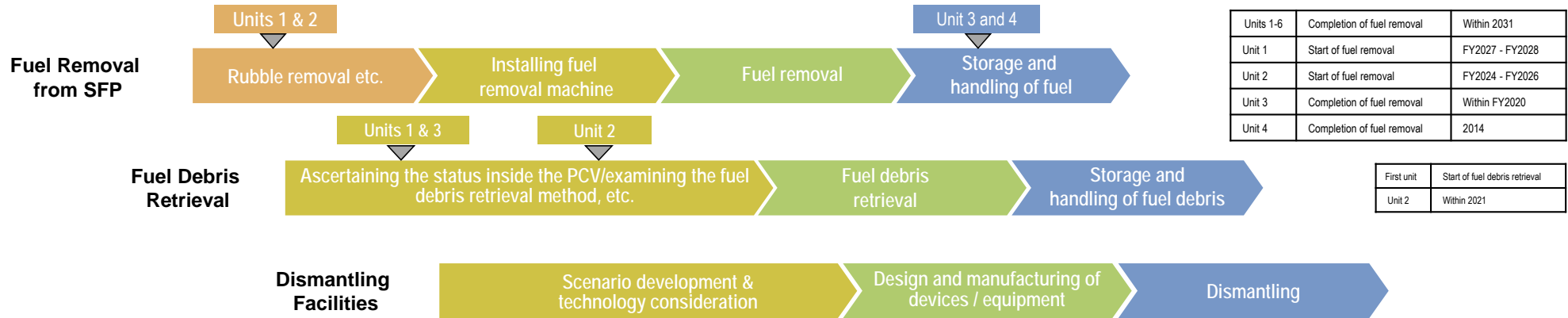


Main decommissioning work and steps

Fuel removal from the spent fuel pool was completed in December 2014 at Unit 4 and on February 28, 2021 at Unit 3.
 Work continues sequentially toward the start of fuel removal from Units 1 and 2 and debris (Note 1) retrieval from Units 1-3.

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



Contaminated water management – triple-pronged efforts -

(1) Efforts to promote contaminated water management based on the three basic policies

- ① “Remove” the source of water contamination
- ② “Redirect” fresh water from contaminated areas
- ③ “Retain” contaminated water from leakage

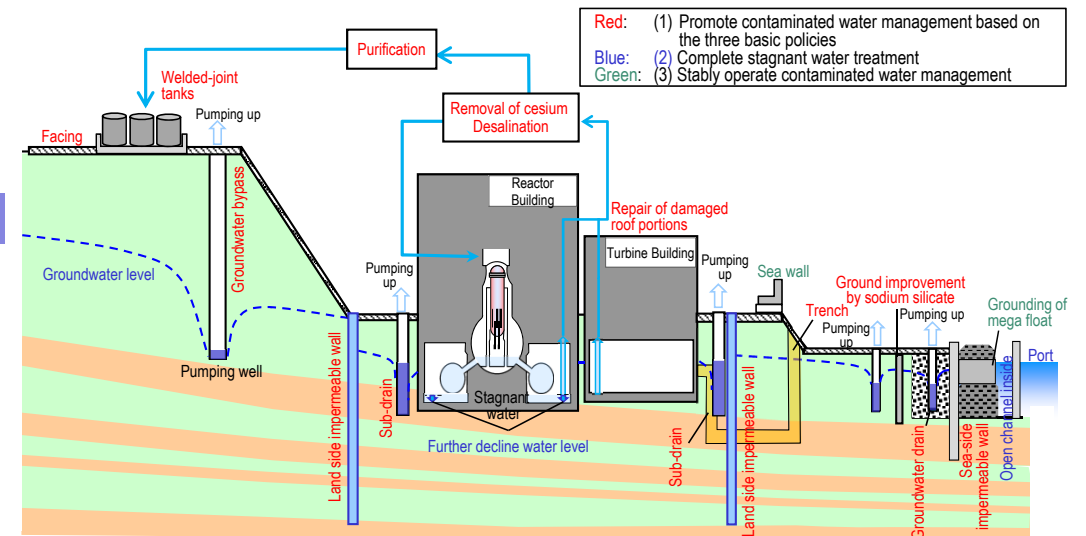
- Strontium-reduced water from other equipment is being re-treated in the multi-nuclide removal equipment (ALPS) and stored in welded-joint tanks.
- Multi-layered contaminated water management measures, including land-side impermeable walls and sub-drains, have stabilized the groundwater at a low level and the increased contaminated water generated during rainfall is being suppressed by repairing damaged portions of building roofs, facing onsite, etc. Through these measures, the generation of contaminated water was **reduced** from approx. 540 m³/day (in May 2014) to approx. 180 m³/day (in FY2019) and **approx. 140 m³/day (in 2020)**.
- Measures continue to further suppress the generation of contaminated water to 100 m³/day or less within 2025.

(2) Efforts to complete stagnant water treatment

- To lower the stagnant water levels in buildings as planned, work to install additional stagnant water transfer equipment is underway. At present, the floor surface exposure condition can be maintained except for the Unit 1-3 Reactor Buildings, Process Main Building and the High Temperature Incinerator Building.
- In 2020, treatment of stagnant water in buildings was completed, except for the Unit 1-3 Reactor Buildings, Process Main Building and High-Temperature Incinerator Building. For Reactor Buildings, the amount of stagnant water there will be reduced to about half of the amount at the end of 2020 during the period FY2022-2024.
- For Zeolite sandbags on the basement floors of the Process Main Building and High-Temperature Incinerator Building, measures to reduce the radiation dose are being examined with stabilization in mind.

(3) Efforts to stably operate contaminated water management

- To prepare for tsunamis, various measures are underway. For heavy rain, sandbags are being installed to suppress direct inflow into buildings while work closing building openings and installing sea walls to enhance drainage channels and other measures are being implemented as planned.



Progress status

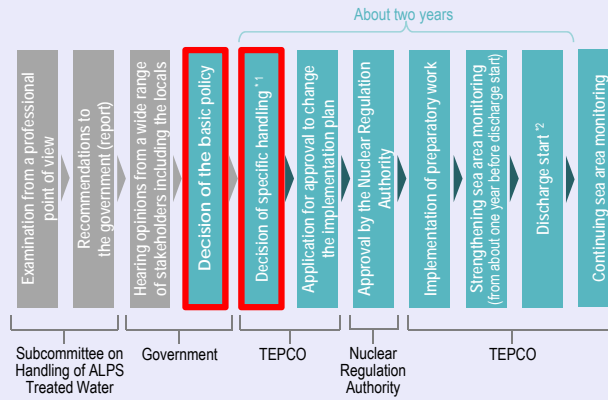
◆ The temperatures of the Reactor Pressure Vessel (RPV) and Primary Containment Vessel (PCV) of Units 1-3 have been maintained within the range of approx. 15-25°C¹ over the past month. There was no significant change in the concentration of radioactive materials newly released from Reactor Buildings into the air². It was concluded 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 March 2021, the radiation exposure dose due to the release of radioactive materials from the Unit 1-4 Reactor Buildings was evaluated at less than 0.00005 mSv/year at the site boundary. The annual radiation dose from natural radiation is approx. 2.1 mSv/year (average in Japan).

The policy on handling of ALPS treated water decided

In "The Inter-Ministerial Council for Contaminated Water, Treated water and Decommissioning" held on April 13, the basic policy on handling of ALPS treated water was decided. Based on this policy, the response of TEPCO was announced on April 16.

Regarding the discharge of ALPS treated water into the sea, TEPCO must comply with the regulatory standards and others related to safety to secure the safety of the public, surrounding environment and agricultural, forestry and fishery products. To minimize adverse impacts on reputation, monitoring will be further enhanced and objectivity and transparency ensured by engaging with third-party experts and safety will be checked by IAEA. Moreover, accurate information will be disseminated continuously in a highly transparent manner.



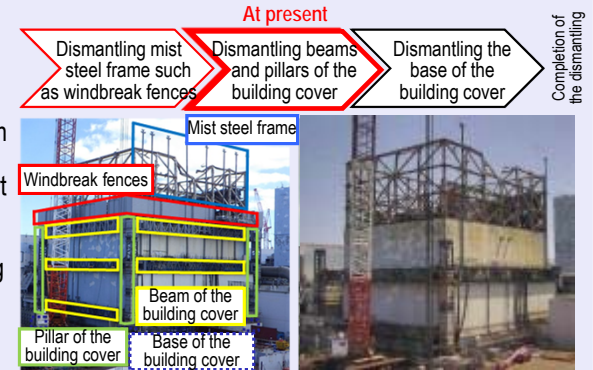
**1 Including radiation impact assessment on the public and environment
 **2 The discharge into the sea will be conducted in small amounts in the initial phase

Dismantling of the Unit 1 Reactor Building cover steadily continues

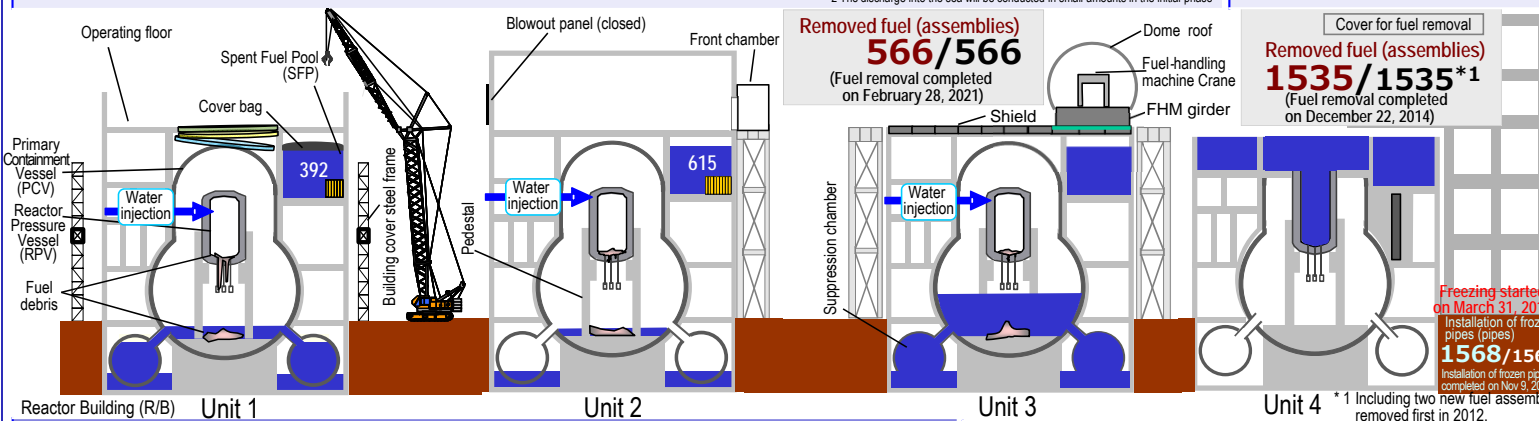
Before installing a large cover over the Reactor Building, dismantling of the interfering building cover (remaining part) started from December 19, 2020 and will be completed in the first part of FY2021.

At present, beams and pillars (upper part) are being dismantled.

Toward completing the installation in FY2023, work will continue according to the plan.



<Full view of the Unit 1 Reactor Building>
 (Left: as of March 2020, Right: as of April 22, 2021)



Inspection of outdoor containers in the temporary storage area implemented continuously

Based on the potential for radioactive materials leaking from the corroded portion of a container housing rubble in the temporary storage area, outdoor containers (approx. 85,000 units) in that area are being inspected from those requiring over-containers or covers.

Containers for which time is needed to identify the contents (approx. 4,000 units) will be investigated.

The Long-Term Maintenance Plan will be reviewed based on this event.

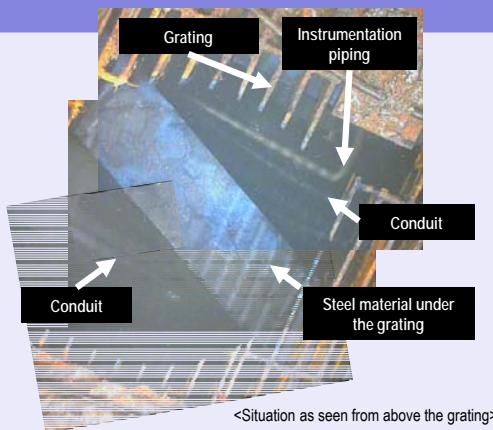
Toward resuming the work to cut obstacles inside the Unit 1 PCV, an internal investigation started

Due to the decline in PCV pressure during preparation for an obstacle investigation inside the PCV, work was suspended from January.

The decline was considered attributable to external force applied to the external door when the investigative equipment was installed.

Measures, including improving the method to install the equipment, were completed on April 19 and the obstacle investigation started from April 23.

Based on the investigative results, cutting work will be resumed.



By suspending water injection into the Unit 3 reactor, the leaking condition from PCV was inspected

A test suspending water injection into the Unit 3 reactor was conducted from April 9 and confirmed the tendency for the water-level drop in the Primary Containment Vessel (PCV) to decline near the lower end of the main steam piping bellows.

