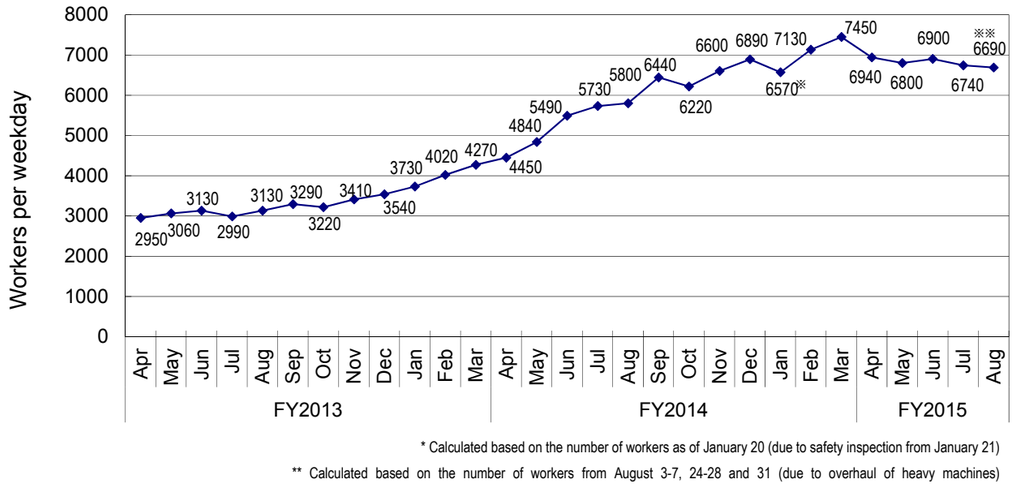
Securing appropriate staff long-term while thoroughly implementing workers' exposure dose control. Improving the work environment and labor conditions continuously based on an understanding of workers' on-site needs

➢ 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 May to July 2015 was approx. 14,100 (TEPCO and partner company workers), which exceeded the monthly average number of actual workers (approx. 11,100). Accordingly, sufficient people are registered to work on site.
- It was confirmed with prime contractors that the estimated manpower necessary for the work in October (approx. 6,710 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 11).

  * Some works for which contractual procedures have yet to be completed are excluded from the October estimate.
- The number of workers from Fukushima Prefecture has remained the same but the number of workers from outside the prefecture has declined slightly. Accordingly, the local employment ratio (TEPCO and partner company workers) as of August remained at around 50% with a slight increase.

- 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 11: Changes in the average number of workers per weekday for each month since FY2013

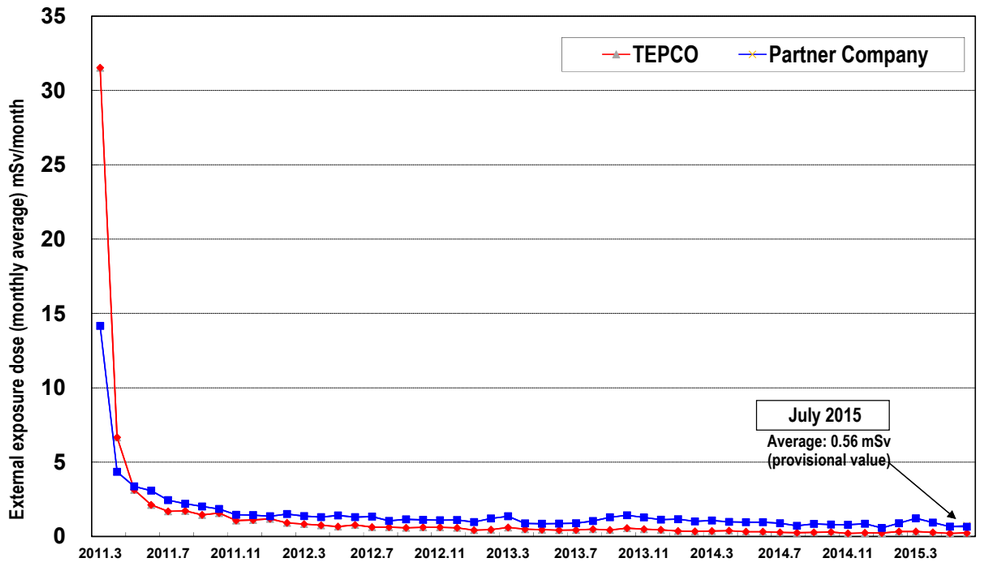


Figure 12: Changes in monthly individual worker exposure dose
(monthly average exposure dose since March 2011)

➢ Status of heat stroke cases

- As of September 29 in FY2015, there were a total of 15 heat stroke cases, 12 of which attributable to work and three alleged cases. Thorough preventive measures for heat stroke continue to be taken. (As of the end of September FY2014, there were a total of 32 heat stroke cases, 15 of which attributable to work and seventeen alleged cases.)

8. Other

➢ Implementers of the decommissioning and contaminated water treatment project (METI FY2014 supplementary budget) were decided

- Public offerings were made regarding the “development of investigation technology inside the reactor pressure vessels” (offering period: July 21 – August 20, 2015).
- Following screening by the review board, comprising external experts, project implementers were decided on August 28.

