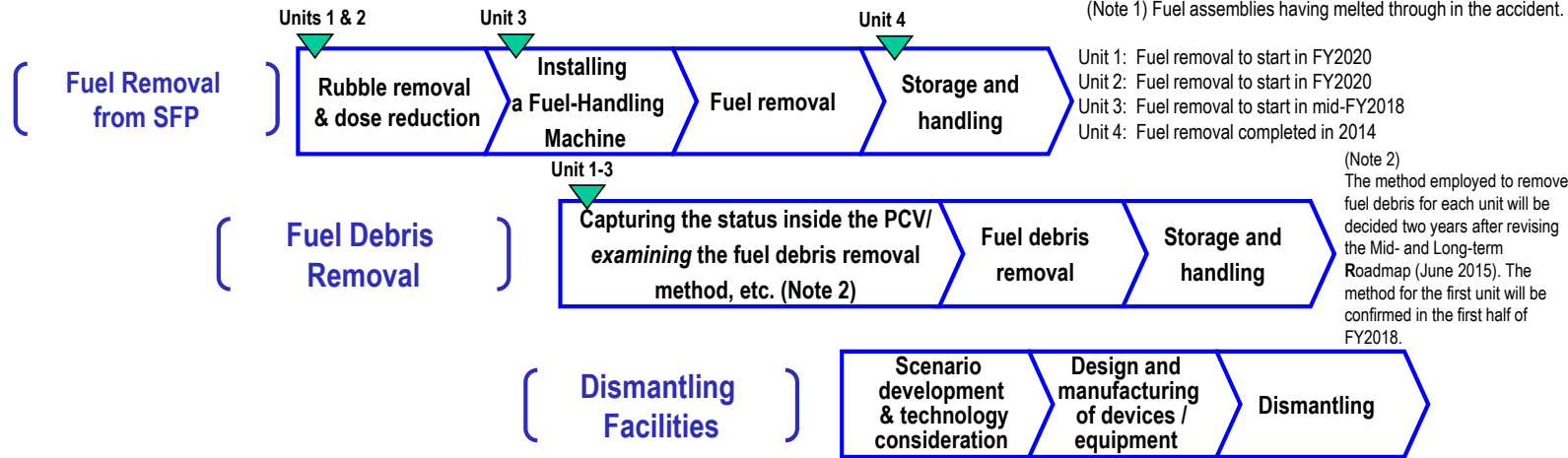


Main decommissioning works and steps

All fuel has been removed from Unit 4 SFP and preparatory work to remove fuel from Unit 1-3 SFP and fuel debris (Note 1) removal is ongoing.

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



Toward fuel removal from pool

To prepare for fuel removal from Unit 3 SFP, works to install the cover are underway.

As dose reduction measures on the Reactor Building operating floor, the decontamination and installation of shields were completed in June and December 2016 respectively. Installation of a cover for fuel removal started from January 2017.



Installation of a cover for fuel removal at Unit 3 (August 28, 2017)

Three principles behind contaminated water countermeasures:

Countermeasures for contaminated water are implemented in accordance with the following three principles:

1. Eliminate contamination sources

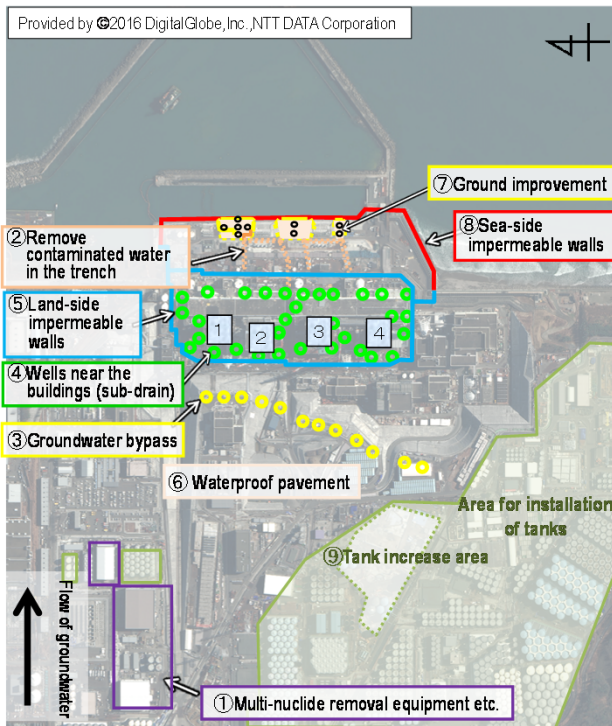
- ① Multi-nuclide removal equipment, etc.
 - ② Remove contaminated water from the trench (Note 3)
- (Note 3) Underground tunnel containing pipes.

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 Enhance soil by adding sodium silicate
- ⑧ Sea-side impermeable walls
- ⑨ Increase the number of (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 of which commenced in September 2014) and a subsidiary project of the Japanese Government (operation of which 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.
- Freezing started on the sea side and part of the mountain side from March 2016 and on 95% of the mountain side from June 2016. Freezing of the remaining unfrozen sections progressed with a phased approach and freezing of all sections started in August 2017.
- On the sea side, the underground temperature declined below 0°C throughout the scope requiring freezing, except for the unfrozen parts under the seawater pipe trenches and the areas above groundwater level in October 2016.



(Opening/closure of frozen pipes)

Sea-side impermeable walls

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



(Sea-side impermeable wall)

Progress Status and Future Challenges of the Mid- and Long-Term Roadmap toward Decommissioning of TEPCO Holdings' Fukushima Daiichi Nuclear Power Station Units 1-4 (Outline)

Progress status

◆ The temperatures of the Reactor Pressure Vessel (RPV) and Primary Containment Vessel (PCV) of Units 1-3 have been maintained within the range of approx. 25-35°C¹ over the past month. There was no significant change in the density of radioactive materials newly released from Reactor Buildings in the air². It was evaluated that the comprehensive cold shutdown condition had been maintained.

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

* 2 In July 2017, the radiation exposure dose due to the release of radioactive materials from the Unit 1-4 Reactor Buildings was evaluated as less than 0.00021 mSv/year at the site boundary. The annual radiation dose from natural radiation is approx. 2.1 mSv/year (average in Japan).

Progress of the Unit 1 building cover modification

The removal of the pillars and beams of the building cover started from March 31, 2017 and was completed on May 11.

Work to install windbreak fences, which will reduce the dust scattering during rubble removal, is underway. Pillars and beams on the north side, for which modification was completed, were installed during the period August 29-31. Installation will continue sequentially.



Unit 1 building cover
<Installation of north-side pillars and beams>
(photo from the northwest side on August 31)

Installation of the Unit 3 fuel removal cover

Toward fuel removal from Unit 3, dome roofs are being installed. One of eight dome roofs was mounted on the slide trestle on August 2. The roof on the slide trestle was then transferred to the prescribed location of the FHM girder on August 5. Following the fixation and installation of east-side exterior materials, installation of the dome roof was completed on August 29.

The second dome roof will be hung in September.

Preparation will continue toward fuel removal in mid-FY2018.



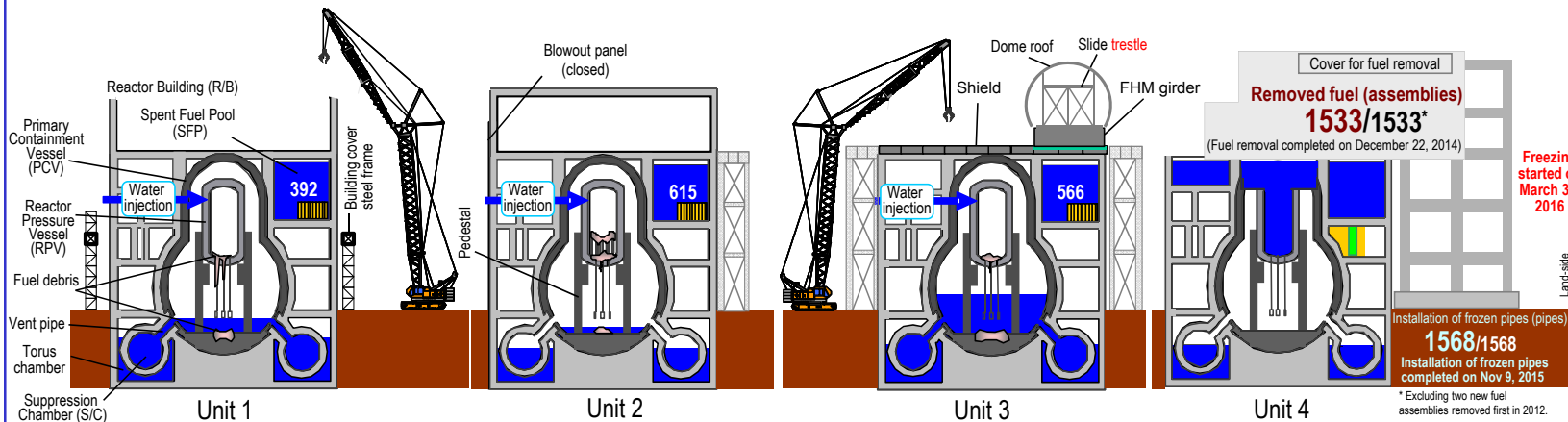
<Installation of dome roof (Photo on August 5)>

Start of complete closure of the land-side impermeable walls

For the land-side impermeable walls (on the mountain side), as the implementation plan for complete closure was approved on August 15, freezing of the remaining unclosed section (West (3)) started from August 22.

The pumped-up groundwater volume, groundwater level, water level in building and underground temperature will continue to be monitored.

A supplementary method will start from July 31 prior to freezing.



Completion of water removal from the Unit 1 condenser

For Unit 1, water removal below the hot well roof in the condenser, which stored high-dose contaminated water, was completed during the period August 1-4 and risks were reduced.

For Units 2 and 3, manufacturing and tests of water removal equipment, etc. are underway to remove water having accumulated below the hot well roof in the condenser.

Water removal above the hot well roof was completed for Units 2 and 3 in April and June respectively.

Publication of the Technical Strategic Plan 2017

The Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF) made and published the "Technical Strategic Plan 2017 for Decommissioning of the Fukushima Nuclear Power Station of Tokyo Electric Power Company Holdings, Inc." today (August 31) aiming to provide a firm technical basis for the government's "Mid and Long-term Roadmap" and to serve as an aid for smooth and steady implementation of decommissioning.

Progress toward revising the Mid- and Long-term Roadmap

At the Fukushima Advisory Board on Decommissioning and Contaminated Water Management held on July 31, the results of the progress status verification regarding the measures stated in the Mid- and Long-term Roadmap were reported and the view of its revision was shown. Work on the revision started.

The roadmap will be revised, which will also involve specifying the fuel debris retrieval policy.

Risk reduction of decontamination equipment sludge

Decontamination equipment sludge generated from accumulated water treatment in buildings is liquid with a high dose of radioactivity. Examination is underway to reduce the risks of storing such sludge.

As well as implementing measures to protect the Process Main Building housing the sludge from 15m-class tsunamis by the first half of FY2018, sludge will be stored in dedicated containers on high ground from FY2020.

Decline in the water level at Subdrain No. 51

On August 2, the water level at Subdrain Pit No. 51 southwest of the Unit 4 Reactor Building temporarily declined below the water level of the building.

The radioactive material density in the groundwater near the pit remained within the past scope and no influence on the water level decline was identified.

As the decline was considered attributable to the effect of drilling around the pit, the work method was changed to drilling with water filled in the subject place.

Any potential inversion of the water level between the building and groundwater will be promptly notified and measures taken to correct the judgement, notification and announcement based on this incident.

Major initiatives – Locations on site



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* Data of Monitoring Posts (MP1-MP8.)

•Data (10-minute values) of Monitoring Posts (MPs) measuring the airborne radiation rate around site boundaries show 0.493 – 1.853 $\mu\text{Sv/h}$ (July 26 – August 29, 2017).

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

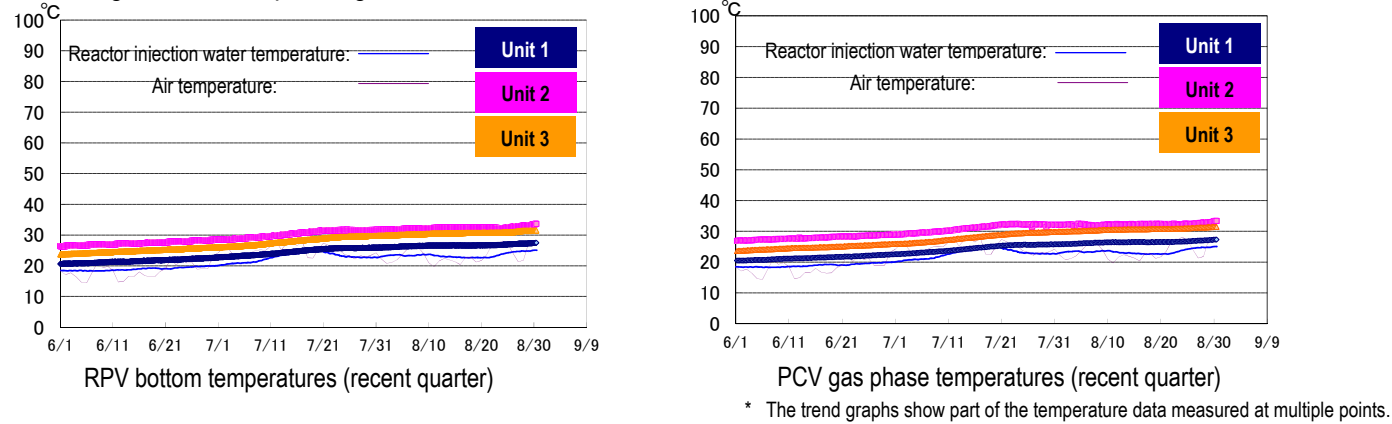
•Therefore monitoring results at these points are lower than elsewhere in the power plant site.