At the same time, the inside of the MSIV chamber was investigated.

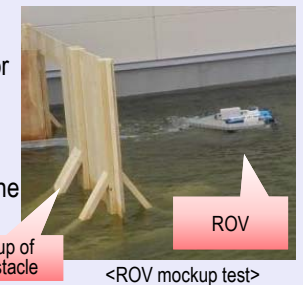
Based on these investigations, the main leakage from the PCV is considered to be near the lower end of those bellows.

Identification of leakage locations in the MSIV chamber and examination of how best to inject water continue.

Toward treatment of Zeolite sandbags, preparation for investigation by a boat-type ROV proceeds

Toward treatment of Zeolite sandbags, an environmental investigation using a boat-type ROV, a modified underwater ROV, is planned inside the Process Main Building and the High Temperature Incinerator Building.

A mockup test is currently underway. Based on the results, the investigation will start from late May.



Major initiatives – Locations on site



* Data of Monitoring Posts (MP1-MP8.)

Data (10-minute values) of Monitoring Posts (MPs) measuring the airborne radiation rate around site boundaries showed 0.360 – 1.186 $\mu\text{Sv/h}$ (March 24 – April 25, 2021).

We improved the measurement conditions of monitoring posts 2 to 8 to measure the air-dose rate precisely. Construction work, 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.

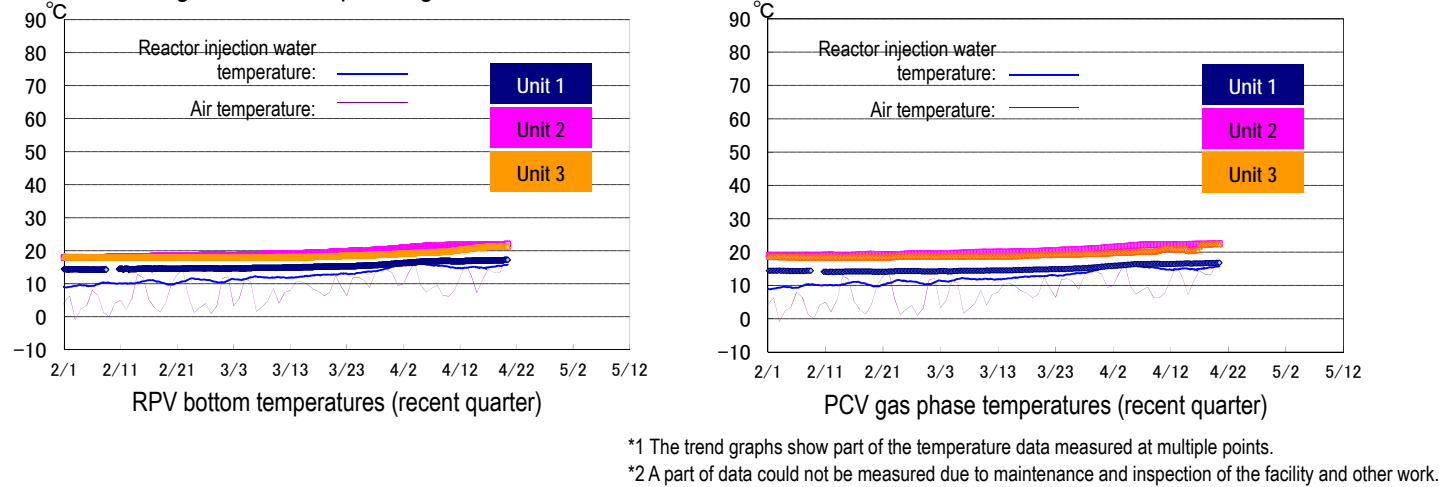
The radiation shielding panels around monitoring post No. 6, which is one of the instruments used to measure the radiation dose at the power station site boundary, were taken off from July 10 - 11, 2013, since further deforestation, etc. had caused the surrounding radiation dose to decline significantly.

Provided by Japan Space Imaging Corp., photo taken on May 24, 2020
Product (C) [2020] DigitalGlobe, Inc., a Maxar company

I. Confirmation of the reactor conditions

Temperatures inside the reactors

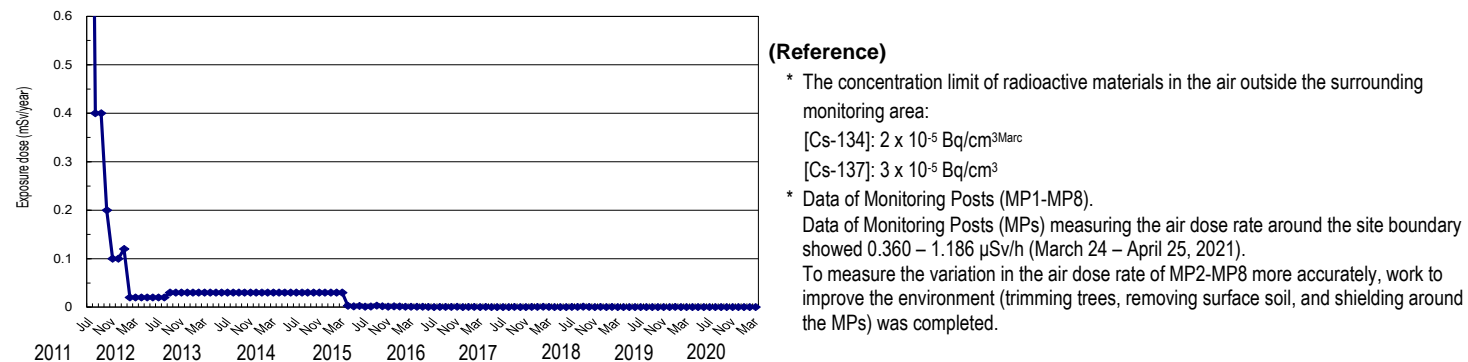
Through continuous reactor cooling by water injection, the temperatures of the Reactor Pressure Vessel (RPV) bottom and the Primary Containment Vessel (PCV) gas phase were maintained within the range of approx. 15 to 25°C for the past month, though it varied depending on the unit and location of the thermometer.



Release of radioactive materials from the Reactor Buildings

As of March 2021, the concentration of radioactive materials newly released from Reactor Building Units 1-4 into the air and measured at the site boundary was evaluated at approx. 2.3×10^{-12} Bq/cm³ and 3.2×10^{-12} Bq/cm³ for Cs-134 and -137 respectively, while the radiation exposure dose due to the release of radioactive materials there was less than 0.00005 mSv/year.

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



Note 1: 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.

Note 2: Radiation dose was calculated using the evaluation values of release amount from Units 1-4 and Units 5 and 6. The radiation dose of Unit 5 and 6 was evaluated based on expected release amount during operation until September 2019 but the evaluation method was reviewed and changed to calculate based on the actual measurement results of Units 5 and 6 from October.

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 anomaly 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

Contaminated water management

Based on the three basic policies: "remove" the source of water contamination, "redirect" fresh water from contaminated areas and "retain" contaminated water from leakage, multi-layered contaminated water management measures have been implemented to stably control groundwater

➤ Status of contaminated water generated

- Multi-layered measures, including pumping up by sub-drains and land-side impermeable walls, which were implemented to control the continued generation of contaminated water, suppressed the groundwater inflow into buildings.
- After implementing "redirecting" measures (groundwater bypass, sub-drains, land-side impermeable walls and others) and rainwater prevention measures, including repairing damaged parts of building roofs, the amount of contaminated water generated within 2020 declined to approx. 140 m³/day.
- Measures will continue to further reduce the amount of contaminated water generated.

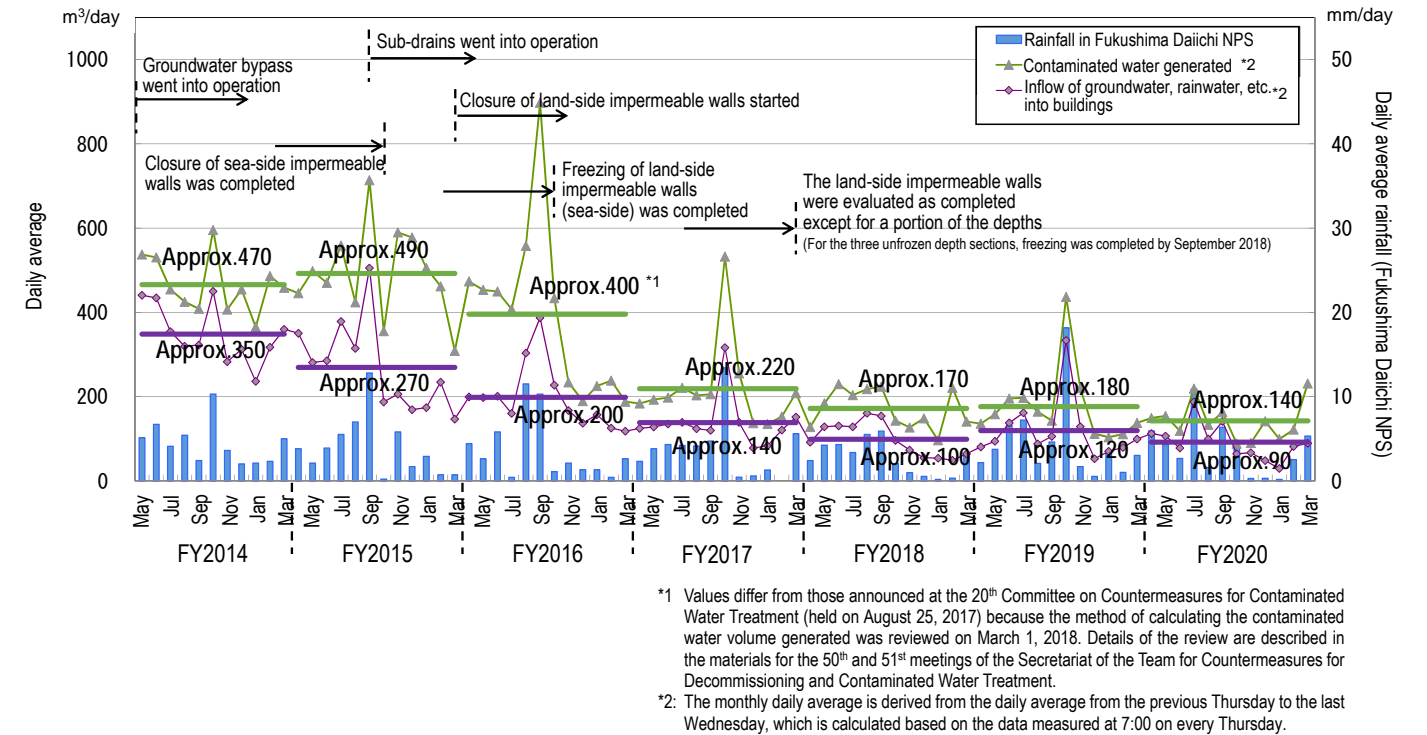


Figure 1: Changes in contaminated water generated and inflow of groundwater and rainwater into buildings

➤ 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 then 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 April 26, 2021, 634,000 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.

➤ Operation of the Water-Treatment Facility special for Sub-drain & Groundwater drains

- To reduce the level of groundwater flowing into the buildings, work began to pump up groundwater from wells (sub-drains) around the buildings on September 3, 2015. The pumped-up groundwater was then purified at dedicated facilities and released from September 14, 2015, in the presence of officials from the Intergovernmental Liaison Office for the Decommissioning and Contaminated Water Issue of the Cabinet Office. Up until April 25, 2021, a total of 1,071,000 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 after the sea-side impermeable walls had been closed, pumping started on November 5, 2015. Up until April 25, 2021, a total of approx. 261,000 m³ had been pumped up and a volume of under 10 m³/day is being transferred from the groundwater drain to the Turbine Buildings (average for the period March 18 - April 21, 2021).
- As one of the multi-layered contaminated-water management measures, in addition to a waterproof pavement that aims to prevent rainwater infiltrating, facilities to enhance the sub-drain treatment system were installed and went into

operation from April 2018, increasing the treatment capacity from 900 to 1,500 m³/day and improving reliability. Operational efficiency was also improved to treat up to 2,000 m³/day for almost a week during the peak period.

- To maintain the groundwater level, work to install additional sub-drain pits and recover those existing is underway. The additional pits are scheduled to start operation sequentially, from pits for which work is completed (12 of 14 new sub-drain pits went into operation). To recover existing pits, work for all three pits scheduled was completed, all of which went into operation from December 26, 2018. Work to recover another pit (No. 49) started from November 2019 and it went into operation from October 9, 2020.
- To eliminate the need to suspend water pumping while cleaning the sub-drain transfer pipe, the pipe will be duplicated. Installation of the pipe and ancillary facilities was completed.
- Since the sub-drains went into operation, the inflow to buildings tended to decline to under 150 m³/day when the sub-drain water level declined below T.P. 3.0 m but increased during rainfall.

