Summary of Decommissioning and Contaminated Water Management

July 30, 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

Unit 1&2 / Unit 3 / Unit 4

Rubble removal & dose reduction → Installing Fuel-Handling Machine → 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 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 Roadmap (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

Fuel removal from SFP

Toward fuel removal from Unit 3 SFP, large rubble within the pool is being removed.
Though the removal of large rubble within Unit 3 SFP had been suspended since rubble fell in August 2014, it has resumed since December 2014 after implementing additional fall-prevention measures.

(FHM to be removed on August 2)

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)

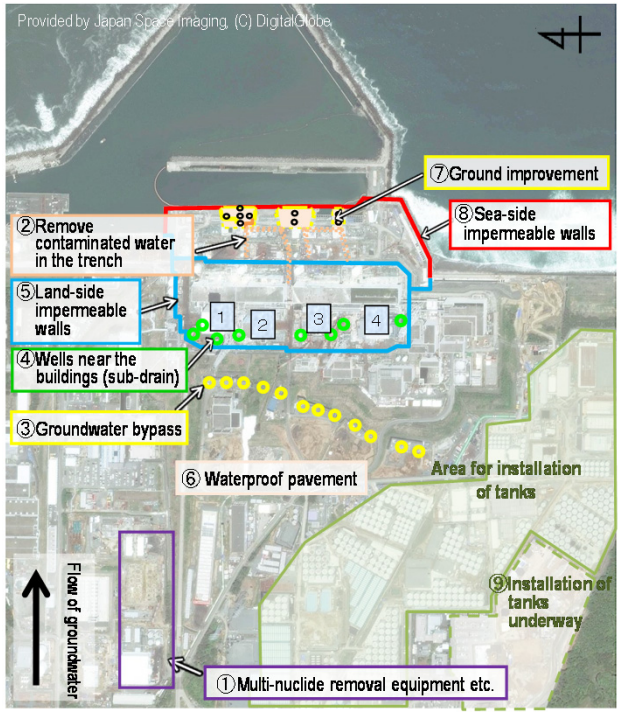
(Note 3) Underground tunnel containing pipes.

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.
- Regarding the mountain side, in which freezing will commence first, the installation of frozen pipes was completed in July 2015.

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

Sea-side impermeable walls

- The walls aim to prevent the flow of contaminated groundwater into the sea.
- The installation of steel sheet piles is almost (98%) complete. The closure time is being coordinated.

(Installation status)

Progress status

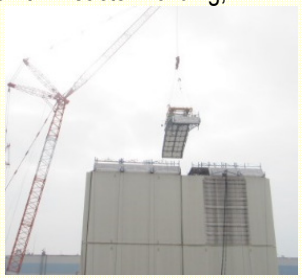
◆ The temperatures of the Reactor Pressure Vessel (RPV) and the Primary Containment Vessel (PCV) of Units 1-3 have been maintained within the range of approx. 20-45°C[*1] for the past month. There was no significant change in the density of radioactive materials newly released from Reactor Buildings 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 June 2015, the radiation exposure dose due to the release of radioactive materials from the Unit 1-4 Reactor Buildings was evaluated as less than 0.0025 mSv/year at the site boundaries. The annual radiation dose by natural radiation is approx. 2.1 mSv/year (average in Japan).

Dismantling of Unit 1 building cover roof panels started

To facilitate rubble removal on the roof of Unit 1 Reactor Building, dismantling of the roof panels started on July 28. All these panels will be removed by the middle of this fiscal year.

Prior to dismantling the building cover, anti-scattering agents were sprayed and windbreak curtains installed to ensure rigid control of scattering. Radioactive materials will continue to be thoroughly monitored.

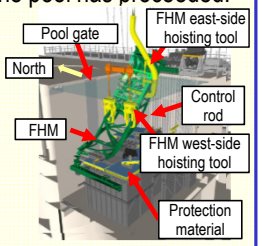


<Status of removal of roof panels>

Removal of fuel-handling machine from Unit 3 spent fuel pool

To facilitate fuel removal from the Unit 3 spent fuel pool, removal of large rubble within the pool has proceeded.

The fuel-handling machine (FHM), the largest rubble having fallen in the pool, will be removed on August 2 following a mock-up hoisting test. The work will progress safely and steadily.



<Image of FHM removal>

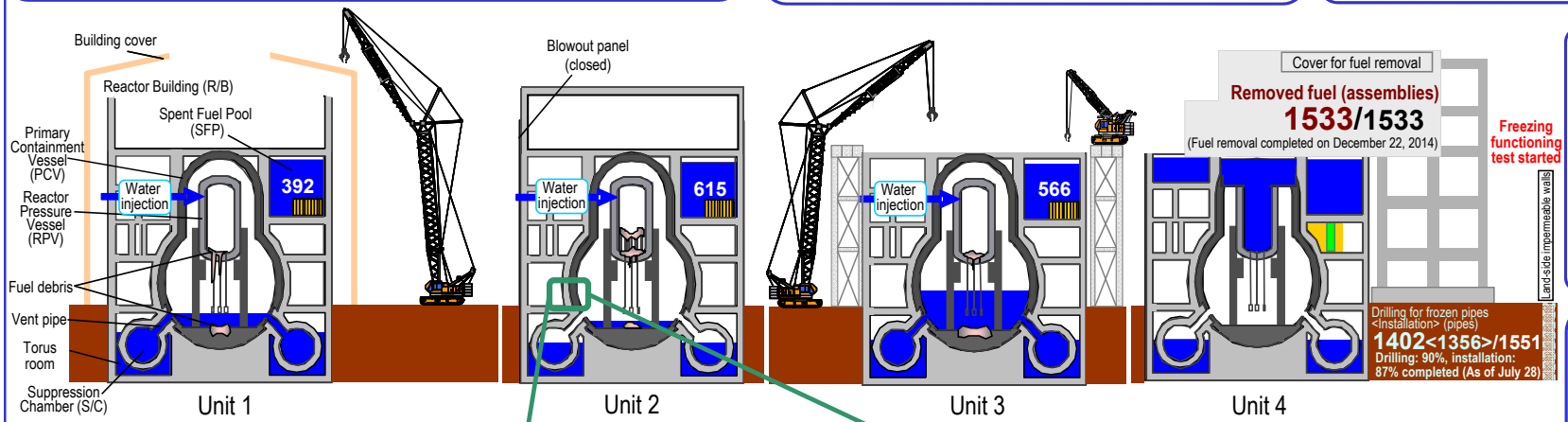
Mountainside installation of frozen pipes of land-side impermeable walls completed

Among frozen pipes of impermeable walls, installation for three sides on the mountain side, in which freezing will commence first, was completed on July 28, including the part where pipes penetrate the underground structure.

Construction on the sea side will commence after the implementation plan for the part penetrating the underground structure is authorized.

Status of 9th solid waste storage facility

The 9th solid waste storage facility will be established to store solid waste generated during the decommissioning works appropriately. Following the authorization of the implementation plan on July 17, construction for the facility is underway.



Meal service at large rest house resumed

The meal service at the dining space of the large rest house, which had been temporarily suspended due to construction for further hygiene-related improvement, will resume on August 3.

Release of a portion of K drainage channel rainwater to the sea due to heavy rainfall

Rainwater falling around Unit 1-4 buildings is transported through K drainage channel, pumped up to C drainage channel and transferred within the port.

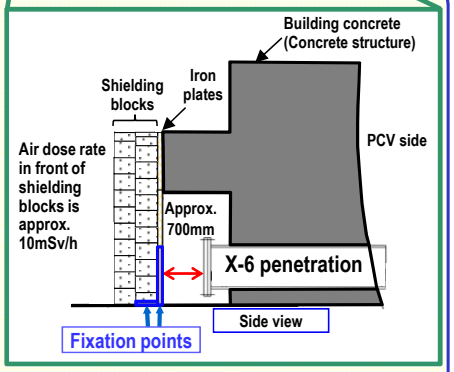
On July 16, a portion of water was released to the sea due to heavy rainfall exceeding the pumping capacity. There has been no significant change in the radiation density outside the port.

For K drainage channel, a route will be installed within this fiscal year, which will lead inside the port without traversing the pumps.

Preparation status to investigate inside Unit 2 PCV

To prepare to investigate the status inside the Unit 2 PCV, work to remove shielding blocks installed in front of the PCV penetration (X-6 penetration), from which the investigation device will be introduced, commenced on June 11 through remote operation. However, seven blocks which were firmly fixed to the ground could not been removed.

Methods to remove these fixed blocks will be considered, including the use of small, remote-control heavy machines and modification of the block removal equipment. After the preparation is completed, removal of the remaining blocks will resume.