•The radiation shielding panels around monitoring post No. 6, which is one of the instruments used to measure the radiation dose at the power station site boundary, were taken off from July 10-11, 2013, since further deforestation, etc. has caused the surrounding radiation dose to decline significantly.

I. Confirmation of the reactor conditions

1. Temperatures inside the reactors

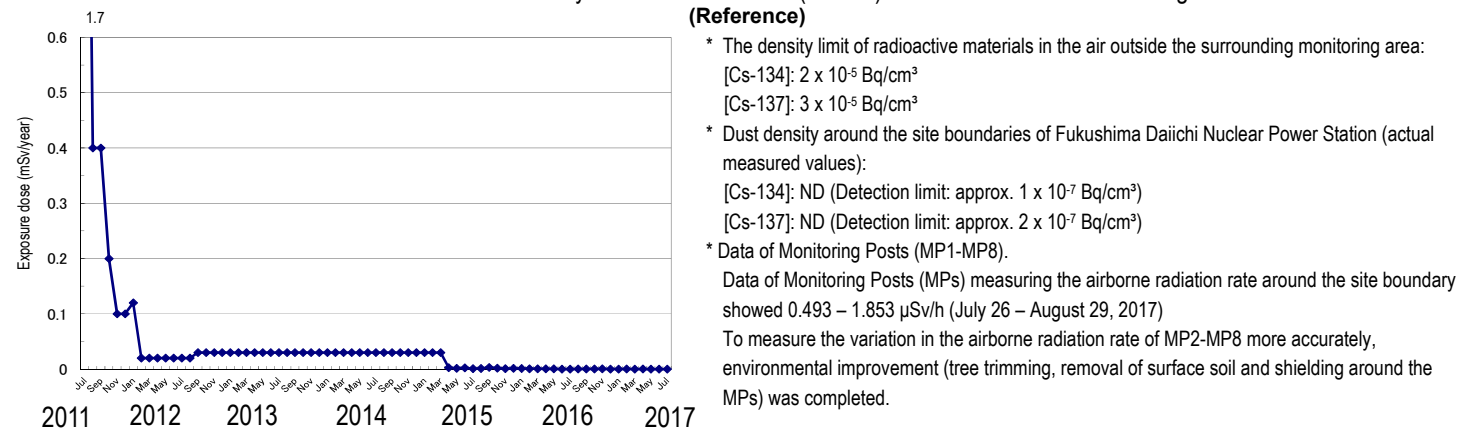
Through continuous reactor cooling by water injection, the temperatures of the Reactor Pressure Vessel (RPV) bottom and the Primary Containment Vessel (PCV) gas phase were maintained within the range of approx. 25 to 35°C for the past month, though it varied depending on the unit and location of the thermometer.



2. Release of radioactive materials from the Reactor Buildings

As of July 2017, the density of radioactive materials newly released from Reactor Building Units 1-4 in the air and measured at the site boundary was evaluated at approx. 1.3×10^{-12} Bq/cm³ for Cs-134 and 3.4×10^{-12} Bq/cm³ for Cs-137, while the radiation exposure dose due to the release of radioactive materials there was less than 0.00021 mSv/year.

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



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 the groundwater bypass

- From April 9, 2014, the operation of 12 groundwater bypass pumping wells commenced sequentially to pump up groundwater. The release started 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. Up until August 29, 2017, 306,496 m³ of groundwater had been released. The pumped-up groundwater was temporarily stored in tanks and released after TEPCO and a third-party organization had confirmed that its quality met operational targets.

- Pumps are inspected and cleaned as required based on their operational status.
- Water treatment facility special for Subdrain & Groundwater drains
 - To reduce the level of groundwater flowing into the buildings, work began to pump up groundwater from wells (subdrains) around the buildings on September 3, 2015. The pumped-up groundwater was then purified at dedicated facilities and released from September 14, 2015. Up until August 29, 2017, a total of 396,286 m³ had been drained after TEPCO and a third-party organization had confirmed that its quality met operational targets.
 - Due to the level of the groundwater drain pond rising since the sea-side impermeable walls were closed, pumping started on November 5, 2015. Up until August 29, 2017, a total of approx. 144,700 m³ had been pumped up. A quantity of less than 10 m³/day is being transferred from the groundwater drain to the Turbine Buildings (average for the period July 20 – August 23, 2017).
 - As a measure to enhance subdrains and groundwater drains, the capability of the treatment facility for subdrains and groundwater drains is being improved. Additional water collection tanks and temporary water storage tanks were installed and the installation of fences, pipes and ancillary facilities is underway. The treatment capacity is being enhanced incrementally to accommodate the increasing volume of pumped-up groundwater during the high rainfall season (before measures: approx. 800 m³/day, from August 22: approx. 900 m³/day, from mid-September: approx. 1,200 m³/day, from early November: approx. 1,500m³/day).
 - To maintain the level of groundwater pumped up from subdrains, work to install additional subdrain pits and recover existing subdrain pits is underway. They will go into operation sequentially from a pit for which work is completed (the number of pits which went into operation: 6 of 15 additional pits, 0 of 4 recovered pits).
 - On August 2, the water level at Subdrain Pit No. 51 southwest of the Unit 4 Reactor Building temporarily declined below the water level of the building. The radioactive material density in the groundwater near the pit remained within the past scope and no influence on the water level decline was identified. As the decline was considered attributable to the effect of drilling around the pit, the work method was changed to drilling with water filled in the subject place. Any potential inversion of the water level between the building and groundwater will be promptly notified and measures taken to correct the judgement, notification and announcement based on this incident.
 - Since the subdrains went into operation, the inflow into buildings tended to decline to below 150 m³/day when the subdrain water level declined below T.P. 3.0 m, while the inflow increased during rainfall.

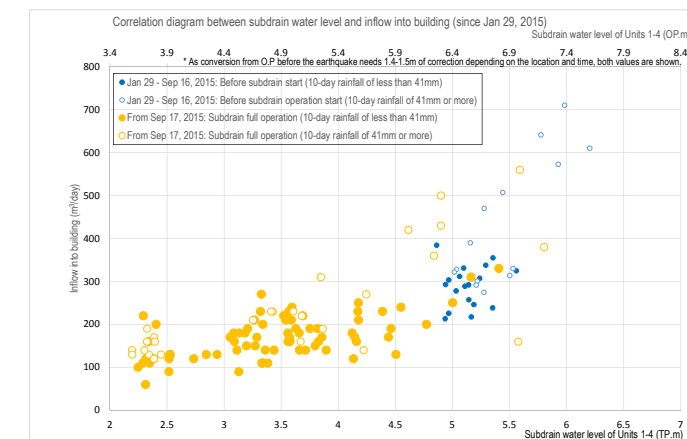


Figure 1: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Unit 1-4 subdrains

➤ Construction status of the land-side impermeable walls

- For the remaining single unclosed section of the land-side impermeable walls (on the mountain side), a supplementary method will start from July 31 prior to freezing.
- As the implementation plan was approved on August 15, freezing of the unclosed section (West (3)) started from August 22.

- The pumped-up groundwater volume, groundwater level, water level in building and underground temperature will continue to be monitored.

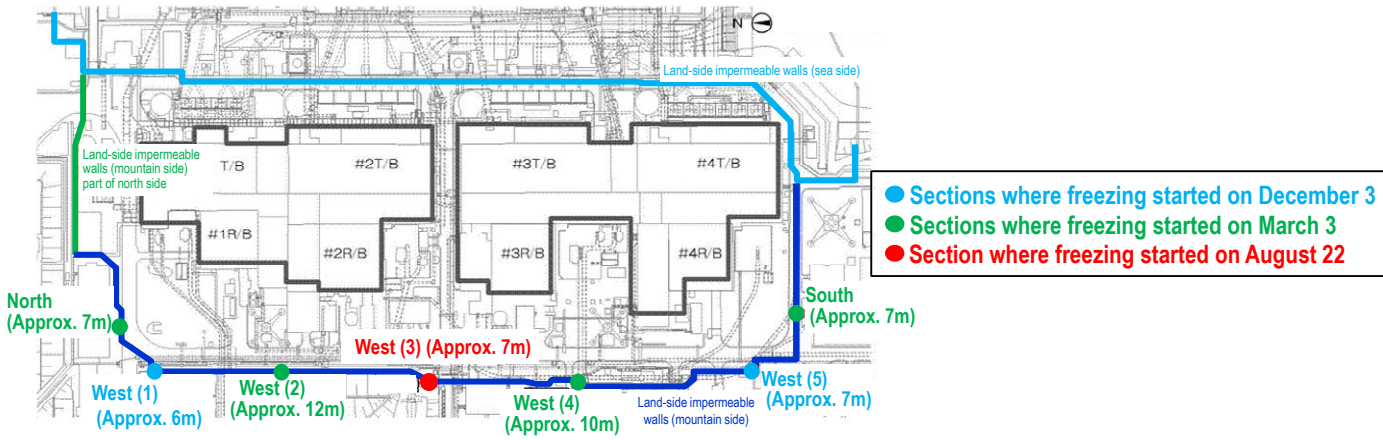


Figure 2: Closure of part of the land-side impermeable walls (on the mountain side)

➤ Operation of multi-nuclide removal equipment

- Regarding the multi-nuclide removal equipment (existing, additional and high-performance), hot tests using radioactive water were 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 and for high-performance equipment, from October 18, 2014).
- As of August 24, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment

were approx. 366,000, 366,000 and 103,000 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).

- To reduce the risks of strontium-treated water, treatment using existing, additional and high-performance multi-nuclide removal equipment has been underway (existing: from December 4, 2015; additional: from May 27, 2015; high-performance: from April 15, 2015). Up until August 24, approx. 376,000 m³ had been treated.
- On August 16, drippage was identified below a drain pipe of the multi-nuclide removal equipment System A (which had been suspended since August 10) iron coprecipitation treatment process. The drippage was considered attributable to leakage trickling down from the drain valve insulator. All the leaked water remained within the fences inside the multi-nuclide removal equipment and no leakage outside the building was identified. The drain pipe was repaired with self-fusing tape and a cover and reception were installed below the pipe. A detailed investigation, including inside the leakage part, will be conducted to identify the cause.

➤ 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, 2015) and the secondary cesium-absorption apparatus (SARRY) (from December 26, 2014) have been underway. Up until August 24, approx. 392,000 m³ had been treated.

➤ Measures in Tank Areas

- Rainwater, under the release standard and having accumulated within 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 August 28, 2017, a total of 89,775 m³).

