Outline of Decommissioning, Contaminated Water and Treated Water Management

July 27, 2023
Secretariat of the Team for Countermeasures for Decommissioning, Contaminated Water and Treated Water

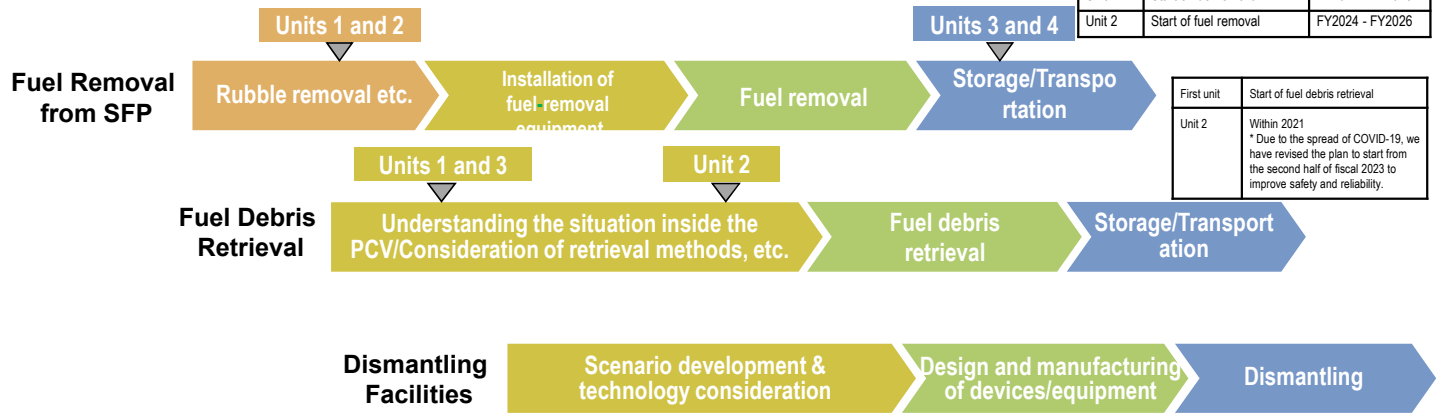
Main decommissioning work and steps

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.

<Milestones in the Mid- and Long-Term Roadmap>

Units 1-6	Completion of fuel removal	Within 2031
Unit 1	Start of fuel removal	FY2027 - FY2028
Unit 2	Start of fuel removal	FY2024 - FY2026

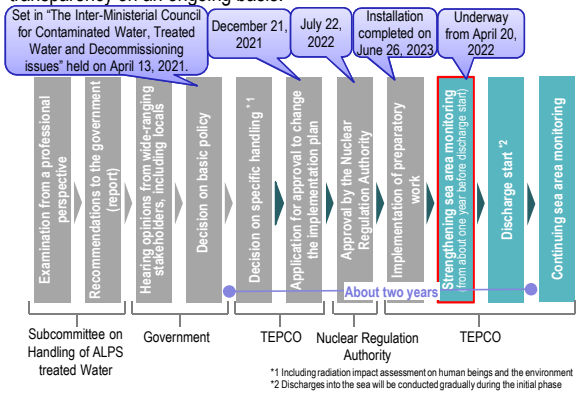


First unit	Start of fuel debris retrieval
Unit 2	Within 2021 * Due to the spread of COVID-19, we have revised the plan to start from the second half of fiscal 2023 to improve safety and reliability.

Measures for treated water

Handling of ALPS treated water

Regarding the discharge of ALPS treated water into the sea, TEPCO must comply with regulatory and other safety standards to safeguard the public, the 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 having safety checked by the IAEA. Moreover, accurate information will be disseminated with full transparency on an ongoing basis.



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

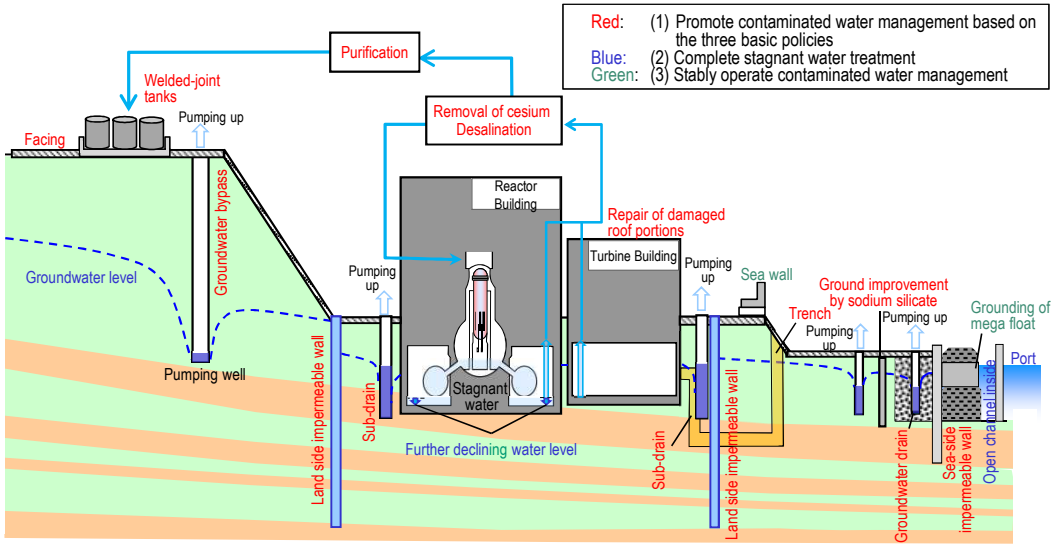
- Strontium-reduced water from other equipment is being re-treated in the Advanced Liquid Processing System (ALPS: multi-nuclide removal equipment) and stored in welded-joint tanks.
- Multi-layered contaminated water management measures, including land side impermeable walls and sub-drains, have stabilized 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 m^3/day (in May 2014) to approx. 130 m^3/day (in FY2021).
- Measures continue to further suppress the generation of contaminated water to 100 m^3/day or less within 2025.

(2) Efforts to complete stagnant water treatment

- To reduce the stagnant water levels in buildings as planned, work to install additional stagnant water transfer equipment is underway.
- 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.
- While conducting the dust impact assessment, measures to reduce the stagnant water level were implemented. In March 2023, the target water level in each building was achieved. For the Units 1-3 Reactor Buildings, "reducing stagnant water in the Reactor Buildings to about half the amount at the end of 2020 during the period FY2022-2024" was achieved.
- 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

- Various measures are underway to prepare for tsunamis. As of countermeasures for heavy rain,sandbags are being installed to suppress direct inflow into buildings while work to close openings in buildings and install sea walls to enhance drainage channels and other measures are being implemented as planned.



Progress status

◆ The temperatures of the Reactor and the Primary Containment Vessel of Units 1-3 have been maintained stable.
There was no significant change in the concentration of radioactive materials newly released from Reactor Buildings into the air. It was concluded that the comprehensive cold shutdown condition had been maintained.

Progress status related to the response to ALPS treated water (completion of the pre-service inspections and publication of the Comprehensive Report of the IAEA safety review)

Regarding ALPS treated Water Dilution/Discharge Facility and Related Facilities, installation of the facilities was completed on June 26, TEPCO underwent the pre-service inspection by the Nuclear Regulatory Authority (NRA) for the period June 28-30 and received a certificate of completion on July 7.

Going forward, TEPCO will do its utmost to maintain and manage ALPS treated water dilution/discharge facility and related facilities while also proactively engaging in initiatives to improve safety in the field, such as implementing operational training, so as to operate these facilities with precision.

The Comprehensive Report on the safety review concerning handling of ALPS -treated water was also published by the IAEA on July 4.

In the Executive Summary of the IAEA Comprehensive Report, the IAEA concluded the following:

- Based on its comprehensive assessment, the IAEA has concluded that the approach to the discharge of ALPS treated water into the sea and the associated activities by TEPCO, NRA and the Government of Japan, are consistent with relevant international safety standards.
- The IAEA has concluded, based on its comprehensive assessment, that the discharge of the ALPS treated water, as currently planned by TEPCO, will have a negligible radiological impact on people and the environment.

We will continue to share necessary information with the IAEA, while striving to foster further understanding of the international community about the discharge of ALPS treated water into the sea.

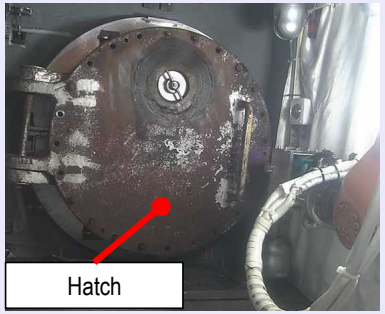
Unit 2 Progress status of PCV internal investigation and trial retrieval

To open the X-6 penetration hatch before retrieving trial debris, removal of 24 hatch bolts is underway.

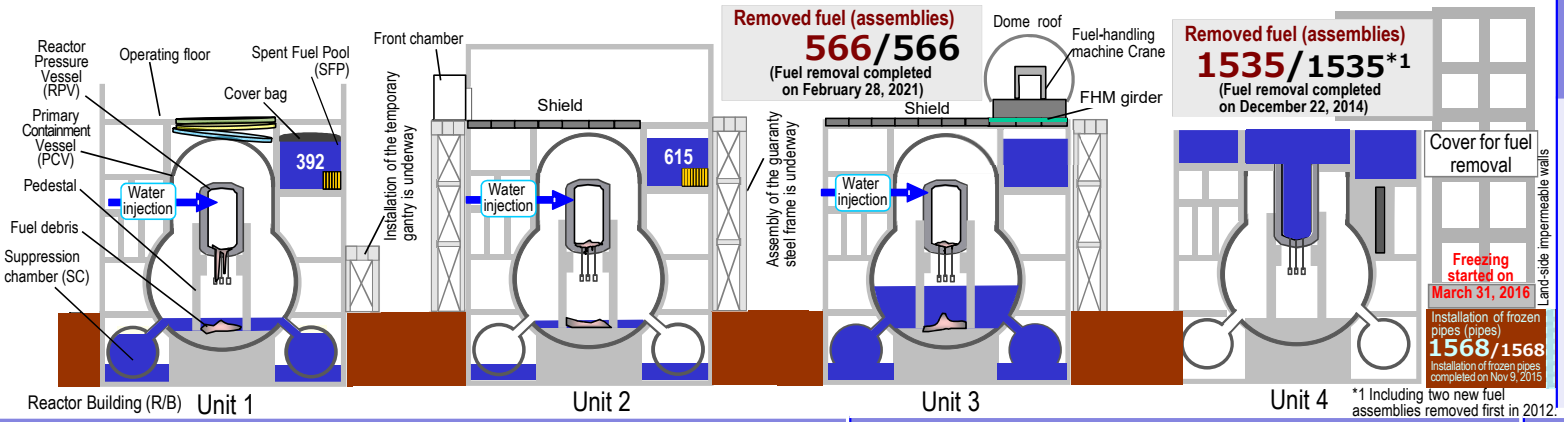
As of July 26, nine of 20 bolts, for which connections with nuts were cut, had been removed.

After cutting the remaining bolt-nut connections, bolts will be pushed in and removed and the hatch will be opened.

No significant variation was detected in the indicated values of dust monitors and monitoring posts, nor any abnormality in plant parameters.



< Status of removal of bolts >
(July 19, 2023)



*1 Including two new fuel assemblies removed first in 2012.

Unit 2 Work to reduce the radiation dose of reactor system instrumentation pipes toward investigation inside the RPV

The internal structure of the Unit 2 Reactor Pressure Vessel (RPV) will be investigated by a fiber scope using the existing instrumentation pipes.

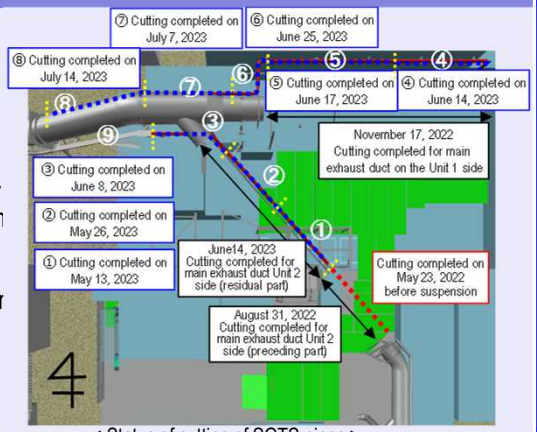
Work to reduce high airborne radiation dose in the work area will be conducted.

Decontamination on the floor and other work has been underway since April 10 and cleaning of the radiation source pipes and other related work will be implemented after August. During work, parameters inside the PCV will be monitored to confirm no significant variation.

Units 1/2 Progress status of removal and other work of SGTS pipes

For pipes of the Units 1/2 Standby Gas Treatment System (SGTS), cutting and removal of 8 sections interfering with installation of the Unit 1 Reactor Building cover were completed on July 14. After removing rubble from the Units 1/2 Radioactive Waste Treatment Building, construction of the large cover south side will commence.

Removed SGTS pipes will be analyzed and stored after shredding.