<Status of fixed shielding blocks>

Removal of contaminated water from Unit 2-3 seawater-pipe trenches completed

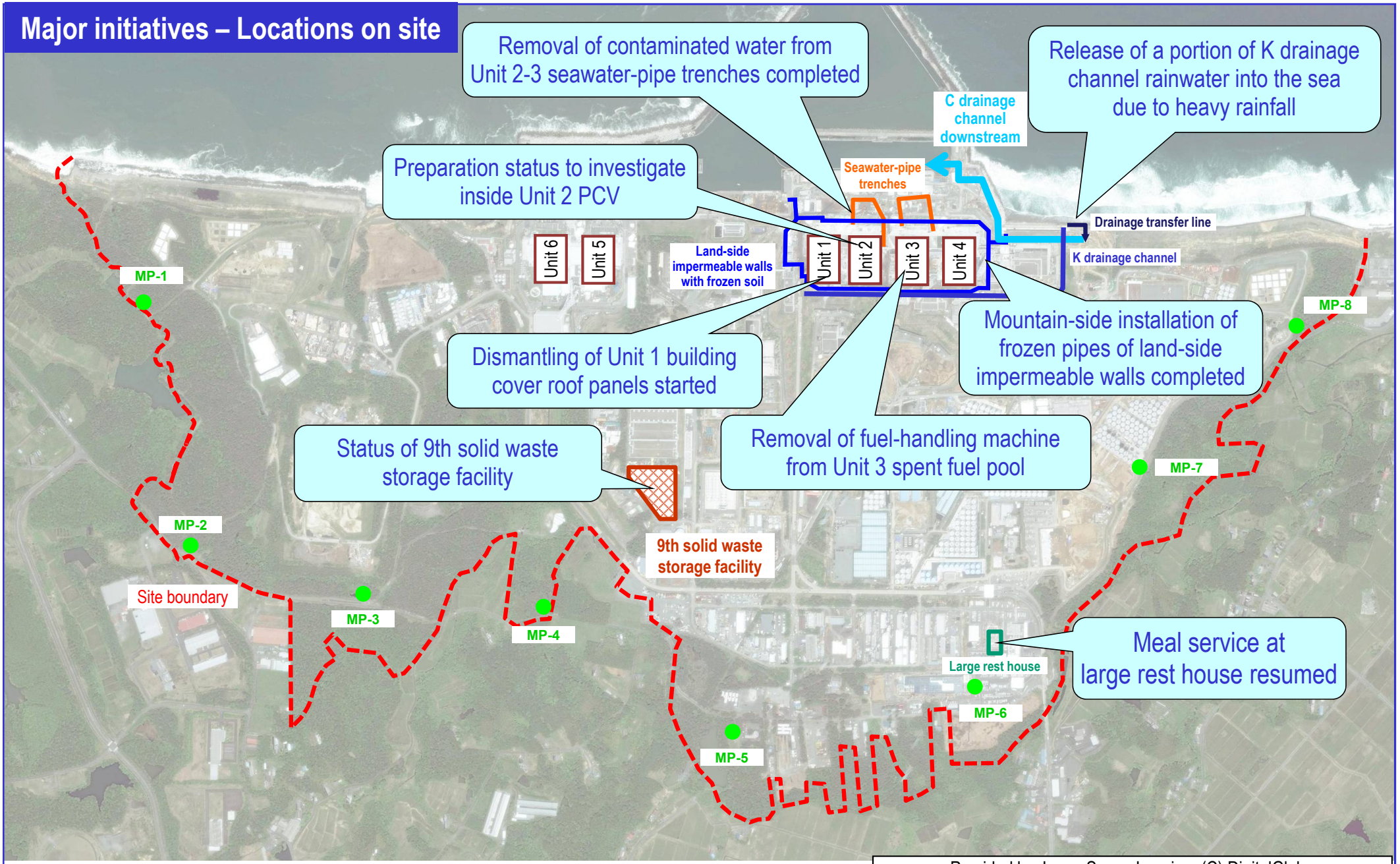
Filling is underway for seawater-pipe trenches(Note) leading from Unit 2-4 Turbine Buildings to the sea side to remove contaminated water.

(Note) Trench: Underground tunnel containing pipes and cables.

Regarding the Unit 2 seawater-pipe trench, removal of contaminated water from the whole trench was completed on June 30, Regarding the Unit 3 seawater-pipe trench, removal of contaminated water from the whole trench will be completed at the end of July, which will significantly reduce the risk of highly contaminated water flowing out.

Regarding the Unit 4 seawater-pipe trench, removal of contaminated water was completed except for a portion on April.

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 0.922 - 3.685 μSv/h (June 24 – July 28, 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.

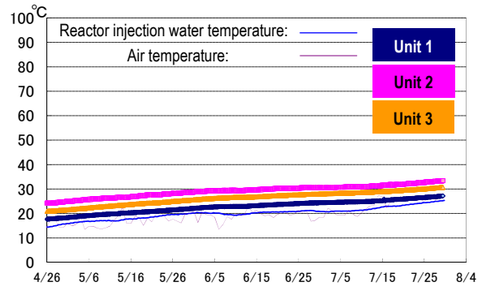
Therefore monitoring results at these points are lower than elsewhere in the power plant site.

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.

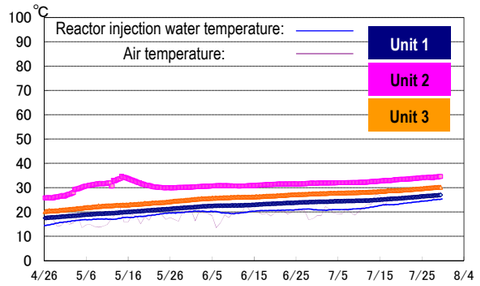
I. Confirmation of the reactor conditions

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)



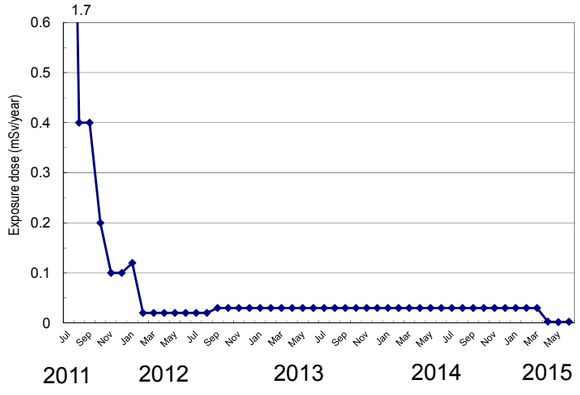
PCV gas phase temperatures (recent quarter)

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

2. Release of radioactive materials from the Reactor Buildings

As of June 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. 8.8×10^{-11} Bq/cm^3 for Cs-134 and 1.6×10^{-10} Bq/cm^3 for Cs-137 respectively. The radiation exposure dose due to the release of radioactive materials was less than 0.0025 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 0.022 - 3.685 μSv/h (June 24-July 28, 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.

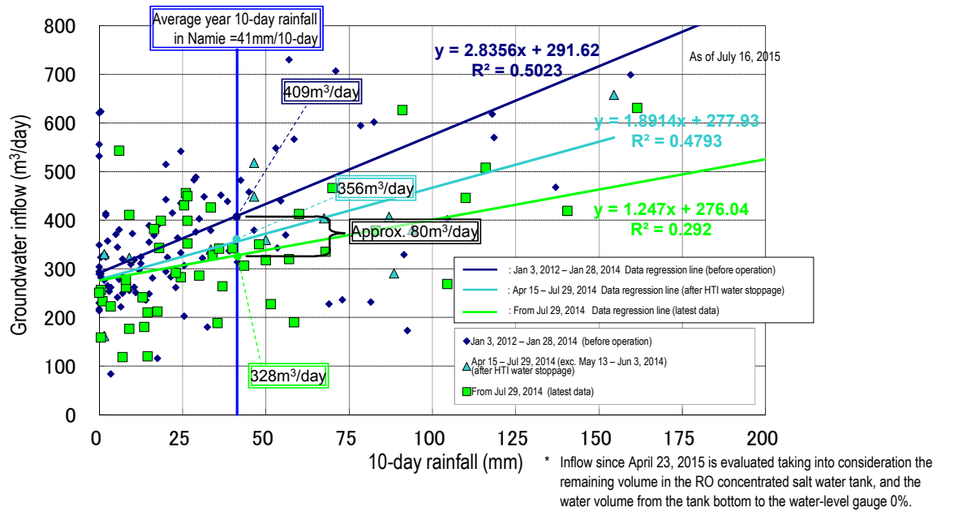
II. Progress status by each plan

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 July 29, 2015, 116,897m³ 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 confirmed that the groundwater inflow into the buildings had decreased by approx. 80 m³/day, based on the evaluation data to date, through measures such as groundwater bypass and water stoppage of the High Temperature Incinerator Building (HTI) (see Figure 1).
- It was confirmed that the groundwater level at the observation holes had decreased by approx. 5-20 cm compared to the level before pumping at the groundwater bypass started.
- As the density of tritium was identified as the target operation value of 1,500Bq/L through the analytical result of water sampled from pumping well No. 10 on June 29, pumping of groundwater terminated on June 30. As no effect was confirmed on the groundwater bypass temporary storage tank through the results of two-week sampling from the same pumping well, pumping of groundwater resumed on July 18.
- For pumping well Nos. 4, 5, 6, 7, 9, 11 and 12, water pumping was suspended for cleaning (No. 4: from July 8; No. 5: May 22 – July 17; No. 6: from July 14; No. 7: June 10 – July 1; No. 9: June 22 - July 9; No. 11: June 29 – July 22; No. 12: May 25 – June 24).



* Inflow since April 23, 2015 is evaluated taking into consideration the remaining volume in the RO concentrated salt water tank, and the water volume from the tank bottom to the water-level gauge 0%.

Figure 1: Analytical results of inflow into buildings

➢ 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, as of July 28, 2015 drilling at 1,036 points (100%, for frozen pipes: 1,036 of 1,036 points, for temperature-measurement pipes: 228 of 228 points) and installation of frozen pipes at 1,036 of 1,036 points (100%) had been completed (see Figure 3). Following the authorization for construction to penetrate the underground structure on the mountain side on July 3, the remaining construction commenced on July 6 and installation of frozen pipes was completed on July 28.
- From April 30, the freezing functioning test is underway at 18 points (58 frozen pipes, approx. 6% on the mountain side). The test confirmed that the facilities were operating correctly and the earth temperature had decreased. As the change in groundwater level at the observation well near the freezing functioning test point No. 7 from the level of multiple observation wells, which had not been affected by freezing, exceeded the standard value for four consecutive days, brine supply to this point was suspended since June 3.