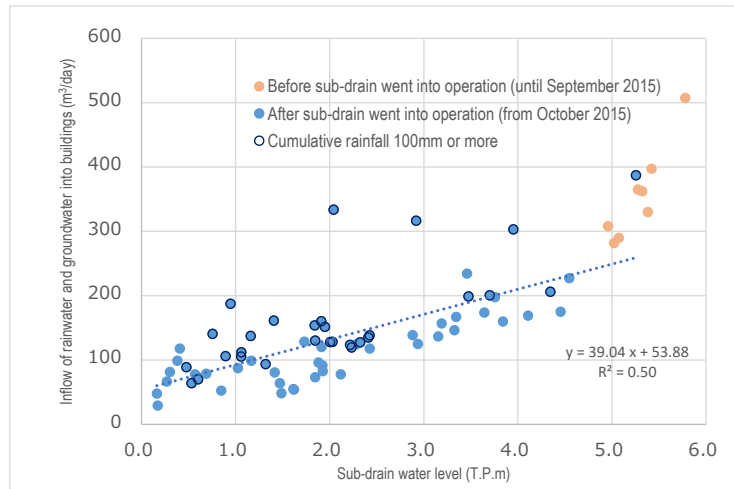


Figure 2: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Units 1-4 sub-drains

➤ Implementation status of facing

- Facing is a measure involving asphaltting of the on-site surface to reduce the radiation dose, prevent rainwater infiltrating the ground and decrease the amount of underground water flowing into buildings. As of the end of March 2021, 95% of the planned area (1,450,000 m² on site) had been completed. For the area inside the land-side impermeable walls, implementation proceeds appropriately after constructing a yard from implementable zones that do not affect the decommissioning work. As of the end of March 2021, 25% of the planned area (60,000 m²) had been completed.

➤ Construction status of the land-side impermeable walls and status of groundwater levels around the buildings

- An operation to maintain the land-side impermeable walls and prevent the frozen soil from thickening further continued from May 2017 on the north and south sides and started from November 2017 on the east side, where sufficiently thick frozen soil was identified. The scope of the maintenance operation was expanded in March 2018.
- In March 2018, construction of the land-side impermeable walls was completed, except for a portion of the depth, based on a monitoring result showing that the underground temperature had declined below 0°C in almost all areas, while on the mountain side, the difference in internal and external water levels increased to approx. 4-5 m. The 21st Committee on Countermeasures for Contaminated-Water Treatment, held on March 7, 2018, evaluated that alongside the function of sub-drains and other measures, a water-level management system to stably control groundwater and redirect groundwater from the buildings had been established and allowed the amount of contaminated water generated to be reduced significantly.
- A supplementary method was implemented for the unfrozen depth and it was confirmed that the temperature of this portion had declined below 0°C by September 2018. From February 2019, a maintenance operation started throughout all sections.

- The groundwater level in the area inside the land-side impermeable walls has been declining every year. On the mountain side, the difference between the inside and outside was maintained, despite varying during rainfall. The water level of the groundwater drain observation well has been maintained at approx. T.P. +1.5 m, sufficiently below the ground surface (T.P. 2.5 m).

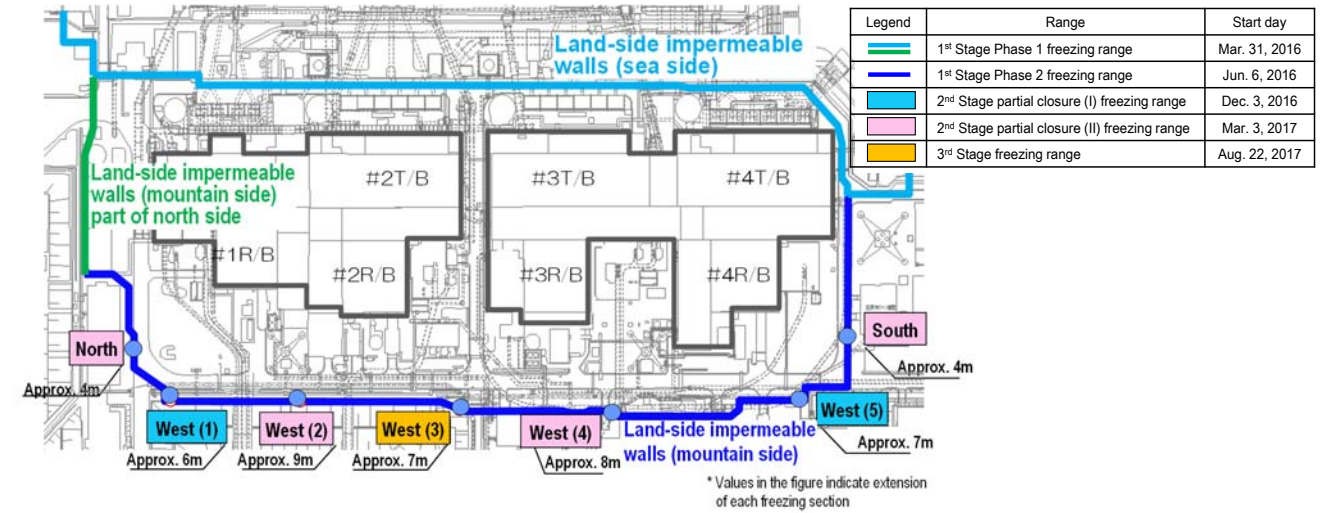


Figure 3: Closure parts of the land-side impermeable walls (on the mountain side)

➤ Operation of multi-nuclide removal equipment

- Regarding the multi-nuclide removal equipment (existing 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; and for high-performance equipment, from October 18, 2014). The additional multi-nuclide removal equipment went into full-scale operation from October 16, 2017.
- As of April 15, 2021, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 467,000, 698,000 and 103,000 m³, respectively (including approx. 9,500 m³ stored in the J1(D) tank, which contained water with highly concentrated radioactive materials at the System B outlet of the existing multi-nuclide removal equipment).
- To reduce the risks of strontium-reduced 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 April 15, 2021, approx. 789,000 m³ had been treated.

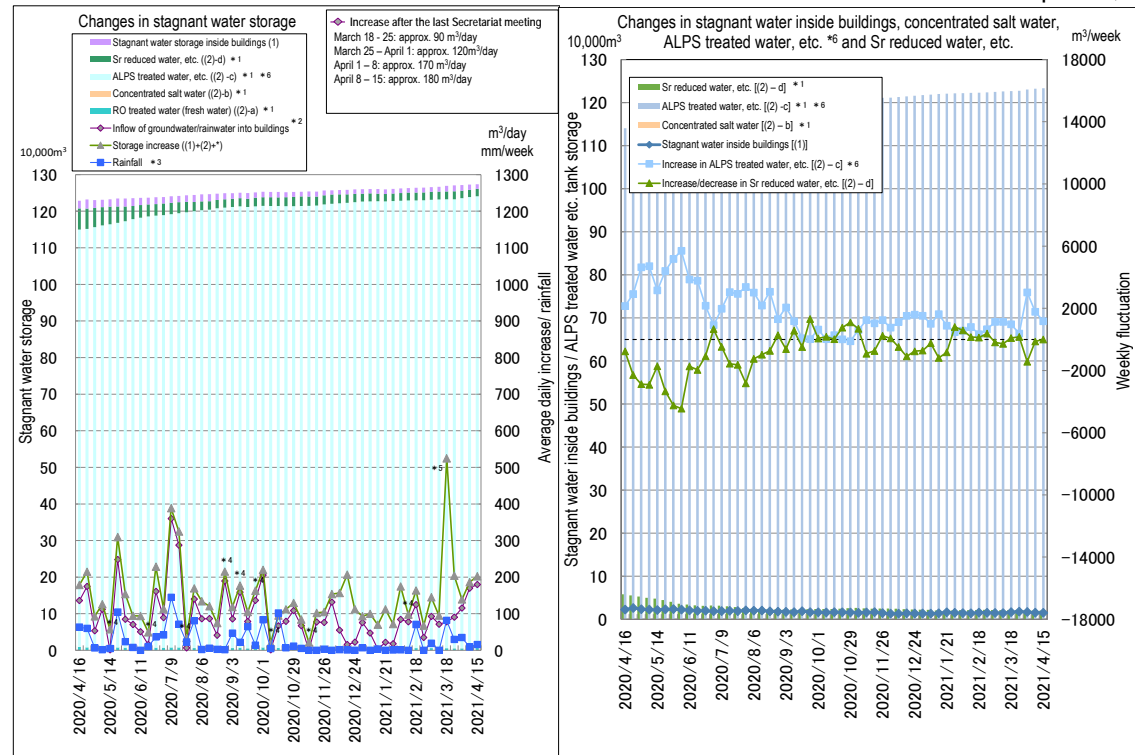
➤ Toward reducing the risk of contaminated water stored in tanks

- Treatment measures comprising the removal of strontium by cesium-adsorption apparatus (KURION) (from January 6, 2015), the secondary cesium-adsorption apparatus (SARRY) (from December 26, 2014) and the third cesium-adsorption apparatus (SARRY II) (from July 12, 2019) are underway. Up until April 15, 2021, approx. 633,000 m³ had been treated.

➤ Measures in the Tank Area

- Rainwater accumulates and is collected inside the area of contaminated-water tanks. After removing radionuclides, the rainwater is sprinkled over the site grounds, if the radioactivity level does not meet the standard for discharging into the environment since May 21, 2014 (as of April 19, 2021, a total of 177,000 m³).

As of April 15, 2021



- *1: Water amount for which the water-level gauge indicates 0% or more
 *2: To detect storage increases more accurately, the calculation method was reviewed as follows from February 9, 2017: (The revised method was applied from March 1, 2018)
 [(Inflow of groundwater/rainwater into buildings) + (other transfer) + (chemical injection into ALPS)]
 *3: Changed from December 13, 2018 from rainfall in Namie to that within the site.
 *4: Considered attributable to fluctuation inflow of groundwater, rainwater, and others to buildings due to the decline in the level of stagnant water in buildings.
 (May 7-14, June 11-18, July 16-23, August 20-27, September 3-10 and 17-24, October 1-8, November 12-19, 2020 and February 4-11, 2021)
 *5: Stored amount increased due to transfer to buildings in association with decommissioning work on March 18, 2021.
 (Major breakdown of the transferred amount: (1) Stagnant water inside the tank fences (water transferred from the Shallow Draft Quay drainage channel) was transferred to the Process Main Building: approx. 390 m³/day, (2) Stagnant water inside the tank fences (water transferred from the Shallow Draft Quay drainage channel) was transferred to the High Temperature Incinerator Building: approx. 10 m³/day, (3) Transfer from the Unit 3 additional FSTR to the Unit 3 Radioactive Waste Treatment Building: approx. 10 m³/day and others)
 *6: The notation of treated water by the multi-nuclide removal equipment and others was reviewed in accordance with the definition change of ALPS treated water by the Government (April 27, 2021)

Figure 4: Status of stagnant water storage

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.

➤ Main work to help spent fuel removal at Unit 1

- After examining two methods: (i) installing a cover after rubble removal and (ii) initially installing a large cover over the Reactor Building and then removing rubble inside the cover, method (ii) was selected to ensure safer and more secure removal.
- Before removing the fallen roof and other objects on the south side, to minimize the risk of the overhead crane/fuel-handling machine shifting its position, becoming imbalanced and subsequently falling, materials to support the fuel-handling machine from below will be installed.
- Among the measures to prevent and alleviate rubble falling, work to install supports for the Unit 1 fuel-handling machine started from October 6, 2020 and was completed by October 23.
- To install the support for the overhead crane, preparation started from October 2020 and the work was completed on November 24.
- From December 19, 2020, before installing a large cover over the Unit 1 Reactor Building, dismantling of the interfering building cover (remaining part) started. The dismantling will be completed in June 2021 and work to install a large cover will start from the first half of FY2021.
- Rubble removal and other work will proceed steadily with safety first, toward starting fuel removal during the period FY2027 to FY2028.

➤ Main work to help spent fuel removal at Unit 2

- After completing the training to practice work skills for transportation, preparatory work inside the operating floor started from July 20, 2020. Containers housing the remaining objects during the previous work were transported to

the solid waste storage facility from August 26, which was completed by December 11.

- For fuel removal methods, based on the investigative results inside the operating floor from November 2018 to February 2019, a method to access from a small opening installed on the south side of the building was selected with aspects such as dust management and lower work exposure in mind (the method previously examined had involved fully dismantling the upper part of the building).

➤ Completion of fuel removal at Unit 3

- On October 11, 2013, removal of large rubble on the top floor of the Reactor Building was completed.
- On November 21, 2015, removal of large rubble inside the spent fuel pool using a crawler crane was completed.
- On June 10, 2016, decontamination on the top floor of the Reactor Building was completed. On December 2, installation of shielding on the top floor of the Reactor Building was completed.
- On January 17, 2017, installation of a cover for fuel removal started. On November 12, a fuel-handling machine was installed inside the cover.
- On February 23, 2018, installation of a cover for fuel removal was completed.
- On April 15, 2019, fuel removal started.
- On February 28, 2021, fuel removal was completed.