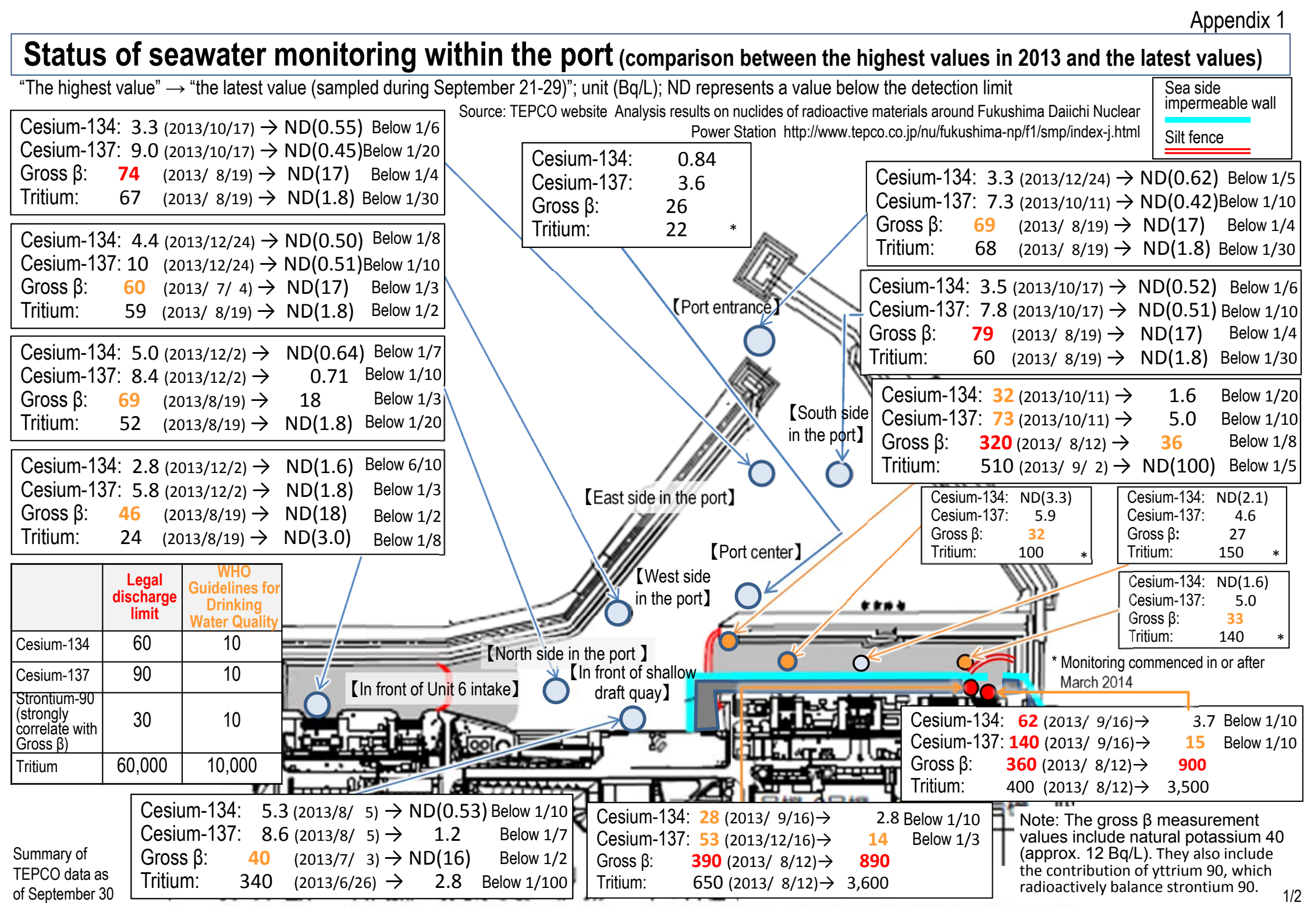
Status of seawater monitoring within the port (comparison between the highest values in 2013 and the latest values)

"The highest value" → "the latest value (sampled during September 21-29)"; 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.co.jp/nu/fukushima-np/f1/smp/index-j.html

Sea side impermeable wall

Silt fence



Cesium-134: 3.3 (2013/10/17) → ND(0.55) Below 1/6
Cesium-137: 9.0 (2013/10/17) → ND(0.45) Below 1/20
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(0.50) Below 1/8
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 1/2

Cesium-134: 5.0 (2013/12/2) → ND(0.64) Below 1/7
Cesium-137: 8.4 (2013/12/2) → 0.71 Below 1/10
Gross β: 69 (2013/8/19) → 18 Below 1/3
Tritium: 52 (2013/8/19) → ND(1.8) Below 1/20

Cesium-134: 2.8 (2013/12/2) → ND(1.6) Below 6/10
Cesium-137: 5.8 (2013/12/2) → ND(1.8) Below 1/3
Gross β: 46 (2013/8/19) → ND(18) Below 1/2
Tritium: 24 (2013/8/19) → ND(3.0) Below 1/8

	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: 0.84
Cesium-137: 3.6
Gross β: 26
Tritium: 22 *