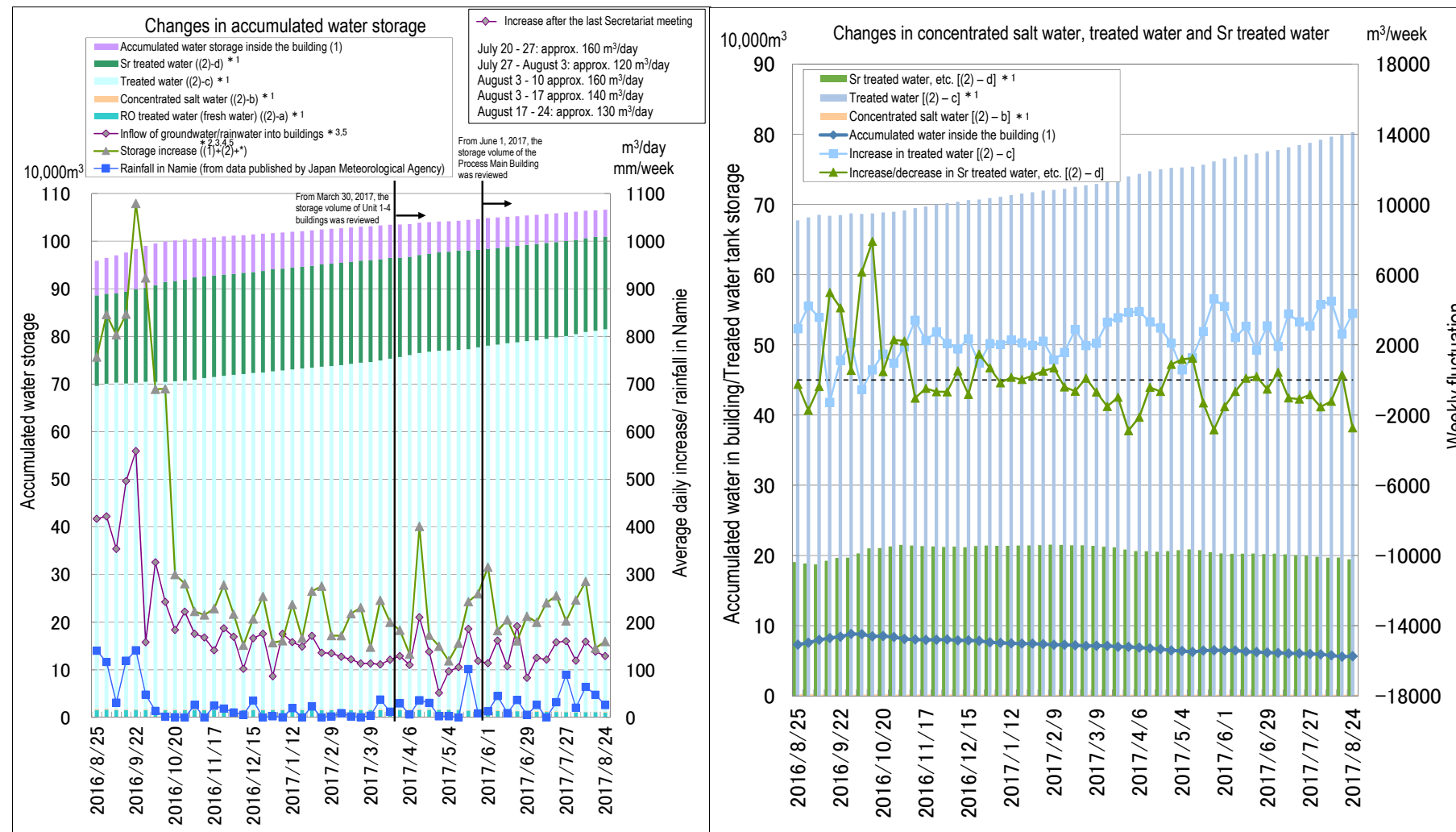


Figure 3: Status of accumulated water storage

As of August 24, 2017

- *1: Water amount for which the water-level gauge indicates 0% or more
- *2: On January 19, 2017, the water volume was reviewed by reevaluating the remaining volume of concentrated salt water and the data was corrected.
- *3: "Increase/decrease of water held in buildings" used to evaluate the "Inflow of groundwater/rainwater into buildings" and "Storage increase" is calculated based on data from the water-level gauge. During the following evaluation periods, when the gauge was calibrated, these two values were evaluated as lower than anticipated. (September 22-29, 2016: Unit 3 Turbine Building)
- *4: Including the effect of variation in water volume stored in tanks with the change in temperature.
- *5: The increase is considered attributable to the uncertain cross-section area (evaluated value) for the water level needed to calculate the water volume stored in the Centralized Radiation Waste Treatment Facility. Since the calculation of June 1, 2017, the cross-section area (evaluated value) has been reviewed.
- *6: Including the rainwater volume, which could not be treated in the rainwater treatment facilities, transferred to Sr-treated water tanks (May 25 – June 1, 2017: 700m³/week).
- *7: Corrected based on the result of an investigation conducted on July 5, 2017 that the water volume in the uninvestigated areas in Unit 1 T/B was less than assumed.

➤ Removal of stored water in Unit 1-3 condensers

- High-dose contaminated water has been stored in Unit 1-3 condensers. To advance accumulated water treatment in buildings, the density of the accumulated water within must be lowered from an early stage to reduce the quantity of radioactive materials in accumulated water in buildings.
- For Unit 1, water accumulated above the hot well roof in the condenser was removed and diluted in November 2016. As preparatory work to remove water having accumulated below the hot well roof, the roof manhole was opened by June 28 and an obstacle (strainer) under the opened roof manhole was removed by mid-July. Pumps and transfer lines, etc. were installed by the end of July. Water was removed during the period August 1-4, the completion of which was confirmed by camera on August 7.
- For Units 2 and 3, water having accumulated above the hot well roof in the condenser was removed (Unit 2: April 3-13, 2017, Unit 3: June 1-6, 2017). Methods to remove the water having accumulated below the hot well roof in the condenser are being examined. The future schedule will be decided once the method is confirmed (water removal to be completed within FY2017).

➤ Declaration of past deviation from the limiting condition for operation (LCO) of the contaminated water treatment facilities and recovery

- The Security of Specified Reactor Facilities Volume 1 Article 27 (Facilities for Contaminated Water Treatment) stipulates that “one facility” of the cesium-absorption apparatus or the secondary cesium-absorption apparatus “shall be operable.” Previously, a dual-system operation using all the four systems of a cesium-absorption apparatus was regarded as meeting the criterion that “one facility shall be operable” if four-system operation could be promptly recovered. However, reexamination prior to constructing related systems concluded that the above operation was deemed not to meet the criteria. As the investigation into past operations conducted based on the conclusion confirmed that the criteria had not been met during the period March 24-28, 2016, past deviation from the limiting condition for operation (LCO) and recovery were declared on August 14.

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

- The removal of pillars and beams of the building cover started from March 31, 2017 and was completed on May 11. Work to install windbreak fences, which will reduce dust scattering during rubble removal, is underway. Modified pillars and beams were installed during the period August 29-31 and installation will continue sequentially.
- Toward formulating a work plan for rubble removal, the rubble status and dose rate measurement on the well plug were additionally investigated during the period May 22 – August 25 to identify the conditions around the well plug.

➤ Main work to help remove spent fuel at Unit 2

- To help remove the spent fuel from the pool of the Unit 2 Reactor Building, preparatory work to form an opening, which would allow access to the operating floor, was completed in the external wall on the west side of the building.
- Toward removal of the roof protection layer, which will start from September, installation of communication facilities for remote-controlled heavy machines has been underway since June 19.

➤ Main work to help remove spent fuel at Unit 3

- Installation of the FHM girder* and work floor started on March 1 and was completed on July 15. Installation of the traveling rail started on June 12 and was complete on July 21. Installation of dome roofs started on July 22. The slide trestle was hung over the traveling rail on July 27 and the Dome Roof 1 (of eight) was mounted on the slide trestle on August 2. Dome Roof 1 mounted on the slide trestle was then transferred to the prescribed location on August 5 and its installation was completed on August 29, following the fixation and installation of east-side exterior materials. The installation of Dome Roof 2 started from August 30 and it will be hung in September.

- To make space in the common pool prior to removing fuel from Unit 3, part of the spent fuel stored in the common pool will be transferred to and stored in the temporary cask storage facility. On June 10, two containers (casks) to store the spent fuel were delivered to the Fukushima Daiichi Nuclear Power Station. Two casks were transferred in July and August, with the remaining seven casks to be transferred by around July 2018.

* Horizontal members comprising the gate structure. A rail will be mounted on the girder where the fuel-handling machine (FHM) and crane will travel.

3. 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 the rubble and trimmed trees

- As of the end of July 2017, the total storage volume of concrete and metal rubble was approx. 211,100 m³ (+600 m³ compared to at the end of June, with an area-occupation rate of 65%). The total storage volume of trimmed trees was approx. 120,400 m³ (+2,400 m³, with an area-occupation rate of 65%). The total storage volume of used protective clothing was approx. 66,400 m³ (-900 m³, with an area-occupation rate of 93%). The increase in rubble was mainly attributable to construction related to tank installation. The increase in trimmed trees was mainly attributable to construction related to site preparation-related work. The decrease in used protective clothing was mainly attributable to the operation of the incinerator.

➤ Management status of secondary waste from water treatment

- As of August 24, 2017, the total storage volume of waste sludge was 597 m³ (area-occupation rate: 85%) and that of concentrated waste fluid was 9,398 m³ (area-occupation rate: 88%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment, etc., was 3,748 (area-occupation rate: 59%).

➤ Risk reduction of decontamination equipment sludge

- Decontamination equipment sludge generated from accumulated water treatment in buildings is liquid with a high dose of radioactivity. Examination is underway to reduce the risks of storing such sludge.
- As well as implementing measures to protect the Process Main Building housing the sludge from 15m-class tsunamis by the first half of FY2018, sludge will be stored in dedicated containers on high ground will start from FY2020.

4. 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

➤ Cooling suspension test of the Unit 1 SFP circulating cooling facility (bypass operation of the primary system heat exchanger)

- The cooling suspension test conducted in April 2017 confirmed the balance between the decay heat of the spent fuel and the heat release from the pool at the stabilized SFP water temperature.
- To verify the evaluation results of the SFP water temperature by checking the rate of change in the SFP water temperature in summer when external temperatures are high, a bypass operation of the SFP circulating cooling facility primary system heat exchanger was tested during the period July 17 – August 29.
- The SFP water temperature had remained constant as initially evaluated ever since the test started, which confirmed that the SFP water temperature would remain below the level of the limiting condition for operation (LCO) (60°C) (stable at approx. 39°C).
- The maximum difference between the evaluated water temperature using the actual climate data during the test period and the actual SFP water temperature was about 1°C, which confirmed the appropriate accuracy of the evaluation formula.

- Cooling suspension test of the Unit 2 SFP circulating cooling facility (passing water suspension test of the secondary system)
 - The result of the Unit 1 cooling suspension test confirmed that the SFP temperature was stable below the level of the limiting condition for operation (LCO) and that the SFP water temperature evaluation formula was appropriately accurate taking natural heat release into consideration.
 - The test is also conducted in Unit 2 to verify that the water temperature will not reach the level of the limiting condition for operation (LCO) during natural cooling and reconfirm the appropriate accuracy of the SFP water temperature evaluation formula in units subject to significant decay heat. The SFP circulating cooling facility is being suspended (passing water suspension of the secondary system) from August 21 to late September.
 - Cooling will resume if the SFP water temperature exceeds the most stringent criteria in the water temperature evaluation taking natural heat release into consideration, or if generated steam affects the work.
- Water injection solely by the FDW system during PE pipe installation work for the Unit 1-3 reactor water injection line
 - In the Unit 1-3 reactor water injection equipment, SUS flexible tubes within and outside the Turbine Building of the core spray system (CS system) line will be replaced with PE pipes to improve reliability. When connecting the newly installed PE pipes to the CS system line, water will be injected into the reactor solely via the feed water (FDW) system. Based on past water injection performance, it was evaluated that the reactor could be cooled by full-volume injection from the FDW system.
 - For Unit 1, a FDW system full-volume injection test was conducted from July 25 prior to the replacement (FDW system sole water injection period: July 25 – August 2). The results confirmed no abnormality in the cooling condition of the reactor.
 - For Unit 2, FDW system full-volume injection was conducted during the period August 22-29 and evaluation is underway. For Unit 3, FDW system full-volume injection will be conducted for about one week from September 5.

5. 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 1-4
 - Regarding radioactive materials in the groundwater near the bank on the north side of the Unit 1 intake, despite the tritium density at groundwater in Observation Hole No. 0-1 gradually increasing since October 2016, it currently remains constant at around 10,000 Bq/L.
 - Regarding the groundwater near the bank between the Unit 1 and 2 intakes, though the density gross β radioactive materials at groundwater Observation Hole No. 1 had remained constant at around 18,000 Bq/L, it has been increasing since June 2017 and currently stands at around 30,000 Bq/L. Though the tritium density at groundwater Observation Hole No. 1-6 had been increasing from around 6,000 to 60,000 Bq/L since November 2016, it currently stands at around 6,000 Bq/L. Though the density of gross β radioactive materials at the same groundwater Observation Hole had been increasing since March 2017, it has been declining since June 2017 and currently stands at around 200,000 Bq/L. Though the density of gross β radioactive materials at groundwater Observation Hole No. 1-8 had remained constant at around 8,000 Bq/L, it has been declining since April 2017 and currently stands at around 4,000 Bq/L. Though the density of gross β radioactive materials at the groundwater Observation Hole No. 1-12 had remained constant at around 20 Bq/L, it has been increasing since May 2017 and currently stands at around 1,500 Bq/L. Though the tritium density at groundwater Observation Hole No. 1-14 had remained constant at around 10,000 Bq/L, it has been declining since April 2017 and currently stands at around 3,000 Bq/L. Though the tritium density at groundwater Observation Hole No. 1-17 had been declining from 40,000 Bq/L and repeatedly increasing since March 2016, and then declining since October 2016, it has been increasing since February 2017 and currently stands at around 40,000 Bq/L. Though the density of gross β radioactive materials at