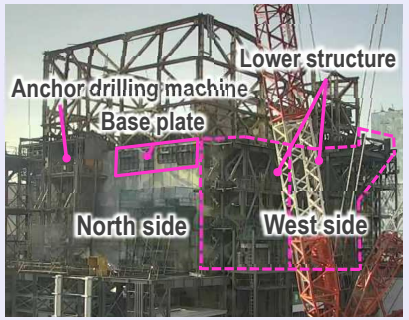


< Status of cutting of SGTS pipes >

Unit 1 Progress status of work toward fuel removal

Toward installing the large cover, anchors are being drilled and base plates are being installed on the east and north sides.

From June, the installation of the lower structure started from the west side. As of July 26, installation of two blocks had been completed (progress rate: approx. 6%).



< Status of work of Unit 1 Reactor Building >
(July 24, 2023)

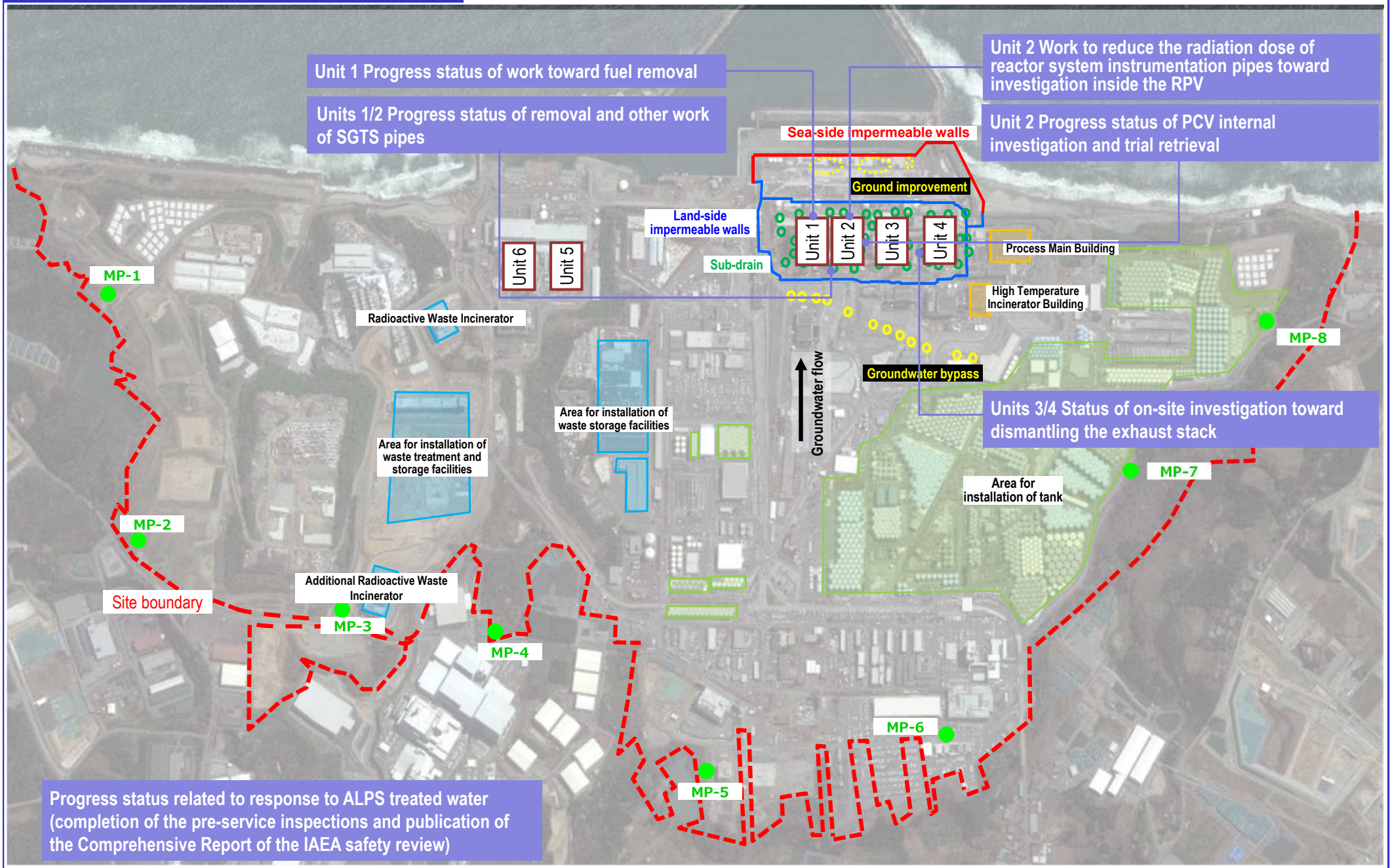
Units 3/4 Status of on-site investigation toward dismantling the exhaust stack

Toward removing the Units 3/4 exhaust stack, to examine the influence of the radiation dose during dismantling and measures to prevent dust scattering, the radiation dose inside the exhaust stack and SGTS pipes were investigated in June.

Investigative results compiled in July showed that the radiation dose inside the exhaust stack was approx. 0.165-0.352 mSv/h and approx. 0.336-0.650 mSv/h inside the SGTS pipes.

These results were lower than the average airborne 0.650 mSv/h dose around the exhaust stack. Based on the dose results acquired during this investigation, specific cutting methods for the exhaust stack and measures to suppress dust scattering will be examined.

Major initiatives – Locations on site



Provided by Japan Space Imaging Corp., photo taken on April 8, 2021
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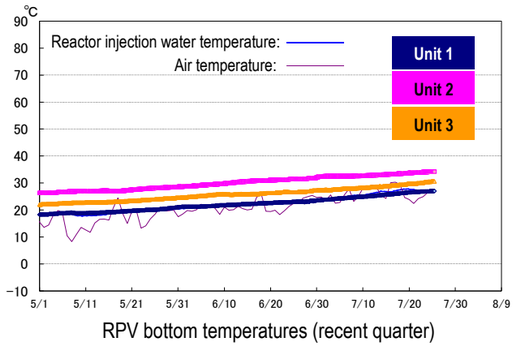
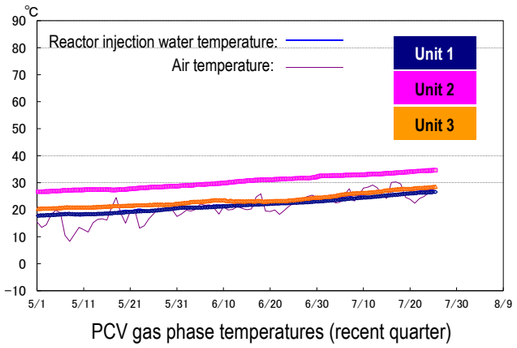
I. Confirmation of the reactor conditions

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

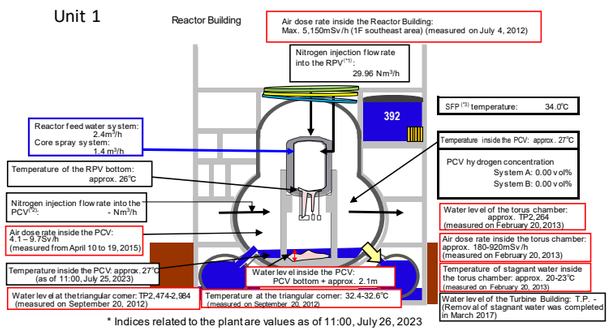


RPV bottom temperatures (recent quarter)

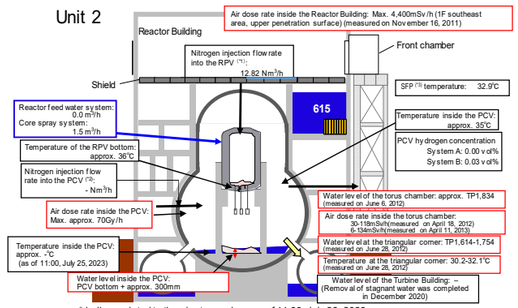


PCV gas phase temperatures (recent quarter)

*1 The trend graphs show part of the temperature data measured at multiple points.
*2 A part of data could not be measured due to maintenance and inspection of the facility and other work.



* Indices related to the plant are values as of 11:00, July 26, 2023



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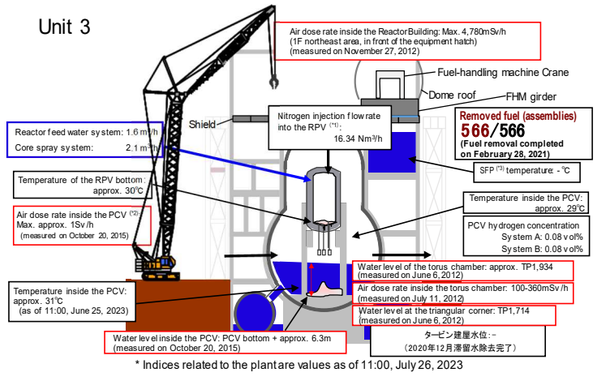


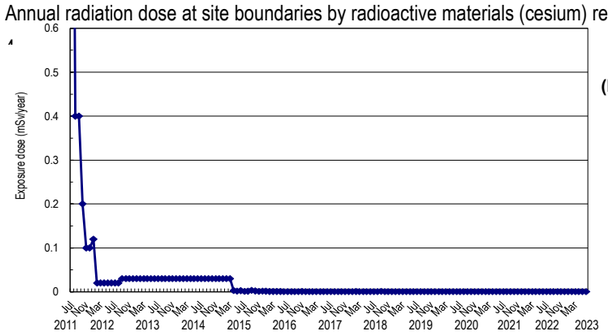
* Indices related to the plant are values as of 11:00, July 26, 2023

(*1) RPV (Reactor Pressure Vessel)
(*2) PCV (Primary Containment Vessel)
(*3) SFP (Spent Fuel Pool)

Release of radioactive materials from the Reactor Buildings

As of June 2023, 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. 1.9×10^{-12} Bq/cm³ and 1.5×10^{-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 0.00004 mSv/year.

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



(Reference)

* The concentration limit of radioactive materials in the air outside the surrounding monitoring area:
[Cs-134]: 2 x 10^{-5} Bq/cm³Marc
[Cs-137]: 3 x 10^{-5} Bq/cm³

* Data of Monitoring Posts (MP1-MP8).
Data of Monitoring Posts (MPs) measuring the air dose rate around the site boundary showed 0.312– 0.996 μSv/h (June 28 – July 25, 2023).
To measure the variation in the air dose rate of MP2-MP8 more accurately, work to improve the environment (trimming trees, removing surface soil and shielding around the MPs) was completed.

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.

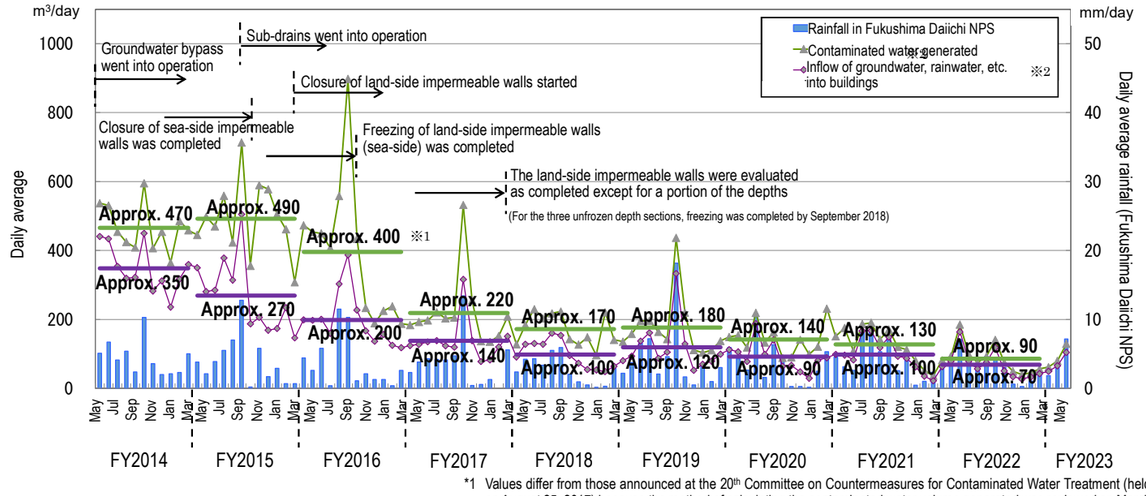
II. Progress status by each plan

Measures for contaminated water and treated water

➢ 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 portions of building roofs and due to less rainfall than in previous normal years without concentrated heavy rain of 100 mm/day or more, the amount of contaminated water generated within FY2022 declined to approx. 90 m³/day.

Measures will continue to further reduce the amount of contaminated water generated.



*1 Values differ from those announced at the 20th Committee on Countermeasures for Contaminated Water Treatment (held on August 25, 2017) because the method of calculating the contaminated water volume generated was reviewed on March 1, 2018. Details of the review are described in the materials for the 50th and 51st meetings of the Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment.

*2: The monthly daily average is derived from the daily average from the previous Thursday to the last Wednesday, which is calculated based on the data measured at 7:00 on every Thursday.

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

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

- At the Water-Treatment Facility Special for Sub-drain & Groundwater drains, release started from September 14, 2015 and up until July 18 2023, 2,211 release operations had been conducted.
  The water quality of all temporary storage tanks satisfied the operational target.