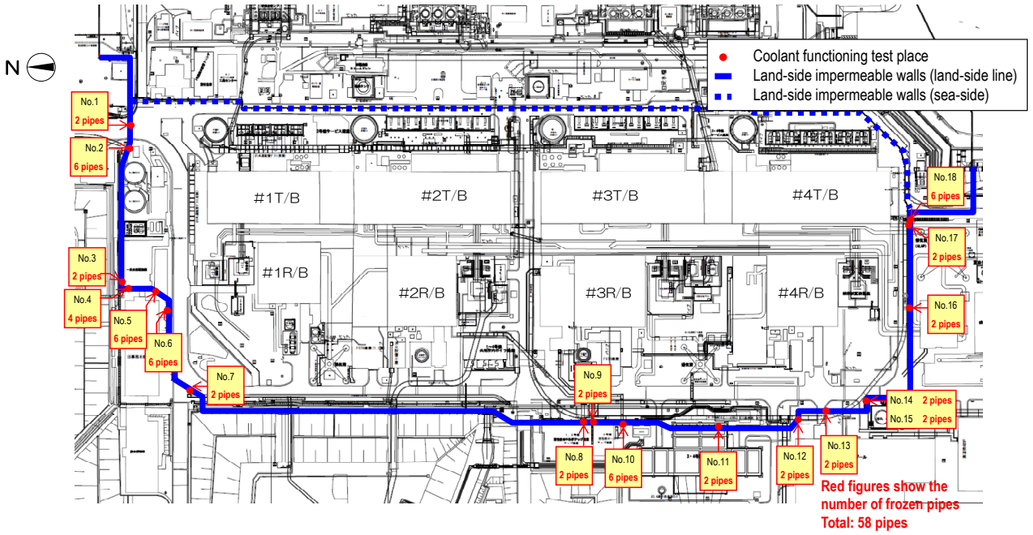


Figure 2: Freezing functioning test place on land-side impermeable walls

T/Mt pipes: Temperature-measurement pipes

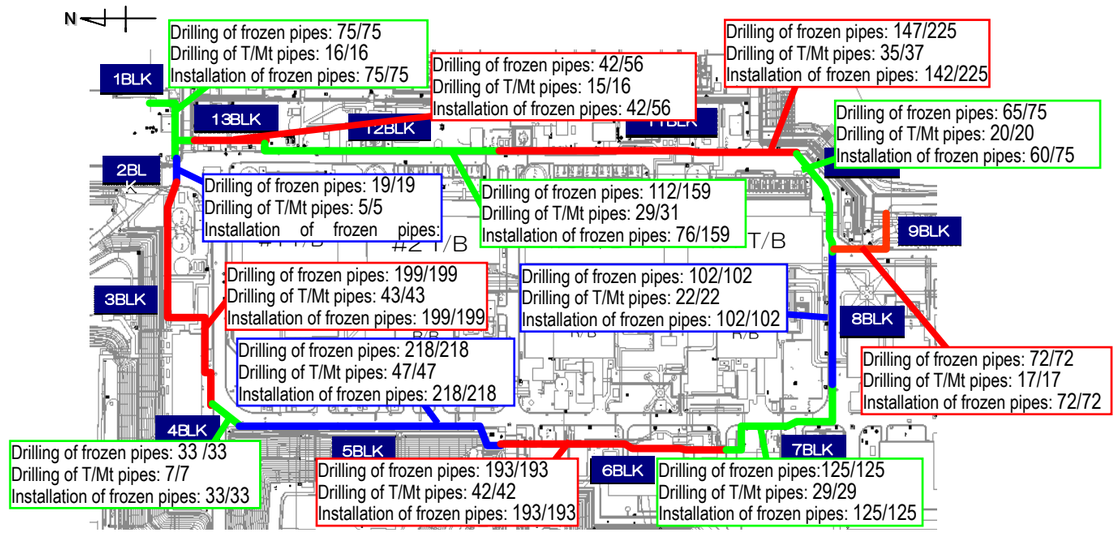
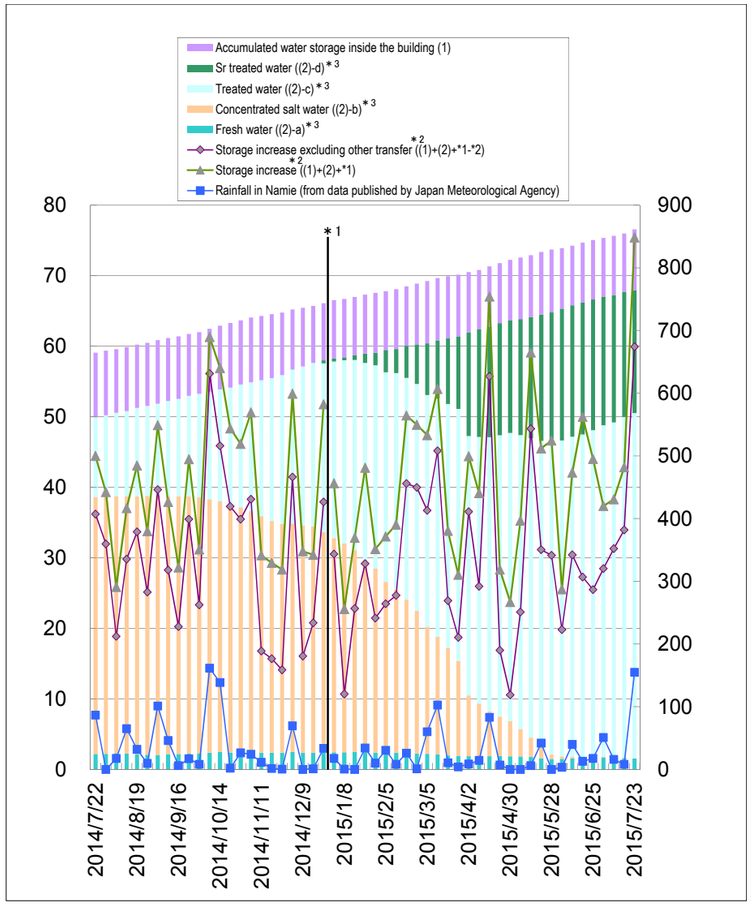
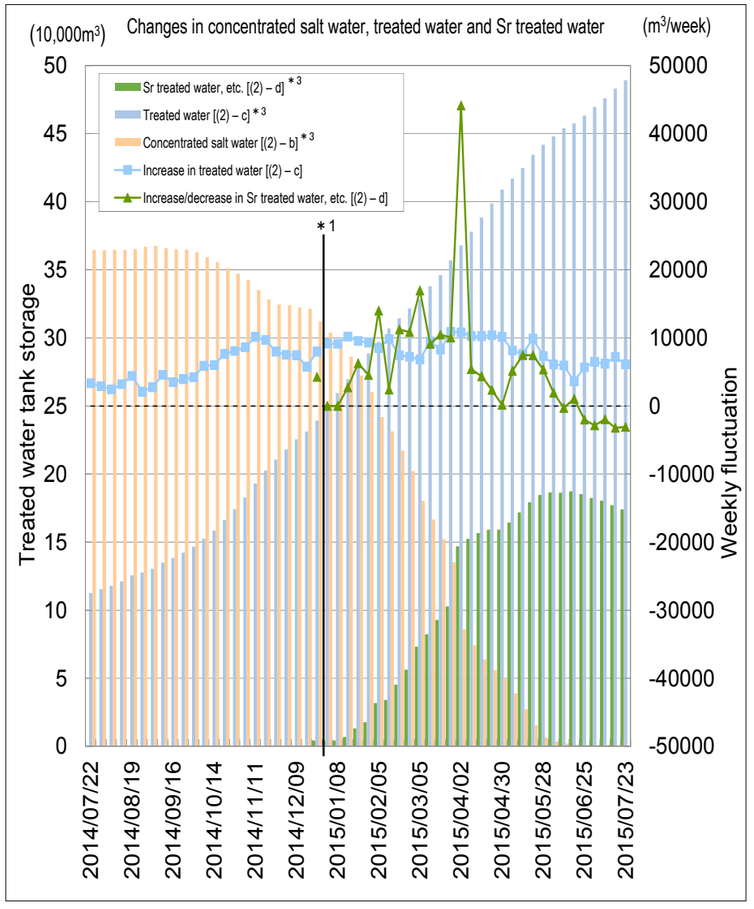


Figure 3: Drilling status for frozen-soil impermeable walls and installation of frozen pipes





As of July 23, 2015

Figure 4: Status of accumulated water storage

*1: Since January 1, 2015, the data collection days have been changed (Tuesdays → Thursdays)

*2: Since April 23, 2015, the data collection method has been changed (Increase in storage: (1)+(2) → (1)+(2)+*1);
increase in storage excluding other amounts transferred: (1)+(2)-*2 → (1)+(2)+*1-*2))

➢ 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 July 23, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 264,000, 167,000 and 74,000 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 necessary 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 July 23, approx. 55,000 m³ had been treated.
- Investigations into the cause were conducted regarding the automatic suspension of successive standby operation occurred at the additional multi-nuclide removal equipment on June 11. It was assumed that the grounding was attributable to a jumper line contacting a nearby metallic body during the jumper wiring conducted at the same time as the grounding. Attention was focused on thoroughly covering points prone to grounding.

➢ 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 July 23, approx. 84,000 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 July 27, 2015 a total of 28,710 m³).

➢ Leakage from desalination equipment (RO3)

- On July 17, a leakage was detected at the high-pressure pump outlet joint of the desalination equipment (RO3), which generates fresh water to be injected into the reactor. Leakage of approx. 2.5m³ of water remained within the fences, but was collected and decontaminated the same day.
- The probable cause was the loosening of the foundation bolt due to vibration of the high-pressure pump, since the loosened bolt augmented the frequency and consequently generated a crack in the joint. Detailed investigations will be conducted in the following step.

➢ Removal of contaminated water from seawater-pipe trenches

- Regarding the Unit 2 seawater-pipe trench, filling of the tunnel sections was completed on December 18, 2014. Filling of trenches was completed with contaminated water within trenches having been transferred by June 30, 2015, and vertical shafts having been filled by July 10.
- Regarding the Unit 3 seawater-pipe trench, filling was completed for the tunnel sections on April 8, Vertical Shaft A on June 6 and Vertical Shaft D on June 30. Filling is underway for Vertical Shaft B from June 13 and Vertical Shaft C from June 17. Removal of contaminated water will be completed by the end of July.
- Regarding the Unit 4 seawater-pipe trench, filling was completed for the tunnel sections on March 21 and opening apertures II and III on April 28. Filling of the parts running over drainage channels will be conducted after coordinating with other construction nearby. Opening aperture I will be filled when the contaminated water level of the building is reduced.
- Regarding the overall contaminated water removal from seawater-pipe trenches, approx. 99% had been completed (as of July 28).