- the same groundwater Observation Hole increased from 200,000 to 600,000 Bq/L in May 2017 and then declining, it currently stands at around 40,000 Bq/L. Since August 15, 2013, pumping of groundwater continued (at the well point between the Unit 1 and 2 intakes: August 15, 2013 – October 13, 2015 and from October 24; at the repaired well: October 14 - 23, 2015).
- Regarding radioactive materials in the groundwater near the bank between the Unit 2 and 3 intakes, the tritium density at groundwater Observation Hole No. 2-2 has been increasing from around 300 Bq/L since May 2017 and currently stands at around 700 Bq/L. Though the tritium density at groundwater Observation Hole No. 2-3 had declined from around 4,000 Bq/L since November 2016 before remaining constant at around 600 Bq/L, it has been increasing since March 2017 and currently stands at around 1,400 Bq/L. Though the tritium density at groundwater Observation Hole No. 2-5 had remained constant at around 500 Bq/L, it has increased to 2,000 Bq/L since November 2016, then declined and currently stands at around 1,000 Bq/L. Though the density of gross β radioactive materials at the same groundwater Observation Hole had been increasing from 10,000 to 80,000 Bq/L since November 2016, it has been declining and currently stands at around 30,000 Bq/L. Since December 18, 2013, pumping of groundwater continued (at the well point between the Unit 2 and 3 intakes: December 18, 2013 - October 13, 2015; at the repaired well: from October 14, 2015).
- Regarding radioactive materials in the groundwater near the bank between the Unit 3 and 4 intakes, though the tritium density at groundwater Observation Hole No. 3 had remained constant at around 9,000 Bq/L, it has been gradually declining since October 2016 and currently stands at around 5,000 Bq/L. Though the density of gross β radioactive materials at the same groundwater Observation Hole had remained constant at around 500 Bq/L, it has been gradually declining since November 2016 and currently stands at around 300 Bq/L. The tritium density at groundwater Observation Hole No. 3-2 has been gradually declining from 3,000 Bq/L since October 2016 and currently stands at around 1,000 Bq/L. The density of gross β radioactive materials at the same groundwater Observation Hole has been gradually declining from 3,500 Bq/L since October 2016 and currently stands at around 600 Bq/L. The density of gross β radioactive materials at the groundwater Observation Hole No. 3-3 has been gradually declining from 6,300 Bq/L since September 2016 and currently stands at around 2,000 Bq/L. At groundwater Observation Hole No. 3-4, though the tritium density had been gradually increasing from 2,500 Bq/L since October 2016, it had declined and currently stands at around 1,000 Bq/L. Since April 1, 2015, pumping of groundwater continued (at the well point between the Unit 3 and 4 intakes: April 1 – September 16, 2015; at the repaired well: from September 17, 2015).
- Regarding the radioactive materials in seawater in the Unit 1-4 intake area, densities have remained low except for the increase in cesium 137 and strontium 90 during heavy rain. They have been declining following the completed installation and the connection of steel pipe sheet piles for the sea-side impermeable walls. The density of cesium 137 has been increasing since January 25, 2017, when a new silt fence was installed to accommodate the relocation.
- Regarding the radioactive materials in seawater in the area within the port, densities have remained low except for the increase in cesium 137 and strontium 90 during heavy rain. They have been declining following the completed installation and the connection of steel pipe sheet piles for the sea-side impermeable walls.
- Regarding the radioactive materials in seawater in the area outside the port, densities of cesium 137 and strontium 90 have been declining and remained low following the completed installation and the connection of steel pipe sheet piles for the sea-side impermeable walls.
- Alert issued from a continuous dust monitor on the site boundary
 - “High alert” indicating an increased density of dust radiation was issued from dust monitors near the monitoring post (MP) Nos. 4 and 2 on August 4 and 23 respectively. Both alerts were considered attributable to natural nuclides for the following reasons: no abnormality was identified in plant parameters when the “high alert” was issued; no abnormality was identified in values measured by the other dust monitors; there was no on-site work around the monitor that could explain the dust increase; a gamma nuclide analysis of the filter used when the “high alert” was

issued confirmed that the densities of artificial nuclides such as cesium were below the detection limit while natural nuclides (bismuth 214) were detected;

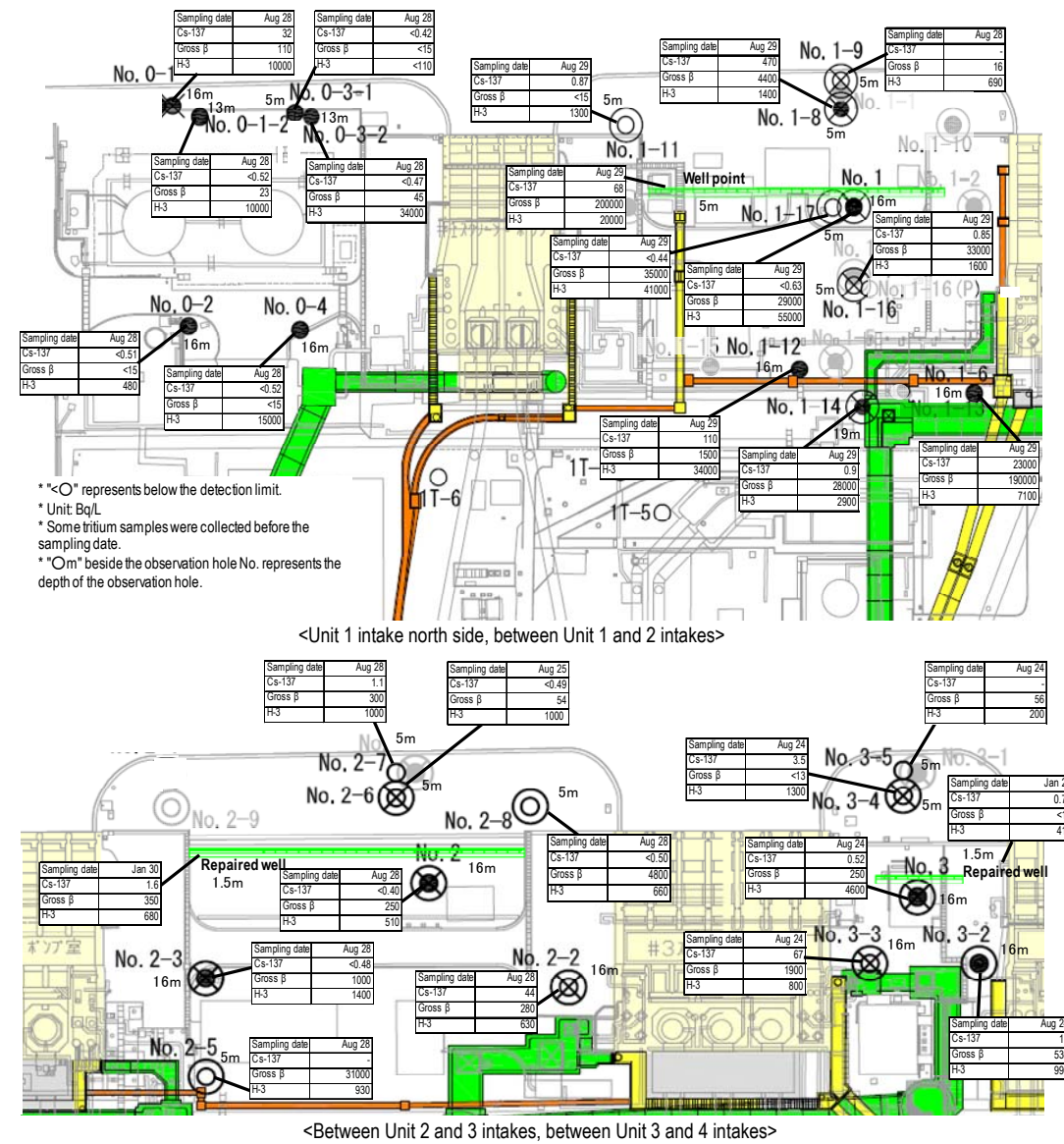


Figure 4: Groundwater density on the Turbine Building east side

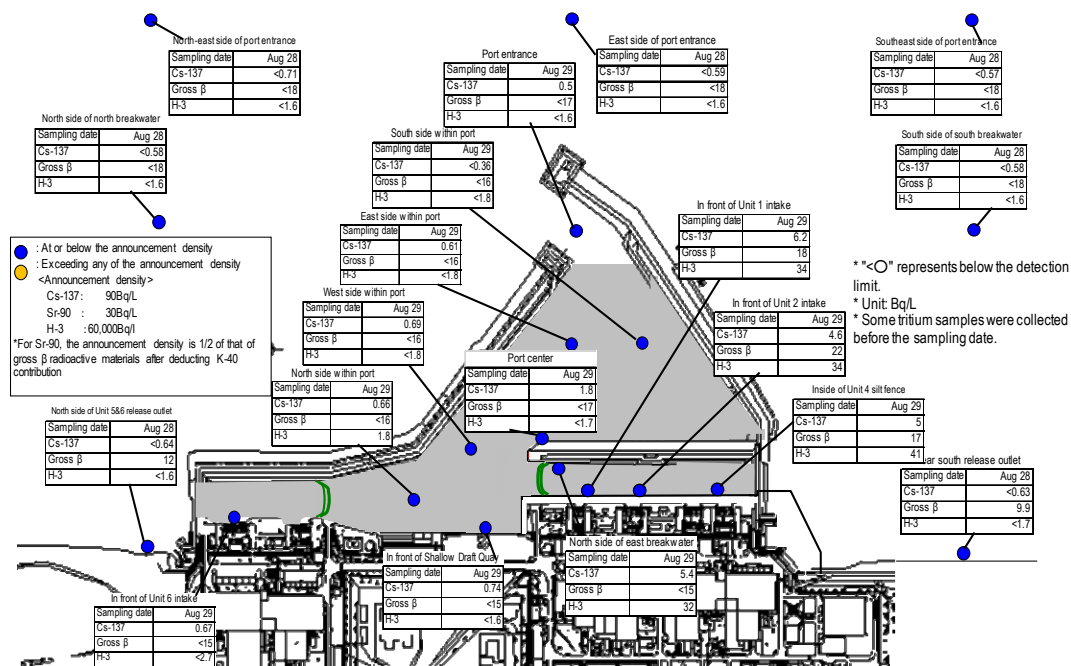


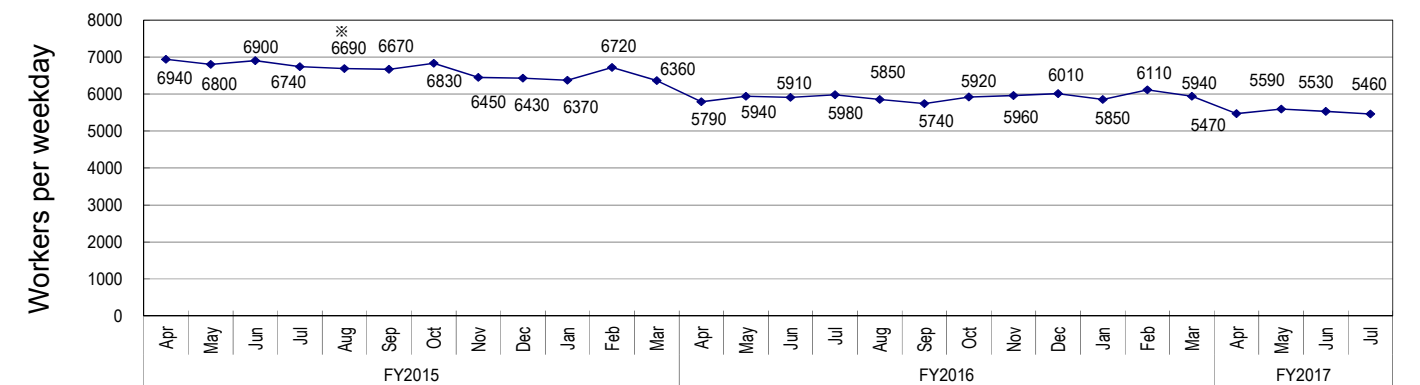
Figure 5: Seawater density around the port

6. Outlook 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 April to June 2017 was approx. 12,000 (TEPCO and partner company workers), which exceeded the monthly average number of actual workers (approx. 9,100). Accordingly, sufficient people are registered to work on site.
- It was confirmed with the prime contractors that the estimated manpower necessary for the work in September 2017 (approx. 5,260 per day: TEPCO and partner company workers)* would be secured at present. The average numbers of workers per day per month (actual values) were maintained, with approx. 5,500 to 7,000 since FY2015 (see Figure 6).
- Some works for which contractual procedures have yet to be completed were excluded from the estimate for September 2017.
- The number of workers from outside Fukushima Prefecture has decreased. The local employment ratio (TEPCO and partner company workers) as of July has remained at around 55%.
- The monthly average exposure dose of workers remained at approx. 0.81 mSv/month during FY2014, approx. 0.59 mSv/month during FY2015 and approx. 0.39 mSv/month during FY2016. (Reference: Annual average exposure dose 20 mSv/year \cong 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 from August 3-7, 24-28 and 31 (due to overhaul of heavy machines)

Figure 6: Changes in the average number of workers per weekday for each month since FY2015 (actual values)

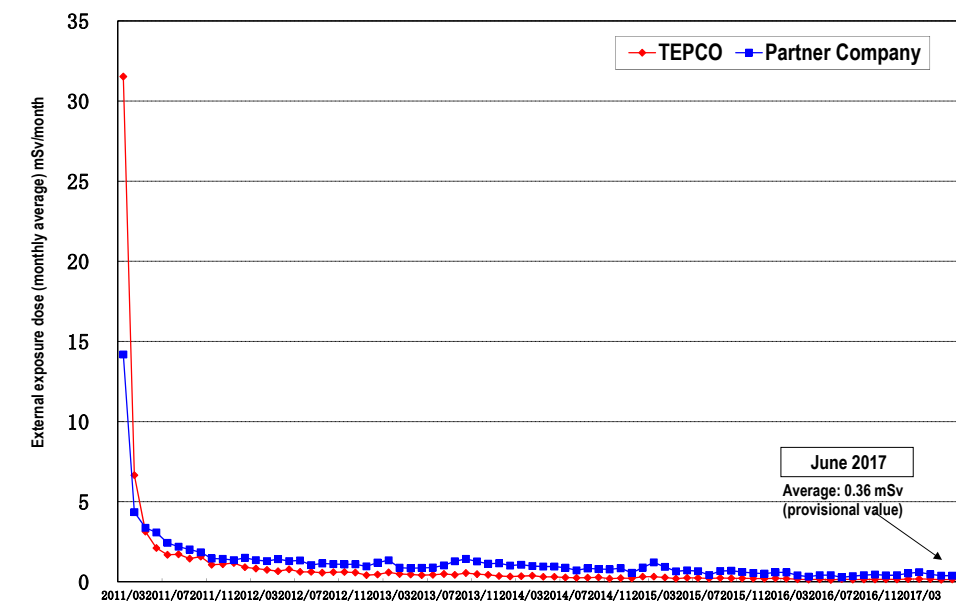


Figure 7: Changes in monthly individual worker exposure dose (monthly average exposure dose since March 2011)

➤ Status of heat stroke cases

- In FY2017, five workers suffered heat stroke due to work, but no worker had suffered light stroke (not requiring medical treatment) as of August 29. Ongoing measures will be taken to prevent heat stroke. (In FY2016, three workers had heat stroke due to work and one worker had light heat stroke as of the end of August.)