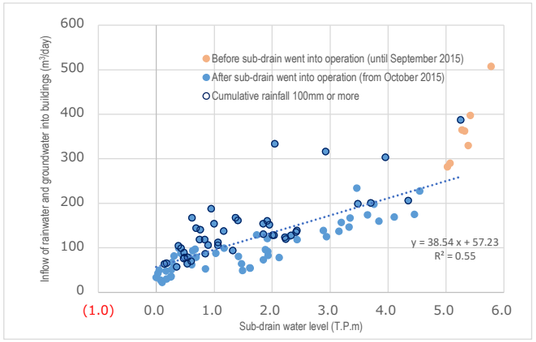


Figure 2: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Units 1-4 sub-drains

➢ Implementation status of facing

- Facing is a measure that involves asphalting the on-site surface to reduce the radiation dose, prevent rainwater infiltrating the ground and reduce the amount of underground water flowing into buildings. As of the end of June 2023, 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 leave the decommissioning work unaffected. As of the end of June 2023, 40% of the planned area (60,000 m²) had been completed.

➢ Status of the groundwater level around buildings

- The groundwater level in the area inside the land-side impermeable walls has been declining each year due to the land-side impermeable walls and the decline in the set water level of the sub-drains. On the mountain side, the average difference between the inside and outside has remained at 4-5 m. The water level in the bank area has also remained low (T.P. 1.4 m) relative to the ground surface (T.P. 2.5 m).
- As the set water level of the sub-drains declined slightly (T.P. -0.55 ⇒ -0.65 m) and others in FY2021, the groundwater level on the sea side of the Unit 1-4 buildings remained low (except during heavy rainfall) compared to the T.P. 2.5 m area.

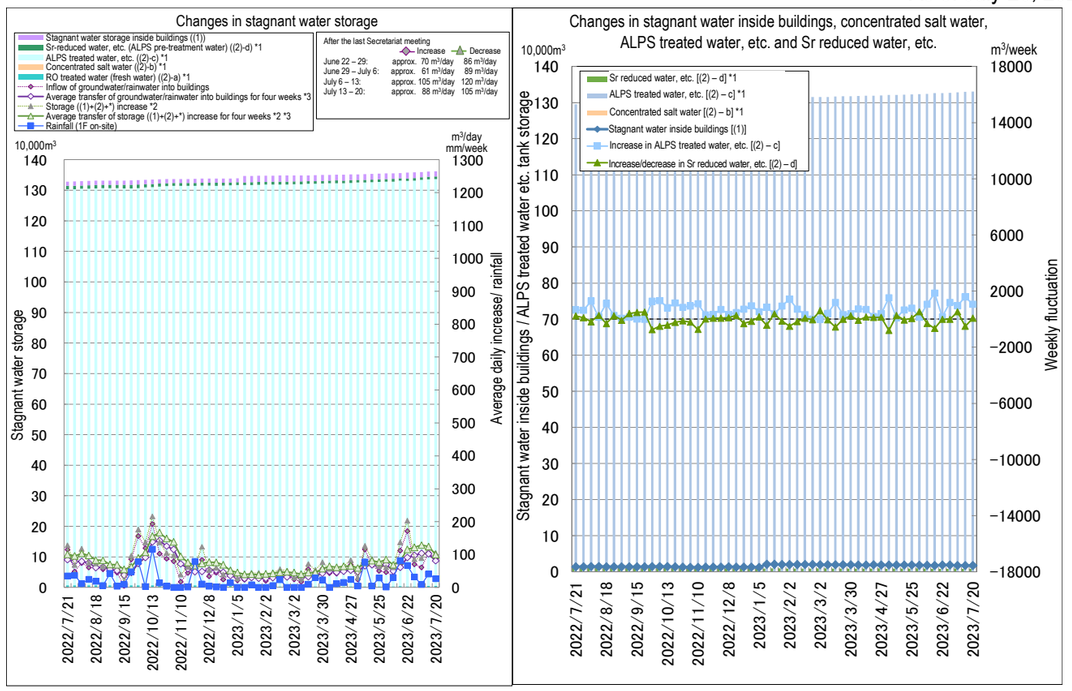
➢ Operation of the multi-nuclide removal equipment and other water-treatment facilities

- Regarding the multi-nuclide removal equipment (existing), hot tests using radioactive water had been conducted (System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013). On March 23, 2022, a pre-service inspection certificate was granted by the Nuclear Regulation Authority (NRA) and the entire pre-service inspection was completed. The multi-nuclide removal equipment (additional) went into full-scale operation from October 16, 2017. Regarding the multi-nuclide removal equipment (high-performance), hot tests using radioactive water had been conducted from October 18, 2014. On March 2, 2023, a pre-service inspection certificate was granted by the NRA and the entire pre-service inspection was completed.
- As of July 20, 2023, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 505,000, 756,000 and 104,000 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).
- Treatment measures comprising the removal of strontium by cesium-adsorption apparatus (KURION), the secondary cesium-adsorption apparatus (SARRY) and the third cesium-adsorption apparatus (SARRY II) continued. Up until July 20, 2023, approx. 724,000 m³ had been treated.

➢ Risk reduction of strontium-reduced water

- To reduce the risks of strontium-reduced water, treatment using existing, additional and high-performance multi-nuclide removal equipment is underway. Up until July 20, 2023, approx. 892,000 m³ had been treated.

As of July 20, 2023



(1): Stagnant water storage inside buildings (Units 1-4, Process Main Building, High Temperature Incinerator Building, Waste Liquid Supply Tank, SPT (A), SPT (B), Units 1-3 CST, buffer tank)
(2): Units 1-4 tank storage [[(2)-a RO treated water (fresh water)] + [(2)-b Concentrated salt water] + [(2)-c ALPS treated water, etc.] + [(2)-d Sr-reduced water, etc. (ALPS pre-treatment water)]
*: Water amount from tank bottom to water-level gauge 0% (DS)
*1: Water amount for which the water-level gauge indicates 0% or more
*2: Calculated in the method of contaminated water generated [(Inflow of groundwater/rainwater into buildings) + (other transfer) + (chemical injection into ALPS)]
*3: Average transfer of storage increase and groundwater/rainwater into buildings for four weeks was added (November 24, 2022)

Figure 3: Status of stagnant water storage

➢ Status of sea-area monitoring related to the handling of ALPS treated water

- The concentration of tritium in seawater within 2km of the port has remained constant over the past two years and was also at new measurement points within the fluctuation range of seawater in Japan*. The concentration of Cesium-137 increased temporarily, which was considered due to rainfall, as applied to the past fluctuation in seawater around the Fukushima Daiichi Nuclear Power Station. However, it remained constant relative to measurement benchmarks over the past two years and at new measurement points, also within the fluctuation range of seawater in Japan*. For tritium, monitoring with a lower detection limit has been conducted since April 18, 2022.
- Both concentrations of tritium and Cesium-137 in seawater within 20km of the coast had remained constant over the past two years and were within the fluctuation range of seawater in Japan*.
- The concentration of tritium in seawater further than 20km from the coast remained, including at new measurement points, within the fluctuation range of seawater in Japan*. The concentration of Cesium-137 remained constant over the past two years within the fluctuation range of seawater in Japan*.

* : The range of the minimum – maximum values detected during April 2019 – March 2022 was as follows in the database below:

In Japan (including off the coast of Fukushima Prefecture):
Tritium concentration: 0.043 - 20 Bq/L
Cesium-137 concentration: 0.0010 - 0.45 Bq/L

Off the coast of Fukushima Prefecture
Tritium concentration: 0.043 – 2.2 Bq/L

Cesium-137 concentration: 0.0010 - 0.45 Bq/L

Source: Environmental Radioactivity and Radiation in Japan, Environmental Radiation Database
https://www.kankyo-hoshano.go.jp/data/database/

- The concentration of tritium in fish sampled at the sampling point T-S8 has remained constant over the past two years. The concentration of tritium in fish sampled at new sampling points, including those for which the analytical value was verified, remained low within a similar fluctuation range for seawater in Japan*. Other measurement data for fish is being verified.

  * : The range of the minimum – maximum values detected during April 2019 – March 2022 was as follows in the database above:

  In Japan (including off the coast of Fukushima Prefecture)

  Tritium concentration (tissue free water type): 0.064 – 0.13 Bq/L

- The concentration of iodine 129 in seaweed sampled since July 2022 had been below the lower detection limit (< 0.1 Bq/kg (raw)). The concentration of tritium had not been analyzed due to a lack of sufficient sample population for reanalysis via the improved method following a review of the analytical procedures based on the verification results of fish tritium analysis data. The fluctuation range of iodine 129 in seaweed in Japan had been within the range of minimum – maximum values detected during April 2019 – March 2022 in the database above.

  In Japan Iodine 129 concentration: 0.00013 Bq/Kg (raw) – 0.00075 Bq/Kg (raw)

➢ Progress of the rearing test of marine organisms in the Fukushima Daiichi Nuclear Power Station

- To eliminate concerns and reassure those in society, a rearing test of marine organisms (flounder and abalones) in seawater with ALPS treated water added and normal seawater for comparison is underway.
- Regarding the flounder test, on June 20, 2023, in the series 1 tank (normal seawater), one flounder died. Since June 21, no further death or abnormality was detected (as of July 20).
- For abalones, since the test started on October 25, 2022, 60-70% had survived (66% in normal seawater and 60% in ALPS treated water diluted by seawater) (as of July 20).
- Rearing of flounder and others in diluted ALPS treated water (less than 1,500 Bq/L) will continue.
- Organically-bonded tritium (OBT) concentration tests on flounder (less than 1,500 Bq/L) will continue.

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 remove spent fuel at Unit 1

- From April 2021, work to assemble a temporary gantry and others has been underway in a yard outside the site as part of efforts to install a large cover.
- A work yard was prepared around the Reactor Building and preliminary work to install a large cover started from August 2021.
- In the Unit 1 Reactor Building, anchor drilling for the fourth stair from the top is underway on the east side. On the north side, drilling of all anchors was completed and installation of base plates is underway. On the west side, installation of two blocks for the lower structure was completed in June.
- Outside the site, ground assembly of steel frames and others proceed and inside the site, drilling of anchors and installation of base plates and the main steel frame will be conducted sequentially.

➢ Main work to remove spent fuel at Unit 2

- Inside the building, preliminary work for decontamination (part 2) has been underway since April 3, 2023. From April 28, 203, suction decontamination started.
- Outside the building, work to install the third level of the gantry for fuel removal started from May 13, 2023. Simultaneously, work to install the floor concrete receiver framework for the front room is underway.
- Outside the site, ground assembly of the steel structure (in units) continues.

Retrieval of fuel debris

➢ Response based on the status of the pedestal inside the Unit 1 PCV

- Assuming that the support function of the pedestal cannot be expected, the Nuclear Regulation Authority instructed on May 24, 2023, that assessment and countermeasures regarding the impact of dust being scattered outside the site should be immediately considered when an opening is generated on the PCV. An explanation was made at the 10th Technical Meeting Related to Review on the Implementation Plan for Specified Nuclear Facility (hereinafter referred to the “Technical Meeting”) held on June 5.
- Regarding the subjects instructed at the 10th Technical Meeting, including additional assessment of the impact of dust scattering, consideration of measures to suppress dust scattering, effects of the large cover to suppress the release of dust, consideration status of tests toward enhancing the enclosure function and concern about local corrosion inside the PCV, answers were delivered at the 12th Technical Meeting on July 11.
- As the next step, regarding the impact on RPV and PCV structures when the pedestal support function is lost, consideration results will be explained sequentially from those preparation is completed (the explanation started in interviews from July).

➢ Sampling results of the Unit 1 RCW heat exchanger (C)

- Regarding the Reactor Building Closed Cooling Water System (RCW), which is a high-dose source inside the Unit 1 Reactor Building, work related to inclusive water sampling to reduce dosage has been conducted since October 2022.
- For the RCW heat exchanger (C), sampling of inclusive water on the housing side has been conducted since June 2023. Sampling of upper, middle and lower parts of the heat exchanger were finished and part of the analytical results have been obtained.
- The concentration of Cesium-137 inside the RCW heat exchanger (C) exceeded the level confirmed before but was at a similar level (10^{10}Bq/L) to that assumed. Regarding concentrations of radioactive materials such as Cesium-137 and water quality, no significant difference was detected within the heat exchanger (between the upper and lower parts).
- During this sampling, a portion of inclusive water in the system was diluted with RO-treated water. Based on the analytical results of this work and inclusive water, it was confirmed that the planned treatment of inclusive water in the heat exchanger would be possible by dilution without affecting the stagnant water treatment equipment. Due to the significant quantity of water having to be removed from the heat exchanger, the dilution method, reduction of workers’ exposure and subjects will all be considered.
- The sampling results will be utilized when investigating the accident in the Fukushima Daiichi Nuclear Power Station.

➢ Progress status toward Unit 2 PCV internal investigation and trial retrieval

- Regarding the robot arm, by correcting the difference between the information acquired through the ongoing Naraha mockup test simulating the site, which had been conducted since February 2022 and the pre-simulation results, to reduce the risk of contact while retrieving the fuel debris, correction of the control program and other improvements are currently underway. (Improvements: correcting and improving the accuracy of the control program, operating the arm more rapidly, improving the cable-mounting tool, increasing visibility, improving the gripper and others)
- As preliminary work of the Unit 2 site, work to install the isolation room toward opening the X-6 penetration hatch was completed in April 2023.
- From June 2023, to open the X-6 penetration hatch before removing the trial debris, removal of the hatch bolts is underway. After cutting the remaining bolt-nut connections, bolts will be pushed in and removed and the hatch will be opened.
- Subsequently, removal of deposits inside the X-6 penetration and other work are scheduled. Work must proceed safely and carefully.