Cesium-134: 3.3 (2013/12/24) → ND(0.62) Below 1/5
Cesium-137: 7.3 (2013/10/11) → ND(0.42) Below 1/10
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(0.52) Below 1/6
Cesium-137: 7.8 (2013/10/17) → ND(0.51) 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) → 1.6 Below 1/20
Cesium-137: 73 (2013/10/11) → 5.0 Below 1/10
Gross β: 320 (2013/ 8/12) → 36 Below 1/8
Tritium: 510 (2013/ 9/ 2) → ND(100) Below 1/5

Cesium-134: ND(3.3)
Cesium-137: 5.9
Gross β: 32
Tritium: 100 *

Cesium-134: ND(2.1)
Cesium-137: 4.6
Gross β: 27
Tritium: 150 *

Cesium-134: ND(1.6)
Cesium-137: 5.0
Gross β: 33
Tritium: 140 *

* Monitoring commenced in or after March 2014

Cesium-134: 62 (2013/ 9/16)→ 3.7 Below 1/10
Cesium-137: 140 (2013/ 9/16)→ 15 Below 1/10
Gross β: 360 (2013/ 8/12)→ 900
Tritium: 400 (2013/ 8/12)→ 3,500

Cesium-134: 5.3 (2013/8/ 5) → ND(0.53) Below 1/10
Cesium-137: 8.6 (2013/8/ 5) → 1.2 Below 1/7
Gross β: 40 (2013/7/ 3) → ND(16) Below 1/2
Tritium: 340 (2013/6/26) → 2.8 Below 1/100

Cesium-134: 28 (2013/ 9/16)→ 2.8 Below 1/10
Cesium-137: 53 (2013/12/16)→ 14 Below 1/3
Gross β: 390 (2013/ 8/12)→ 890
Tritium: 650 (2013/ 8/12)→ 3,600

Summary of TEPCO data as of September 30

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 September 21-29)

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 (0.64)
Cesium-137: ND (2013) → ND (0.81)
Gross β: ND (2013) → ND (17)
Tritium: ND (2013) → ND (1.6)

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

Cesium-134: ND (2013) → ND (0.67)
Cesium-137: 1.6 (2013/10/18) → ND (0.68) Below 1/2
Gross β: ND (2013) → ND (17)
Tritium: 6.4 (2013/10/18) → ND (1.6) Below 1/4

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

Cesium-134: ND (2013) → ND (0.83)
Cesium-137: ND (2013) → ND (0.72)
Gross β: ND (2013) → ND (17)
Tritium: ND (2013) → ND (1.6)

Cesium-134: ND (2013) → ND (0.68)
Cesium-137: ND (2013) → ND (0.75)
Gross β: ND (2013) → ND (17)
Tritium: 4.7 (2013/ 8/18) → ND (1.6) 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 (0.84)
Cesium-137: ND (2013) → ND (0.49)
Gross β: ND (2013) → ND (17)
Tritium: ND (2013) → ND (1.6)

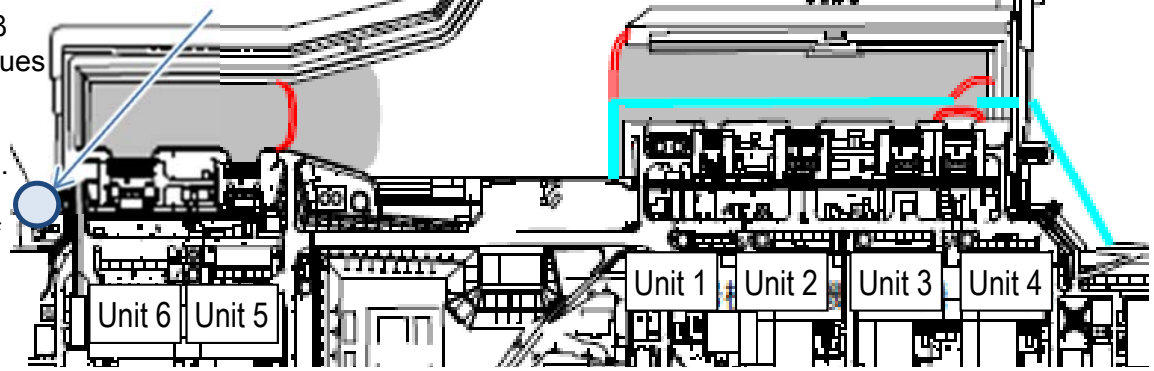
【North side of Units 5 and 6 discharge channel】

Cesium-134: 1.8 (2013/ 6/21) → ND (0.76) Below 1/2
Cesium-137: 4.5 (2013/ 3/17) → ND (0.76) Below 1/5
Gross β: 12 (2013/12/23) → 16
Tritium: 8.6 (2013/ 6/26) → ND (1.5) Below 1/5

Cesium-134: 3.3 (2013/12/24) → ND (0.62) Below 1/5
Cesium-137: 7.3 (2013/10/11) → ND (0.42) Below 1/10
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 (0.81)
Cesium-137: 3.0 (2013/ 7/15) → ND (0.75) Below 1/4
Gross β: 15 (2013/12/23) → 11
Tritium: 1.9 (2013/11/25) → ND (2.0)

【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 September 30

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 1, 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
- Dry cask temporary storage facility


Rubble storage tent


Temporary soil cover type


Rubble


Inside the rubble


Rubble (container storage)