➤ Expansion of Green Zone (general clothing area)

- A "Remote-Control Room and Rest House" for work related to spent fuel removal will be established. To ease the burden on workers during transfer from the access control building, the area around the room will be reclassified from a Yellow Zone to a Green Zone (from early September 2017).

7. Others

➤ Publication of the Technical Strategic Plan 2017

- The Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF) made and published the "Technical Strategic Plan 2017 for Decommissioning of the Fukushima Nuclear Power Station of Tokyo Electric Power Company Holdings, Inc." today (August 31) aiming to provide a firm technical basis for the government's "Mid- and long-term Roadmap" and serve as an aid for the smooth and steady implementation of decommissioning.

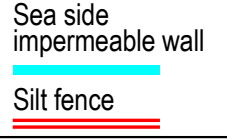
➤ Move toward revising the Mid- and Long-term Roadmap

- At the Fukushima Advisory Board on Decommissioning and Contaminated Water Management held on July 31, the results of the progress status verification regarding the measures stated in the Mid- and Long-term Roadmap were reported and the view of its revision was shown. Work on the revision started.
- The roadmap will be revised, which will also involve specifying the fuel debris retrieval policy.

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 17-25)”; 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>



Cesium-134: 3.3 (2013/10/17) → ND(0.36) Below 1/9
Cesium-137: 9.0 (2013/10/17) → 0.61 Below 1/10
Gross β: **74** (2013/ 8/19) → ND(16) Below 1/4
Tritium: 67 (2013/ 8/19) → ND(1.8) Below 1/30

Cesium-134: 4.4 (2013/12/24) → ND(0.27) Below 1/10
Cesium-137: **10** (2013/12/24) → 0.69 Below 1/10
Gross β: **60** (2013/ 7/ 4) → ND(16) Below 1/3
Tritium: 59 (2013/ 8/19) → 3.4 Below 1/10

Cesium-134: 5.0 (2013/12/2) → ND(0.29) Below 1/10
Cesium-137: 8.4 (2013/12/2) → 0.66 Below 1/10
Gross β: **69** (2013/8/19) → ND(16) Below 1/4
Tritium: 52 (2013/8/19) → ND(1.8) Below 1/20

Cesium-134: 2.8 (2013/12/2) → ND(0.47) Below 1/5
Cesium-137: 5.8 (2013/12/2) → 0.67 Below 1/8
Gross β: **46** (2013/8/19) → ND(15) Below 1/3
Tritium: 24 (2013/8/19) → ND(2.7) Below 1/8

Cesium-134: ND(0.51)
Cesium-137: 1.8
Gross β: ND(17)
Tritium: 1.8 *

Cesium-134: 3.3 (2013/12/24) → ND(0.43) Below 1/7
Cesium-137: 7.3 (2013/10/11) → 0.50 Below 1/10
Gross β: **69** (2013/ 8/19) → ND(17) Below 1/4
Tritium: 68 (2013/ 8/19) → ND(1.6) Below 1/40

Cesium-134: 3.5 (2013/10/17) → ND(0.25) Below 1/10
Cesium-137: 7.8 (2013/10/17) → ND(0.36) Below 1/20
Gross β: **79** (2013/ 8/19) → ND(16) Below 1/4
Tritium: 60 (2013/ 8/19) → ND(1.8) Below 1/30

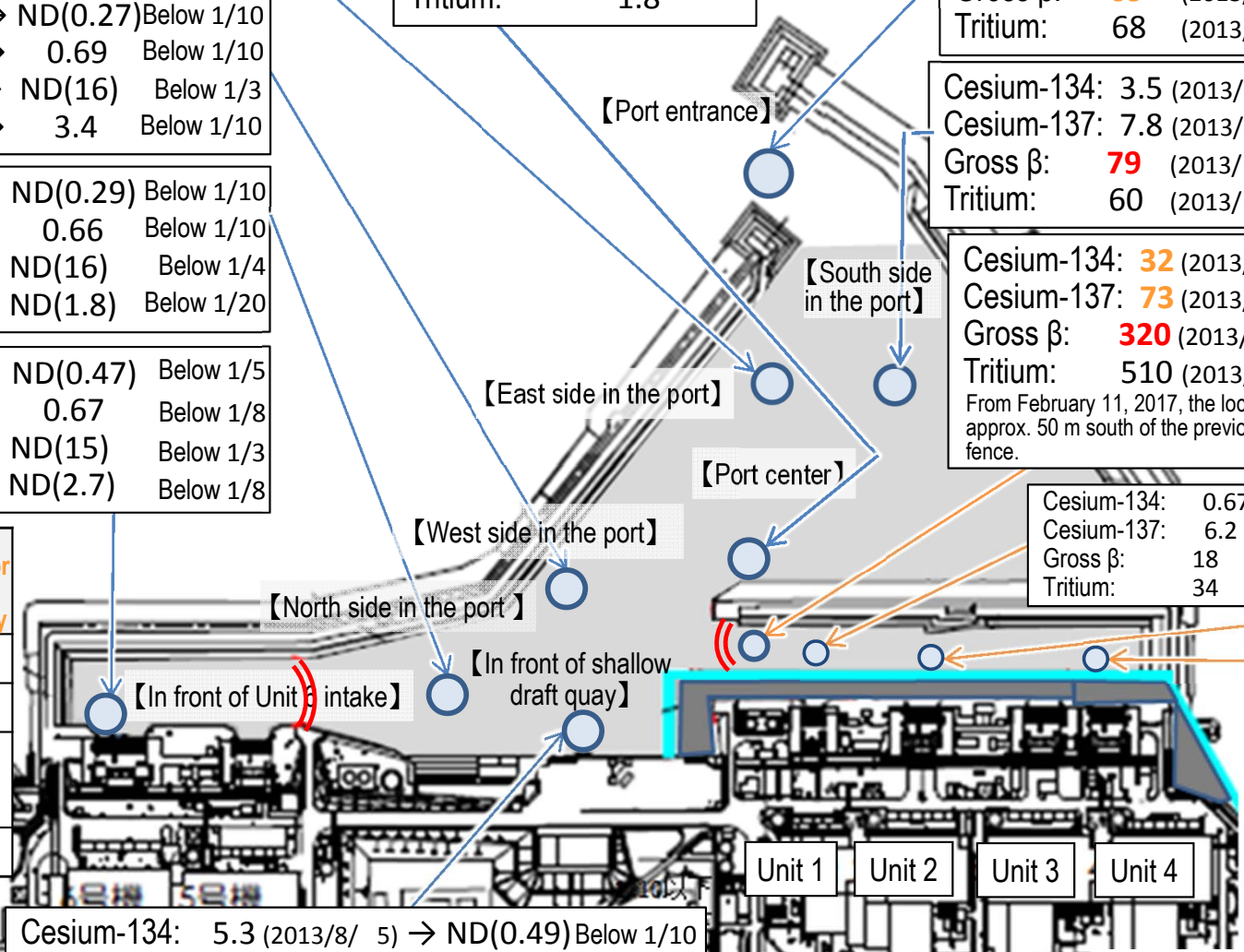
Cesium-134: **32** (2013/10/11) → 0.76 Below 1/40
Cesium-137: **73** (2013/10/11) → 5.4 Below 1/10
Gross β: **320** (2013/ 8/12) → ND(15) Below 1/20
Tritium: 510 (2013/ 9/ 2) → 32 Below 1/10
From February 11, 2017, the location of the sampling point was shifted approx. 50 m south of the previous point due to the location shift of the silt fence.

Cesium-134: 0.67
Cesium-137: 6.2
Gross β: 18
Tritium: 34 *

Cesium-134: ND(0.60)
Cesium-137: 4.6
Gross β: 22
Tritium: 34 *

Cesium-134: 0.71
Cesium-137: 5.0
Gross β: 17
Tritium: 41 *

* Monitoring commenced in or after March 2014. Monitoring inside the sea-side impermeable walls was finished because of the landfill.



	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: 5.3 (2013/8/ 5) → ND(0.49) Below 1/10
Cesium-137: 8.6 (2013/8/ 5) → 0.74 Below 1/10
Gross β: **40** (2013/7/ 3) → ND(15) Below 1/2
Tritium: 340 (2013/6/26) → ND(1.6) Below 1/200

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 August 30, 2017

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

Cesium-134: ND (2013) → ND (0.80)

Cesium-137: ND (2013) → ND (0.71)

Gross β: ND (2013) → ND (18)

Tritium: ND (2013) → ND (1.8)

Cesium-134: ND (2013) → ND (0.67)

Cesium-137: 1.6 (2013/10/18) → ND (0.59) Below 1/2

Gross β: ND (2013) → ND (18)

Tritium: 6.4 (2013/10/18) → ND (1.8) Below 1/3

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

Cesium-134: ND (2013) → ND (0.65)

Cesium-137: ND (2013) → ND (0.57)

Gross β: ND (2013) → ND (18)

Tritium: ND (2013) → ND (1.8)

Cesium-134: ND (2013) → ND (0.59)

Cesium-137: ND (2013) → ND (0.58)

Gross β: ND (2013) → ND (18)

Tritium: 4.7 (2013/ 8/18) → ND (1.8) Below 1/2

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

○【North side of Unit 5 and 6 release outlet】

Cesium-134: 1.8 (2013/ 6/21) → ND (0.62) Below 1/2

Cesium-137: 4.5 (2013/ 3/17) → ND (0.64) Below 1/7

Gross β: 12 (2013/12/23) → 12

Tritium: 8.6 (2013/ 6/26) → ND (1.6) Below 1/5

○【Port entrance】

Cesium-134: 3.3 (2013/12/24) → ND (0.43) Below 1/7

Cesium-137: 7.3 (2013/10/11) → 0.50 Below 1/10

Gross β: 69 (2013/ 8/19) → ND (17) Below 1/4

Tritium: 68 (2013/ 8/19) → ND (1.6) Below 1/40

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

Cesium-134: ND (2013) → ND (0.68)

Cesium-137: ND (2013) → ND (0.58)

Gross β: ND (2013) → ND (18)

Tritium: ND (2013) → ND (1.8)

Cesium-134: ND (2013) → ND (0.71)

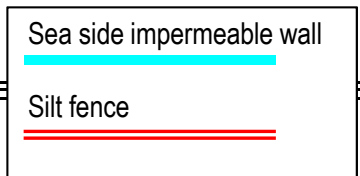
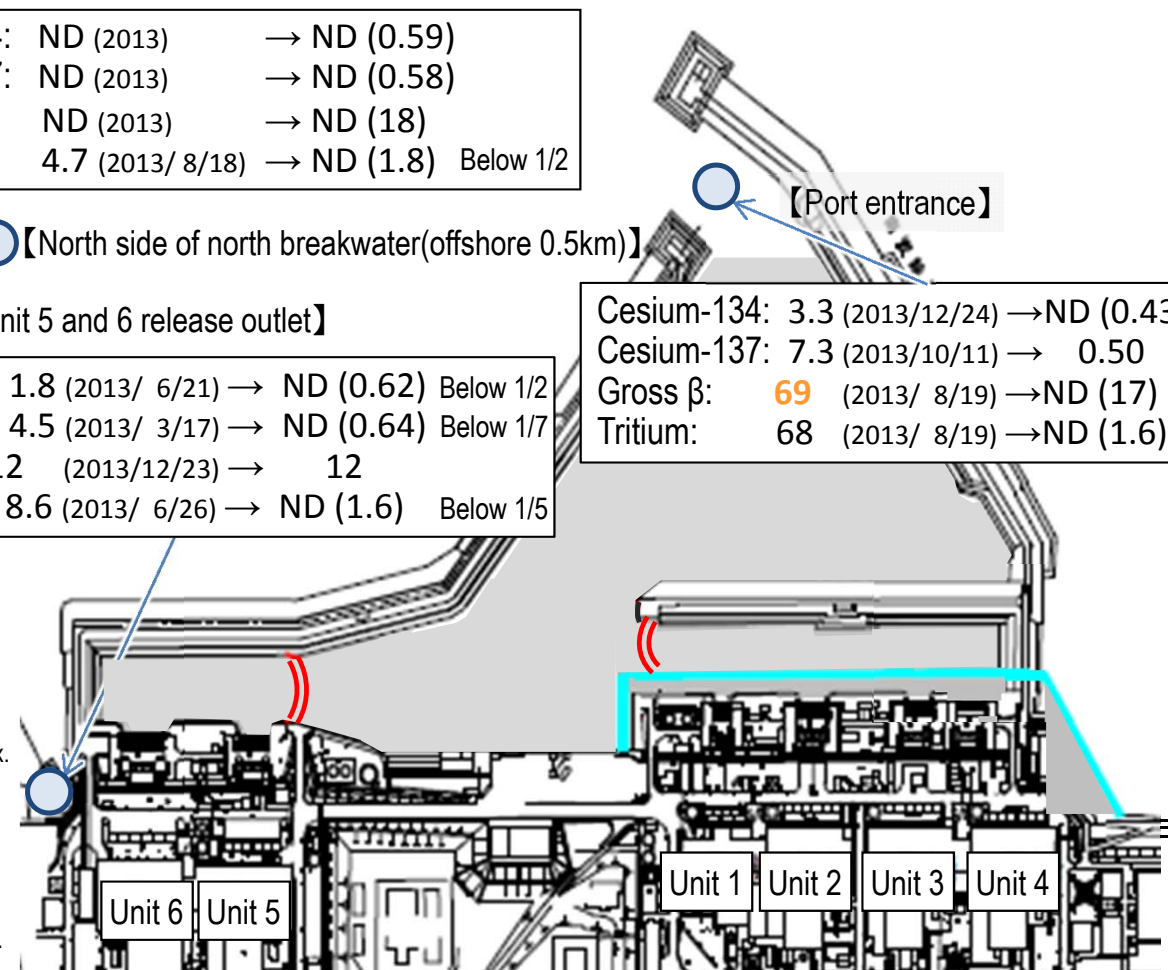
Cesium-137: 3.0 (2013/ 7/15) → ND (0.63) Below 1/4

Gross β: 15 (2013/12/23) → 9.9

Tritium: 1.9 (2013/11/25) → ND (1.6)

○【Near south release outlet】

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.