Plans to store, process and dispose of solid waste and decommission of reactor facilities

Promoting efforts to reduce and store waste generated appropriately and R&D to facilitate adequate and safe storage, processing and disposal of radioactive waste

➢ Management status of rubble and trimmed trees

- As of the end of June 2023, the total storage volume for rubble of concrete and metal etc. was approx. 391,000 m³ (+1,500 m³ compared to the end of May with an area-occupation rate of 77%). The total storage volume of trimmed trees was approx. 117,000 m³ (-5,100 m³, with an area-occupation rate of 64%). The total storage volume of used protective clothing was approx. 18,900 m³ (+1,200 m³, with an area-occupation rate of 75%). The total storage volume of radioactive solid waste (incinerated ash and others) was approx. 38,100 m³ (a slight increase, with an area-occupation rate of 60%). The increase in rubble was attributable to decontamination of flanged tanks, construction related to areas around the Units 1-4 buildings, work related to the port and others.

➢ Management status of secondary waste from water treatment

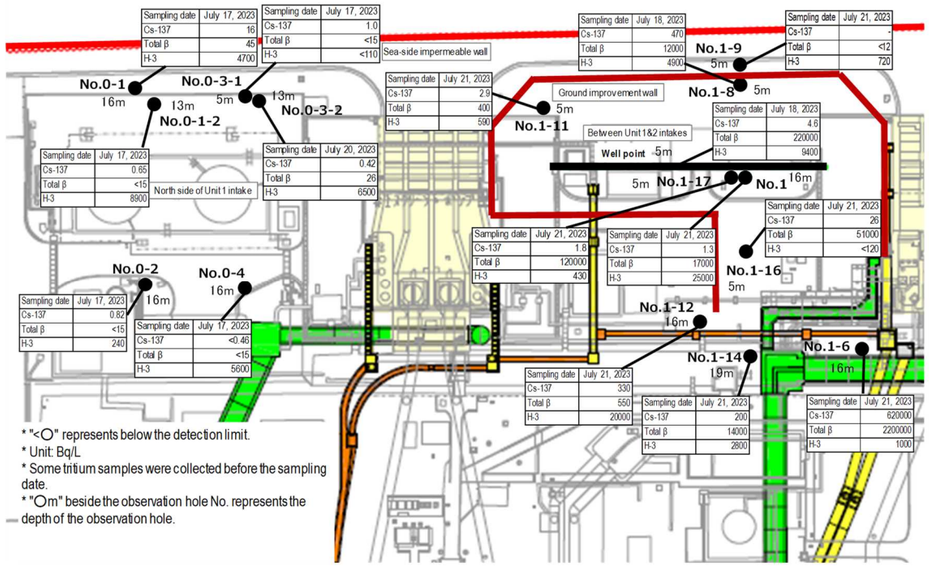
- As of July 6, 2023, the total storage volume of waste sludge was 418 m³ (area-occupation rate: 60%), while that of concentrated waste fluid was 9,469 m³ (area-occupation rate: 92%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment and other vessels, was 5,594 (area-occupation rate: 86%).

Reduction in radiation dose and mitigation of contamination

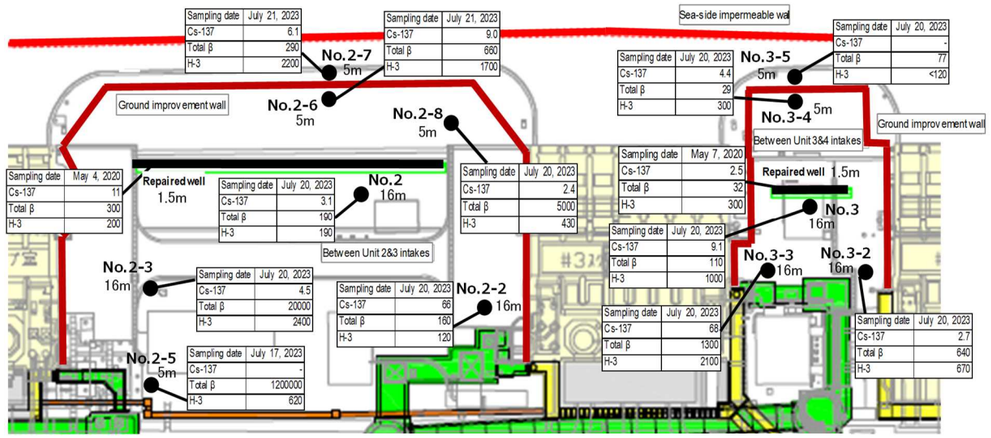
Effective dose-reduction at site boundaries and purification of port water to mitigate the impact of radiation on the external environment

➢ Status of the 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 has remained constant overall but increased temporarily from April 2020 and is even increasing or declining at many observation holes at present, including Nos. 0-1-2, 0-3-1, 0-3-2 and 0-4. The trend continues to be carefully monitored.
- 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 Nos. 1-14, 1-16 and 1-17 but has otherwise remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall but has been increasing or declining at many observation holes, including Nos. 1-6, 1-9, 1-11, 1-12, 1-14, 1-16 and 1-17. The trend continues to be carefully monitored.
- 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. It has been increasing and declining at Nos. 2-3, 2-5, 2-6 and 2-7 but has remained constant overall. The concentration of total β radioactive materials has remained constant overall but has been increasing or declining at No. 2-5. The trend continues to be carefully monitored.
- 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 overall. The concentration of total β radioactive materials has remained constant overall but has been increasing or declining at many observation holes, including Nos. 3-4 and 3-5. The trend continues to be carefully monitored.
- In the groundwater on the east side of the Turbine Buildings, as with the total β radioactive materials, the concentration of cesium has also remained constant as the overall area but been increasing or declining and exceeded the previous highest record at some observation holes. Investigations into the fluctuation are underway for Nos. 0-3-2, 1, 1-6, 2-5, 2-6 and 3-3.
- The concentration of radioactive materials in drainage channels has remained constant overall, despite increasing during rainfall. In Drainage Channel D, drainage of the low-dose area on the west side of the site started to pass from August 30, 2022 and the concentration has remained low. From November 29, 2022, continuous monitors were installed and drainage around the Units 1 and 2 switch yard started to pass.
- In the open channel area of seawater intake for Units 1 to 4, the concentration of radioactive materials in seawater has remained below the legal discharge limit and been declining long term, despite the temporary 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 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 radioactive materials in seawater has remained below the legal discharge limit and has been declining long term, despite temporary 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. Regarding the concentration of Cs-137, a temporary increase was sometimes observed on the north side of the Unit 5 and 6 outlets and near the south outlet due to the influence of weather, marine meteorology and other factors. Regarding the concentration of Sr-90, variation was observed in FY2021 in the area outside the port (north and south outlets). Monitoring of the tendency continues, including the potential influence of the weather, marine meteorology and others.

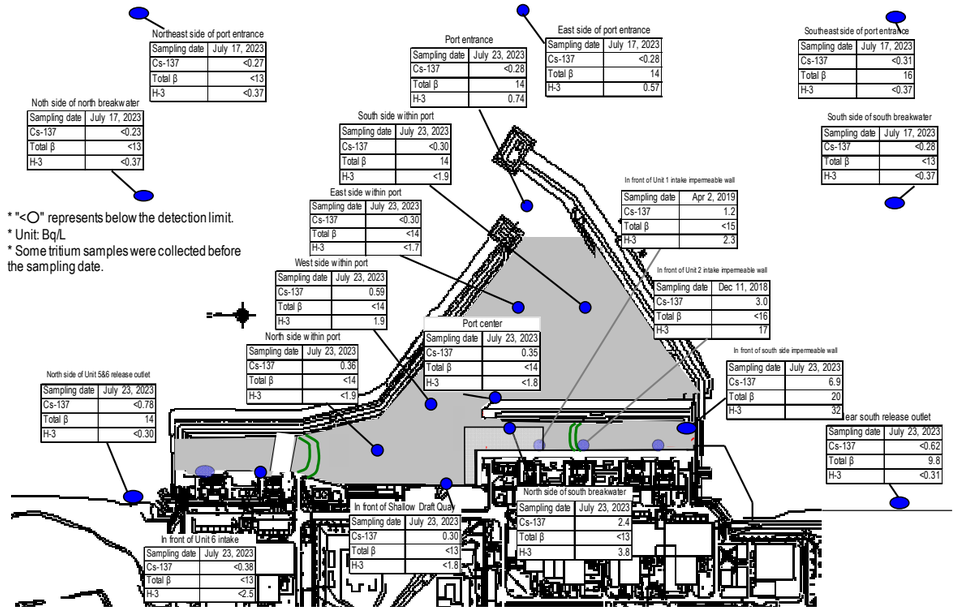


<Unit 1 intake north side, between Unit 1 and 2 intakes>



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

Figure 4: Groundwater concentration on the Turbine Building east side



* "<○" represents below the detection limit.
* Unit: Bq/L
* Some tritium samples were collected before the sampling date.

Figure 5: 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 March to May 2023 was approx. 9,400 (cooperating company workers and TEPCO HD employees), which exceeded the monthly average workforce (approx. 7,600). Accordingly, sufficient personnel were registered to work on site.
- It was confirmed with the prime contractors that the estimated manpower necessary for the work in August 2023 (approx. 4,100 workers 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) for the most recent 2 years were maintained, with approx. 3,000 to 4,600.

- The number of workers from within Fukushima Prefecture increased slightly and that outside remained constant. The local employment ratio (cooperating company workers and TEPCO HD employees) as of June 2023 remained constant at around 70%.
- The average exposure doses of workers were approx. 2.60, 2.51 and 2.15 mSv/person-year during FY2020, 2021 and 2022, respectively (The legal exposure dose limits are 100 and 50 mSv/person-year respectively over five years, the TEPCO HD management target is 20 mSv/person-year).
- For most workers, the exposure dose was sufficiently within the limit and allowed them to continue engaging in radiation work.

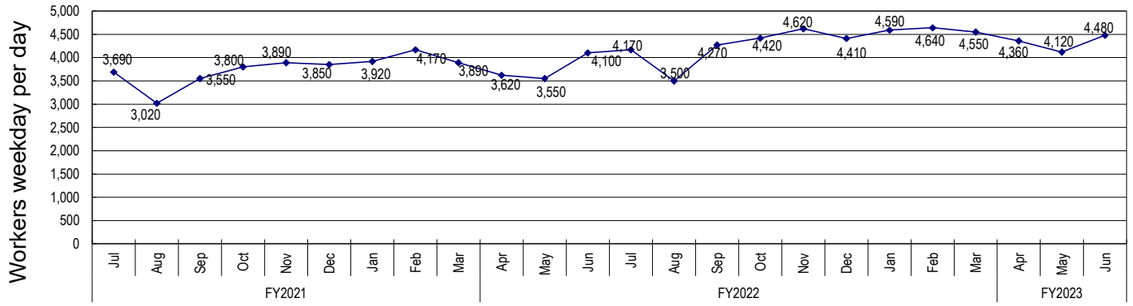


Figure 6: Changes in the average number of workers weekday per day for each month of the most recent 2 years (actual values)

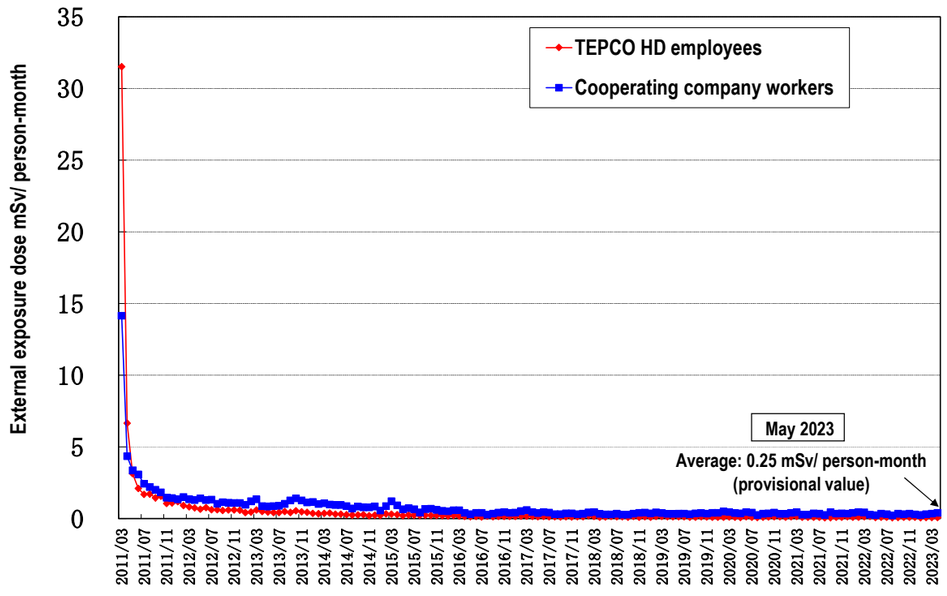


Figure 7: Changes in monthly average exposure dose of individual worker
(monthly exposure dose since March 2011)

➢ Survey to improve the work environment

- With the aim of improving the work environment for workers at the power station, an annual survey is being conducted. Distribution of the 14th survey questionnaire sheet will start sequentially from late July and the results will be summarized in December.
- In this survey, new questions are added to ask what improvements workers request regarding the rest house as “interval with other workers and comfort in the rest house” and questions about “countermeasures to suppress the spread of COVID-19 infections” are abolished.