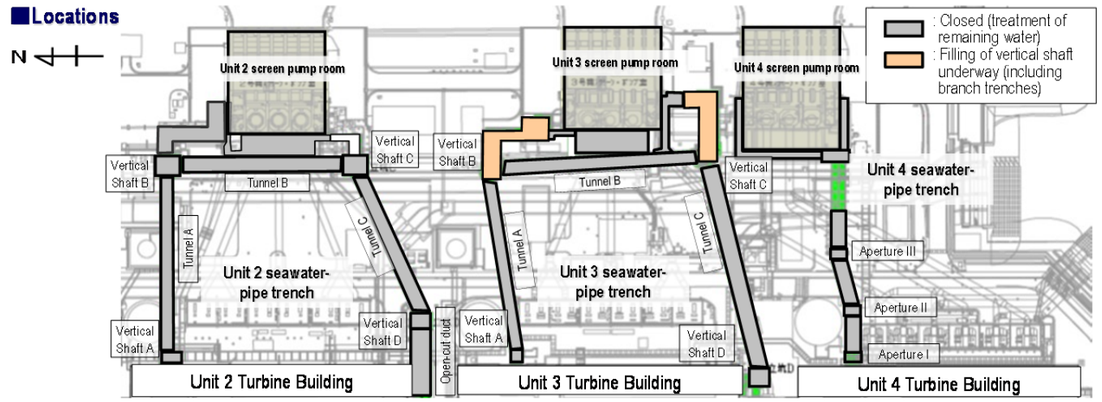


Figure 5: Progress status of contaminated water removal of seawater-pipe trenches

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 May 21, a disconnect was found with the balloon installed on the Reactor Building 3rd floor equipment hatch to reduce the release of radioactive materials. As the evaluation results of the latest data showed that the release amount was sufficiently low without a balloon, it will not be recovered. However, windbreak curtains were installed within the large carry-in building to control wind inflow (completed on July 27).
- Prior to removing the building cover roof panels, anti-scattering agents were sprayed through the holes from July 17. Removal of roof panels started on July 28. During these works, no significant change was identified in the dust densities at dust monitors and monitoring posts, etc.
- 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, a yard is being constructed around the Reactor Building to ensure a work area for installing large heavy-duty machines, etc.
- Preparatory works are now underway, including closure of ducts, etc. and transfer of existing facilities. Once these works are complete, full-scale dismantling of interfering buildings will commence from around August 2015.

➢ Main work to help remove spent fuel at Unit 3

- Removal of large rubble within the spent fuel pool has resumed since June 22 and a portion of the walkway was removed (by July 10). After preparing hoisting tools, driving equipment and countermeasures in case of any leakage of pool water, the fuel-handling machine will be removed on August 2.

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)

➢ Preparation for investigation inside the Unit 2 PCV

- To prepare to investigate the status of the platform inside the Unit 2 PCV pedestal (A2 investigation), removal of shielding blocks installed in front of the PCV penetration (X-6 penetration), from which the investigation device will be introduced, commenced on June 11 through remote operation. Though 128 of 135 blocks had been removed by July 8, the remaining 7 blocks, which were firmly fixed to the ground, could not be removed.
- After considering how best to remove these fixed blocks, including the application of small, remote-controlled heavy machines, removal of fixed material by vibration, etc. and chemical removal of fixed material, a method evaluated as capable of removing the blocks will be implemented from an early stage, while starting to modify the block removal equipment. As soon as the preparation is completed, the remaining blocks will be removed.
- Opening a hole of X-6 penetration and the A2 investigation process will be changed based on the status of the above consideration.
- The muon transmission method, which can be measured swiftly due to easy installation of measurement equipment, will be implemented first to evaluate the existence of fuel inside the PCV.
- On July 14, an implementation plan concerning the investigation inside Unit 2 and 3 PCVs was authorized.

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 June, the total storage volume of concrete and metal rubble was approx. 156,600 m³ (+1,500 m³ compared to at the end of May, with an area-occupation rate of 61%). The total storage volume of trimmed trees was approx. 82,500 m³ (+21 m³ compared to at the end of May, with an area-occupation rate of 60%). The increase in rubble was mainly attributable to construction related to facing and the removal of rubble around Unit 1-4 buildings. The increase in trimmed trees was mainly attributable to the acceptance of trunks and roots generated in various constructions on site as needed.

➢ Management status of secondary waste from water treatment

- As of July 23, 2015, the total storage volume of waste sludge was 597 m³ (area-occupation rate: 85%) and that of concentrated waste fluid was 9,360 m³ (area-occupation rate: 47%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment, etc. was 2,683 (area-occupation rate: 44%).

➢ Status of 9th solid waste storage facility

- An implementation plan for solid waste storage facility with a capacity of approx. 110,000 200L-drums was authorized on July 17.

➢ Fire involving crawler crane near Radioactive Waste Incinerator

- On July 20, near the Radioactive Waste Incinerator, which is currently under construction, a fire was identified at part of the crawler crane's radiator during operation. Initial fire-fighting was conducted and the extinction was confirmed.

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

➢ Temperature inside Unit 1 PCV and injection flow rate into the reactor

- As it was evaluated that some of the thermometers inside Unit 1 PCV, for which temperature variation had been identified due to the effect of the nitrogen injection flow rate, would be stabilized by increasing the injection flow rate, a test will be conducted, which will involve increasing the nitrogen injection flow rate.
- Aiming to improve the insight related to assumed heat sources, a test will be conducted to verify the temperature response inside the PCV to the increased injection flow rate from the reactor feed water system.

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

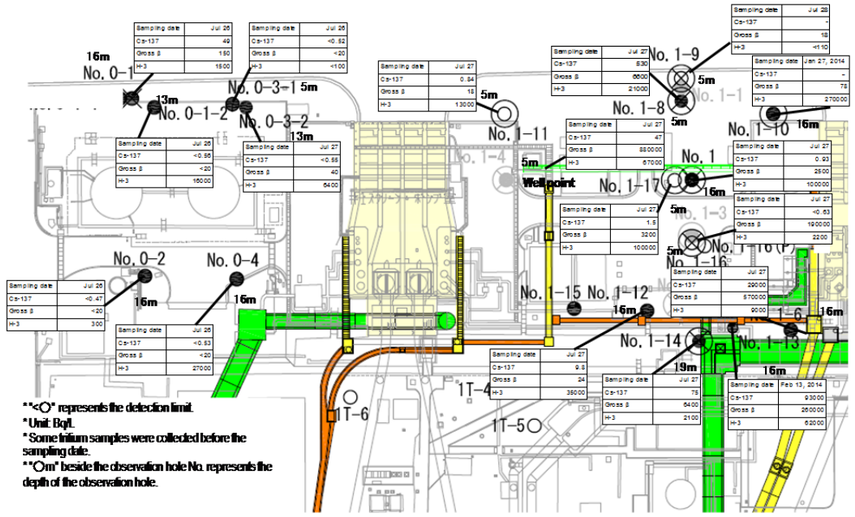
➢ Status of groundwater and seawater on the east side of Turbine Building Units 1 to 4

- 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 July 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 110,000 Bq/L since March 2015. The density of gross β radioactive materials at groundwater Observation Hole No. 1 has been increasing since February 2015 and currently stands at around 2,000 Bq/L, while the density at groundwater Observation Hole No. 1-17 has been decreasing and currently stands at around 3,000 Bq/L. Water pumping from the well point (10 m³/day) and the pumping well No. 1-16 (P) (1 m³/day) installed near Observation Hole Nos. 1-16 continues.
- Regarding radioactive materials in the groundwater near the bank between the Unit 2 and 3 intakes, the densities of tritium and gross β radioactive materials have been further decreasing from March and currently stand at around 500 Bq/L for both tritium and gross β radioactive materials. To treat the surface of the ground improvement area and repair the well point, the volume of water pumped from the well point increased to 50 m³/day (from October 31, 2014). The surface treatment commenced on January 8 and was concluded on February 18. The repair of the well point was completed and test operation will start from early August.
- 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. Following the surface treatment in the ground improvement area (March 19-31), pumping of groundwater commenced (20 m³/day from April 1, 10 m³/day from April 24). Both densities of tritium and gross β radioactive materials have been increasing at groundwater Observation Hole No. 3 since April. The repair of the well point was completed and test operation will start following the well point between Units 2 and 3.
- 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 June.
- The density of radioactive materials in seawater within the port has remained low at the same level as up to June.
- 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 had 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.

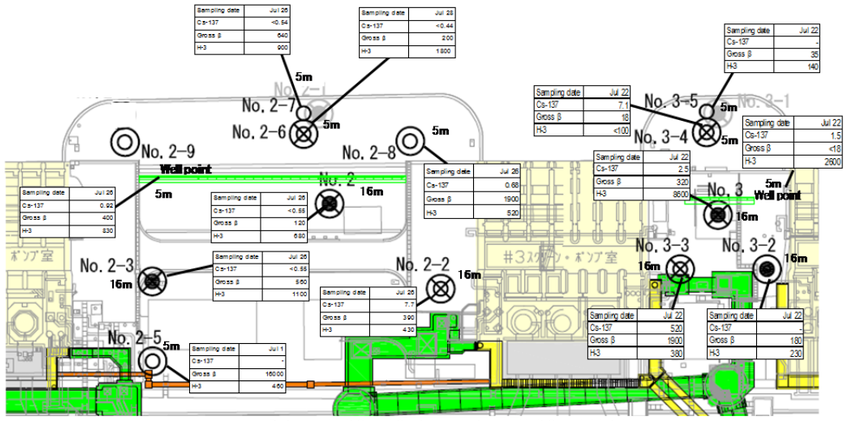
➢ Release of K drainage channel rainwater to the sea due to heavy rainfall

- Water of K drainage channel, which leads from around Unit 1-4 buildings to outside the port, is being transported to C drainage channel, which leads to inside the port, through pumps with fences installed inside the K drainage channel. On July 16, though all pumps were operating normally, it was confirmed that a portion of water was released from those fences to the sea due to heavy rainfall exceeding the transportation volume of the pumps.
- The analytical results of radiation density in water of K drainage channel sampled on July 16 increased those on the previous day (July 15), which is probably attributable to the temporary increase, due, in turn, to the effect of heavy rainfall. There was no significant variation in monitoring values near the port entrance and south outlet.
- Despite heavy rainfall (18.5 mm/h) in the early morning of July 20 (5:00-6:00), no status exceeding the fences inside K drainage channel was identified during the regular patrol (8:00). Later investigation of the transfer pumps

confirmed the full-scale operation of eight pumps (5:40-6:08).