Note: Because safety of the sampling points was unassured due to the influence of Typhoon No. 10 in 2016, samples were taken from approx. 330 m south of the Unit 1-4 release outlet. From January 27, 2017, the location of the sampling point was also shifted approx. 280 m south of the Unit 1-4 release outlet.

Summary of TEPCO data as of August 30, 2017

TEPCO Holdings Fukushima Daiichi Nuclear Power Station Site

Appendix 2
August 31, 2017

- Rubble storage area
- Rubble storage area (planned)
- Trimmed trees area
- Trimmed trees area (planned)
- Mid-/ low-level contaminated water tank (existing)
- Mid-/ low-level contaminated water tank (planned)
- High-level contaminated water tank (existing)
- High-level contaminated water tank (planned)
- Secondary waste from water treatment (existing)
- Secondary waste from water treatment (planned)
- Multi-nuclide removal equipment
- Water treatment facility special for Subdrain & Groundwater drain
- Dry cask temporary storage facility
- Used protective clothing



Inside the rubble storage tent



Rubble (container storage)



Rubble storage tent



Temporary soil cover type storage



Rubble (outdoor accumulation)



Solid waste storage facility



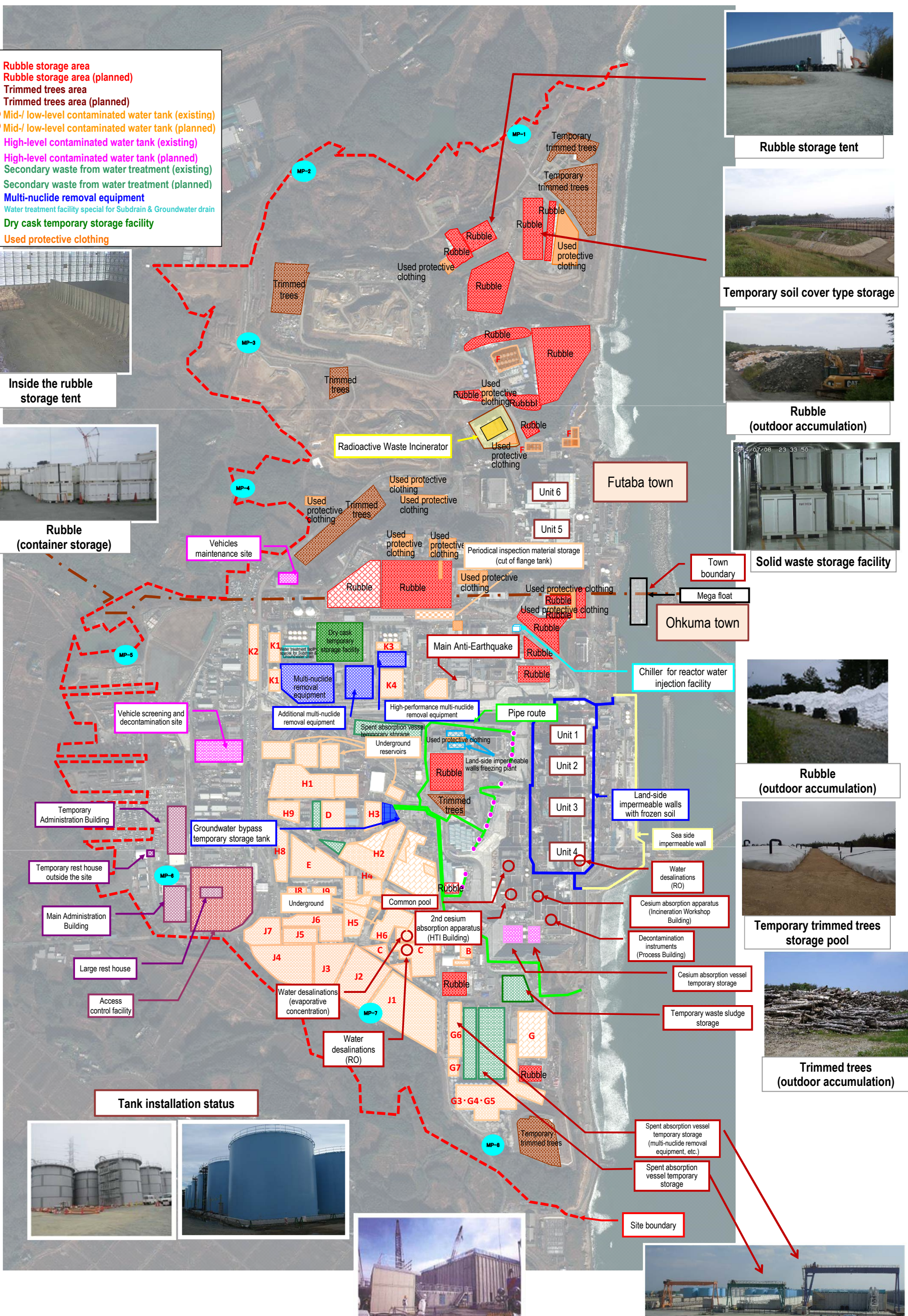
Rubble (outdoor accumulation)



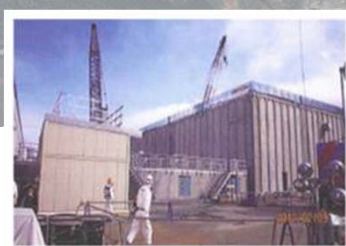
Temporary trimmed trees storage pool



Trimmed trees (outdoor accumulation)



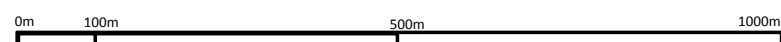
Tank installation status



Temporary waste sludge storage



Provided by ©2016 DigitalGlobe, Inc., NTT DATA Corporation



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 top floor of the Reactor Building (operating floor). All roof panels and wall panels of the building cover were dismantled by November 10, 2016. Removal of pillars and beams of the building was completed on May 11. Modification of the pillars and beams (including windbreak sheets) will follow. Prior to formulating a work plan for rubble removal, additional investigation into rubble status on the operating floor is underway. Thorough monitoring of radioactive materials will continue.

<Dismantling of wall panels>



Flow of building cover dismantling

Unit 2

To facilitate removal of fuel assemblies and debris in the Unit 2 spent fuel pool, the scope of dismantling and modification of the existing Reactor Building rooftop was examined. From the perspective of ensuring safety during the work, controlling impacts on the outside of the power station, and removing fuel rapidly to reduce risks, we decided to dismantle the whole rooftop above the highest floor of the Reactor Building.

Examination of the following two plans continues: 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 from the pool.

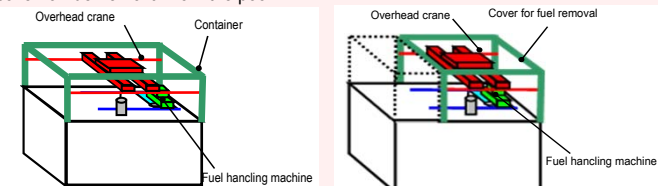


Image of Plan 1

Image of Plan 2

Unit 3

Prior to the installation of a cover for fuel removal, removal of large rubble from the spent fuel pool was completed in November 2015. To ensure safe and steady fuel removal, training of remote control was conducted at the factory using the actual fuel-handling machine which will be installed on site (February – December 2015).

Measures to reduce dose on the Reactor Building top floor (decontamination, shields) were completed in December 2016. Installation of a cover for fuel removal and a fuel-handling machine is underway from January 2017.



Installation of a cover for fuel removal (photo taken on August 5, 2017)

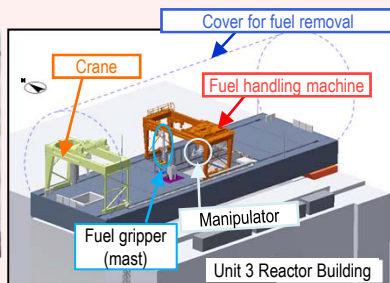


Image of entire fuel handling facility inside the cover

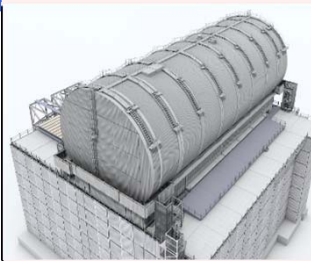


Image of the cover for fuel removal

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.

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)

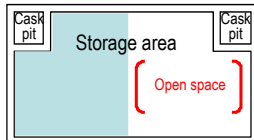
This marks the completion of fuel removal from the Unit 4 Reactor Building. Based on this experience, fuel assemblies will be removed from Unit 1-3 pools.

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



Fuel removal status

Common pool

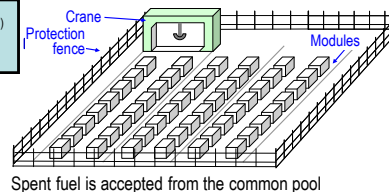


An open space will be maintained in the common pool (Transfer to the temporary dry cask storage facility)

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 (*) 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>

(*) Cask: Transportation container for samples and equipment, including radioactive materials.

Immediate target	Identify the plant status and commence R&D and decontamination toward fuel debris removal
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Investigation into TIP Room of the Unit 1 Reactor Building

- To improve the environment for future investigations inside the PCV, etc., an investigation was conducted from September 24 to October 2, 2015 at the TIP Room⁽¹⁾. (Due to high dose around the entrance in to the TIP Room, the investigation of dose rate and contamination distribution was conducted through a hole drilled from the walkway of the Turbine Building, where the dose was low)
- The investigative results identified high dose at X-31 to 33 penetrations⁽²⁾ (instrumentation penetration) and low dose at other parts.
- As it was confirmed that work inside the TIP room would be available, the next step will include identification of obstacles which will interfere the work inside the TIP Room and formulation of a plan for dose reduction.

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

Investigation in the leak point detected in the upper part of Unit 1 S/C from May 27, 2014 from one expansion joint cover among the lines installed there. As no leakage was identified from other parts, specific methods will be examined to halt the flow of water and repair the PCV.



Leak point

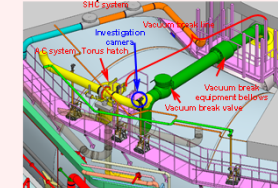
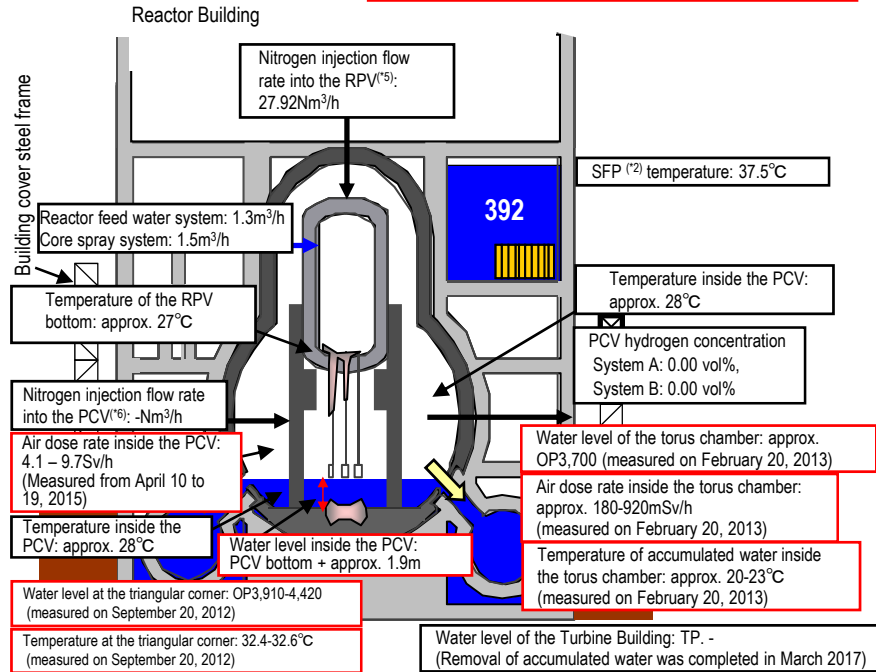


Image of the S/C upper part investigation

Unit 1

Air dose rate inside the Reactor Building:
Max. 5,150mSv/h (1F southeast area) (measured on July 4, 2012)



* Indices related to the plant are values as of 11:00, August 30, 2017

Investigations inside PCV	1st (Oct 2012)	2nd (Apr 2015)	3rd (Mar 2017)
	- Acquiring images - Measuring air temperature and dose rate - Measuring water level and temperature - Sampling accumulated water - Installing permanent monitoring instrumentation	Confirming the status of PCV 1st floor - Acquiring images - Measuring air temperature and dose rate - Replacing permanent monitoring instrumentation	Confirming the status of PCV 1st basement floor - Acquiring images - Measuring air temperature and dose rate - Sampling deposit - Replacing permanent monitoring instrumentation
Leakage points from PCV	- PCV vent pipe vacuum break line bellows (identified in May 2014) - Sand cushion drain line (identified in November 2013)		

Status of investigation inside the PCV

Prior to fuel debris removal, an investigation inside the PCV will be conducted to inspect the status there including the location of fuel debris.