- Efforts to create “a safe and comfortable workplace” continue.

➢ Health management of workers in the Fukushima Daiichi Nuclear Power Station

- 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 fourth quarter (January – March) in FY2022 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 third quarter in FY2022 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.

➢ Review of countermeasures to suppress the spread of COVID-19 infections

- At the Fukushima Daiichi Nuclear Power Station, in accordance with the TEPCO HD policy, each of the countermeasures to suppress the spread of infections has been abolished in principle since May 8, 2023. However, from the BCP (business continuity plan) perspective, part of the countermeasures to suppress the spread of infections within the workplace remain in place, including the wearing of masks in crowded and closed areas, a gradual review of operations for commuting and on-site buses and avoidance of contact with duty staff.
- Based on social trends and the infection status within the workplace and other conditions, the entire abolishment, including for duty staff, will be considered.
- Basic countermeasures (visiting medical institutions when feeling unwell, ventilation, avoidance of the “Three Cs,” frequent handwashing, etc.) will continue to be implemented appropriately by each worker and TEPCO will proceed with decommissioning while prioritizing safety.

➢ Status of heat stroke cases

- In FY2023, further measures to prevent heat stroke commenced from April to cope with the hottest season.
- In FY2023, four workers suffered heat stroke due to work up until July 24 (in FY2022, five workers up until the end of July). Continued measures will be taken to prevent heat stroke.

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 10-24)"; unit (Bq/L); ND represents a value below the detection limit

Summary of TEPCO data as of July 25, 2023

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.

Cesium-134	:	ND(0.42)		
Cesium-137	:	0.48		
Total β	:	ND(14)		
Toritium	:	3.0	※1	

Cesium-134	:	3.3 (H25/12/24)	→	ND(0.37)	Below 1/8
Cesium-137	:	7.3 (H25/10/11)	→	ND(0.34)	Below 1/20
Total β	:	69 (H25/8/19)	→	ND(14)	Below 1/4
Toritium	:	68 (H25/8/19)	→	1.3	Below 1/50

Cesium-134	:	3.3 (H25/10/17)	→	ND(0.30)	Below 1/10
Cesium-137	:	9 (H25/10/17)	→	ND(0.34)	Below 1/20
Total β	:	74 (H25/8/19)	→	17	Below 1/4
Toritium	:	67 (H25/8/19)	→	2.4	Below 1/20

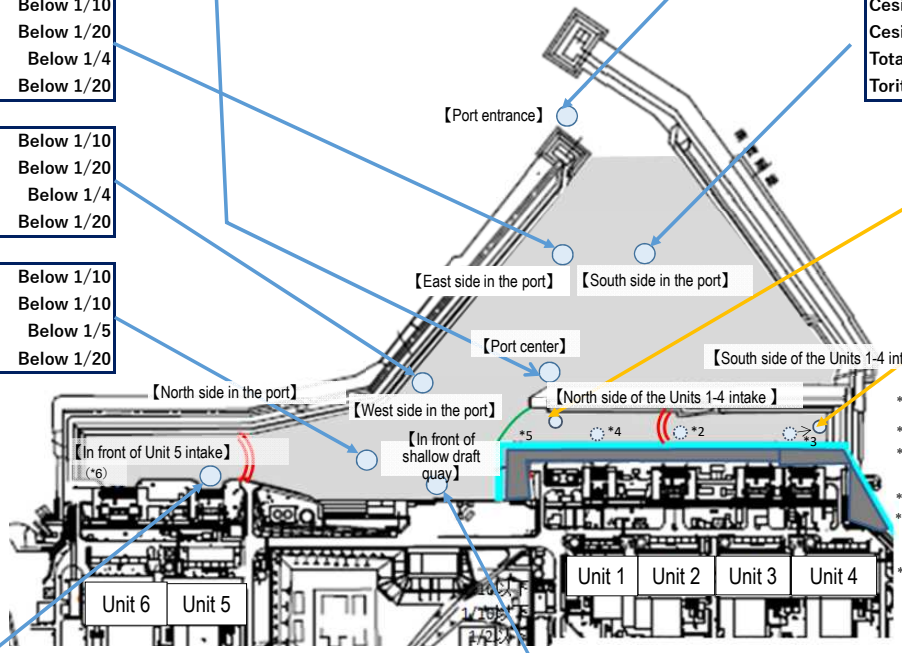
Cesium-134	:	3.5 (H25/10/17)	→	ND(0.37)	Below 1/9
Cesium-137	:	7.8 (H25/10/17)	→	0.31	Below 1/20
Total β	:	79 (H25/8/19)	→	14	Below 1/5
Toritium	:	60 (H25/8/19)	→	2.1	Below 1/20

Cesium-134	:	4.4 (H25/12/24)	→	ND(0.37)	Below 1/10
Cesium-137	:	10 (H25/12/24)	→	ND(0.34)	Below 1/20
Total β	:	60 (H25/7/4)	→	13	Below 1/4
Toritium	:	59 (H25/8/19)	→	2.8	Below 1/20

Cesium-134	:	32 (H25/10/11)	→	ND(0.43)	Below 1/70
Cesium-137	:	73 (H25/10/11)	→	1.6	Below 1/40
Total β	:	320 (H25/8/12)	→	15	Below 1/20
Toritium	:	510 (H25/9/2)	→	9.6	Below 1/50

Cesium-134	:	5 (H25/12/2)	→	ND(0.41)	Below 1/10
Cesium-137	:	8.4 (H25/12/2)	→	0.44	Below 1/10
Total β	:	69 (H25/8/19)	→	ND(12)	Below 1/5
Toritium	:	52 (H25/8/19)	→	2.4	Below 1/20

Cesium-134	:	ND(0.37)
Cesium-137	:	4.8
Total β	:	38
Toritium	:	16 *1



Sea side impermeable wall
Silt fence
Silt fence for construction

Cesium-134	:	2.8 (H25/12/2)	→	ND(0.34)	Below 1/8
Cesium-137	:	5.8 (H25/12/2)	→	ND(0.35)	Below 1/10
Total β	:	46 (H25/8/19)	→	ND(14)	Below 1/3
Toritium	:	24 (H25/8/19)	→	2.0	Below 1/10

Cesium-134	:	5.3 (H25/8/5)	→	ND(0.35)	Below 1/10
Cesium-137	:	8.6 (H25/8/5)	→	ND(0.28)	Below 1/30
Total β	:	40 (H25/7/3)	→	ND(14)	Below 1/2
Toritium	:	340 (H25/6/26)	→	3.0	Below 1/100

*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. The point was further moved to the outside of the silt fence from January 20, 2023, to install the silt fence to the Drainage Channel K outlet as a measure for fish in the port. (The sampling point was moved to approx.. 3m east side)
*4: For the point, monitoring was finished from April 3, 2019 due to preparatory work for transfer of mega float.
*5: For the point, monitoring point was moved to the land side from May 25, 2023 along with work in the surrounding area.
*6: For the point, with the completion of work to install ALPS related facilities and others, monitoring point was moved from "In front of Unit 6 intake" to "In front of Unit 5 intake" from July 3, 2023.

	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

Source: TEPCO website Analysis results on nuclides of radioactive materials around Fukushima Daiichi Nuclear Power Station http://www.tepco.co.jp/decommision/planaction/monitoring/index-j.html

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 July 10-24)

Summary of TEPCO data as of July 25, 2023

	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

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

Cesium-134	: ND	(H25)	→	ND(0.33)	
Cesium-137	: ND	(H25)	→	ND(0.30)	
Total β	: ND	(H25)	→	ND(14)	
Toritium	: ND	(H25)	→	_	

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

Cesium-134	: ND	(H25)	→	ND(0.25)	
Cesium-137	: 1.6	(H25/10/18)	→	ND(0.26)	Below 1/2
Total β	: ND	(H25)	→	ND(12)	
Toritium	: 6.4	(H25/10/18)	→	_	

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

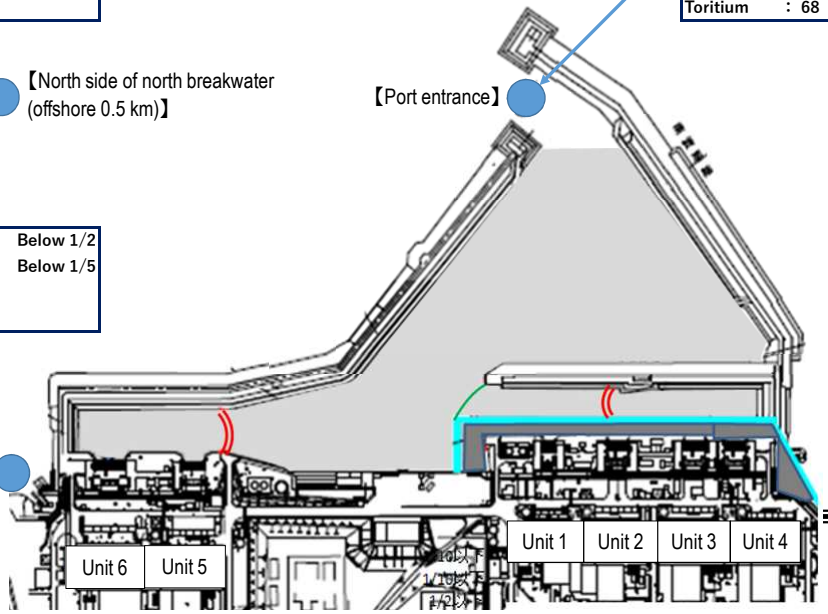
Cesium-134	: ND	(H25)	→	ND(0.28)	
Cesium-137	: ND	(H25)	→	ND(0.20)	
Total β	: ND	(H25)	→	18	
Toritium	: ND	(H25)	→	_	

Cesium-134	: ND	(H25)	→	ND(0.35)	
Cesium-137	: ND	(H25)	→	ND(0.32)	
Total β	: ND	(H25)	→	ND(14)	
Toritium	: 4.7	(H25/8/18)	→	_	

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

Cesium-134	: 3.3	(H25/12/24)	→	ND(0.37)	Below 1/8
Cesium-137	: 7.3	(H25/10/11)	→	ND(0.34)	Below 1/20
Total β	: 69	(H25/8/19)	→	ND(14)	Below 1/4
Toritium	: 68	(H25/8/19)	→	1.3	Below 1/50

【Port entrance】



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

Cesium-134	: ND	(H25)	→	ND(0.34)	
Cesium-137	: ND	(H25)	→	ND(0.34)	
Total β	: ND	(H25)	→	ND(14)	
Toritium	: ND	(H25)	→	_	

Cesium-134	: 1.8	(H25/6/21)	→	ND(0.88)	Below 1/2
Cesium-137	: 4.5	(H25/3/17)	→	ND(0.78)	Below 1/5
Total β	: 12	(H25/12/23)	→	11	
Toritium	: 8.6	(H25/6/26)	→	_	

【North side of Unit 5 and 6 release outlet】

Cesium-134	: ND	(H25)	→	ND(0.74)	
Cesium-137	: 3	(H25/7/15)	→	ND(0.76)	Below 1/3
Total β	: 15	(H25/12/23)	→	11	
Toritium	: 1.9	(H25/11/25)	→	_	

【Near south release outlet (*)】

Sea side impermeable wall

Silt fence

Silt fence for construction

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

*: 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.
Samples were also taken from a point approx. 280m south from the same release outlet from January 27, 2017 and approx. 320m from March 23, 2018.