<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

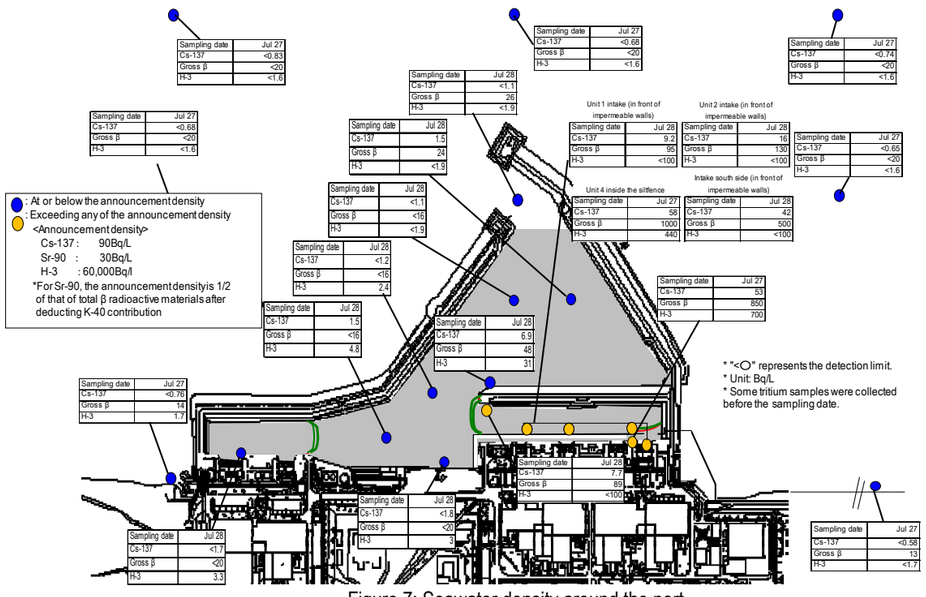


Figure 7: Seawater density around the port

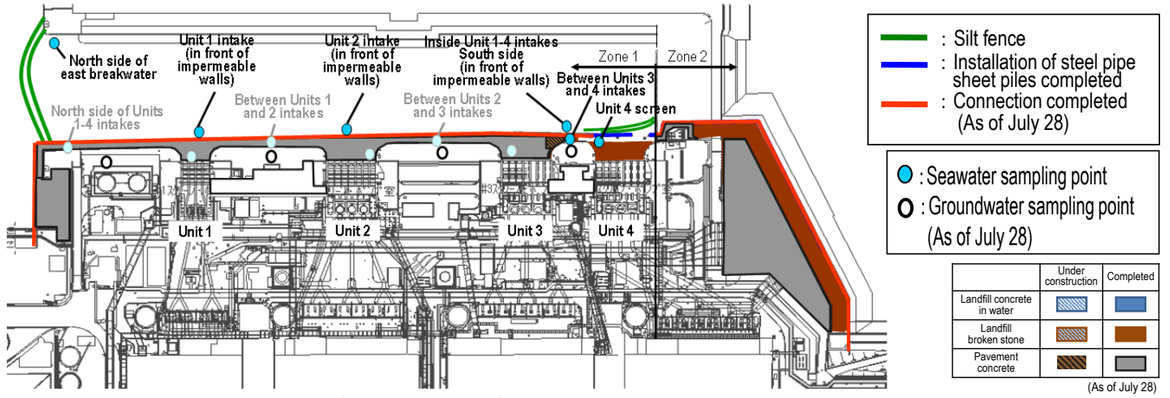


Figure 8: Progress status of impermeable walls on the sea side

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

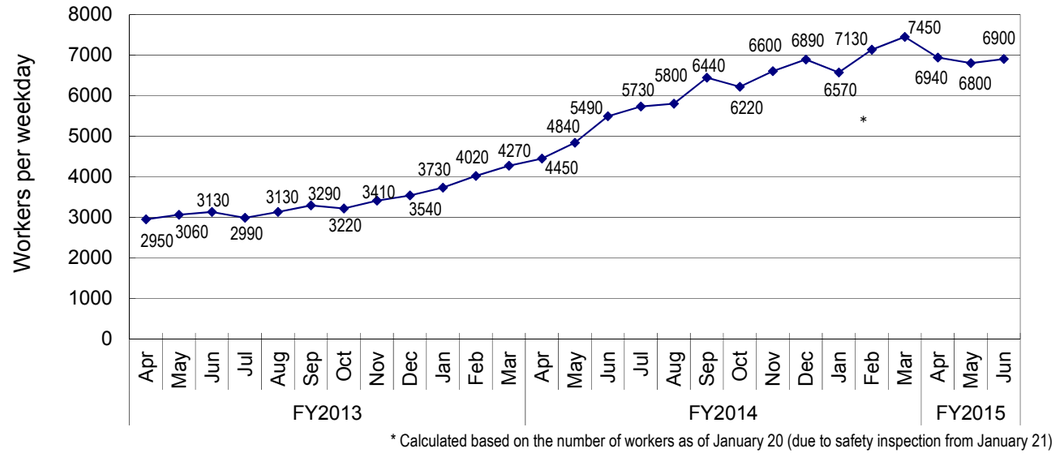
Securing appropriate staff long-term while thoroughly implementing workers' exposure dose control. Improving the work environment and labor conditions continuously based on an understanding of workers' on-site needs

➢ 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 March to May 2015 was approx. 14,700 (TEPCO and partner company workers), which exceeded the monthly average number of actual workers (approx. 11,500). Accordingly, sufficient people are registered to work on site.
- It was confirmed with prime contractors that the estimated manpower necessary for the work in August (approx. 6,700 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 August estimate.

- The number of workers from Fukushima Prefecture has remained the same but the number of workers from outside the prefecture has been slightly decreasing. Accordingly, the local employment ratio (TEPCO and partner company workers) as of June remained at around 45% with a little increase.
- The average exposure dose of workers remained at approx. 1 mSv/month during both FY2013 and FY2014. (Reference: Annual average exposure dose 20mSv/year ≒ 1.7mSv/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)

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

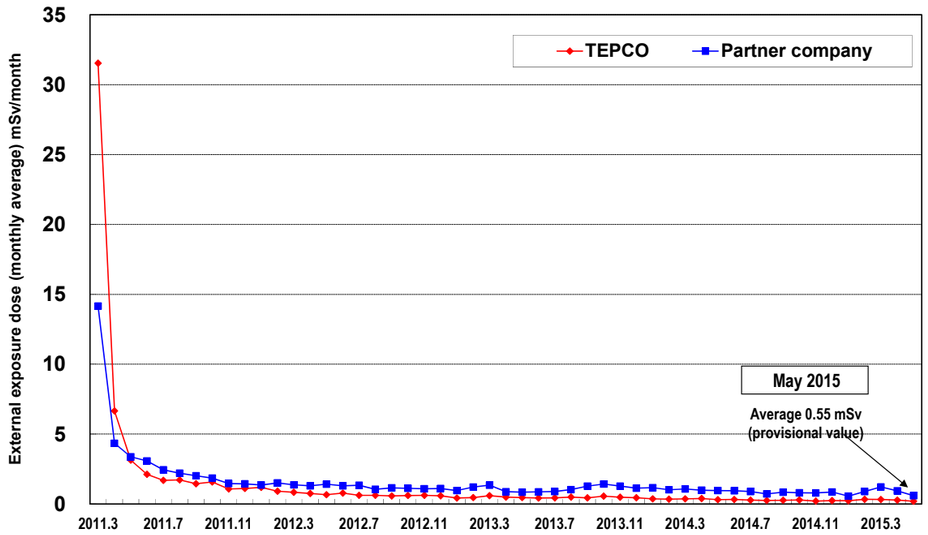


Figure 10: Changes in monthly individual worker exposure dose
(monthly average exposure dose since March 2011)

➢ Status of heat stroke cases

- As of July 28 in FY2015, there were a total of 12 heat stroke cases, including 10 cases attributable to work and two alleged cases. Thorough preventive measures for heat stroke continue to be taken. (As of the end of July FY2014, there were a total of 16 heat stroke cases, eight of which attributable to work and eight alleged cases.)

➢ Renovation of dining space at the large rest house

- At the large rest house with a capacity of approx. 1,200 workers, operation started on May 31 and meal services at the dining room commenced on June 1.
- Regarding the meal service at the large rest house, it was decided that a portion of the building would require renovation to continue long-term operation and further improve it from a hygiene perspective. The work included enhancing the ceiling, installing additional washrooms and establishing a container carry-in entrance. Meal service, which has been temporarily closed from June 9 to 23 and from June 29, will resume from August 3. During the suspension period, the service hours of the dining room at the new Administration Office Building are being extended to enhance usability for workers.

9. Other

➢ Formulation of database for facilities and maintenance plan

- To appropriately manage the facilities installed in the Fukushima Daiichi Nuclear Power Station, a database of facilities, etc. and a maintenance plan will be developed and a new system established to confirm and support the progress of activities by the organizations responsible for the facilities and ensure appropriate organization-wide facility maintenance.

➢ Alert of grounding issued from the power source facility and white smoke generated from Eflex pipes

- On July 28, a grounding alert was issued from the power source facility on site and smoke generated from the Eflex pipes was detected near the multi-nuclide removal equipment building. The identified cause was a worker, who was installing weedproof sheets, damaged a cable with a sheet fixing pin. Countermeasures are being considered including stipulating rules concerning methods to install sheets and confirmation of cables within the work range.

➢ Meeting of Decommissioning Research and Development Cooperation Council

- On July 6, the first meeting of the Decommissioning Research and Development Cooperation Council, which was set up in the Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF), was held.
- Related organizations in both industry and academia involved in researching and developing decommissioning introduced their own R&D achievements. In addition, with future cooperation in mind, discussions ensued concerning how to facilitate two-way information delivery between needs and seeds, increasing the participation of diverse researchers and the enhancement of HR-related activities.
- Based on this direction, specific actions to be taken by related organization will be considered and shared by the next meeting.