[Investigative outline]

- In April 2015, a device, which entered the inside of the PCV through a narrow access opening (bore: ϕ 100 mm), collected information such as images and airborne dose inside the PCV 1st floor.
- In March 2017, the investigation using a self-propelled investigation device, conducted to inspect the spreading of debris to the basement floor outside the pedestal, took images of the PCV bottom status for the first time. The status inside the PCV will continue to be examined based on the collected image and dose data.

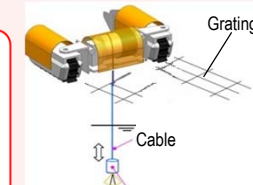
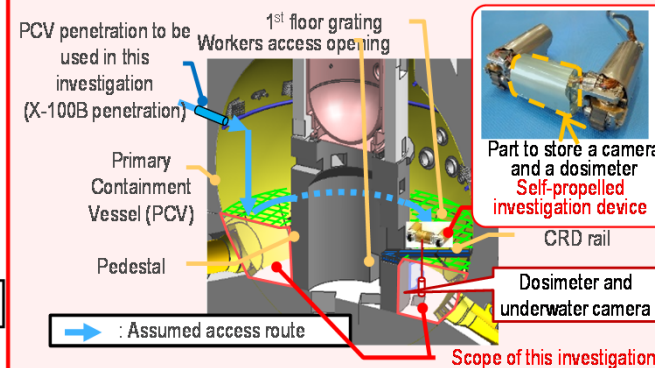


Image of hanging of dosimeter and camera



Image near the bottom

Capturing the location of fuel debris inside the reactor by measurement using muons

Period	Evaluation results
Feb - May 2015	Confirmed that there was no large fuel in the reactor core.

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

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

August 31, 2017

Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
3/6

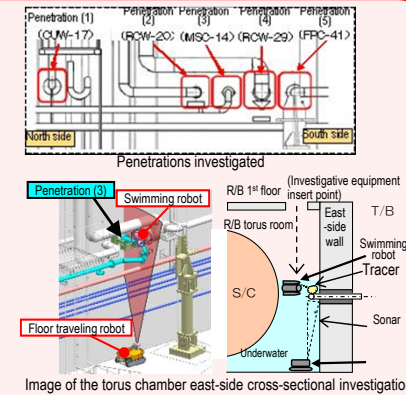
Immediate target Identify the plant status and commence R&D and decontamination toward fuel debris removal

Installation of an RPV thermometer and permanent PCV supervisory instrumentation

- Replacement of the RPV thermometer
 - As the thermometer installed at the Unit 2 RPV bottom after the earthquake had broken in February 2014, it was excluded from the monitoring thermometers.
 - On April 2014, removal of the broken thermometer failed and was suspended. Rust-stripping chemicals were injected and the broken thermometer was removed on January 2015. A new thermometer was reinstalled on March. The thermometer has been used as a part of permanent supervisory instrumentation since April.
- 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 2013). The instrumentation was removed on May 2014 and new instruments were reinstalled on June 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.

Investigative results on torus chamber walls

- The torus chamber 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 (*) 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)



Status of investigation inside the PCV

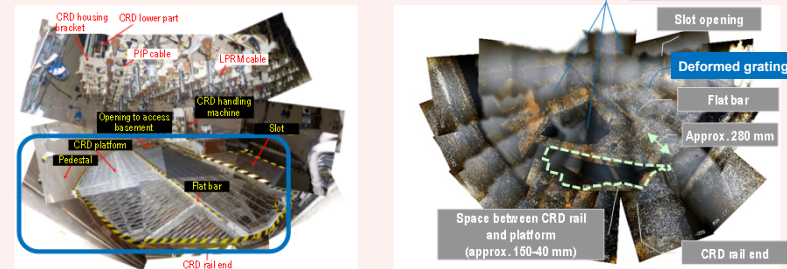
Prior to fuel debris removal, an investigation inside the PCV will be conducted to inspect the status there including the location of fuel debris.

[Investigative outline]

- A robot, injected from Unit 2 X-6 penetration (*1), will access the inside of the pedestal using the CRD rail.

[Progress status]

- As manufacturing of shields necessary for dose reduction around X-6 penetration was completed, a hole was made in December 2016 at the PCV penetration from which a robot will be injected.
- On January 26 and 30, 2017, a camera was inserted from the PCV penetration to inspect the status of the CRD replacement rail on which the robot will travel. On February 9, deposit on the access route of the self-propelled investigative device was removed and on February 16, the inside of the PCV was investigated using the device.
- The results of this series of investigations confirmed fallen and deformed gratings and a quantity of deposit inside the pedestal. The evaluation results of the collected information will be utilized in considering the policy for fuel debris removal.



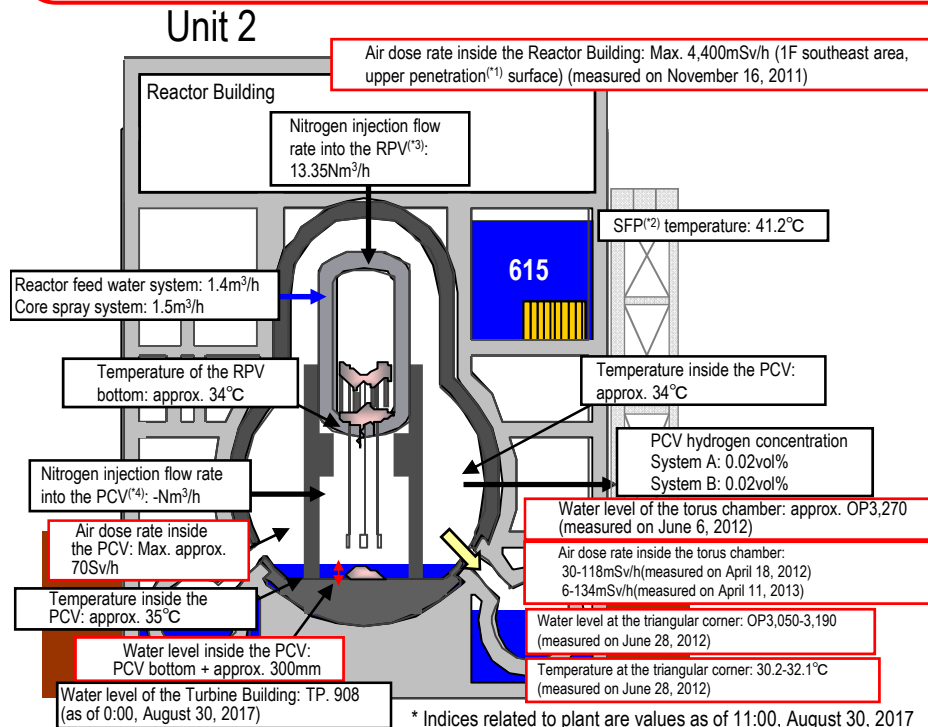
(Reference) Inside the Unit 5 pedestal

Scope of investigation inside the PCV

Capturing the location of fuel debris inside the reactor by measurement using muons

Period	Evaluation results
Mar - Jul 2016	Confirmed the existence of high-density materials, which was considered as fuel debris, at the bottom of RPV, and in the lower part and the outer periphery of the reactor core. It was assumed that a large part of fuel debris existed at the bottom of RPV.

<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



* Indices related to plant are values as of 11:00, August 30, 2017

Investigations inside PCV	1st (Jan 2012)	- Acquiring images - Measuring air temperature
	2nd (Mar 2012)	- Confirming water surface - Measuring water temperature - Measuring dose rate
	3rd (Feb 2013 - Jun 2014)	- Acquiring images - Sampling accumulated water - Measuring water level - Installing permanent monitoring instrumentation
	4th (Jan - Feb 2017)	- Acquiring images - Measuring dose rate - Measuring air temperature
Leakage points from PCV	- No leakage from torus chamber rooftop - No leakage from all inside/outside surfaces of S/C	

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

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

On January 18, 2014, a flow of water from around the door of the Steam Isolation Valve room in the Reactor Building Unit 3 1st floor northeast area to the nearby floor drain funnel (drain outlet) was detected. As the drain outlet connects with the underground part of the Reactor Building, there is no possibility of outflow from the building.

From April 23, 2014, image data has been acquired by camera and the radiation dose measured via pipes for measurement instrumentation, which connect the air-conditioning room on the Reactor Building 2nd floor with the Main Steam Isolation Valve Room on the 1st floor. On May 15, 2014, water flow from the expansion joint of one Main Steam Line was detected.

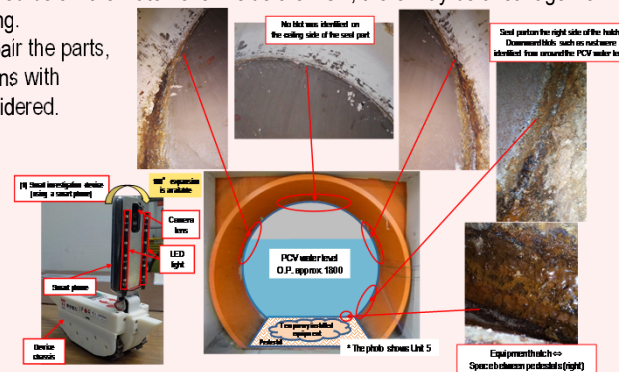
This is the first leak from PCV detected in the Unit 3. Based on the images collected in this investigation, the leak volume will be estimated and the need for additional investigations will be examined. The investigative results will also be utilized to examine water stoppage and PCV repair methods.

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

Investigative results into the Unit 3 PCV equipment hatch using a small investigation device

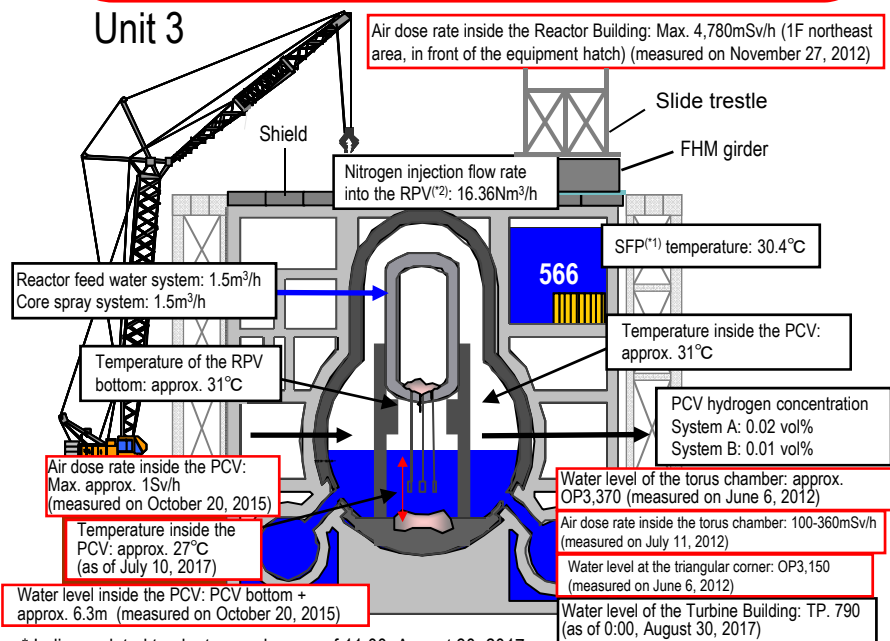
As part of the investigation into the PCV to facilitate fuel debris removal, the status around the Unit 3 PCV equipment hatch was investigated using a small self-traveling investigation device on November 26, 2015.

Given blots such as rust identified below the water level inside the PCV, there may be a leakage from the seal to the extent of bleeding. Methods to investigate and repair the parts, including other PCV penetrations with a similar structure, will be considered.



Unit 3

Air dose rate inside the Reactor Building: Max. 4,780mSv/h (1F northeast area, in front of the equipment hatch) (measured on November 27, 2012)



* Indices related to plant are values as of 11:00, August 30, 2017

Investigations inside PCV	1st (Oct – Dec 2015)	- Acquiring images - Measuring air temperature and dose rate - Measuring water level and temperature - Sampling accumulated water - Installing permanent monitoring instrumentation (scheduled for December 2015)
Leakage points from PCV	-	- Main steam pipe bellows (identified in May 2014)

Investigation inside the PCV

Prior to removing fuel debris, the inside of the Primary Containment Vessel (PCV) was investigated to identify the status there including the location of the fuel debris.