Retrieval of fuel debris

➤ Plan to decrease the water level in the Unit 1 PCV

- For the Unit 1 Primary Containment Vessel (PCV) which has a high water level, to improve its earthquake resistance, the water level in the suppression chamber (S/C) will be decreased in a phased manner.
- At present, it was confirmed that in addition to the assumption of S/C inclusive water momentarily leaking outside, even though the water level of the building increases on a conservative condition, it will remain below the first floor of the Reactor Building and water inside the building will not directly leak outside.
- Toward reducing the water level of the Unit 1 PCV (S/C), the feasibility of water intake from the PCV (S/C) will be examined and the environment around the facility-installation area will be improved. Moreover, the quality of S/C inclusive water will be determined (by installing a sampling mechanism and sampling water).
- At the same time, the water-level reduction of the dry well by reducing the water injection rate will also be examined.

➤ Progress status of preparation for the investigation inside the Unit 2 PCV and trial retrieval

- Regarding the robot arm, which is being developed in the UK, operation tests and a confirmation of combination with the enclosure are underway.
- After this process, the equipment will be transported to Japan and undergo performance verification tests and others. The transportation time will be carefully examined by taking the infection status of COVID-19 into consideration.

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 March 2021, the total storage volume for concrete and metal rubble was approx. 311,000 m³ (+1,100 m³ compared to at the end of February with an area-occupation rate of 77%). The total storage volume of trimmed trees was approx. 134,500 m³ (+100 m³, with an area-occupation rate of 77%). The total storage volume of used protective clothing was approx. 32,200 m³ (+1,000 m³, with an area-occupation rate of 47%). The increase in rubble was mainly attributable to work around the Unit 1-4 buildings, work related to tanks, transfer for area arrangement and work related to water-treatment facilities, while the increase in used protective clothing was attributable to the suspension of incinerator operation.

➤ Management status of secondary waste from water treatment

- As of April 1, 2021, the total storage volume of waste sludge was 420 m³ (area-occupation rate: 60%), while that of

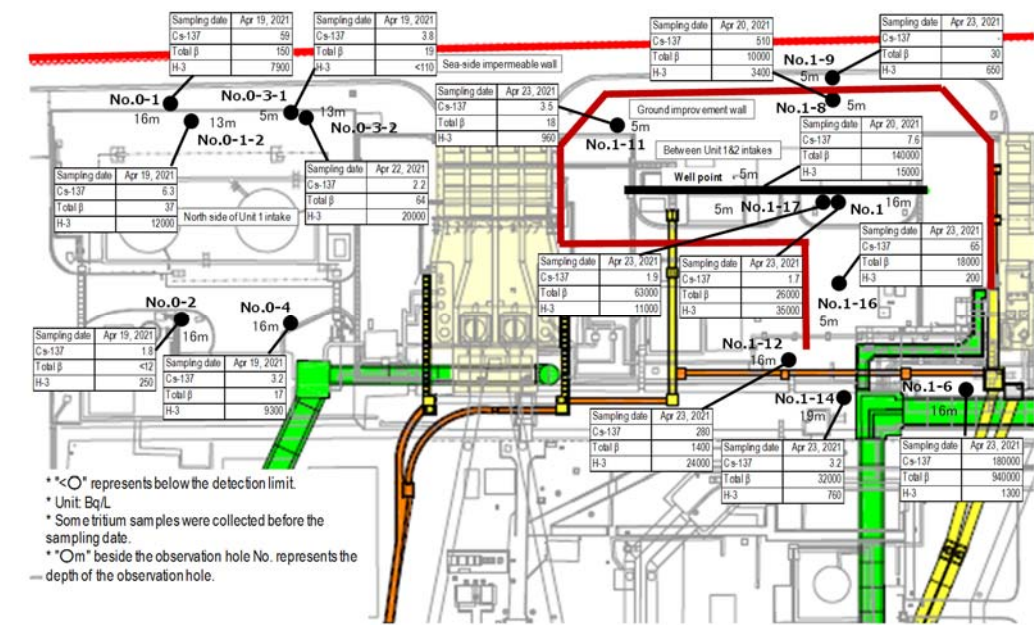
concentrated waste fluid was 9,345 m³ (area-occupation rate: 91%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment and other vessels, was 5,090 (area-occupation rate: 80%).

- Progress status of the Large Waste Storage Facility in the Fukushima Daiichi Nuclear Power Station
 - The lifting equipment and the spent adsorption vessel storage frame of the Large Waste Storage Facility will be used for the long term or are scheduled to be installed. Based on the Fukushima Prefecture Offshore Earthquake occurring on February 13, the seismic margin of these facilities will be reviewed to a design with a larger margin.
 - The completion time will be changed after confirming the period to review the design and manufacturing processes and others.

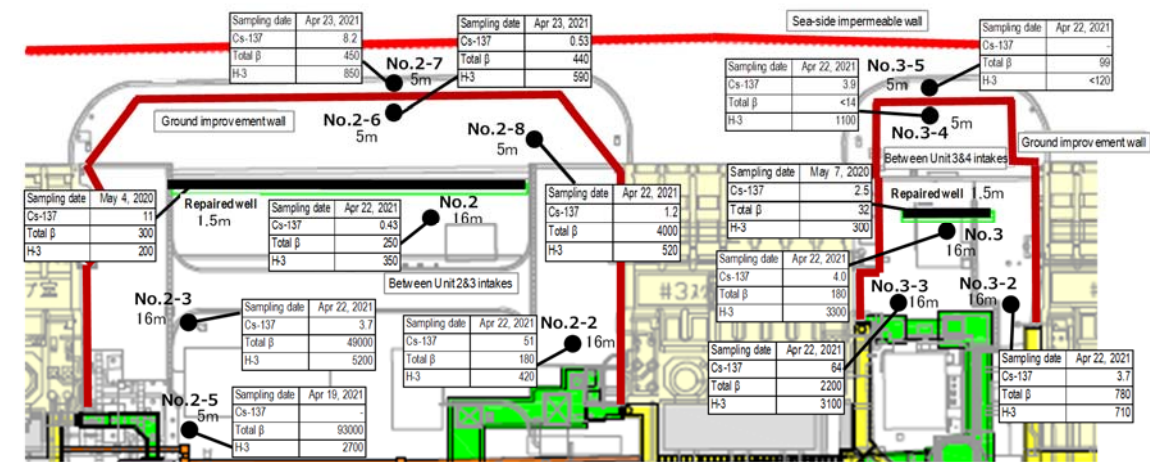
Reduction in radiation dose and mitigation of contamination

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
 - In the Unit 1 intake north side area, the H-3 concentration was below the legal discharge limit of 60,000 Bq/L at all observation holes and remained constant or has been declining overall. The concentration of total-β radioactive materials increased temporarily from April 2020 but currently remains constant or is declining overall.
 - In the area between the Unit 1 and 2 intakes, the H-3 concentration has remained below the legal discharge limit of 60,000 Bq/L at all observation holes. It has been increasing or declining at No. 1-14 but has remained constant or been declining at many observation holes overall. The concentration of total-β radioactive materials has remained constant or been declining at many observation holes overall.
 - In the area between the Unit 2 and 3 intakes, the H-3 concentration has been below the legal discharge limit of 60,000 Bq/L at all observation holes and remained almost constant or been declining. The concentration of total-β radioactive materials has remained almost constant or been declining overall though increasing and declining at No. 2-3.
 - In the area between the Unit 3 and 4 intakes, the H-3 concentration has been below the legal discharge limit of 60,000 Bq/L at all observation holes and remained constant or been declining though increasing and declining at No. 3-3. The concentration of total-β radioactive materials has also remained constant or been declining overall.
 - The concentration of radioactive materials in drainage channels has remained constant, despite increasing during rainfall.
 - In the open channel area of seawater intake for Units 1 to 4, the concentration of radionuclides in seawater has remained below the legal discharge limit, despite increases in Cs-137 and Sr-90 noted during rainfall. They have also been declining following the completed installation and the connection of steel pipe sheet piles for the sea-side impermeable walls. The concentration of Cs-137 has remained slightly higher in front of the south side impermeable walls and slightly lower on the north side of the east breakwater since March 20, 2019, when the silt fence was transferred to the center of the open channel due to mega float-related construction.
 - In the port area, the concentration of radionuclides in seawater has remained below the legal discharge limit, despite increases in Cs-137 and Sr-90 observed during rainfall. They have remained below the level of those in the Units 1-4 intake open channel area and been declining following the completed installation and connection of steel pipe sheet piles for the sea-side impermeable walls.
 - In the area outside the port, regarding the concentration of radioactive materials in seawater, those of Cs-137 and Sr-90 declined and remained low after steel pipe sheet piles for the sea-side impermeable walls were installed and connected.



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



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

Figure 5: Groundwater concentration on the Turbine Building east side

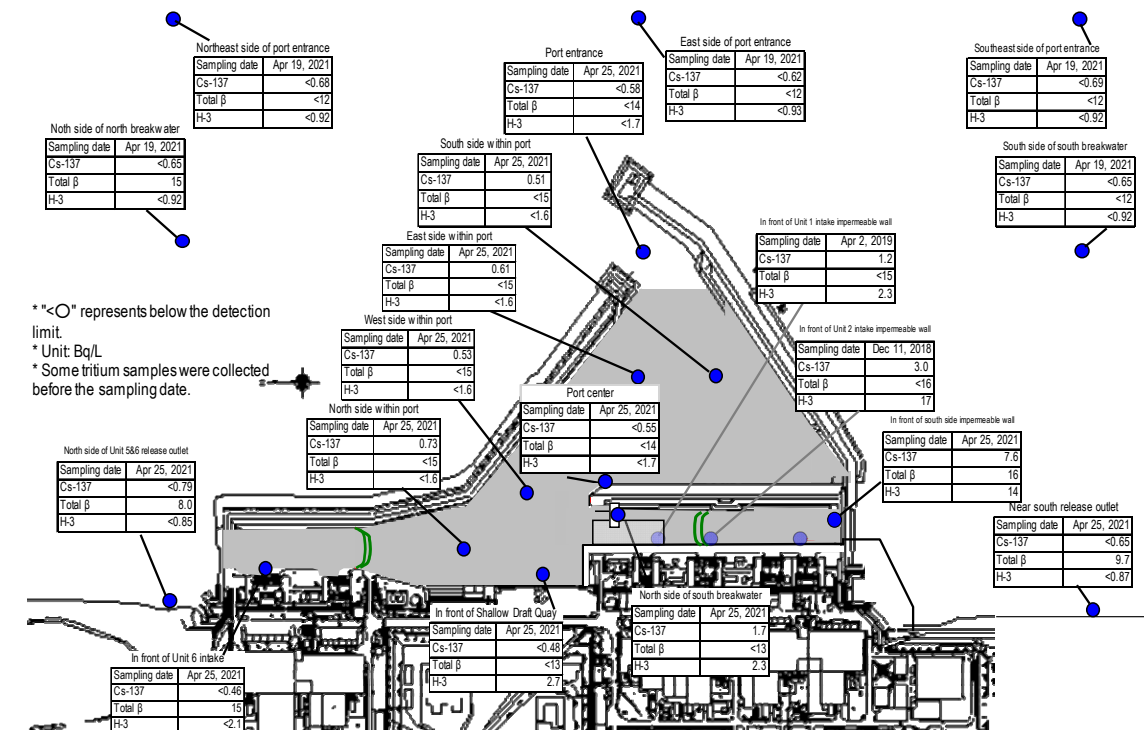


Figure 6: Seawater concentration around the port

Outlook of the number of staff required and efforts to improve the labor environment and conditions

Adequate number of staff will be secured in the long-term while firmly implementing radiation control of workers. The work environment and labor conditions will be continuously improved by responding to the needs on the site.

➤ **Staff management**

- The monthly average total of personnel registered for at least one day per month to work on site during the past quarter from December 2020 to February 2021 was approx. 8,900 (cooperating company workers and TEPCO HD employees), which exceeded the monthly average number of actual workers (approx. 6,800). Accordingly, sufficient personnel are registered to work on site.
- It was confirmed with the prime contractors that the estimated manpower necessary for the work in April 2021 (approx. 3,600 weekday per day: cooperating company workers and TEPCO HD employees) would be secured at present. The average numbers of workers per day for each month (actual values) of recent 2 years were maintained, with approx. 3,400 to 4,200 (see Figure 7).
- The number of workers from within Fukushima Prefecture remained constant while the number of those from outside decreased. The local employment ratio (cooperating company workers and TEPCO HD employees) as of March 2021 also remained constant at around 65%.
- The monthly average exposure doses of workers remained at approx. 0.22, 0.20 and 0.21 mSv/month during FY2017, 2018 and 2019, respectively. (Reference: Annual average exposure dose 20 mSv/year \approx 1.7 mSv/month)
- For most workers, the exposure dose was sufficiently within the limit and allowed them to continue engaging in radiation work.