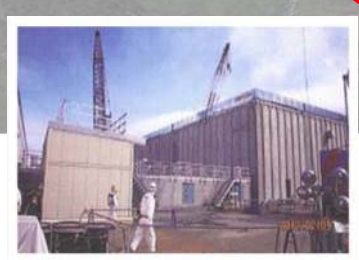

Solid waste storage facility


Rubble (outdoor accumulation)


Temporary trimmed trees


Trimmed trees (outdoor accumulation)

Tank installation status


Temporary waste sludge storage

Provided by Japan Space Imaging Corporation, (C)DigitalGlobe

0m 100m 500m 1000m

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
Dry cask temporary storage facility
MP-1
MP-2
MP-3
MP-4
MP-5
MP-6
MP-7
MP-8
Temporary trimmed trees
Rubble
Trimmed trees
F
Radioactive Waste Incinerator (Installation underway)
Futaba town
Unit 6
Unit 5
Unit 1
Unit 2
Unit 3
Unit 4
Trimmed
Vehicles maintenance site
Periodical inspection material storage (cut of flange tank)
Town boundary
Mega float
Ohkuma town
RO concentrated water treatment facility
Subdrain-purification system
Dry cask temporary storage facility
Main Anti-Earthquake
Chiller for reactor water injection facility
K1
K2
K3
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
Land-side impermeable walls freezing plant
Underground reservoirs
Temporary trimmed trees storage pool
H1
H2
H3
H4
H5
H6
H7
H8
H9
D
E
Land-side impermeable walls with frozen soil (Installation
Administration Office Building
Groundwater bypass temporary storage tank
Temporary rest house outside the site
Administration Office Building (planned)
Large rest house
Access control facility
Sea side impermeable wall
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
Common pool
2nd cesium absorption apparatus (HTI
Underground
J1
J2
J3
J4
J5
J6
J7
J8
Water desalinations (evaporative concentration)
Water desalinations (RO)
G
G3・G4・G5
G6
G7

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

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

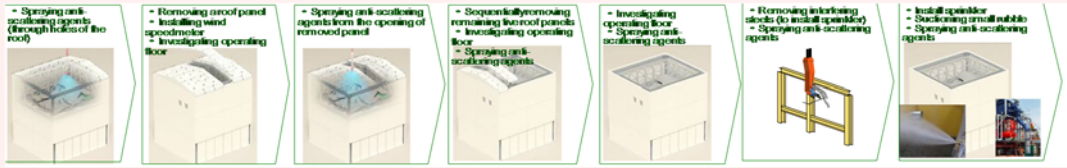
Unit 1

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.

On July 28, removal of the roof panels started. All these panels will be removed by the middle of this fiscal year. 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, preparatory work is currently underway to construct a yard around the Reactor Building.

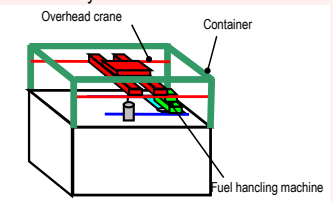


Image of Plan 1

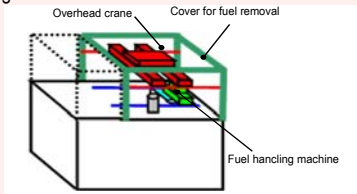


Image of Plan 2

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

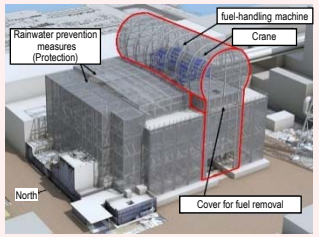


Image of the cover for fuel removal

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

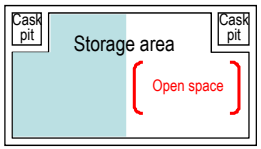
On November 5, 2014, within a year of commencing work to remove the fuel, all 1,331 spent fuel assemblies in the pool had been transferred. The transfer of the remaining non-irradiated fuel assemblies to the Unit 6 SFP was completed on December 22, 2014. (2 of the non-irradiated fuel assemblies were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

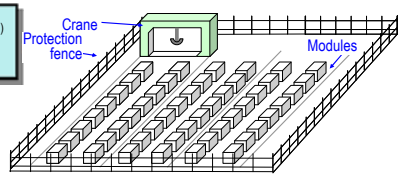


An open space will be maintained in the common pool (Transfer to the temporary dry cask storage facility)

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

3D laser scan inside the Unit 1 R/B underground floor

The upper part of the underground floor (torus room) of Unit 1 R/B was investigated with a laser scan using a remote-controlled robot, and collected 3D data.

3D data, which allows examination based on actual measurements, can be used to examine more detailed accessibility and allocation of equipment.

Combining it with 3D data on the R/B 1st floor allows obstacles on both 1st and underground floors to be checked simultaneously. This allows efficient examination of positions to install repair equipment for PCVs and vacuum break lines.