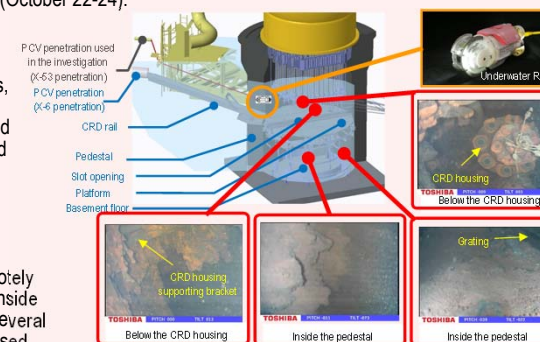
[Investigative outline]

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. The results showed that the penetration was not under the water (October 22-24).

For the purpose of confirming the status inside the PCV, an investigation device was inserted into the PCV from X-53 penetration on October 20 and 22, 2015 to obtain images, data of dose and temperature and sample accumulated water. No damage was identified on the structure and walls inside the PCV and the water level was almost identical with the estimated value. In addition, the dose inside the PCV was confirmed to be lower than in other Units.

In July 2017, the inside of the PCV was investigated using the underwater ROV (remotely operated underwater vehicle) to inspect the inside of the pedestal. The investigation identified several fallen obstacles and deposits, such as supposed solidified molten materials and grating, inside the pedestal.

Image data collected in the investigation will be analyzed to identify the detailed status inside the pedestal.



Status inside the pedestal

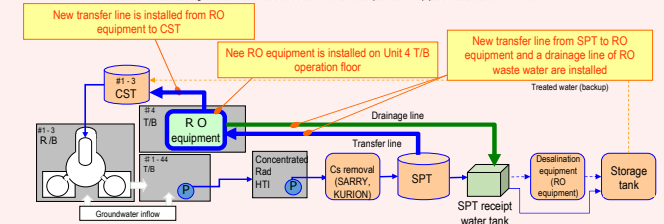
<Glossary>

- (*) SFP (Spent Fuel Pool)
- (*) RPV (Reactor Pressure Vessel)
- (*) PCV (Primary Containment Vessel)
- (*) Penetration: Through-hole of the PCV

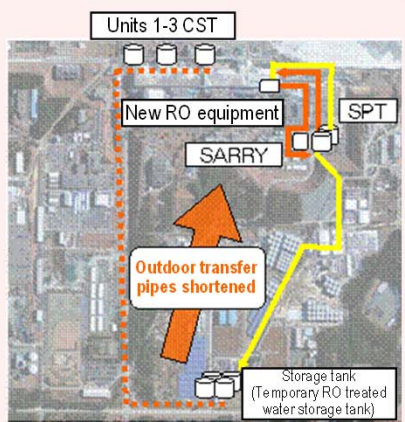
Immediate target Stably continue reactor cooling and accumulated water treatment, and improve reliability

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 Condensate Storage Tank (CST) as a water source commenced (from July 5, 2013). Compared to the previous systems, the reliability of the reactor water injection system was enhanced, e.g. by increasing the amount of water-source storage and enhancing durability.
- To reduce the risk of contaminated-water leakage, the circulation loop was shortened by installing a reverse osmosis (RO) device in the Unit 4 Turbine Building within the circulation loop, comprising the transfer of contaminated water, water treatment and injection into the reactors. Operation of the installed RO device started from October 7 and 24-hour operation started from October 20. Installation of the new RO device inside the building shortened the circulation loop from approx. 3 to 0.8 km.



* 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).



Progress status of dismantling of flange tanks

- To facilitate replacement of flange tanks, dismantling of flange tanks started in H1 east/H2 areas in May 2015. Dismantling of all flange tanks was completed in H1 east area (12 tanks) in October 2015, in H2 area (28 tanks) in March 2016 and in H4 area (56 tanks) in May 2017. Dismantling of flange tanks in H3, H5 and B areas is underway.



Start of dismantling in H1 east area

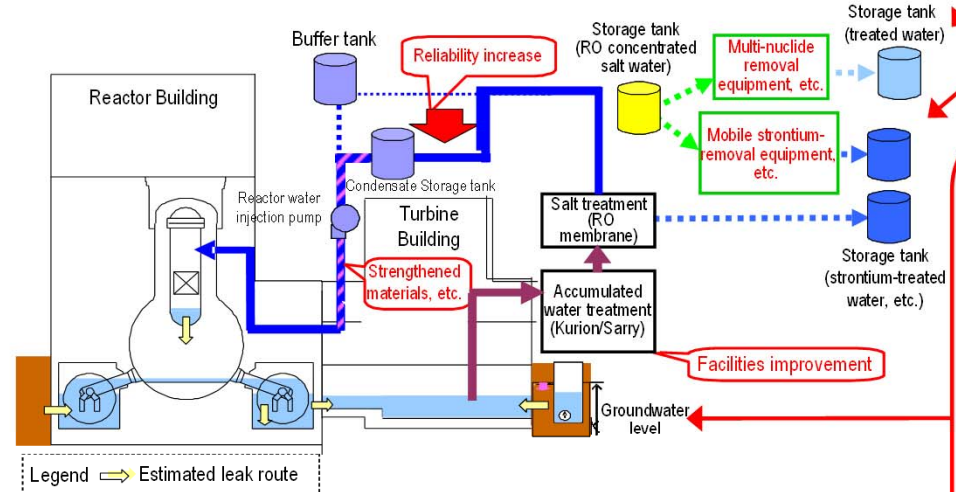


After dismantling in H1 east area

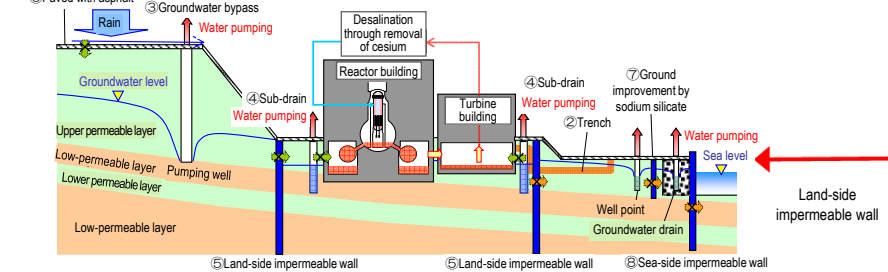
Completion of purification of contaminated water (RO concentrated salt water)

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, 2015, with the exception of the remaining water at the tank bottom. The remaining water will be treated sequentially toward dismantling the tanks.

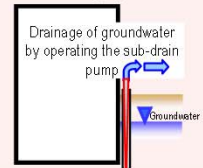
The strontium-treated water from other facilities than the multi-nuclide removal equipment will be re-purified in the multi-nuclide removal equipment to further reduce risks.



Legend → Estimated leak route



Preventing groundwater from flowing into the Reactor Buildings



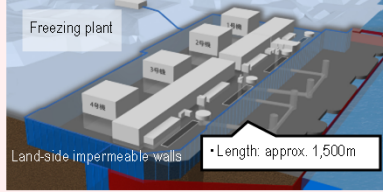
Reducing groundwater inflow by pumping sub-drain water

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

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

Measures to pump up groundwater flowing from the mountain side upstream of the Building to reduce the groundwater inflow (groundwater bypass) have been implemented. The pumped up groundwater is temporarily stored in tanks and released after TEPCO and a third-party organization have confirmed that its quality meets operational targets. Through periodical monitoring, pumping of wells and tanks is operated appropriately. At the observation holes installed at a height equivalent to the buildings, the trend showing a decline in groundwater levels is checked. The analytical results on groundwater inflow into the buildings based on existing data showed a declining trend.

Installing land-side impermeable walls with frozen soil around Units 1-4 to prevent the inflow of groundwater into the building



To prevent the inflow of groundwater into the buildings, installation of impermeable walls on the land side is planned.

Freezing started on the sea side and at a part of the mountain side from March 2016 and at 95% of the mountain side from June 2016. On the sea side, the underground temperature declined 0°C or less throughout the scope requiring freezing except for the unfrozen parts under the sea-water pipe trenches and the areas above groundwater level in October 2016.

Freezing started for two of seven unfrozen sections on the mountain side from December 2016, and four of the remaining five unfrozen sections from March 2017. Freezing of the remaining unfrozen section started in August 2017.

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

Immediate targets

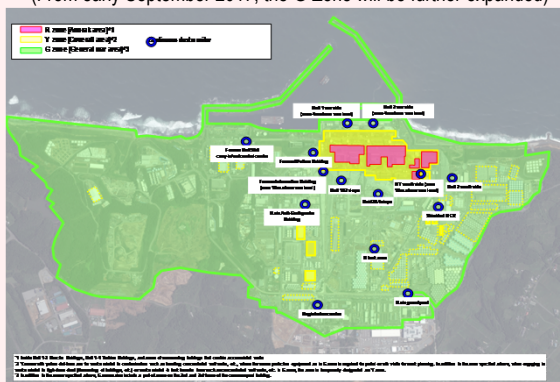
- Reduce the effect of additional release from the entire power station and radiation from radioactive waste (secondary water treatment waste, rubble, etc.) generated after the accident, to limit the effective radiation dose to below 1mSv/year at the site boundaries.
- Prevent contamination expansion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

Optimization of radioactive protective equipment

Based on the progress of measures to reduce environmental dosage on site, the site is categorized into two zones: highly contaminated area around Unit 1-4 buildings, etc. and other areas to optimize protective equipment according to each category aiming at improving safety and productivity by reducing load during work.

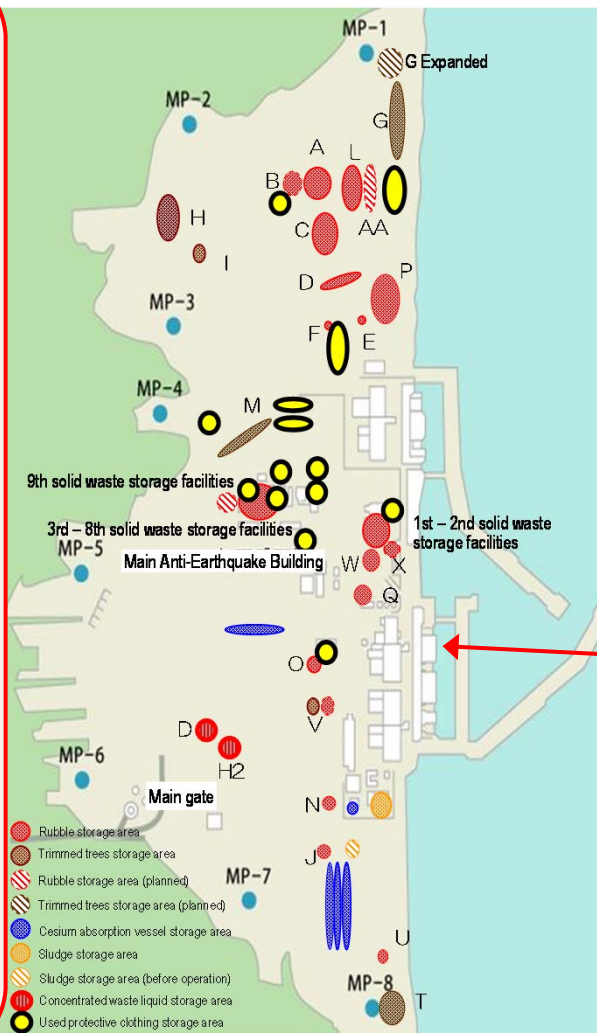
From March, 2016, limited operation started. From March, 2017 the G Zone is expanded.

(From early September 2017, the G Zone will be further expanded)



R zone (Anorak area)	Y zone (Coverall area)	G zone (General wear)
Full-face mask 	Full-face or half-face masks 1, 2  	Disposable disposable mask 
Anorak on coverall Or double coveralls 	Coverall 	General*3 Dedicated on-site wear  

*1 For works in buildings including water treatment facilities (multi-nuclide removal equipment, etc.) (excluding site visits), wear a full-face mask.
 *2 For works in tank areas containing concentrated salt water or Sr-treated water (excluding works not handling concentrated salt water, etc.), patrol, on-site investigation for work planning, and site visits) and works related to tank transfer lines, wear a full-face mask.
 *3 Specified light works (patrol, monitoring, delivery of goods brought from outside, etc.)



Installation of dose-rate monitors

To help workers in the Fukushima Daiichi Nuclear Power Station precisely understand the conditions of their workplaces, a total of 86 dose-rate monitors were installed by January 4, 2016.

These monitors allow workers to confirm real time on-site dose rates at their workplaces.

Workers are also able to check concentrated data through large-scale displays installed in the Main Anti-Earthquake Building and the access control facility.



Installation of Dose-rate monitor

Installation of sea-side impermeable walls

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

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



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

Status of the large rest house

A large rest house for workers was established and its operation commenced on May 31, 2015.

Spaces in the large rest house are also installed for office work and collective worker safety checks as well as taking rest.

On March 1, 2016 a convenience store opened in the large rest house. On April 11, operation of the shower room started. Efforts will continue to improve convenience of workers.