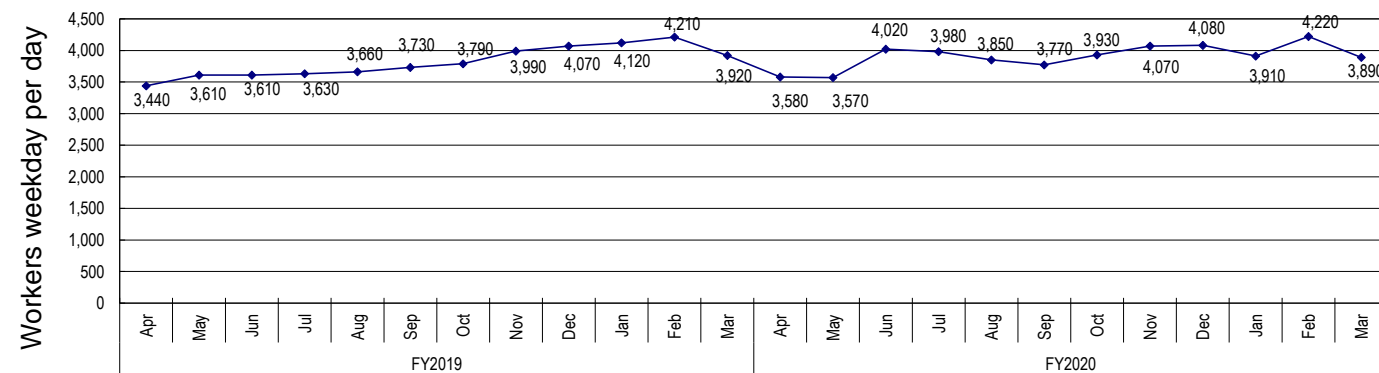


Figure 7: Changes in the average number of workers weekday per day for each month of recent 2 years (actual values)

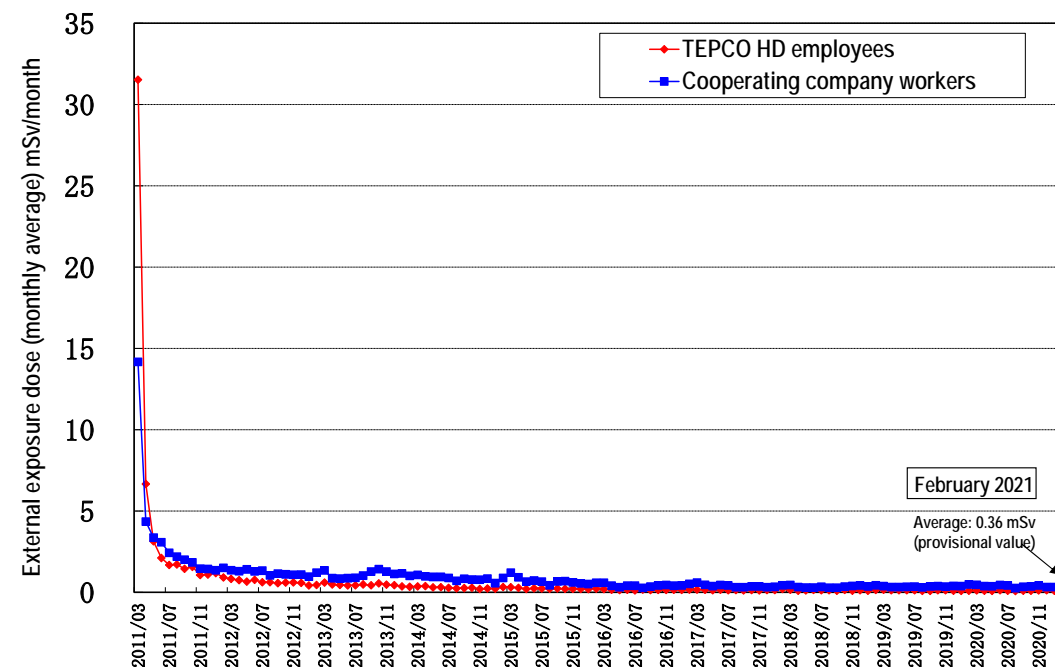


Figure 8: Changes in monthly individual worker exposure dose (monthly average exposure dose since March 2011)

➤ **Measures to prevent infection and expansion of influenza and norovirus**

- Since November, measures for influenza and norovirus have been implemented, including free influenza vaccinations (subsidized by TEPCO HD) at medical clinics around the site (from October 12, 2020 to January 28, 2021) for partner company workers. As of January 28, 2021, a total of 5,393 had been vaccinated. In addition, other measures are also being implemented across the board, including daily actions to prevent infection and expansion (measuring body temperature, health checks and monitoring infection status) and response after detecting possible infections (swift exit of possible patients and control of entry, mandatory wearing of masks in working spaces, etc.).

➤ **Status of influenza and norovirus cases**

- Until the 16th week of 2021 (April 19-25, 2021), one influenza infection and one norovirus infection respectively were recorded. The totals for the same period for the previous season showed 170 cases of influenza and ten norovirus infections.

Note: The above data is based on reports from TEPCO and partner companies, which include diagnoses at medical clinics outside the site. The subjects of this report were workers of partner companies and TEPCO in Fukushima Daiichi and Daini Nuclear Power Stations.

➤ **COVID-19 infectious disease countermeasures**

- As of 15:00, April 26, 2021, 15 TEPCO HD employees and cooperating company workers (including one TEPCO HD employee) of the Fukushima Daiichi Nuclear Power Station (NPS) had contracted COVID-19. No significant influence on decommissioning work, such as a delay to the work processes due to this infection, had been identified.
- Countermeasures have continued to prevent the COVID-19 infection spreading, such as requiring employees to take their temperature prior to coming to the office, wear masks at all times and avoid the “Three Cs” (Closed spaces, Crowded places, Close-contact settings) by using the rest house in shifts and others, eating silently, etc. Moreover, based on the application of semi-emergency coronavirus measures, such as to prevent the spread of disease on April 5, in addition to the ongoing infection prevention measures, a portion of the measures was enhanced, including when moving across area where semi-emergency coronavirus measures, such as to prevent the spread of disease, were applied (including returning home during the Golden Week holidays), an advanced check of the action plan by a supervisor second-ranked or higher is necessary (as of April 24, 2021).

➤ **FY2020 accident occurrence status and FY2021 safety activity plan**

- The number of work accidents in FY2020 decreased to 27 from 32 in the previous fiscal year. The number of accidents decreased but still remained high. Issues need to be analyzed and ongoing accident prevention measures must continue to be reviewed and improved. There were no serious injuries (incapacitating the persons concerned from work for 14 days or more).
- The number of heat stroke cases in FY2020 decreased to 11 from 14 in the previous fiscal year. FY2020 had a hot summer as in the previous year. Heat-stroke rules were followed, heat-stroke prevention measures customized to each company site were implemented, and new ice packs which tripled the cooling effect of conventional equivalents were introduced. Consequently, there were no serious heat stroke cases of degree-II or more. Furthermore, as FY2020 involved many cases of workers with a medical history or chronic diseases, these characteristics will be reflected in the heat-stroke prevention plan as in the previous year.
- In FY2021, safety activities will be implemented focused on “improving safety management skills,” “activities to improve the work environment” and “activities to improve KY.” In addition, measures to prevent heat stroke cases will also be enhanced by improving the operation of ice packs, including introducing more new ice packs and installing additional freezers to eliminate accidents causing injury or death.

➤ **Health management of workers in the Fukushima Daiichi NPS**

- As health management measures in line with the guidelines of the Ministry of Health, Labour and Welfare (issued in August 2015), a scheme was established and operated, whereby prime contractors confirmed reexamination at medical institutions and the subsequent status of workers who were diagnosed as requiring “detailed examination and treatment” in the health checkup, with TEPCO confirming the operation status by the prime contractors.
- The recent report on the management status of the health checkup during the third quarter (October – December) in FY2020 confirmed that the prime contractors had provided appropriate guidance and managed operations properly

under the scheme. The report on the follow-up status during the second quarter in FY2020 and before confirmed that responses to workers, which had not been completed by the time of the previous report, were being provided on an ongoing basis and checking of operations will continue.

Other

- Alarm issued when the sub-drain purification system started
 - On April 6, when an operator started the supply pump (B) to check for any leakage after a closure flange was installed for the preprocessing filter (B) system of the sub-drain purification system, the alarm “supply pump (B) discharge pressure high-high” was issued and the supply pump was automatically stopped. After the stoppage, it was confirmed that there was no on-site abnormality such as leakage.
 - A reinspection of the system configuration detected that the communication valve with the preprocessing filter (A) system was “fully closed,” although it should have been “fully opened.”
 - Subsequently, the communication valve was “fully opened” and the supply pump (B) was restarted. It was confirmed there was no abnormality in the operation condition and the system such as leakage.
 - The cause was that due to a misunderstanding, the operator having checked the on-site condition started the supply pump (B) without “fully opening” the communication valve with the preprocessing filter (A) system. Recurrence prevention measures will be steadily examined.

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 April 12-22)” ; unit (Bq/L); ND represents a value below the detection limit

Note: The Total 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 April 23, 2021

Cesium-134	ND(0.57)
Cesium-137	ND(0.51)
Total β	ND(13)
Torium	ND(1.7)

Cesium-134	: 3.3 (H25/12/24)	→	ND(0.48)	Below 1/6
Cesium-137	: 7.3 (H25/10/11)	→	ND(0.55)	Below 1/10
Total β	: 69 (H25/8/19)	→	14	Below 1/4
Torium	: 68 (H25/8/19)	→	ND(1.7)	Below 1/40

Cesium-134	: 3.3 (H25/10/17)	→	ND(0.30)	Below 1/10
Cesium-137	: 9 (H25/10/17)	→	0.35	Below 1/20
Total β	: 74 (H25/8/19)	→	ND(13)	Below 1/5
Torium	: 67 (H25/8/19)	→	1.7	Below 1/30

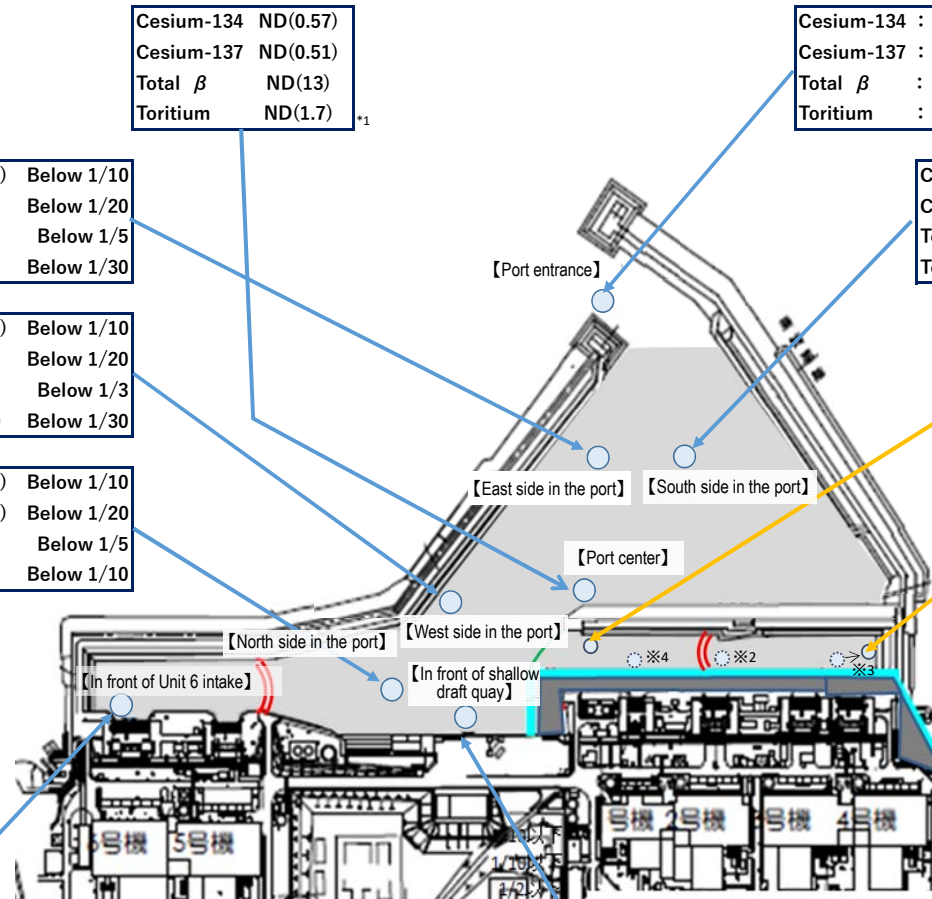
Cesium-134	: 3.5 (H25/10/17)	→	ND(0.29)	Below 1/10
Cesium-137	: 7.8 (H25/10/17)	→	ND(0.35)	Below 1/20
Total β	: 79 (H25/8/19)	→	ND(13)	Below 1/6
Torium	: 60 (H25/8/19)	→	1.6	Below 1/30

Cesium-134	: 4.4 (H25/12/24)	→	ND(0.23)	Below 1/10
Cesium-137	: 10 (H25/12/24)	→	0.45	Below 1/20
Total β	: 60 (H25/7/4)	→	16	Below 1/3
Torium	: 59 (H25/8/19)	→	ND(1.6)	Below 1/30