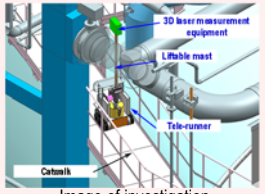
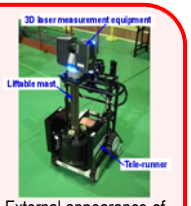


Image of investigation



External appearance of remote-controlled robot

Image of 3D data

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

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

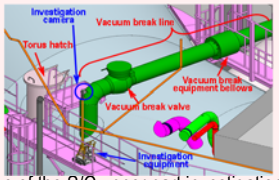
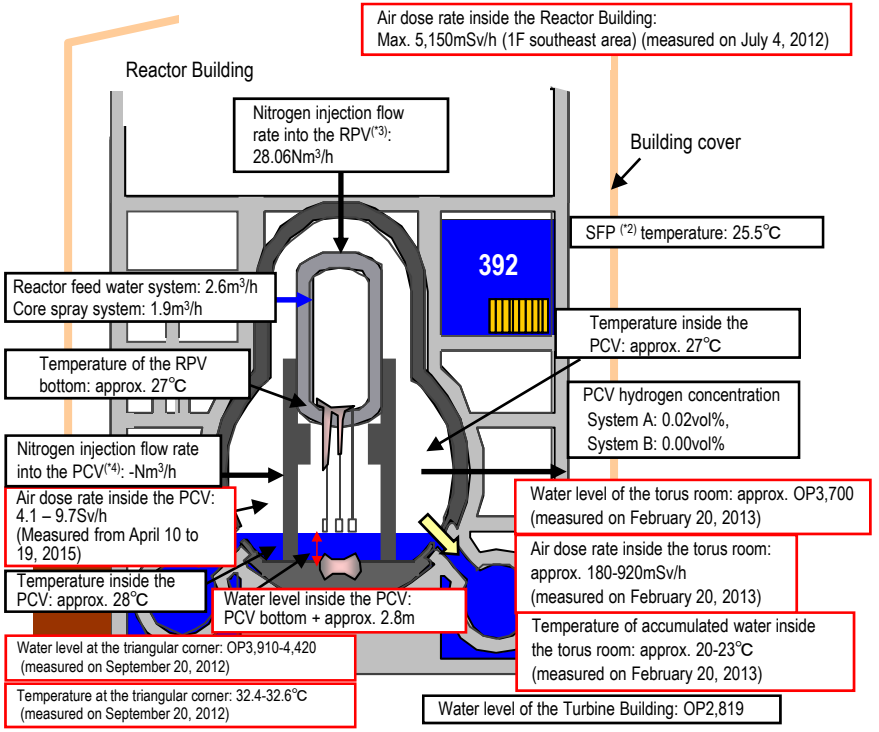


Image of the S/C upper part investigation

Unit 1



* Indices related to the plant are values as of 11:00, September 30, 2015

Status of equipment development toward investigating inside the PCV

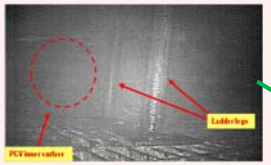
Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigation inside the PCV is scheduled.

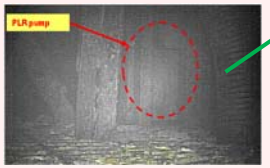
[Investigative outline]

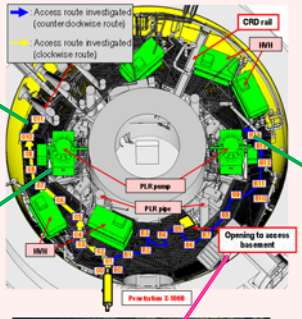
- Inserting equipment from Unit 1 X-100B penetration(*5) to investigate in clockwise and counter-clockwise directions.

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

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

October 1, 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

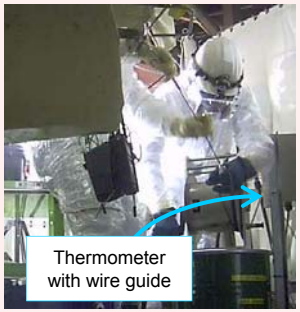
Installation of an RPV thermometer and permanent PCV supervisory instrumentation

(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

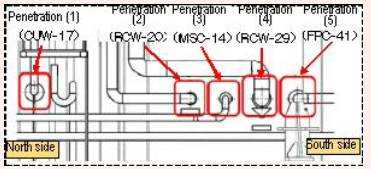
- Some of the permanent supervisory instrumentation for PCV could not be installed in the planned locations due to interference with existing grating (August 13, 2013).
- The instrumentation was removed on May 27, 2014 and new instruments were reinstalled on June 5 and 6, 2014. The trend of added instrumentation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