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 July 20-28)"; 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(1.2)	Below 1/2
Cesium-137:	9.0	(2013/10/17) →	ND(1.1)	Below 1/8
Gross β:	74	(2013/ 8/19) →	ND(16)	Below 1/4
Tritium:	67	(2013/ 8/19) →	ND(1.9)	Below 1/30

Cesium-134:	4.4	(2013/12/24) →	ND(0.98)	Below 1/4
Cesium-137:	10	(2013/12/24) →	ND(1.2)	Below 1/8
Gross β:	60	(2013/ 7/ 4) →	ND(16)	Below 1/3
Tritium:	59	(2013/ 8/19) →	2.4	Below 1/20

Cesium-134:	5.0	(2013/12/2) →	ND(1.2)	Below 1/4
Cesium-137:	8.4	(2013/12/2) →	1.5	Below 1/5
Gross β:	69	(2013/8/19) →	ND(16)	Below 1/4
Tritium:	52	(2013/8/19) →	4.8	Below 1/10

Cesium-134:	2.8	(2013/12/2) →	ND(1.3)	Below 1/2
Cesium-137:	5.8	(2013/12/2) →	ND(1.7)	Below 1/3
Gross β:	46	(2013/8/19) →	ND(20)	Below 1/2
Tritium:	24	(2013/8/19) →	3.3	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:	ND(2.5)			
Cesium-137:	6.9			
Gross β:	48			
Tritium:	31	*		

【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:	3.3	(2013/12/24) →	ND(1.0)	Below 1/3
Cesium-137:	7.3	(2013/10/11) →	ND(1.1)	Below 1/6
Gross β:	69	(2013/ 8/19) →	26	Below 1/2
Tritium:	68	(2013/ 8/19) →	ND(1.9)	Below 1/40

Cesium-134:	3.5	(2013/10/17) →	ND(0.90)	Below 1/3
Cesium-137:	7.8	(2013/10/17) →	1.5	Below 1/5
Gross β:	79	(2013/ 8/19) →	24	Below 1/3
Tritium:	60	(2013/ 8/19) →	ND(1.9)	Below 1/30

Cesium-134:	32	(2013/10/11) →	ND(2.1)	Below 1/10
Cesium-137:	73	(2013/10/11) →	7.7	Below 1/9
Gross β:	320	(2013/ 8/12) →	89	Below 1/3
Tritium:	510	(2013/ 9/ 2) →	ND(100)	Below 1/5

Cesium-134:	ND(2.0)	
Cesium-137:	9.2	
Gross β:	95	
Tritium:	ND(100)	*

Cesium-134:	3.4	
Cesium-137:	16	
Gross β:	130	
Tritium:	ND(100)	*

Cesium-134:	12	
Cesium-137:	42	
Gross β:	500	
Tritium:	ND(100)	*

* Monitoring commenced in or after March 2014

Cesium-134:	62	(2013/ 9/16)→	18	Below 1/3
Cesium-137:	140	(2013/ 9/16)→	58	Below 1/2
Gross β:	360	(2013/ 8/12)→	1,000	
Tritium:	400	(2013/ 8/12)→	440	

Cesium-134:	5.3	(2013/8/ 5) →	ND(1.2)	Below 1/4
Cesium-137:	8.6	(2013/8/ 5) →	ND(1.8)	Below 1/4
Gross β:	40	(2013/7/ 3) →	ND(20)	Below 1/2
Tritium:	340	(2013/6/26) →	3.0	Below 1/100

Cesium-134:	28	(2013/ 9/16)→	14	Below 1/2
Cesium-137:	53	(2013/12/16)→	53	
Gross β:	390	(2013/ 8/12)→	850	
Tritium:	650	(2013/ 8/12)→	700	

Summary of TEPCO data as of July 29

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 July 20-28)

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 (0.86)
Cesium-137: ND (2013) → ND (0.83)
Gross β: ND (2013) → ND (20)
Tritium: ND (2013) → ND (1.6)

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

Cesium-134: ND (2013) → ND (0.64)
Cesium-137: 1.6 (2013/10/18) → ND (0.68) Below 1/2
Gross β: ND (2013) → ND (20)
Tritium: 6.4 (2013/10/18) → ND (1.6) Below 1/3

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

Cesium-134: ND (2013) → ND (0.71)
Cesium-137: ND (2013) → ND (0.74)
Gross β: ND (2013) → ND (20)
Tritium: ND (2013) → ND (1.6)

Cesium-134: ND (2013) → ND (0.68)
Cesium-137: ND (2013) → ND (0.68)
Gross β: ND (2013) → ND (20)
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 (0.60)
Cesium-137: ND (2013) → ND (0.65)
Gross β: ND (2013) → ND (20)
Tritium: ND (2013) → ND (1.6)

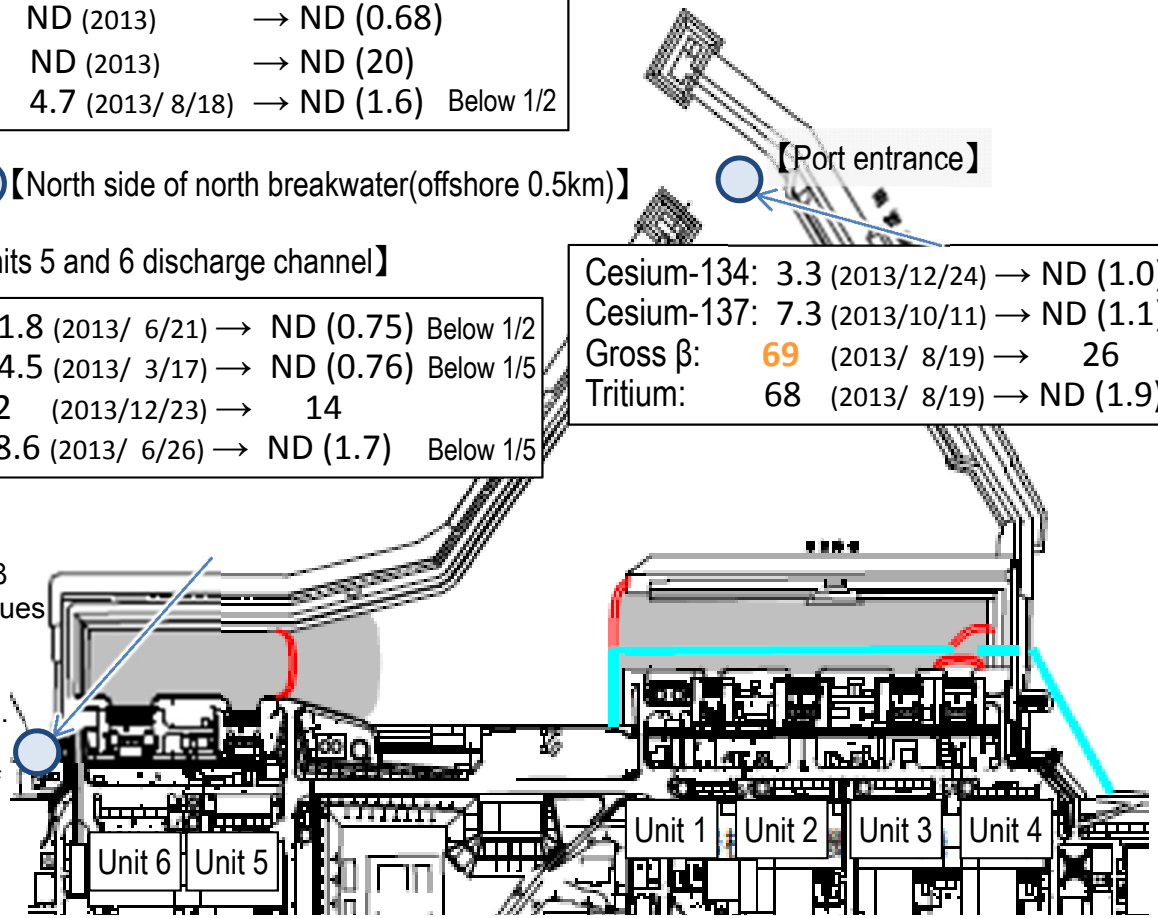
【North side of Units 5 and 6 discharge channel】

Cesium-134: 1.8 (2013/ 6/21) → ND (0.75) Below 1/2
Cesium-137: 4.5 (2013/ 3/17) → ND (0.76) Below 1/5
Gross β: 12 (2013/12/23) → 14
Tritium: 8.6 (2013/ 6/26) → ND (1.7) Below 1/5

Cesium-134: 3.3 (2013/12/24) → ND (1.0) Below 1/3
Cesium-137: 7.3 (2013/10/11) → ND (1.1) Below 1/6
Gross β: 69 (2013/ 8/19) → 26 Below 1/2
Tritium: 68 (2013/ 8/19) → ND (1.9) Below 1/40

Cesium-134: ND (2013) → ND (0.63)
Cesium-137: 3.0 (2013/ 7/15) → ND (0.58) Below 1/5
Gross β: 15 (2013/12/23) → 13
Tritium: 1.9 (2013/11/25) → ND (1.7)

【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 July 29

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
July 30, 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 (planned)
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

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

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

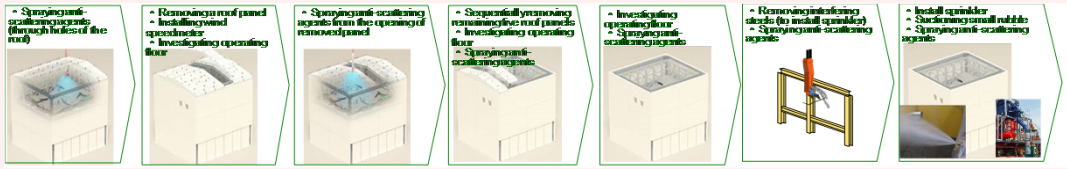
Unit 1

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.

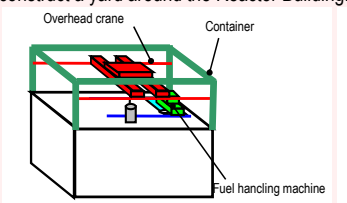


Image of Plan 1

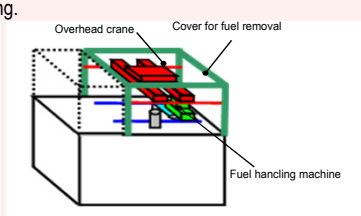


Image of Plan 2

Unit 3

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

Before removal of the large rubble

After removal of the large rubble

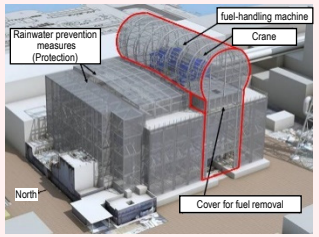


Image of the cover for fuel removal

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

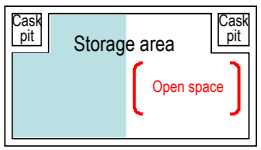
On November 5, 2014, within a year of commencing work to remove the fuel, all 1,331 spent fuel assemblies in the pool had been transferred. The transfer of the remaining non-irradiated fuel assemblies to the Unit 6 SFP was completed on December 22, 2014. (2 of the non-irradiated fuel assemblies were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

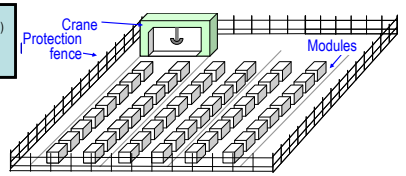


An open space will be maintained in the common pool (Transfer to the temporary dry cask storage facility)

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.