Cesium-134	: 32 (H25/10/11)	→	ND(0.51)	Below 1/60
Cesium-137	: 73 (H25/10/11)	→	2.1	Below 1/30
Total β	: 320 (H25/8/12)	→	ND(13)	Below 1/20
Torium	: 510 (H25/9/2)	→	5.0	Below 1/100

Cesium-134	: 5 (H25/12/2)	→	ND(0.30)	Below 1/10
Cesium-137	: 8.4 (H25/12/2)	→	ND(0.34)	Below 1/20
Total β	: 69 (H25/8/19)	→	ND(13)	Below 1/5
Torium	: 52 (H25/8/19)	→	2.8	Below 1/10

Cesium-134	ND(0.44)
Cesium-137	5.8
Total β	17
Torium	35



Sea side impermeable wall
Silt fence
Silt fence for construction

Cesium-134	: 2.8 (H25/12/2)	→	ND(0.38)	Below 1/7
Cesium-137	: 5.8 (H25/12/2)	→	ND(0.57)	Below 1/10
Total β	: 46 (H25/8/19)	→	ND(13)	Below 1/3
Torium	: 24 (H25/8/19)	→	2.3	Below 1/10

Cesium-134	: 5.3 (H25/8/5)	→	ND(0.39)	Below 1/10
Cesium-137	: 8.6 (H25/8/5)	→	ND(0.46)	Below 1/10
Total β	: 40 (H25/7/3)	→	19	Below 1/2
Torium	: 340 (H25/6/26)	→	ND(1.7)	Below 1/200

*1: Monitoring commenced in or after March 2014. Monitoring inside the sea-side impermeable walls was finished because of the landfill.
 *2: For the point, monitoring was finished from December 12, 2018 due to preparatory work for transfer of mega float.
 *3: For the point, monitoring point was moved from February 6, 2019 due to preparatory work for transfer of mega float.
 *4: For the point, monitoring was finished from April 3, 2019 due to preparatory work for transfer of mega float.

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

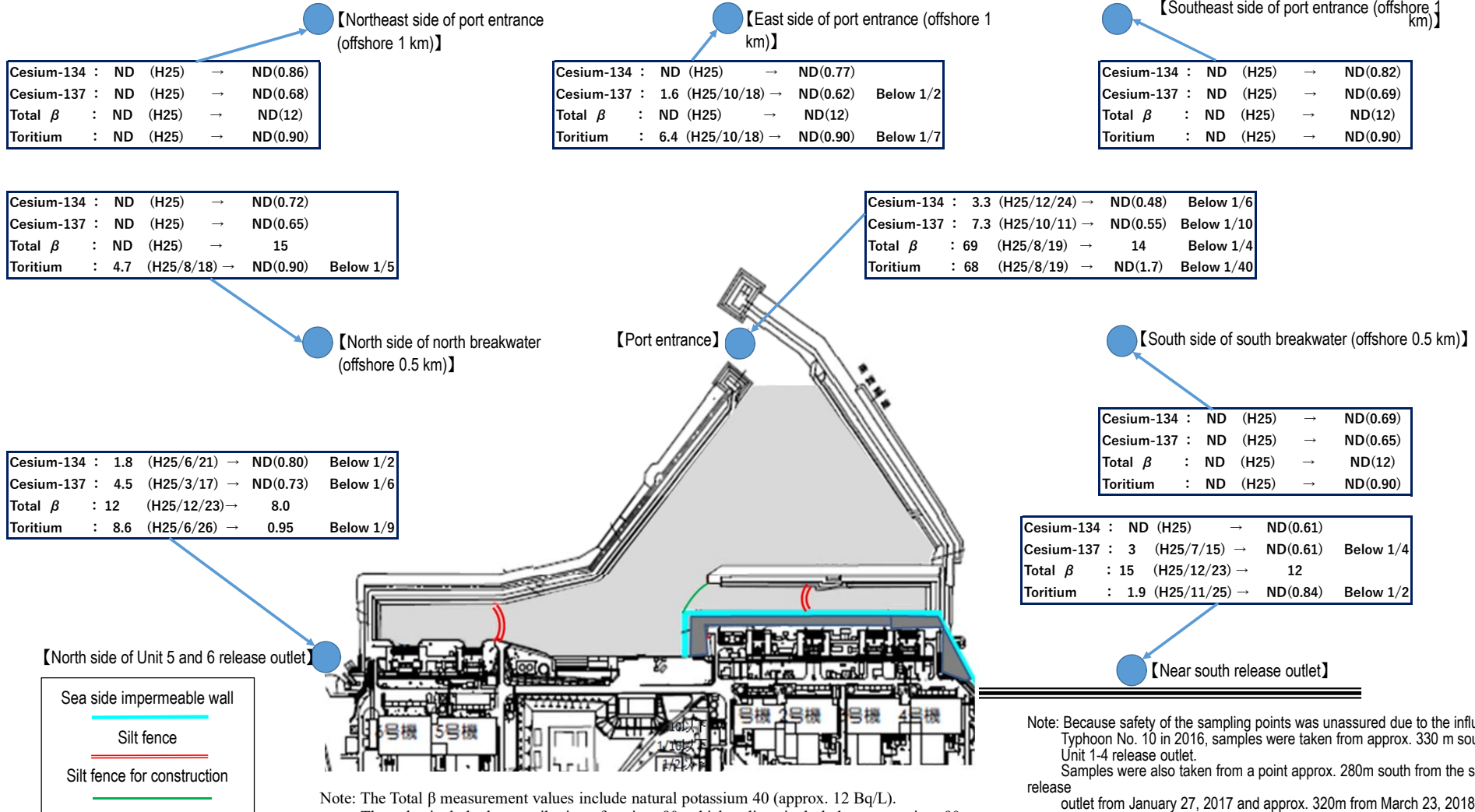
Status of seawater monitoring around outside of the port (comparison between the highest values in 2013 and the latest values)

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

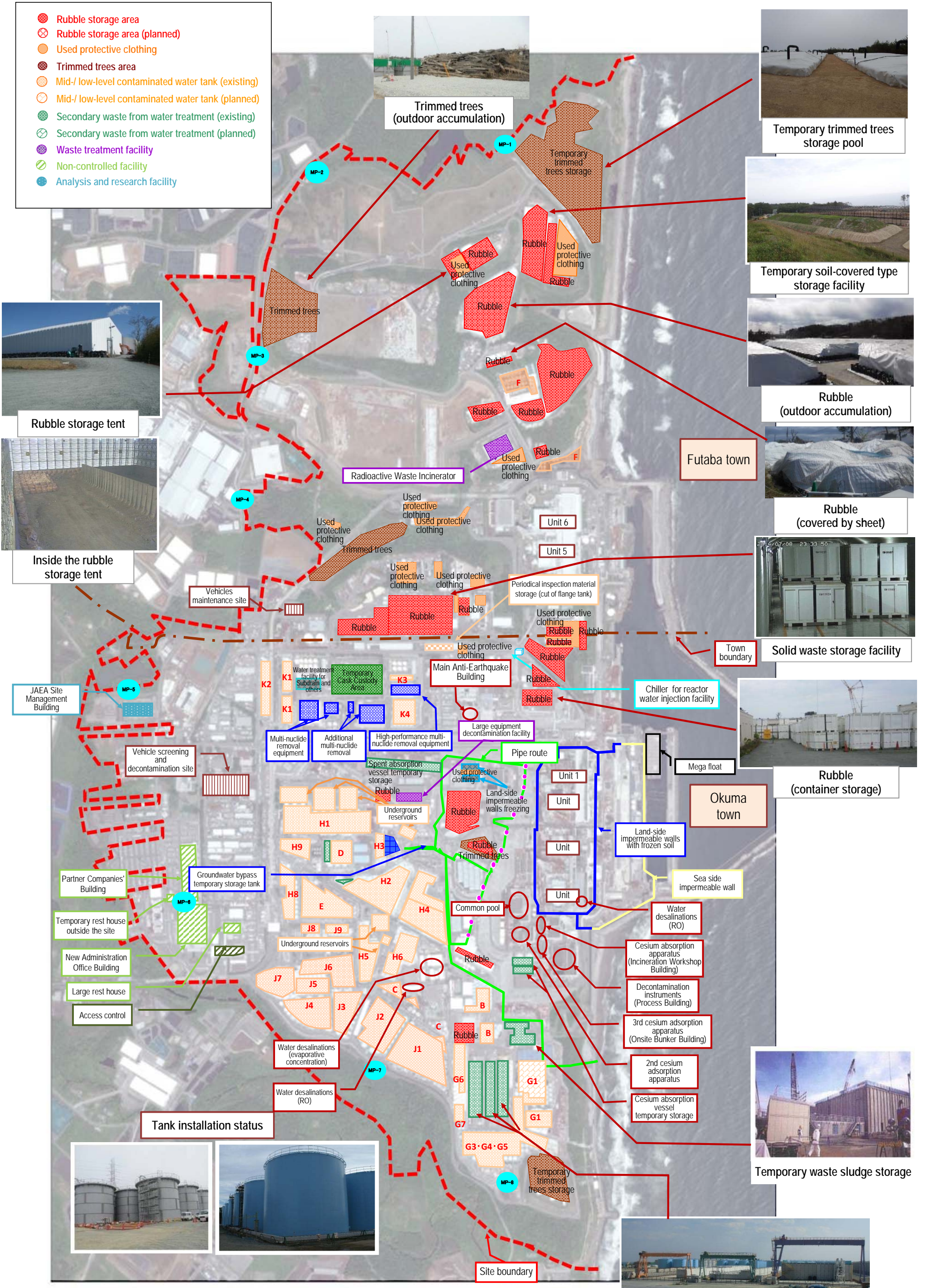
(The latest values sampled during April 12-22)

Summary of TEPCO data as of April 23, 2021

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



TEPCO Holdings Fukushima Daiichi Nuclear Power Station Site Layout



Provided by Japan Space Imaging Corporation, photo taken on May 24, 2020
Product(C) [2020] DigitalGlobe, Inc., a Maxar company

0m 100m 500m 1000m

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

Immediate target

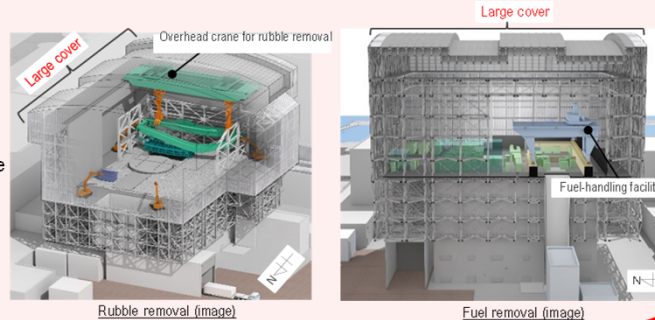
Commence fuel removal from the Unit 1-2 Spent Fuel Pools

Unit 1

Toward fuel removal from the Unit 1 spent fuel pool, investigations have been implemented to ascertain the conditions of the fallen roof on the south side and the contamination of the well plug. Based on the results of these investigations, "the method to initially install a large cover over the Reactor Building and then remove rubble inside the cover" was selected to ensure a safer and more secure removal. Work to install a large cover will start from the first half of FY2021. Work continues to complete installation of a large cover by around FY2023 and start fuel removal from FY2027 to FY2028.

<Reference> Progress to date

Rubble removal on the north side of the operating floor started from January 2018 and has been implemented sequentially. In July and August 2019, the well plug, which was misaligned from its normal position, was investigated and in August and September, the conditions of the overhead crane were checked. Based on the results of these investigations, as the removal requires more careful work taking dust scattering into consideration, two methods were examined: installing a cover after rubble removal and initially installing a large cover over the Reactor Building and then removing rubble inside the cover.

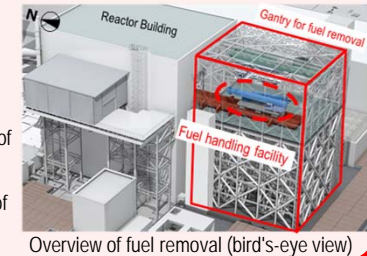


Unit 2

Toward fuel removal from the Unit 2 spent fuel pool, based on findings from internal operating floor investigations from November 2018 to February 2019, instead of fully dismantling the upper part of the building, the decision was made to install a small opening on the south side and use a boom crane. Examination continues to start fuel removal from FY2024 to FY2026.