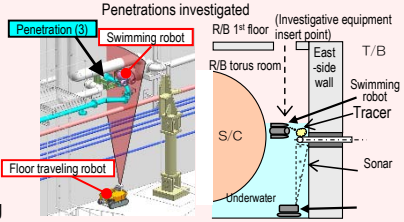
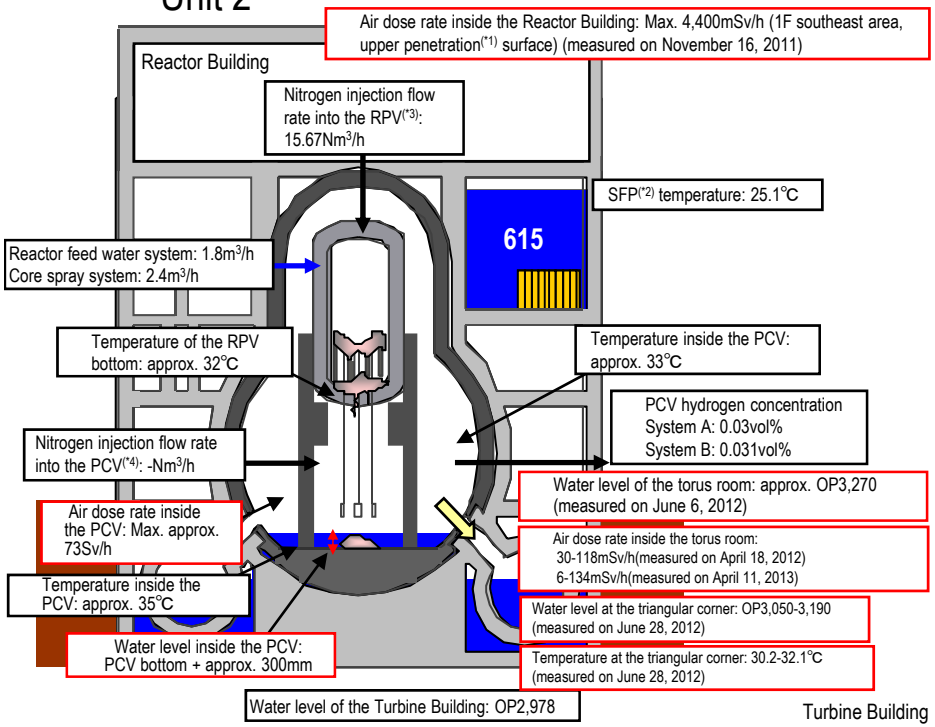


Image of the torus room east-side cross-sectional investigation

Unit 2



* Indices related to plant are values as of 11:00, September 30, 2015

Status of equipment development toward investigating inside the PCV

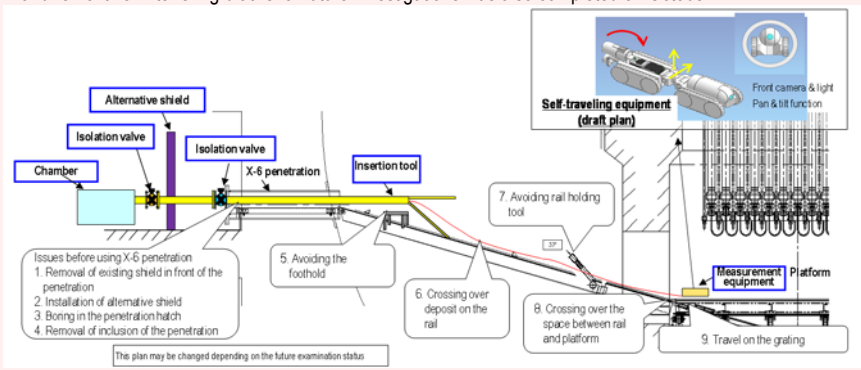
Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigations inside the PCV are scheduled.

[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 1, 2015
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
4/6

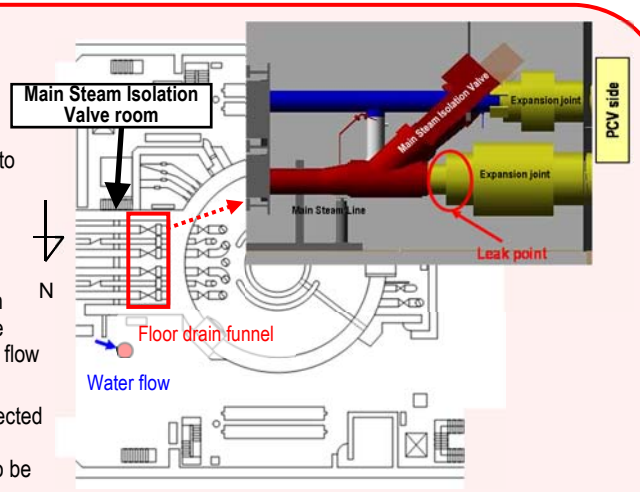
Immediate target	Identify the plant status and commence R&D and decontamination toward fuel debris removal

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 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.