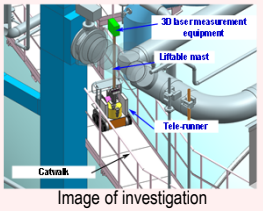
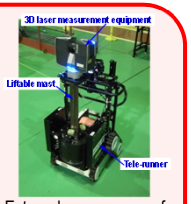


Image of investigation



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

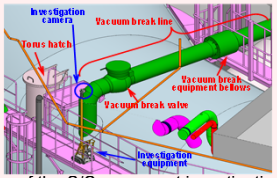
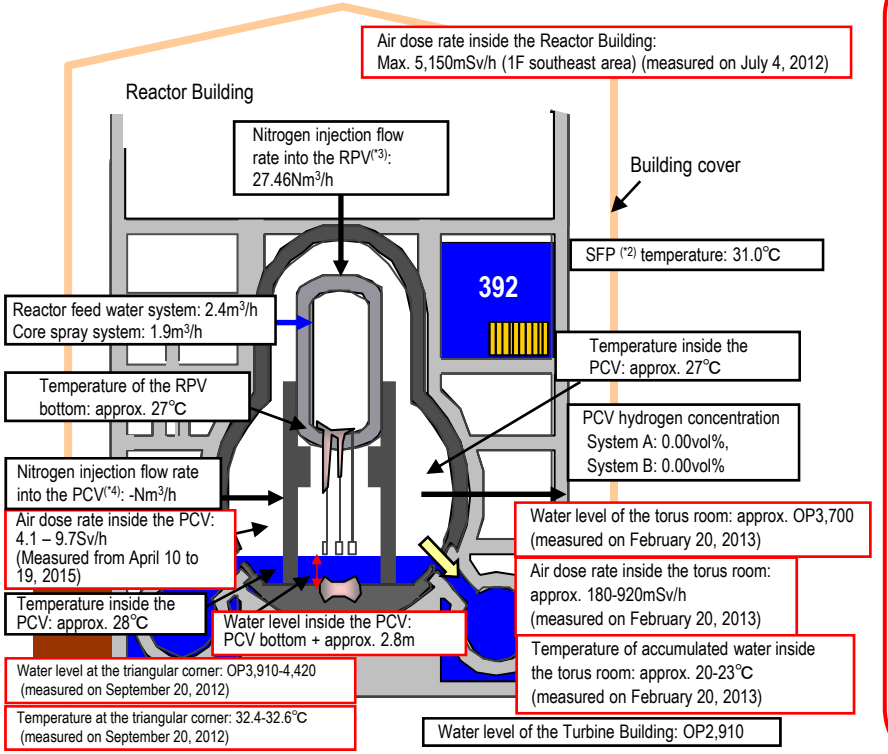


Image of the S/C upper part investigation

Unit 1



* Indices related to the plant are values as of 11:00, July 29, 2015

Status of equipment development toward investigating inside the PCV

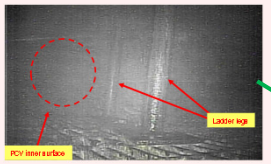
Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigation inside the PCV is scheduled.

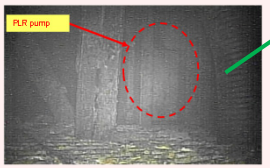
[Investigative outline]

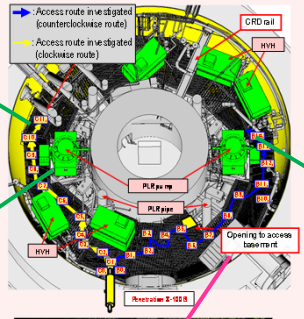
- Inserting equipment from Unit 1 X-100B penetration(*5) to investigate in clockwise and counter-clockwise directions.

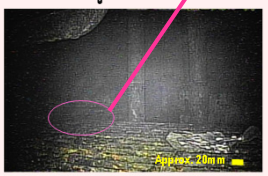
[Status of investigation equipment development]

- 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

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

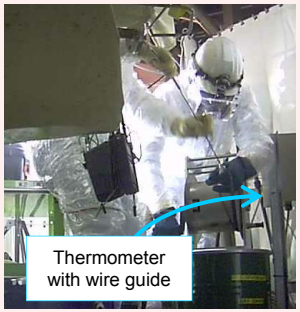
Installation of an RPV thermometer and permanent PCV supervisory instrumentation

(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

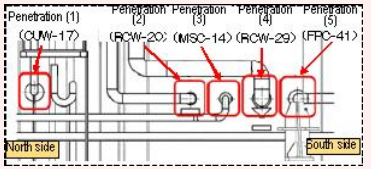
- Some of the permanent supervisory instrumentation for PCV could not be installed in the planned locations due to interference with existing grating (August 13, 2013).
- The instrumentation was removed on May 27, 2014 and new instruments were reinstalled on June 5 and 6, 2014. The trend of added instrumentation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

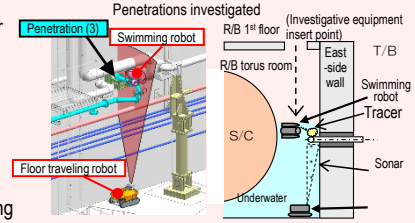
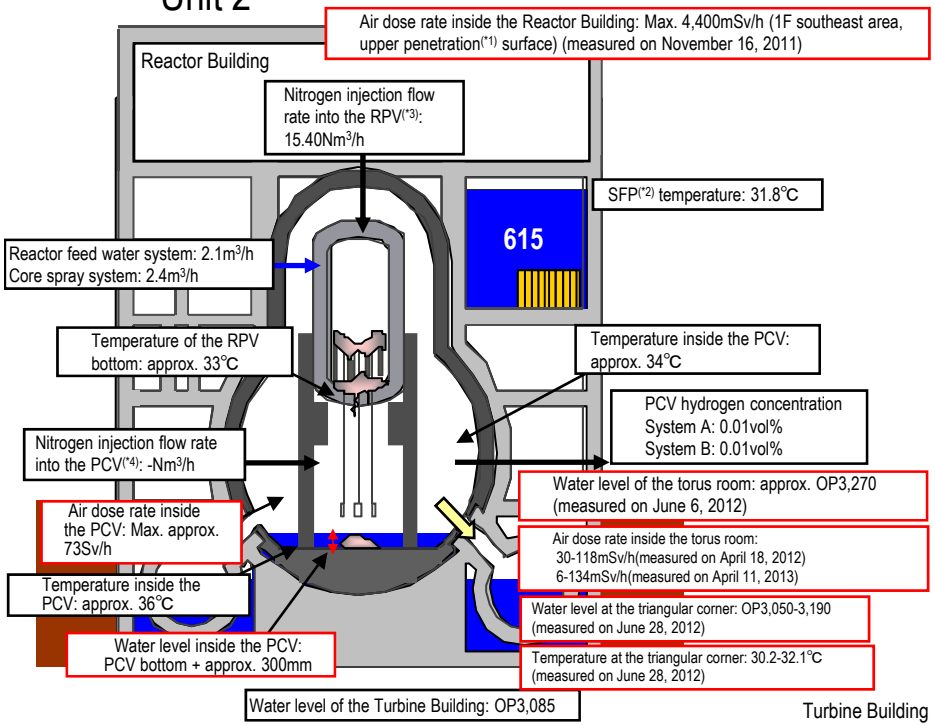


Image of the torus room east-side cross-sectional investigation

Unit 2



* Indices related to plant are values as of 11:00, July 29, 2015

Status of equipment development toward investigating inside the PCV

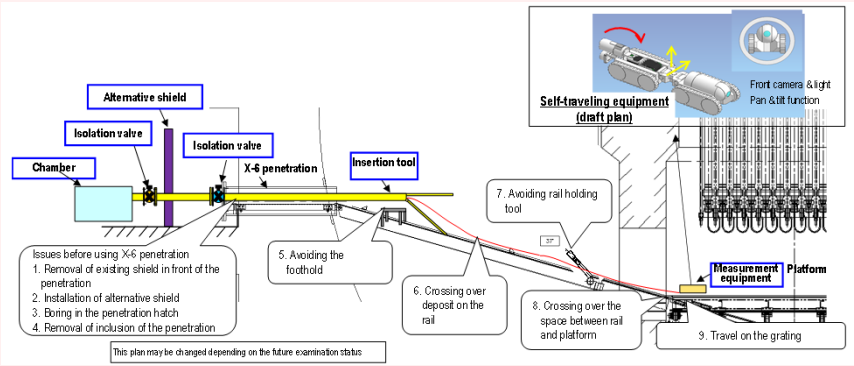
Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigations inside the PCV are scheduled.

[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.
- Solution is being examined to the issue that a portion of shielding blocks installed in front of X-6 penetration could not be moved. After the preparation is completed, removal of the remaining blocks will resume.



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

July 30, 2015
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
4/6

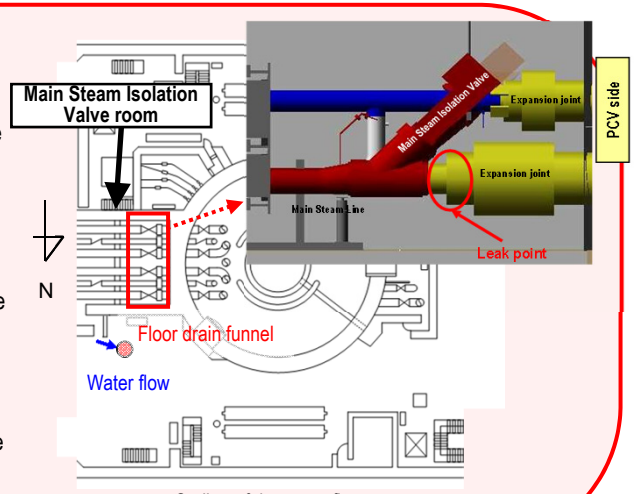
Immediate target	Identify the plant status and commence R&D and decontamination toward fuel debris removal