<Reference> Progress to date

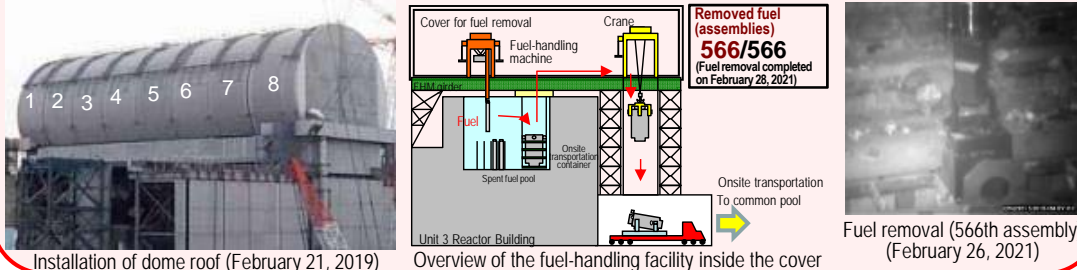
Previously, potential to recover the existing overhead crane and the fuel handling machine was examined. However, the high radiation dose inside the operating floor meant the decision was taken to dismantle the upper part of the building in November 2015. Findings from internal investigations of the operating floor from November 2018 to February 2019 underlined the potential to conduct limited work there and the means of accessing from the south side had been examined.



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 the fuel removal cover was completed on February 23, 2018.

Toward fuel removal, the rubble retrieval training inside the pool, which was scheduled in conjunction with fuel removal training, started from March 15, 2019, and started fuel removal from April 15, 2019. Fuel removal was completed on February 28, 2021.



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 fuel removal, 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 in December 22, 2014. (2 of the non-irradiated fuel assemblies were removed in advance in July 2012 for fuel checks)

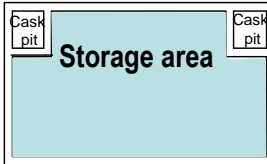
This marks the completion of fuel removal from the Unit 4 Reactor Building. Based on this experience, fuel assemblies will be removed from other Unit pools.

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



Fuel removal status

Common pool

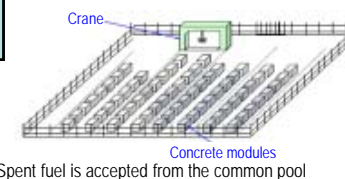


An open space will be maintained in the common pool (Transfer to the temporary cask custody area)

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 removal from the Unit 4 spent fuel pool began to be received (November 2013 - November 2014)
- Fuel removal from the Unit 3 spent fuel pool began to be received (April 2019 – February 2021)

Temporary cask (*) custody area



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>

- (*) 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.
- (*) 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 retrieval

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

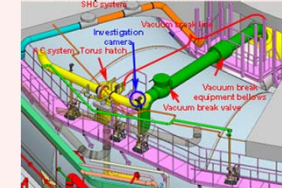
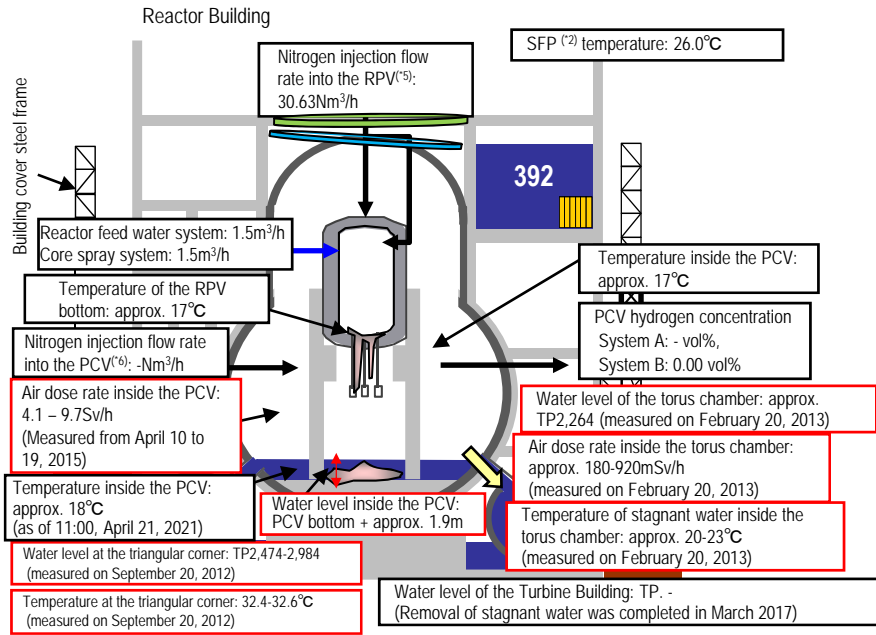


Image of the S/C upper part investigation

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, April 21, 2021

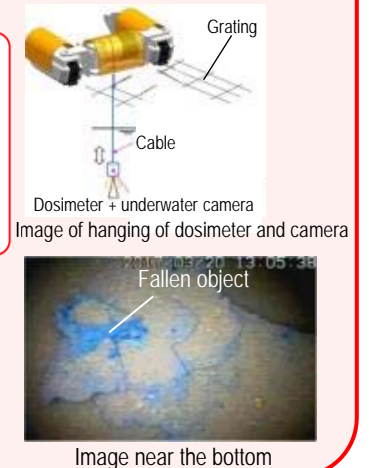
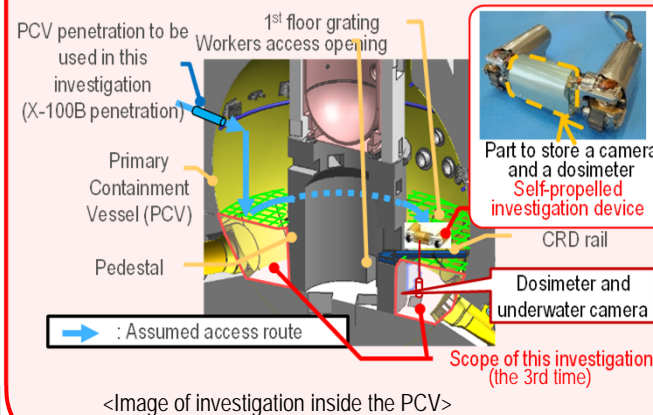
Investigations inside PCV	1st (Oct 2012)	2nd (Apr 2015)	3rd (Mar 2017)
	- Acquiring images - Measuring air temperature and dose rate - Measuring water level and temperature - Sampling stagnant water - Installing permanent monitoring instrumentation	- Confirming the status of PCV 1st floor - Acquiring 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 retrieval, 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.



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 retrieval

April 27, 2021

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

3/6

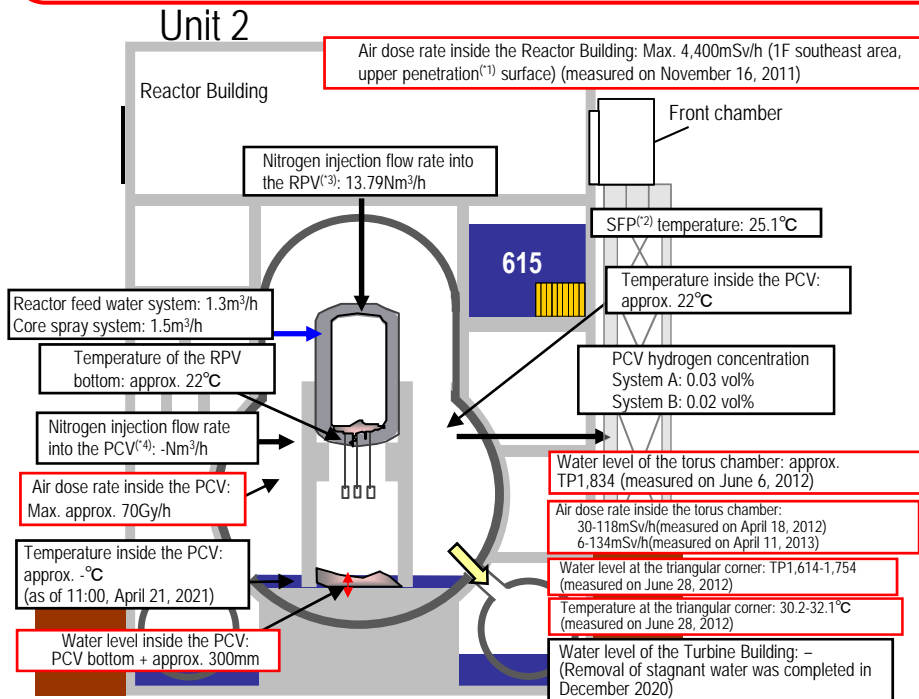
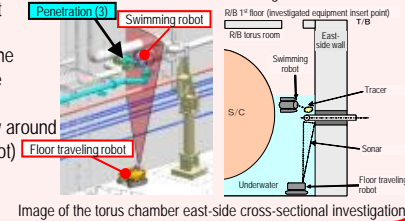
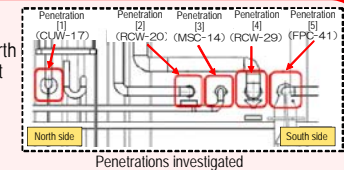
Immediate target Identify the plant status and commence R&D and decontamination toward fuel debris retrieval

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.
 - In April 2014, removal of the broken thermometer failed and was suspended. Rust-stripping chemicals were injected and the broken thermometer was removed in January 2015. A new thermometer was reinstalled in 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 in May 2014 and new instruments were reinstalled in 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

- July 2014, the torus chamber walls were investigated (on the north and 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)



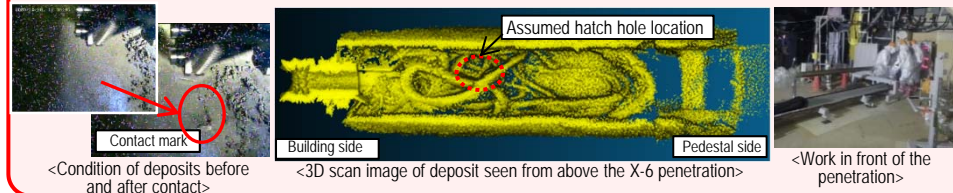
* Indices related to plant are values as of 11:00, April 21, 2021

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 stagnant water - Measuring water level - Installing permanent monitoring instrumentation
	4th (Jan - Feb 2017)	- Acquiring images - Measuring dose rate - Measuring air temperature
	5th (Jan 2018)	- Acquiring images - Measuring dose rate - Measuring air temperature
	6th (Feb 2019)	- Acquiring images - Measuring dose rate - Measuring air temperature - Grasping characteristics of a portion of deposit
Leakage points from PCV	- No leakage from torus chamber rooftop - No leakage from all inside/outside surfaces of S/C	

Status of investigation inside the PCV

Prior to fuel debris retrieval, an investigation inside the PCV will be conducted to inspect the status there including the location of fuel debris. [Investigative outline]

- Investigative devices such as a robot will be injected from Unit 2 X-6 penetration⁽¹⁾ and access the inside of the pedestal using the CRD rail.
- [Progress status]
- 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.
 - On January 19, 2018, the status below the platform inside the pedestal was investigated using an investigative device with a hanging mechanism. From the analytical results of images obtained in the investigation, deposits probably including fuel debris were found at the bottom of the pedestal. In addition, multiple parts higher than the surrounding deposits were also detected. We presumed that there were multiple routes of fuel debris falling. Obtained data were processed in panoramic image visualization to acquire clearer images.
 - On February 13, 2019, an investigation touching the deposits at the bottom of the pedestal and on the platform was conducted and confirmed that the pebble-shaped deposits, etc. could be moved and that hard rock-like deposits that could not be gripped may exist. In addition, images, etc. would help determine the contour and size of the deposits could be collected by moving the investigative unit closer to the deposits than the previous investigation.
 - On October 28, 2020, as a preparatory stage of the PCV internal investigation and the trial retrieval, a contact investigation into deposits inside the penetration (X-6 penetration) was conducted. In this investigation, a guide pipe incorporating an investigative unit inserted into the penetration. By the contact, it was confirmed that deposits inside the penetration did not deform and unstuck.
 - On October 30, 2020, a 3D scan investigation was conducted, measuring deposits by the 3D scan sensor mounted on the top of the investigative unit. Information obtained in the investigation will be utilized in the mockup test of the equipment to remove deposits inside the X-6 penetration.



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

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

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.

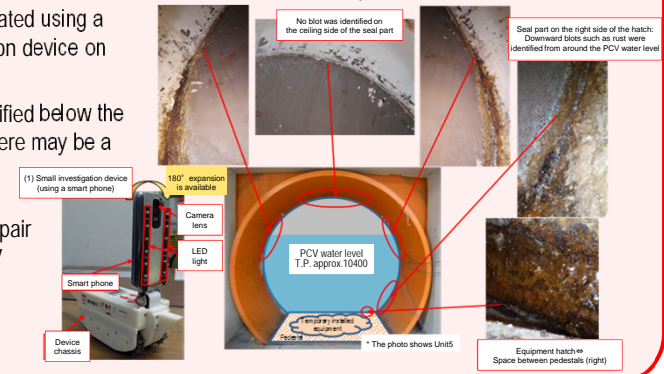
This is the first leak from PCV detected in the Unit 3. Based on the images collected in this investigation, the leak volume will be estimated and the need for additional investigations will be examined. The investigative results will also be utilized to examine water stoppage and PCV repair methods.