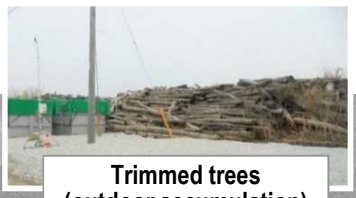
Source: TEPCO website, Analysis results on nuclides of radioactive materials around Fukushima Daiichi Nuclear Power Station http://www.tepco.co.jp/decommision/planaction/monitoring/index-j.html

Appendix 2

July 27, 2023

TEPCO Holdings Fukushima Daiichi Nuclear Power Station Site Layout

- Rubble storage area
- Rubble storage area (planned)
- Used protective clothing
- Trimmed trees area
- Mid-/ low-level contaminated water tank (existing)
- Mid-/ low-level contaminated water tank (planned)
- Secondary waste from water treatment (existing)
- Secondary waste from water treatment (planned)
- Waste treatment facility
- Non-controlled facility
- Analysis and research facility



Trimmed trees (outdoor accumulation)

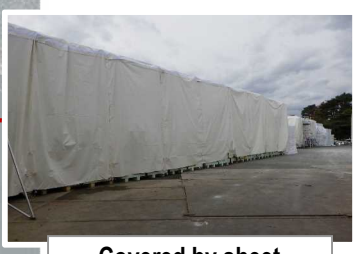
Temporary trimmed trees storage pool

Temporary soil-covered type

Rubble (outdoor accumulation)

Rubble (covered by sheet)

Solid waste storage facility



Covered by sheet (container storage)

Spent adsorption vessel temporary storage facility

Temporary waste sludge storage

Tank installation status

Provided by Japan Space Imaging Corporation, photo taken on April 8, 2021
Product(C) [2020] DigitalGlobe, Inc., a Maxar company

0m 100m 500m 1000m

1 Contaminated water management

- Efforts to promote contaminated water management based on three basic policies:
  ① "Remove" the source of water contamination ② "Redirect" fresh water from contaminated areas
  ③ "Retain" contaminated water from leakage

Milestones of the Mid- and-Long-Term Roadmap (major target processes)
- [Completed] Suppressing the amount of contaminated water generated to 150 m³/day or less (within 2020)
- Suppressing the amount of contaminated water generated to 100 m³/day or less (within 2025)
- [Completed] Treatment of contaminated water in buildings was completed* (within 2020) *Except for Units 1-3 Reactor Buildings, Process Main Building and High Temperature Incinerator Building.
- [Completed] Contaminated water in Reactor Buildings was reduced to about a half of the level at the end of 2020 (FY2022-FY2024)

2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024

Contaminated water management【Remove】

Contaminated water treatment facility
- ▽Reception start of contaminated water to Central Waste Treatment Building
- ▽Decontamination equipment (AREVA)
- ▽Evaporative concentration equipment
- ▽Cesium Adsorption Apparatus (KURION)
- ▽2nd Cesium Adsorption Apparatus (SARRY)
- ▽Treatment of RO-condensed salt water complete
- ▽Reduction of strontium by Cesium Adsorption Apparatus (KURION) (from 2015.1.6)
- ▽Reduction of strontium by 2nd Cesium Adsorption Apparatus (SARRY) (from 2014.12.26)
- ▽Purification of strontium-reduced water in flanged tanks complete
- ▽Purification of strontium-reduced water complete
- ▽Reduction of strontium by 3rd Cesium Adsorption Apparatus (SARRY II) (from 2019.7.12)
- ▽Treatment start of strontium-reduced water (ALPS: from 2015.12.4, additional: from 2015.5.27, high-performance: from 2015.4.15)
- ▽Multi-nuclide Removal Equipment (ALPS) (System A: from 2013.3.30, System B: from 2013.6.13, System C: from 2013.9.27, hot tests conducted)
- ▽Multi-nuclide Removal Equipment (additional ALPS)
- ▽Start of full-scale operation (from 2017.10.16)
- ▽Multi-nuclide Removal Equipment (high performance ALPS) (from 2014.10.18, hot tests conducted)
- ▽Pre-service inspection granted (2023.3.2)

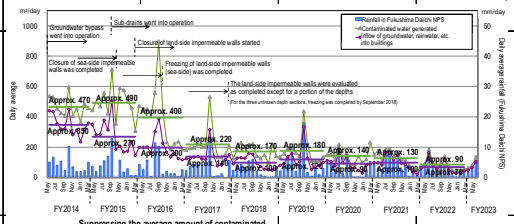
Cesium Adsorption Apparatus (KURION)

Landing of the second Cesium Adsorption Apparatus (SARRY)

Multi-nuclide removal equipment (ALPS)

Removal of contaminated water from seawater pipe trench
- ▽Trench Purification by mobile equipment
- ▽Completion of tunnel filling
- ▽Transfer of stagnant water complete
- ▽Completion of shaft filling
- 【Removal of contaminated water in seawater pipe trench】
- Unit 3
  - ▽Completion of tunnel filling
  - ▽Transfer of stagnant water complete
  - ▽Completion of shaft filling (except for upper part of Shaft D)
  - ▽Filling of openings II and III complete
  - ▽Transfer stagnant water complete
  - ▽Completion of filling parts running over drainage channel
- Unit 4

Unit 2 seawater pipe trench Shaft D filling work



Suppressing the average amount of contaminated water generated to approx. 130 m3/day ▽

Contaminated water management【Redirect】

Groundwater bypass
- ▽Installation start of groundwater bypass
- ▽Operation start of groundwater bypass (drainage started from 2014.5.21)

Pumping well

Sub-drain
- ▽Recovery of existing sub-drain pit and start of new installation
- ▽Installation start of Water-Treatment Facility special for Sub-drain & Groundwater drains
- ▽Operation start of sub-drain (drainage started from 2015.9.14) (Treatment capacity: 1000 m³/day)
- ▽Enhancement of treatment capacity (2000m³/day)

Sub-drain purification system

Land-side impermeable wall
- ▽Start of maintenance operation on north and south sides
- ▽Freezing completion
- ▽Start of maintenance operation in all sections
- In some temperature measurement tubes near the K drainage channel cross, temperature exceeded 0℃ locally
- Although no influence was detected on the impermeable function of the land-side impermeable walls but test investigation is underway for the stoppage effect
- ▽Start of maintenance operation on east side
- ▽Freezing start
- ▽Freezing completion (except for some parties)

Land-side impermeable wall brine (refrigerant) circulation pipe

Facing
- ▽Completion of waterproof pavement (facing) (except for areas of 2.5 and 6.5m above sea level and around Unit 1-4)
- ▽Completion of waterproof pavement (facing) (except for around Unit 1-4)

Placement of seaside impermeable walls complete

Contaminated water management【Retain】

Bank groundwater measures
- High concentration of radioactive materials detected from observation well of bank
- ▽Area 2.5m above sea level – Start of ground improvement by water glass
- ▽Completion
- ▽Start of pumping of water from contaminated areas (well point)
- ▽Installation start of seaside impermeable walls
- ▽Installation of seaside impermeable walls complete
- ▽Operation start of groundwater drain (pumping-up started on 2015.11.5)

Storage facility
- ▽Completion of purification treatment of RO concentrated salt water
- ▽Storage in steel square tanks
- ▽Completion of replacement of steel square tanks
- ▽Removal of steel horizontal tanks complete (except for condensed waste liquid)
- ▽Water leakage (300L) from flanged tank
- ▽Water leakage (100t) from flanged tank
- ▽Storage in flanged cylindrical tanks
- ▽Completion of fence to prevent leakage expanding
- ▽Water leakage (10L) from flanged tank
- ▽Work to raise fence height complete
- ▽Purification of strontium-reduced water in flanged tanks complete
- ▽Transfer and storage of all treated water in welded-joint tanks
- ▽Leakage of contaminated water from underground reservoir => Start of transfer to tanks
- ▽Transfer of contaminated water to tanks complete
- ▽Storage in cylindrical steel welded-joint tanks
- ▽Purification of strontium-reduced water complete
- ▽Sprinkling start of rainwater within tank fences by rainwater treatment facility (from 2014.5.21)

Construction of welded-joint tanks

Flanged and welded-joint tanks

Treatment of stagnant water
- ▽Start to maintain water-level difference with sub-drain water level
- ▽Transfer start from each building to Central Rw Building
- ▽Installation of stagnant water transfer equipment/transfer start
- ▽Completion of work to improve reliability of transfer line (replacement with PE pipes)
- ▽Treatment of stagnant water in buildings complete
- ▽Reduction of contaminated water in the Reactor Buildings to approx. half of the level at the end of 2020 achieved
- ▽Floor exposure of Unit 1 T/B
- ▽Separation of stagnant water between Units 1 and 2
- ▽Floor exposure of Unit 1 Rw/B
- ▽Separation of stagnant water between Units 3 and 4
- ▽Floor exposure of Unit 2 T/B, Rw/B
- ▽Floor exposure of Unit 3 T/B, Rw/B
- ▽Floor exposure of Unit 4 R/B, T/B, Rw/B

Countermeasures to tsunami

Closure of openings
- ▽Examination start of measures to close building openings
- ▽Work for common pool complete
- ▽Work for Units 1 and 2 T/B complete
- ▽Work for HTI building complete
- ▽Work for Process Main Building complete
- ▽Work for Unit 3 T/B complete
- ▽Work for Unit 1-3 R/B complete
- ▽Measures to close openings were completed
- ▽Work for Units 1-4 RwB was completed

Seawall
- ▽Installation of outer-rise tsunami seawall complete
- ▽Construction start of Chishima Trench Tsunami Seawall
- Japan Trench tsunami seawall
- ▽Completion of installation ▽On-site start

Mega float
- ▽Start of marine construction
- Temporary grounding of mega float▽
- ▽Internal filling complete (reduction of tsunami risks)

Chishima Trench Tsunami Seawall complete

Construction of Japan Trench Tsunami Seawall

2 Handling of ALPS treated water

In “The Inter-Ministerial Council for Contaminated Water, Treated water and Decommissioning” held on April 13, the basic policy on how to handle ALPS treated water was set. Based on this, the response of TEPCO was announced on April 16.

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

Information provision and communication to foster understanding

■ Measures for decommissioning, contaminated water and treated water of the Fukushima Daiichi Nuclear Power Station need efforts to reduce risks over a long term. Regarding handling of ALPS treated water as a part of decommissioning, to local residents, those who in the fishery industry and related parties, we will thoroughly explain about the policies and responses concerning the facility design, operation and management to ensure safety, monitoring of radioactive materials and others, and proceed with **efforts to sincerely face their concerns and interests and respond to each of them**.

■ Moreover, to **further deepen the understanding** of everyone in Japan and overseas, efforts to **coherently disseminate** measurement results of ALPS treated water and information concerning facility operation, radiation impact assessment and others will continue and be enhanced.

- For overseas, the was renewed. **“Treated Water portal site in English, Chinese and Korean”**
  - “Sea Area Monitoring” page in English, Chinese and Korean was published
  - “The 1st IAEA Review” explanation booklet was published in English, Chinese and Korean
- When inaccurate or misleading overseas information was detected, for maximum suppression of reputation, return call or other actions will be taken.
- A condition to deliver science-based information to overseas media and embassies in Japan will be created.
  - Approach to major media and embassies is being enhanced.
  - For accurate media coverage, regular press conferences will continue to be held.

- **Visits and Discussion Meetings of Fukushima Daiichi Nuclear Power Station**

To solve people’s questions, TEPCO invites their visits to the power station and answer their questions on site. From people who participated in the visit gave feedbacks such as “by directly seeing the decommission site and having dialogues, they could obtain deeper understanding about the present situation, issues and status of safety measures.” TEPCO will continue these efforts to invite more people including online visits.
<Visits in FY2022: 15 times, 142 participants in total>

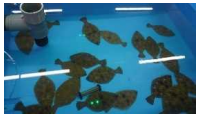
Examination concerning handling of ALPS treated water

- **Safety review of International Atomic Energy IAgency (IAEA)**

In November 2022, IAEA review team visited Japan to conduct the second review concerning safety of ALPS treated water (the first review was conducted in February 2022 and the report was published in April)
- The article of the IAEA Review concerning handling of ALPS treated water and overview of the report are published timely on the TEPCO website.
- Instructions from IAEA were reflected in the revision of the implementation plan and the radiation assessment report.
- The report of the second review will be published around early 2023.


IAEA review team arrived at the Fukushima Daiichi Nuclear Power Station

- **Rearing test of marine organisms**
  - To alleviate concerns and lead to relief of local residents, related parties and the everyone in society, marine orgasms are being reared in tanks of seawater containing ALPS treated water and the status is compared with the original seawater controls. The progress will be shown coherently and clearly.
  - Regarding behaviors of tritium and others, a lot of research has been conducted in Japan and overseas. Based on the experimental results, firstly experimental data for a half year will be collected and subsequently, the same as past experimental results, the theory “tritium in vivo is not concentrated and the concentration of tritium in vivo will not exceed the level in the growing environment” will also be reaffirmed.


Flounder in rearing preparation tank

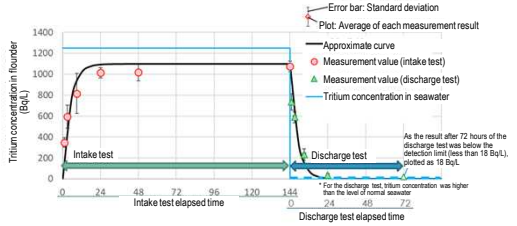

Overall view of mockup tanks

- **Measurement of tritium concentration of flounder (tritium concentration less than 1,500 Bq/L) and analysis of results**

Based on the measurement results of tritium concentration, the following was confirmed as in the past insight:

[Intake test]
- The tritium concentration did not exceed the level in the growing environment (in this test, the concentration exceeding the level in ALPS treated water diluted with seawater)
- The tritium concentration reached equilibrium in a certain period

[Discharge test]
- When flounder having reached equilibrium in the tritium concentration higher than the level of normal seawater is returned to normal seawater, the concentration decreased over time



- Daily rearing status is published in the TEPCO website and Twitter
  - TEPCO website: http://www.tepco.co.jp/decommission/information/newsrelease/breedingtest/index-j.html
  - TEPCO Twitter: https://twitter.com/TEPCOfishkeeper

Tritiated Water Taskforce (2013.12 – 2016.5, 15 meetings)


Tank area viewed from the Large Rest House (2015.10.29)

2016.6 Report of Tritiated Water Taskforce

Subcommittee on Handling of ALPS treated water (2016.11 – 2020.1, 17 meetings)

2018.8 Explanatory and hearing meeting, receiving opinions

2020.2 Report of Subcommittee on Handling of ALPS treated water

Opportunity for receiving opinions from parties concerned concerning handling of ALPS treated water (2020.4 – 2020.10, 7 meetings)

2021.4.13 The basic policy on the handling of ALPS treated water was set
2021.4.16 The response of TEPCO was announced

2021.12.21 The “Application Documents for Approval to Amend the Implementation Plan for Fukushima Daiichi Nuclear Power Station Specified Nuclear Facility” regarding ALPS treated water were submitted to the Nuclear Regulation Authority
2021.12.28 “The Action Plan concerning the Continuous Implementation of the Basic Policy on Handling of ALPS Treated Water” was formulated