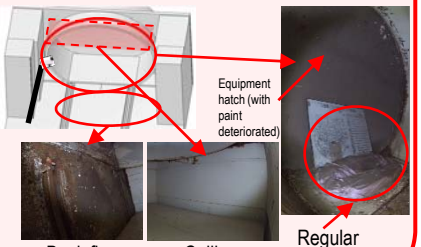


Outline of the water-flow status

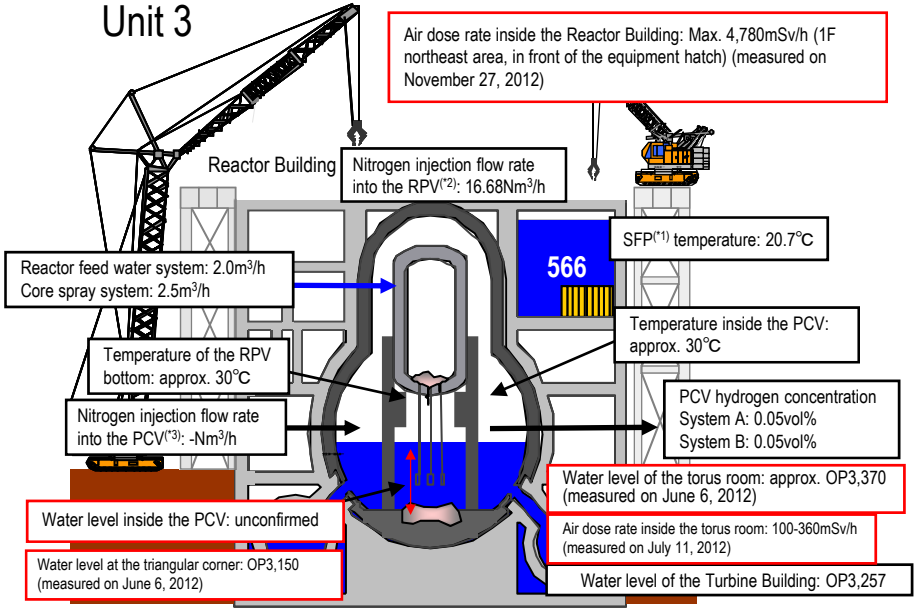
* Main Steam Isolation Valve: A valve to shut off the steam generated from the Reactor in an emergency

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, September 30, 2015

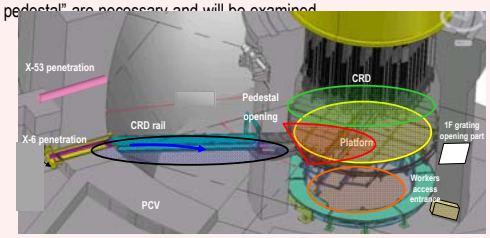
Status of equipment development toward investigating inside the PCV

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. As the water level inside the PCV is high and the penetration scheduled for use in Units 1 and 2 may be under the water, another method needs to be examined.

[Steps for investigation and equipment development]

(1) 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.
- An investigation of the inside of the PCV is scheduled for around the 1st half of FY2015. Given the high radioactivity around X-53 penetration, the introduction of remote-controlled equipment will be examined based on the decontamination status and shielding.

(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.



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

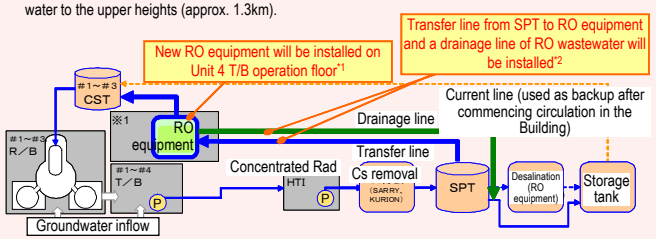
Progress toward decommissioning: Work related to circulation cooling and accumulated water treatment line

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

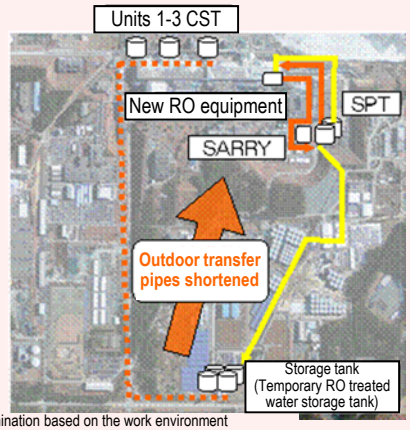
Work to improve the reliability of the circulation water injection cooling system and pipes to transfer accumulated water.

- 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.