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

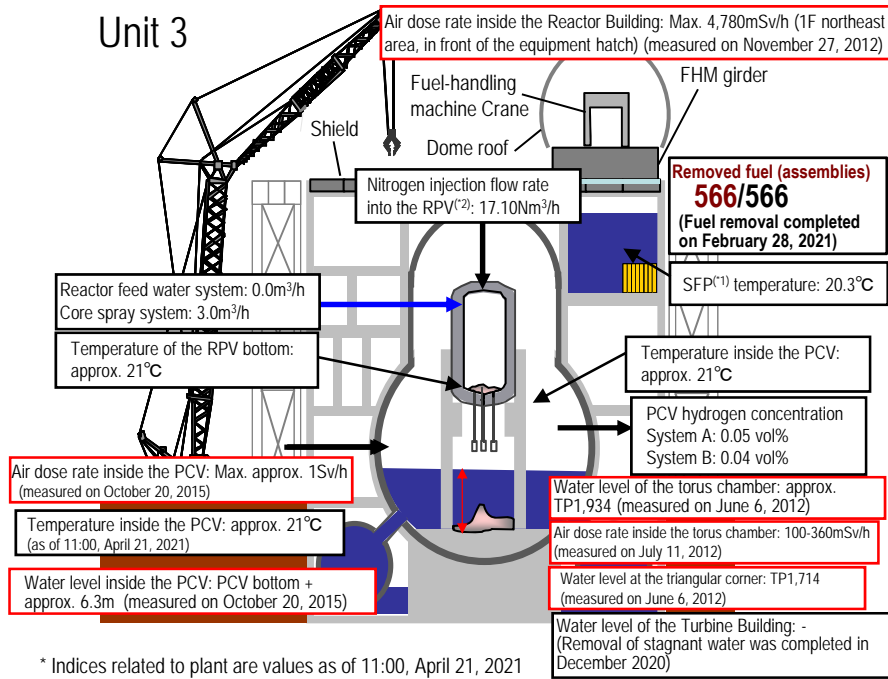
Investigative results into the Unit 3 PCV equipment hatch using a small investigation device

- As part of the investigation into the PCV to facilitate fuel debris retrieval, 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



* Indices related to plant are values as of 11:00, April 21, 2021

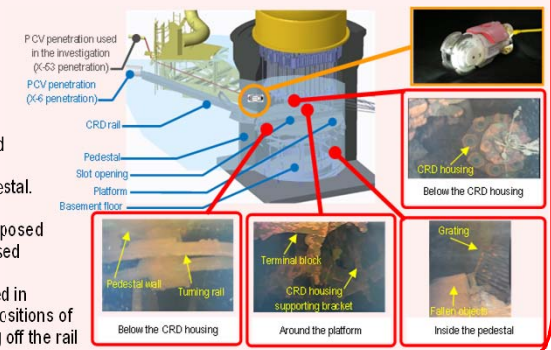
Investigations inside PCV	1st (Oct – Dec 2015)	- Acquiring images - Measuring air temperature and dose rate - Measuring water level and temperature - Sampling stagnant water - Installing permanent monitoring instrumentation (December 2015)
	2nd (Jul 2017)	- Acquiring images - Installing permanent monitoring instrumentation (August 2017)
Leakage points from PCV	- Main steam pipe bellows (identified in May 2014)	

Investigation inside the PCV

Prior to fuel debris retrieval, 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⁽⁴⁾, 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, 2014).
- 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 stagnant 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.
- Analysis of image data obtained in the investigation identified damage to multiple structures and the supposed core internals. Consideration about fuel removal based on the obtained information will continue.
- Videos obtained in the investigation were reproduced in 3D. Based on the reproduced images, the relative positions of the structures, such as the rotating platform slipping off the rail with a portion buried in deposits, were visually understood.



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

Period	Evaluation results
May – Sep 2017	The evaluation confirmed that no large lump existed in the core area where fuel had been placed and that part of the fuel debris potentially existed at the bottom of the RPV.

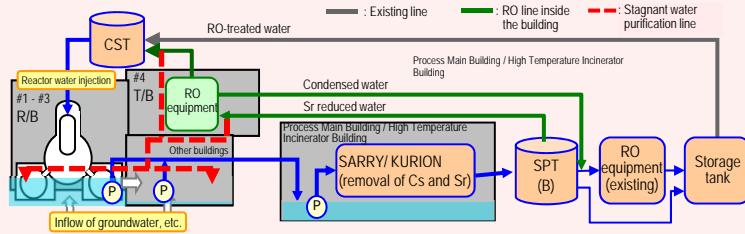
<Glossary>
 (1) SFP (Spent Fuel Pool) (2) RPV (Reactor Pressure Vessel) (3) PCV (Primary Containment Vessel) (4) Penetration: Through-hole of the PCV

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

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

Work to improve the reliability of the circulation water injection cooling system and pipes to transfer stagnant 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.
- To accelerate efforts to reduce the radiation density in stagnant water inside the buildings, circulating purification of stagnant water inside the buildings started on the Unit 3 and 4 side on February 22 and on the Unit 1 and 2 side on April 11.
- For circulating purification, a new pipe (stagnant water purification line) divided from the water treatment equipment outlet line was installed to transfer water purified at the water treatment equipment to the Unit 1 Reactor Building and the Unit 2-4 Turbine Buildings.
- The risks of stagnant water inside the buildings will continue to be reduced in addition to reduction of its storage.



Progress status of dismantling of flange tanks

- To facilitate replacement of flanged tanks, dismantling of flanged tanks started in H1 east/H2 areas in May 2015. Dismantling of all flanged tanks was completed in H1 east area (12 tanks) in October 2015, in H2 area (28 tanks) in March 2016, in H4 area (56 tanks) in May 2017, in H3 B area (31 tanks) in September 2017, in H5 and H5 north areas (31 tanks) in June 2018, in G6 area (38 tanks) in July 2018, H6 and H6 north areas (24 tanks) in September 2018 and G4 south area (17 tanks) in March 2019.



Start of dismantling in H1 east area

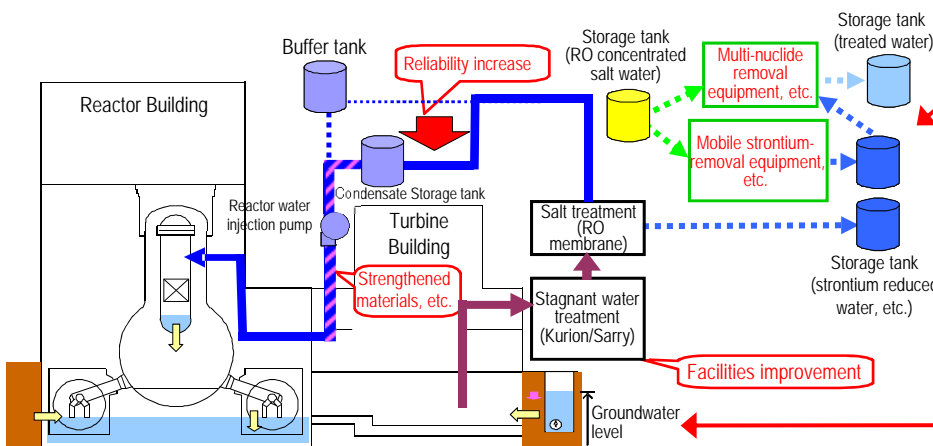


After dismantling in H1 east area

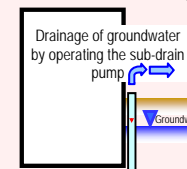
Completion of purification of contaminated water (RO concentrated salt water)

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



Preventing groundwater from flowing into the Reactor Buildings

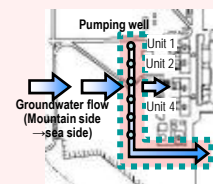


Reducing groundwater inflow by pumping sub-drain water

To reduce groundwater flowing into the buildings, pumping-up of groundwater from wells (sub-drains) 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.

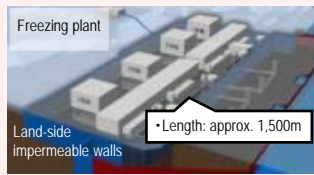
Via a groundwater bypass, reduce the groundwater level around the Building and groundwater inflow into the Building

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

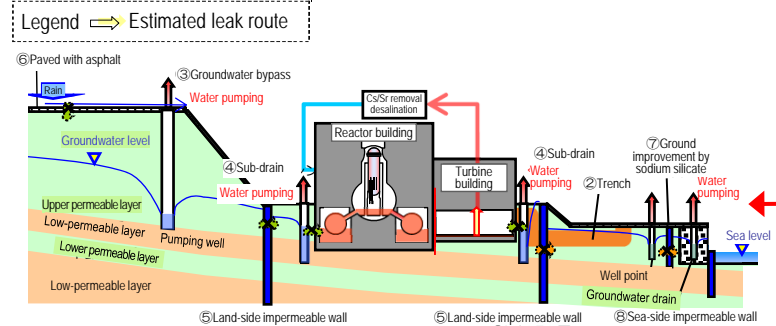
To prevent the inflow of groundwater into the buildings, installation of impermeable walls on the land side is planned. Freezing started on the sea side and at a part of the mountain side from March 2016 and at 95% of the mountain side from June 2016. Freezing of the remaining unfrozen sections advanced with a phased approach and freezing of all sections started in August 2017.



• Length: approx. 1,500m

In March 2018, construction of the land-side impermeable walls was completed, except for a portion of the depth, based on a monitoring result showing that the underground temperature had declined below 0°C in almost all areas, while on the mountain side, the difference between the inside and outside increased to approx. 4-5 m. The 21st Committee on Countermeasures for Contaminated Water Treatment, held on March 7, 2018, evaluated that together with the function of sub-drains, etc., a water-level management system to stably control groundwater and isolate the buildings from it had been established and had allowed a significant reduction in the amount of contaminated water generated.

For the unfrozen depth, a supplementary method was implemented and it was confirmed that temperature of the part declined below 0°C by September 2018. From February 2019, maintenance operation started at all sections.

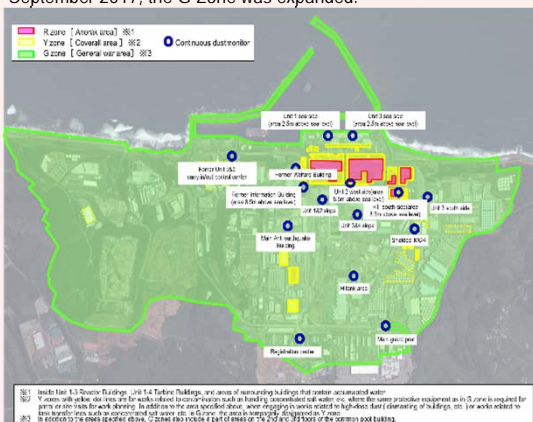


Progress toward decommissioning: Work to improve the environment within the site

Immediate targets

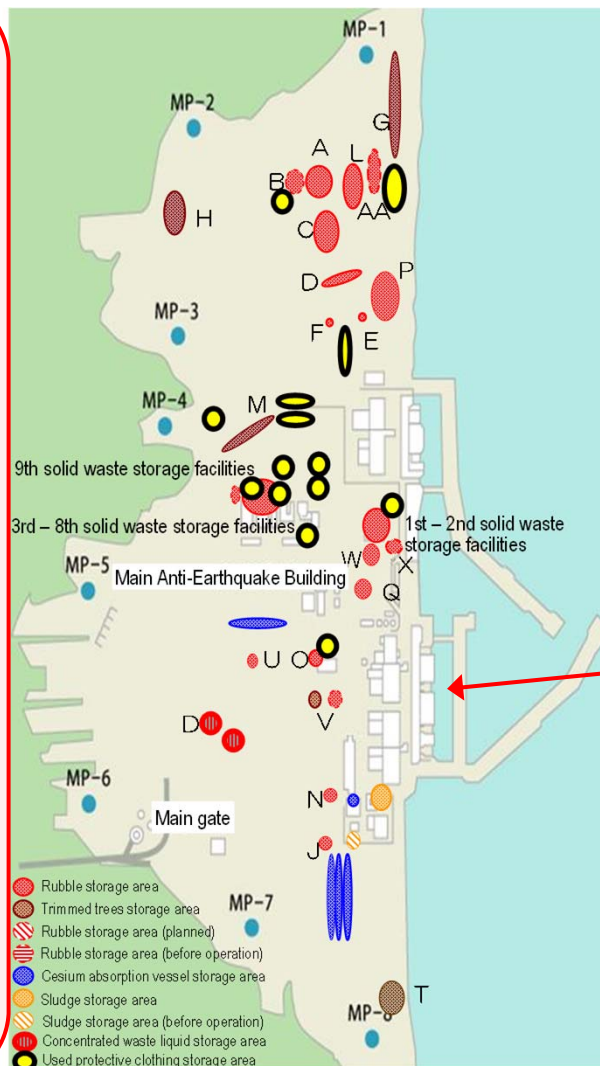
- Reduce the effect of additional release from the entire power station and radiation from radioactive waste (secondary water treatment waste, rubble, etc.) generated after the accident, to limit the effective radiation dose to below 1mSv/year at the site boundaries.
- Prevent contamination expansion 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 and September 2017, the G Zone was expanded.



R zone (Anorak area)	Y zone (General 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.