Review meeting concerning the implementation plan on handling of ALPS treated water (from 2021.7 to 2022.4, 15 meetings)

2022.4.28, 5.13, 7.15 Application to partially revise the Application Documents for Approval to Amend the Implementation Plan was submitted

2022.7.22 Application for the Application Documents for Approval to Amend the Implementation Plan was approved

2022.8.4 Work has commenced

2023.5.10 Approval

2023.2.14, 20 Application for the Application Documents for Approval to Amend the Implementation Plan was submitted (amendment of organizational structure, and nuclides to be measured and assessed, and others)

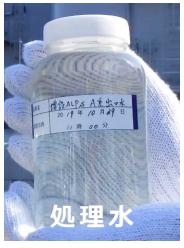
2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

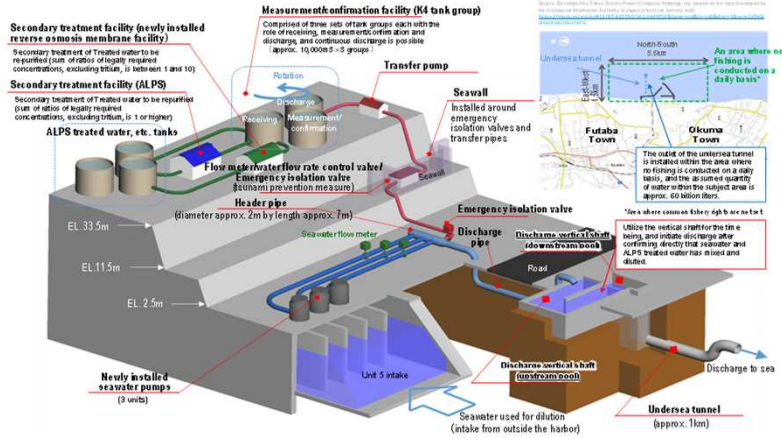
2022/8/30 The "Approach to Strengthening and Expansion of Measures in the Handling of ALPS Treated Water" was summarized

2022.11.14 Application for the Application Documents for Approval to Amend the Implementation Plan was submitted (amendment of organizational structure, and nuclides to be measured and assessed, and others)

2023.6.26 Completion of installation
2023.7.7 Receipt of Certificate of Completion for Pre-service Inspections

【Overview of ALPS treated water dilution and discharge facility】





3 Removal of fuel from spent pool

Milestones of the Mid- and-Long-Term Roadmap (major target processes)

- Completion of Unit 1-6 fuel removal (within 2031)
- Completion of installation of Unit 1 large cover (around FY2023), start of Unit 1 fuel removal (FY2027-2028)
- Start of Unit 2 fuel removal (FY2024-2026)

July 27, 2023
Secretariat of the Team for Countermeasures for Decommissioning, Contaminated Water and Treated Water

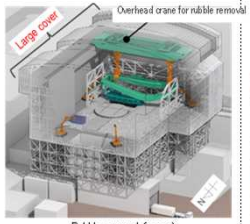
Legend: Rubble removal, etc. | Installing a fuel removal machine | Fuel removal | Storage and handling of fuel

2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023～

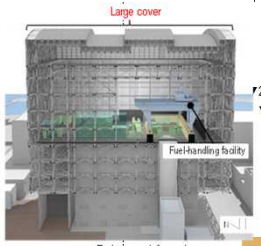
Unit 1

For Unit 1, a large cover will be installed over the whole building, within which rubble will be removed.

<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, was investigated, followed in August and September by the conditions of the overhead crane. 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, initially installing a large cover over the Reactor Building, then removing rubble inside the cover.



Rubble removal (image)



Fuel removal (image)

▼2017.12 Completion of building cover dismantling and windbreak fence installation
▼2018.1-2020.12 Rubble removal on the north side of Reactor Building
▼2018.9-12 Removal of X-braces
▼2020.3-6 Installation of spent fuel pool cover
▼2020.9-11 Measures to prevent and alleviate rubble falling
▼2020.11-2021.6 Dismantling of remaining cover
▼2021.8 Start of large cover pre-work
▼2022.4 Start of large cover installation work

As part of efforts to remove fuel from the Unit 1 spent fuel pool, investigations are underway to ascertain the conditions of the fallen roof on the south side and the contamination of the well plug. Based on the results, “the method initially installing a large cover over the Reactor Building, then removing rubble within the cover” was selected to ensure safer and more secure removal. Work to install a large cover started from August 2021. Work to complete the installation of a large cover by around FY2023 is ongoing, with fuel removal scheduled to run from FY2027 to FY2028.

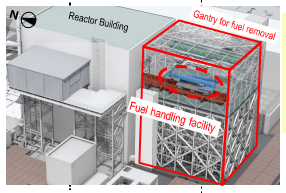

<Unit 1 northwest side 2023.2.9>

Unit 2

For Unit 2, with the removal of spent fuel in mind, a “gantry for fuel removal” (gantry and front room) will be constructed on the south side of the building.

<Reference> Progress to date
Previously, scope 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 was examined.

Unit 2
Overview of fuel removal (bird's-eye view)



▼2015.3-2016.11 Yard construction
▼2016.9-2017.4 West-side gantry installation work
▼2017.5 Opening a hole in the west-side external wall
▼2018.8-2020.12 Moving and containment of remaining objects
▼2020.6 Investigation inside the spent fuel pool
▼2020.6 Investigation inside the spent fuel pool
▼2023.1 Start of steel erection
▼2023.2 Start of south-side existing facilities dismantling

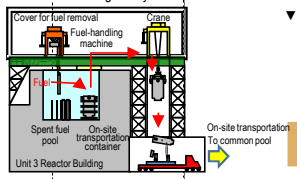

<Unit 2 Construction of gantry for fuel removal>

As part of efforts to remove fuel from the Unit 2 spent fuel pool and 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 initiate fuel removal from FY2024 to FY2026.

Unit 3

All fuel assemblies from Unit 3 had been removed by February 2021.

Overview of the fuel-handling facility inside the cover



▼2013.10 Completion of removal of large rubble on the Reactor Building top floor
▼2015.8 Completion of removal of the fuel-handling machine B within the spent fuel pool
▼2016.12 Completion of shielding on the Reactor Building top floor
▼2017.1 Installation start of a cover for fuel removal
▼2019.4.15 Start of fuel removal
▼2021.2.28 Fuel removal completed (566 assemblies)

Before installing a cover for fuel removal, the process of removing large rubble from the spent fuel pool was completed in November 2015. To ensure safe and steady fuel removal, training via remote control was conducted at the factory using the actual fuel-handling machine to be installed on site (February – December 2015). Installation of the fuel removal cover was completed on February 23, 2018.
With fuel removal in mind, rubble retrieval training inside the pool, which was scheduled in conjunction with fuel removal training, started from March 15, 2019 and fuel removal started from April 15, 2019. Fuel removal was completed on February 28, 2021.

<Unit 3 Cover for fuel removal (dome roof) 2019.2.21>

Unit 4

All fuel assemblies from Unit 4 had been removed by December 2014.

▼2011.11- 2012.7 Removal of rubble on the Reactor Building top floor
▼2012.4-2013.3 Ground improvement and foundation work
▼2013.4-2013.7 Installation of external walls and roof panels
▼2013.6-2013.10 Installation of overhead crane and fuel-handling machine
▼2013.8-2013.10 Removal of rubble inside the reactor well and pool
▼2013.11.18 Start of fuel removal
▼2014.12.22 Fuel removal was completed (1533 assemblies)


<Unit 4 Cover for fuel removal>

In the Mid- and-Long-Term Roadmap, the Phase 1 target involved starting to remove fuel from inside the spent fuel pool (SFP) of the 1st Unit within two years of completing Step 2 (by December 2013).
On November 18, 2013, fuel removal from Unit 4, namely the first Unit, got underway and Phase 2 of the roadmap started.
On November 5, 2014, within a year of commencing fuel removal work, 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. (two 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.


Fuel removal

* Part of the photo is corrected because it includes machine information related to nuclear material protection.

4 Work toward fuel debris retrieval

July 27, 2023
Secretariat of the Team for Countermeasures for Decommissioning, Contaminated Water and Treated Water

Milestones of the Mid- and-Long-Term Roadmap (major target processes)

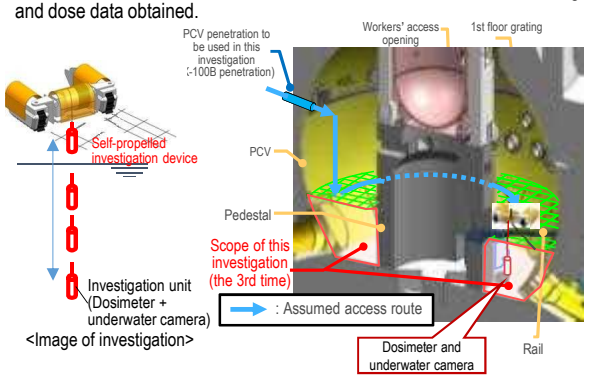
Start of fuel debris retrieval from the first unit (Unit 2). Expanding the scale in stages (within 2021 * The schedule will be extended for about 1 year due to the spread of COVID-19 infections)

Before removing fuel debris, investigations inside the Primary Containment Vessel (PCV) are conducted to inspect the conditions there, including locations of fuel debris.

Unit 1 Investigation overview

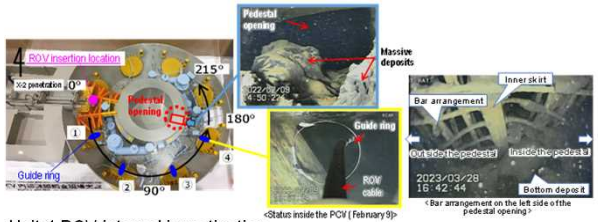
・In April 2015, a device having entered the inside of the PCV via a narrow opening (bore:φ100 mm) collected information such as images and airborne dose inside the PCV 1st floor.

・In March 2017, an investigation using a self-propelled investigation device was conducted to inspect the spreading of debris to the basement floor outside the pedestal, with images taken of the PCV bottom status for the first time. The conditions inside the PCV will continue to be examined, based on the imagery and dose data obtained.



<Image of investigation>

・In February 2022, the guide ring" was installed to facilitate the investigation. From March 28, 2023, the investigation inside the pedestal by ROV-A2 started and confirmed that a portion of the bar arrangement was exposed. Regarding the soundness of the pedestal, based on the past earthquake resistant evaluation by the International Research Institute for Nuclear Decommissioning (IRID), it was evaluated that even though a portion of the pedestal was lost, there would be no serious risk. However, as the present information is very limited, the investigation will continue to acquire as much information as possible for continued evaluation.



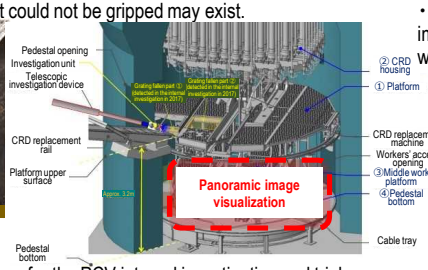
Unit 2 Investigation overview

・In January 2017, a camera was inserted from the PCV penetration to inspect the conditions of the rail on which the robot traveled. The results of a series of investigations confirmed some gratings had fallen and deformed as well as a quantity of deposit inside the pedestal.

・In January 2018, the conditions below the platform inside the pedestal were investigated. Based on the analytical results of images obtained in the investigation, deposits, probably including fuel debris, were found at the bottom of the pedestal. Moreover, multiple parts exceeding the surrounding deposits were also detected. We presumed that there were multiple instances of fuel debris falling.

・In February 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.

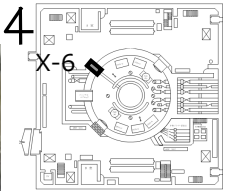

Bottom of the pedestal (after being processed in panoramic image visualization)



・In October 2020, as part of work to prepare for the PCV internal investigation and trial retrieval, a contact investigation to study deposits inside the penetration (X-6 penetration) was conducted, which involved inserting a guide pipe incorporating an investigative unit into the penetration. This confirmed that deposits inside the penetration had not deformed and come unstuck. The investigative information obtained will be utilized in the mockup test of the equipment to remove deposits inside the X-6 penetration.

<Conditions of deposits before and after contact>


<Work in front of the penetration>



<Unit 2 Reactor Building 1st floor Location of the penetration>

Unit 3 Investigation overview

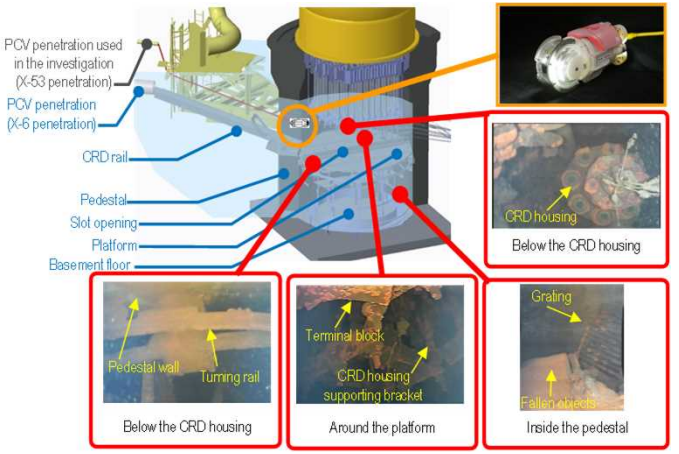
・In October 2014, the conditions of X-53 penetration, which may be under water and which is scheduled for use to investigate the inside of the PCV, was investigated via remote-controlled ultrasonic test equipment. The results showed that the penetration was not under water.