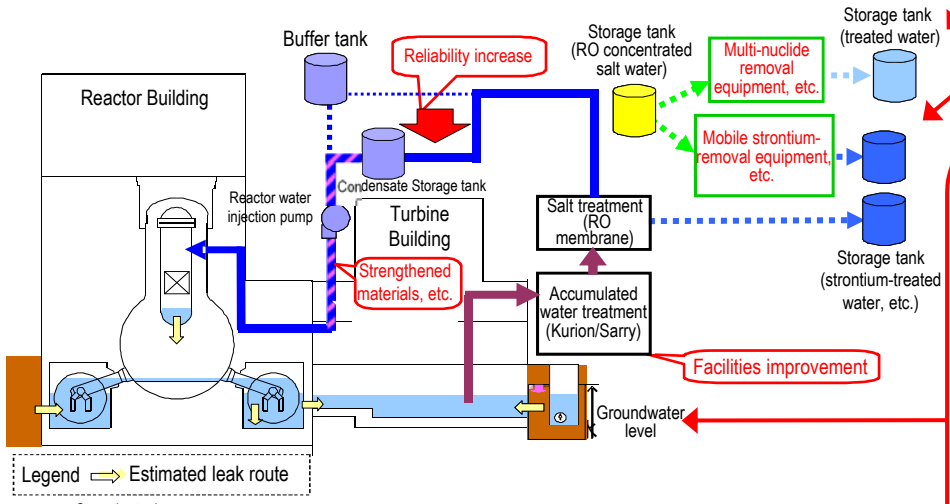
Before installing the fence cover

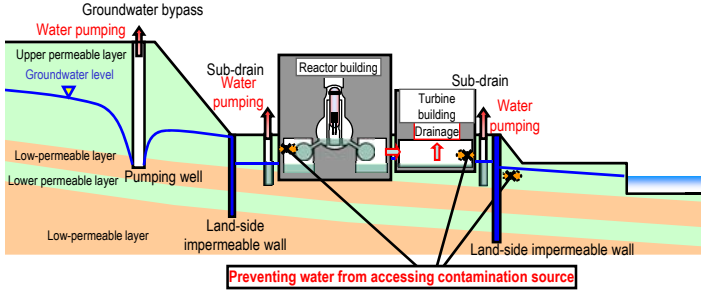
After installing the fence cover

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

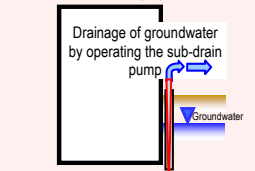
Contaminated water (RO concentrated salt water) is being treated using seven types of equipment including the multi-nuclide removal equipment (ALPS). Treatment of the RO concentrated salt water was completed on May 27, with the exception of the remaining water at the tank bottom. The remaining water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



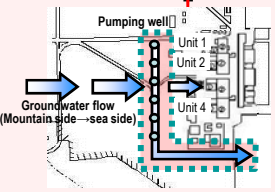


Preventing groundwater from flowing into the Reactor Buildings



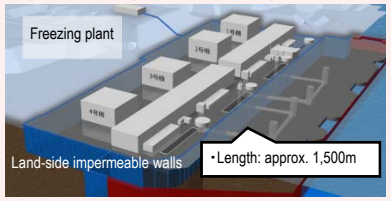
To reduce groundwater flowing into the buildings, pumping-up of groundwater from wells (subdrains) around the buildings started on September 3, 2015. Pumped-up groundwater was purified at dedicated facilities and released after TEPCO and a third-party organization confirmed that its quality met operational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

Reducing groundwater inflow by pumping sub-drain water



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

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



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.
Regarding the mountain-side, in which freezing will commence first, installation of frozen pipes was completed on July 28, 2015.
Freezing functioning test started on April 30, 2015.

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

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

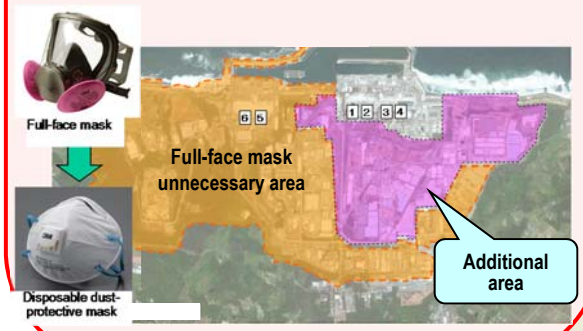
Progress toward decommissioning: Work to improve the environment within the site

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.

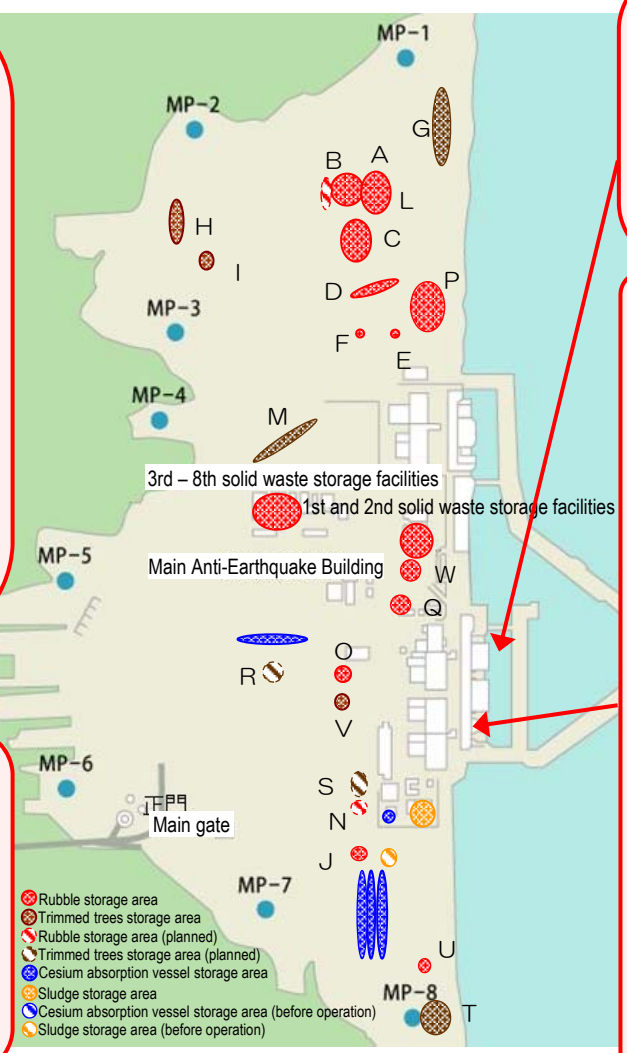
However, wearing full- or half-face mask is required for works exposed to highly concentrated dust; and full-face masks, for works involving a risk of ingesting concentrated salt water, etc.



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 impermeable walls on the sea side

To prevent contamination expansion into the sea when contaminated water leaks into groundwater, impermeable walls are being installed.
Installation of steel pipe sheet piles was completed on September 22. Connection of these piles is underway and landfill inside the sea-side impermeable will start. Status of completed installation of steel pipe sheet piles for sea-side impermeable walls

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