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

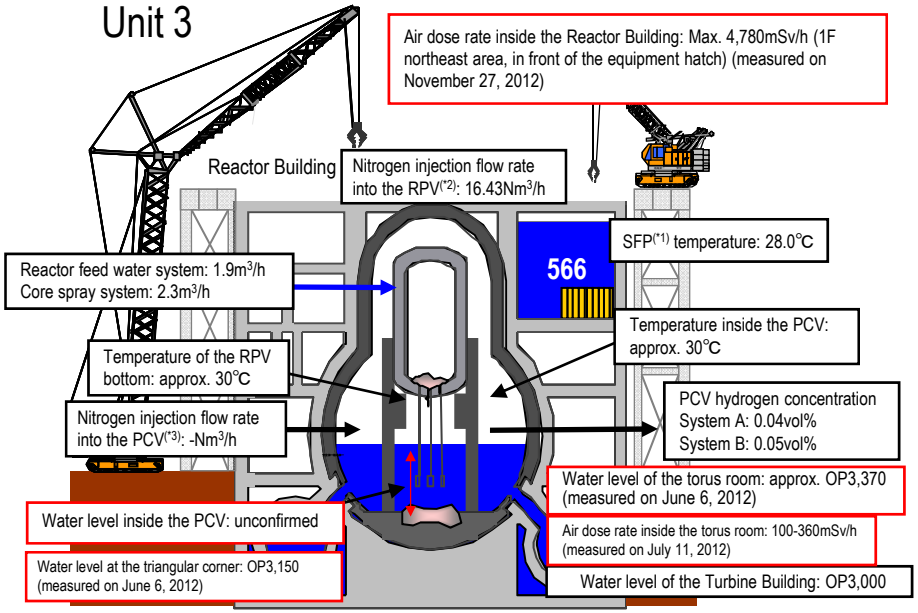
* Main Steam Isolation Valve: A valve to shut off the steam generated from the Reactor in an emergency

Decontamination inside R/B

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

Robot for investigating the contamination status (gamma camera mounted)

Unit 3



* Indices related to plant are values as of 11:00, July 29, 2015

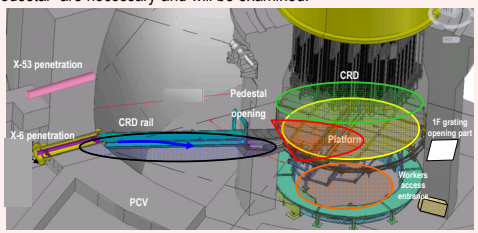
Status of equipment development toward investigating inside the PCV

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

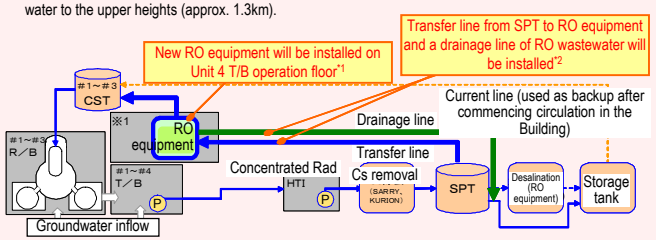
July 30, 2015
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
5/6

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

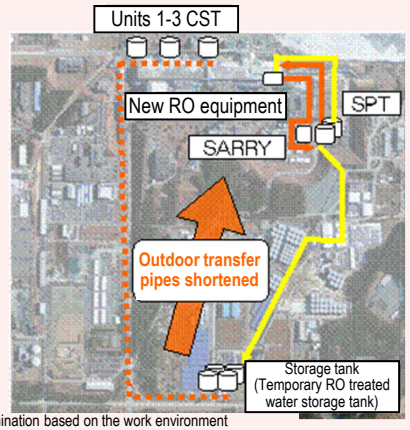
Work to improve the reliability of the circulation water injection cooling system and pipes to transfer accumulated water.

- 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 by the 1st half of 2015, 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, no outflow of contaminated rainwater from inside the fences was detected.

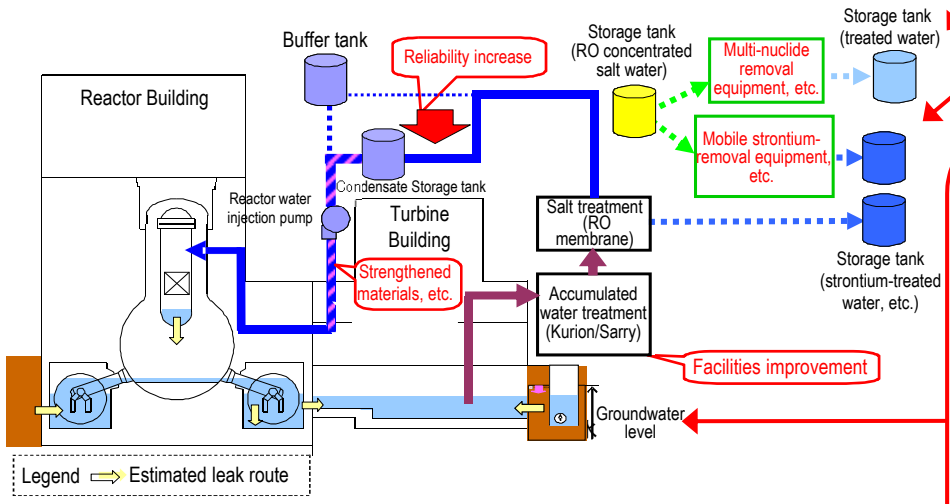
Before installing the fence cover

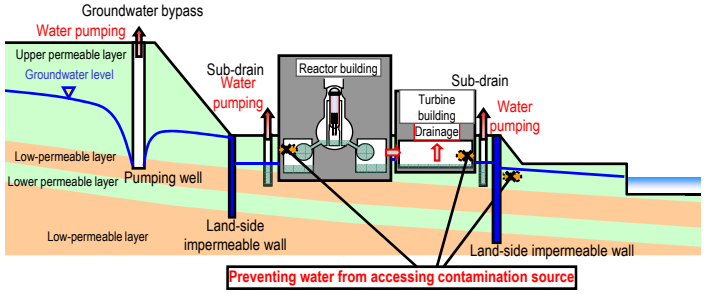
After installing the fence cover

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

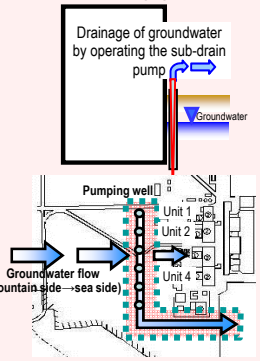
Contaminated water (RO concentrated salt water) is being treated using seven types of equipment including the multi-nuclide removal equipment (ALPS). Treatment of the RO concentrated salt water was completed on May 27, with the exception of the remaining water at the tank bottom. The remaining water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



Aiming to reduce the level of groundwater by pumping subdrain water, tests were conducted to verify the stable operation of water treatment facilities, including subdrain.

The results showed that through purification by the system, the density of radioactive materials declined to below the operational target and no other γ nuclides were detected.

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.

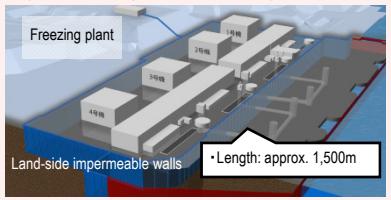
The pumped up groundwater is temporarily stored in tanks and released after TEPCO and a third-party organization have confirmed that its quality meets operational targets.

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

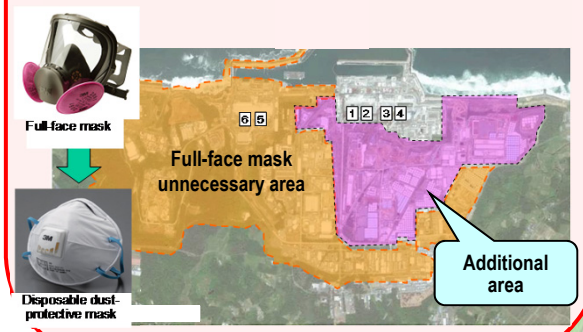
Progress toward decommissioning: Work to improve the environment within the site

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.

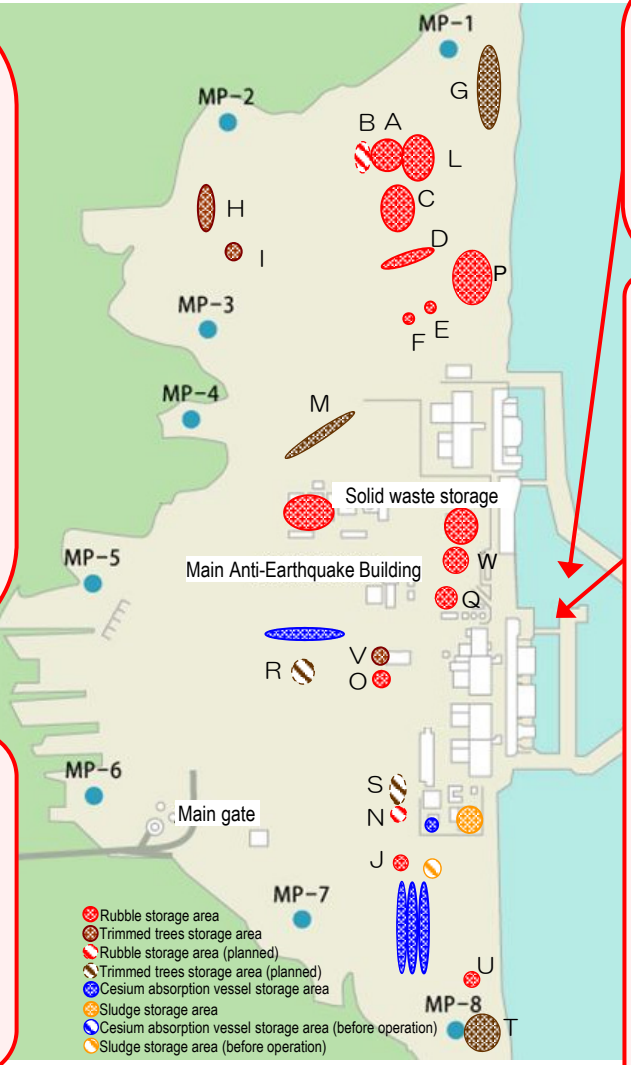
However, wearing full- or half-face mask is required for works exposed to highly concentrated dust; and full-face masks, for works involving a risk of ingesting concentrated salt water, etc.



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, will resume on August 3.



Installation of impermeable walls on the sea side

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

Installation of steel pipe sheet piles temporarily completed by December 4, 2013 except for 9 pipes.

The next stage will involve installing steel pipe sheet piles outside the port, landfilling within the port, and installing a pumping facility to close before the construction completion.

Installation status of impermeable walls on the sea side
(Landfill status on the Unit 1 intake side)

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.
  From May 2, 2015 – filling of Vertical Shafts is underway. Removal of contaminated water will be completed within July.
  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