・In October 2015, to confirm the conditions inside the PCV, an investigative device was inserted into the PCV from X-53 penetration to obtain images, data on dosage and temperature and sample stagnant water. No damage to the structure and walls inside the PCV was identified and the water level was almost identical to estimated values. 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 the imagery obtained in the investigation identified damage to multiple structures and the supposed core internals.

・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.

<Conditions inside the pedestal>



Unit 1 PCV internal investigation

Investigations inside the PCV	1st (2012.10)	- Acquiring images - Measuring the air temperature and dose rate - Measuring the water level and temperature - Sampling stagnant water - Installing permanent monitoring instrumentation
	2nd (2015.4)	Confirming the status of the PCV 1st floor - Acquiring images - Measuring the air temperature and dose rate - Replacing permanent monitoring instrumentation
	3rd (2017.3)	Confirming the status of the PCV 1st basement floor - Acquiring images - Measuring the dose rate - Sampling deposit - Replacing permanent monitoring instrumentation
	4th (From 2022.2)	Acquiring information inside PCV (inside/outside of the pedestal) - Acquiring images - Measuring deposit thickness and sampling deposit - Detecting deposit debris, 3D mapping
Leakage points from PCV	- PCV vent pipe vacuum break line bellows (identified in 2014.5) - Sand cushion drain line (identified in 2013.11)	

Evaluation of the location of fuel debris inside the reactor by measurement using muons
Confirmed that there was no large fuel in the reactor core. (2015.2-5)

Unit 2 PCV internal investigation

Investigations inside the PCV	1st (2012.1)	- Acquiring images - Measuring the air temperature
	2nd (2012.3)	- Confirming water surface - Measuring the water temperature - Measuring the dose rate
	3rd (2013.2 – 2014.6)	- Acquiring images - Sampling stagnant water - Measuring water level - Installing permanent monitoring instrumentation
	4th (2017.1-2)	- Acquiring images - Measuring the dose rate - Measuring the air temperature
	5th (2018.1)	- Acquiring images - Measuring the dose rate - Measuring the air temperature
	6th (2019.2)	- Acquiring images - Measuring the dose rate - Measuring the air temperature - Determining characteristics of a portion of deposit
Leakage points from PCV	- No leakage from the torus chamber rooftop - No leakage from any internal/external surfaces of S/C	

Evaluation of the location of fuel debris inside the reactor by measurement using muons
The existence of high-density materials, which were considered to constitute fuel debris, was confirmed at the bottom of RPV and in the lower part and outer periphery of the reactor core. It was assumed that a significant portion of fuel debris existed at the bottom of RPV. (2016.3-7)

Unit 3 PCV internal investigation

Investigations inside the PCV	1st (2015.10-12)	- Acquiring images - Measuring the air temperature and dose rate - Measuring the water level and temperature - Sampling stagnant water - Installing permanent monitoring instrumentation (2015.12)
	2nd (2017.7)	- Acquiring images - Installing permanent monitoring instrumentation (2017.8)
Leakage points from PCV	- Main steam pipe bellows (identified in 2014.5)	

Evaluation of the location of fuel debris inside the reactor by measurement using muons
The evaluation confirmed that no large lump existed in the core area where fuel had been placed and that a portion of the fuel debris potentially existed at the bottom of the RPV. (2017.5-9)

Images are provided by the International Research Institute for Nuclear Decommissioning (IRID)

5 Management of solid radioactive waste

Milestones of the Mid- and-Long-Term Roadmap (major target processes)
Eliminating temporary outdoor storage of rubble and others * Except for secondary waste of water treatment and materials for reuse or recycling (within FY2028)

★ 2017.6 Revision ★ 2018.6 Revision ★ 2019.6 Revision ★ 2020.7 Revision ★ 2021.7 Revision

★ 2016.3 Announcement of Storage Management Plan of Solid Waste (Ver. 1)

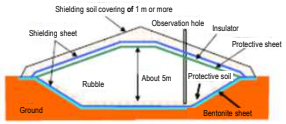
▼ 2012.9 Transfer start of rubble to the soil-covered temporary storage facility

▼ 2015.6 Transfer start of rubble to the soil-covered temporary storage facility (Tank 3)

▼ 2013.1 Start of volume reduction of trimmed trees and storage in temporary storage tank A

▼ 2019.6 Start of building construction
1st Large Waste Storage

1st Large Waste Storage Roof construction (from the inside)



<Outline of soil-covered temporary storage facility>

External view of the 9th Solid Waste Storage

▼ 2014.7 Start of pre-work
9th Solid Waste Storage


Whole view of the soil-covered temporary storage facility Tank 3

▼ 2018.2 Operation start

2021.3 High alert issued from the Shallow Draft Quay drainage channel PS monitor▼
(leakage from temporary storage Area W)

▼ 2021.7 Leakage of radioactive materials from a notch tank stored in temporary storage Area P

2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022

▼ 2013.5 Installation work gets underway
Solid Waste Incinerator

▼ 2016.3 Operation start

▲2016.8-11 Manual stop (due to pin-hole incidence)


Whole view of Solid Waste Incinerator


Electrical room


Control room

Whole view of Solid Waste Incinerator (Left: System A; right: System B)

▼ 2017.4 Start of pre-work
Additional Solid Waste Incinerator

▼2022.5 Start of operation

2017.10 Installation work gets

▼ 2018.5 Operation start
Large Equipment Decontamination Facility

▼ 2020.9 Start of pre-work
Compaction Facility

Site of Volume Reduction Facility

Present status Note

Storage of rubble and others

Present storage Approx.540,000 m³ (as of 2022.3)

Rubble (combustible), trimmed trees, used protective clothing)

Contaminated soil (0.005 - 1 mSv/h)

Rubble (metal, concrete, others)

More than 1 mSv/h

0.005-1 mSv/h

Less than 0.005mSv

Storage of water treatment secondary waste

Estimate for the next decade (or so) Approx.**810,000** m³ (*2)

Approx. 360,000 m³
Approx. 70,000 m³
Approx. 60,000 m³
Approx. 130,000 m³
Approx. 180,000 m³
Approx. 7,100 tanks

Status after a decade

(*3) Approx. **270,000** m³ (*2)

Legend : Newly installed equipment and facility

Incineration

To (A) (*1)

Incinerator Pre-treatment Facility
(scheduled for completion in FY2025)


Crusher example

Radioactive Waste Incinerator

Additional Radioactive Waste Incinerator
(Completion in May 2022)

Stored and managed in Solid Waste Storage as done for rubble

Volume reduction

To (A) (*1)

Compaction Facility
(scheduled for completion in FY2022)


Concrete crusher example


Metal cutter example

Melting

Melting equipment
(under consideration)


Electric furnace example

To (B)

Treatment measures and others will be examined

Storage /management

Approx. 20,000 m³
Approx. 70,000 m³
(A) (*1) Approx. 70,000 m³
(B) Approx. 60,000 m³
Approx. 50,000 m³ (*1)

Solid Waste Storage
(Storage capacity: approx. 250,000 m³)

Existing Solid Waste Storage
1st-8th (existing)
9th (Operation launch in 2018.2)

Additional Solid Waste Storage
10th-11th
(Scheduled for completion after FY2024)

Based on the estimates for the amount of waste to be generated, the storage capacity (approx. 250,000 m³) will be reached in around 2031. Scope to install an additional solid waste facility and others will be examined

Reuse will be examined

Spent Adsorption Vessel Temporary Storage

Large Waste Storage
(Scheduled for completion FY2023)
The earthquake-resistant design is being reviewed based on the Fukushima prefecture offshore earthquake in FY2021


Work of main part

(*1) Items for which incineration, compaction, melting or reuse is difficult are stored directly in Solid Waste Storage without being treated
(*2) As values less than 10,000 m³ are rounded, they may not be consistent with the total of breakdown
(*3) In the estimate, approx. 240,000 m³ of waste will be stored in Solid Waste Storage at the end of FY2028.

Note: Used protective clothing before incineration and BG-level concrete waste for which treatment and reuse is decided at present are not included.

- The exposure dose at the site boundaries will be reduced by aggregation to indoor storage and eliminating outdoor storage.
- The exposure dosage in exhaust gas from incinerators and at site boundaries is measured and announced on the website and others.

6 Improvement of work environment

July 27, 2023
Secretariat of the Team for Countermeasures for Decommissioning, Contaminated Water and Treated Water

While ensuring reliable exposure dose management for workers, sufficient personnel are secured. Moreover, while getting a handle on on-site needs, the work environment and labor conditions are continuously improved.

Regarding the site-wide reduction in the radiation dose and prevention of contamination spreading, the radiation dose on site was reduced by removal of rubble, topsoil and facing. Moreover, the operation was improved to use environmentally-improved areas as a Green Zone, within which workers are allowed to wear general work clothes and disposable dust-protective masks which are less of a physical burden.

2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

▼ From March 12, 2011, in response to the increased airborne concentration of radioactive materials, instructions were issued to wear full-face masks throughout the Fukushima Daiichi NPS site, excluding the Main Anti-Earthquake Building and the rest house.

▼ From May 2013, full-face mask unnecessary area was expanded sequentially.

External view of Access Control Facility

▼ In June 2013, operation of the Access Control Facility started near the main gate of the Fukushima Daiichi NPS, to which duties conducted at J-village were shifted, including contamination examination, decontamination, switching protective equipment on and off and distribution/collection of dosimeters.

▼ To help workers in the Fukushima Daiichi NPS precisely understand the conditions of their workplaces, a total of 86 dose-rate monitors were installed by January 2015. These monitors allow workers to confirm on-site dose rates at their workplaces in real time.

Large rest house under construction (2014.9.30)

▼ In March 2015, the Fukushima revitalization meal service center opened.

▼ A large rest house for workers was established and its operation commenced in May 2015.
Spaces in the large rest house are also installed for office work and collective worker safety checks as well as taking rest.
In March 2016, a convenience store opened in the large rest house. In April, the shower room went into operation.

Access Control Facility (2014.11.7)

▼ In February 2017, operation started at the Partner Companies' Building next to the New Administration Office Building.

▼ In May 2017, a heliport for emergency transport was installed inside the Fukushima Daiichi NPS and went into operation. Compared to the previous operation (at Koriyama Coast, Futaba Town or Fukushima Daini NPS, relaying to a doctor helicopter), a faster response is available for seriously ill patients requiring treatment at external medical institutions.

▼ From November 2018, from the west-side high-ground area, where Unit 1-4 can be viewed, visitors can see the site in their normal clothes without having to change.

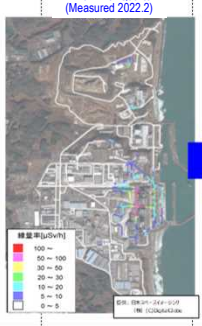
Visit by Governor of Fukushima Prefecture to the Fukushima Daiichi NPS (2018.11.1)

Visit by Prime Minister Kishida to the Fukushima Daiichi NPS (2021.10.17)

<Travel survey results of major roads within the site>

It was confirmed that compared with the last fiscal year, the dose rate has been declining on roads near the southeast side of the Unit 4 Turbine Building and the west side of the Process Main Building (area circled by yellow dot line).

<FY2021 4th Quarter> (Measured 2022.2)



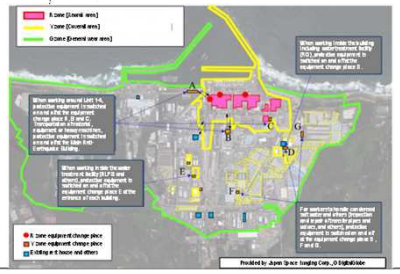
<FY2022 4th Quarter> (Measured 2023.2)

▼ In May 2013, areas excluding those around Unit 1-4, tank areas and rubble storage areas were set to full-face mask unnecessary areas.

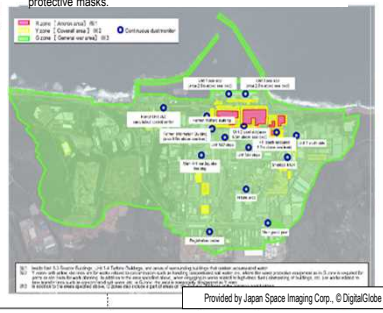
▼ In May 2015, full-face mask unnecessary area was expanded to cover about 90% of the site.

▼ In March 2017, the G-zone area was expanded (to cover 95% of the whole site).

▼ In March 2016, based on the progress of measures to reduce the environmental dosage on site, the site was categorized into two zones: Highly contaminated area around Unit 1-4 buildings, etc. and other areas where limited operation started to optimize protective equipment according to each category.



▼ In May 2018, within about 96% of the site, workers are allowed to wear light equipment such as general workwear and disposable dust-protective masks.



Provided by Japan Space Imaging Corp., © DigitalGlobe

▼ In August 2021, operation started while eliminating the need for the DS2 mask during light work in G-zone outside the protection area around Unit 1-4 (except for inside Units 5 and 6).

Move in general working clothes (2016.1.7)

Facing (2017.4.13)