Outline of Decommissioning, Contaminated Water and Treated Water Management

June 29, 2023
Secretariat of the Team for Countermeasures for Decommissioning, Contaminated Water and Treated Water

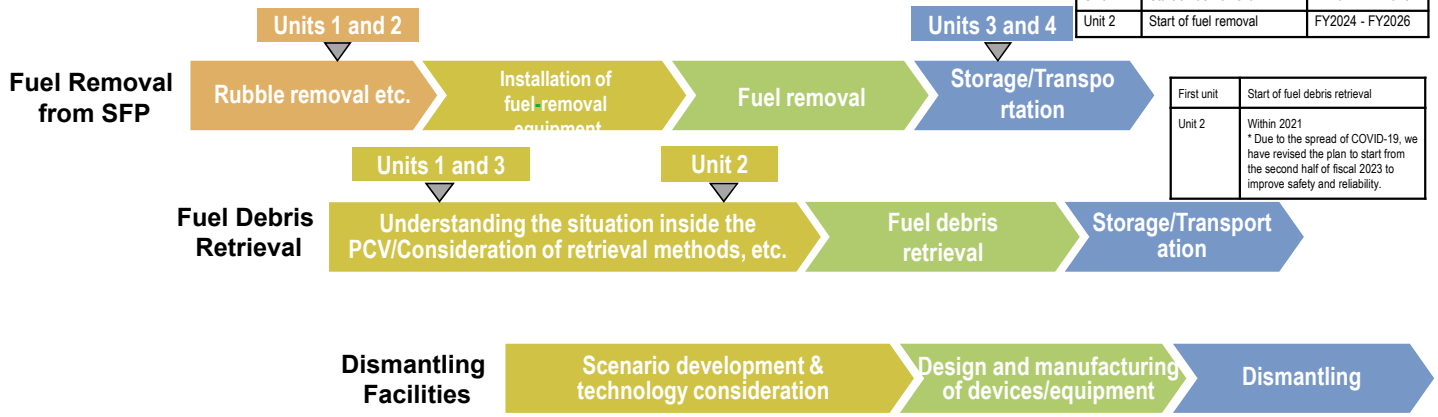
Main decommissioning work and steps

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

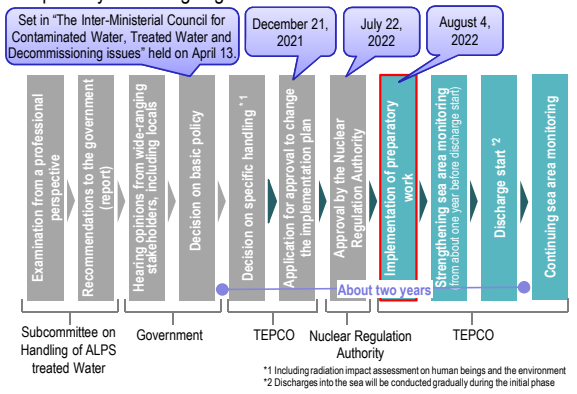


First unit	Start of fuel debris retrieval
Unit 2	Within 2021 * Due to the spread of COVID-19, we have revised the plan to start from the second half of fiscal 2023 to improve safety and reliability.

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

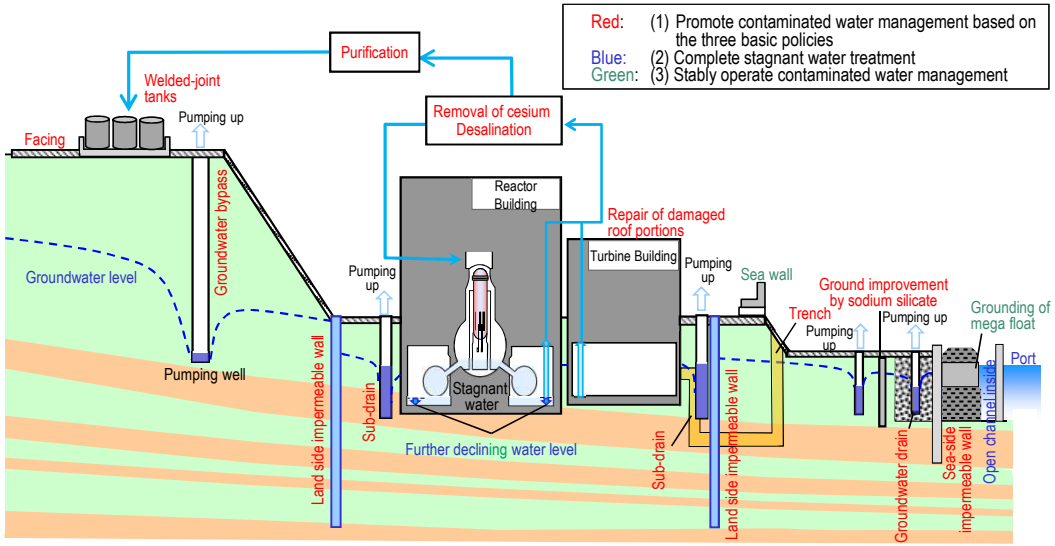
- Strontium-reduced water from other equipment is being re-treated in the Advanced Liquid Processing System (ALPS: multi-nuclide removal equipment) and stored in welded-joint tanks.
- Multi-layered contaminated water management measures, including land-side impermeable walls and sub-drains, have stabilized 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. 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 is 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.

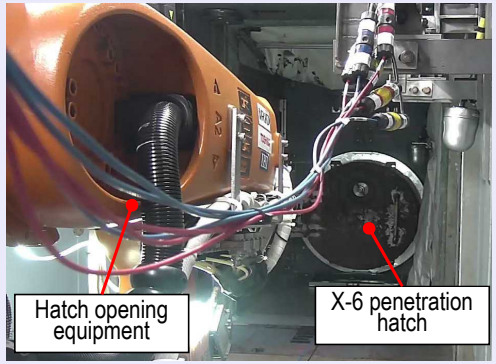
Unit 2 Preparation status for the internal investigation of the Primary Containment Vessel and trial retrieval

From June 19, work to cut the hatch bolts is underway to open the X-6 penetration hatch before trial debris retrieval. As of June 28, 20 of 24 bolts had been disconnected.

After cutting the remaining bolts and removing the bolts which were disconnected from the nuts, the hatch will be opened.

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

Work continues while prioritizing safety.



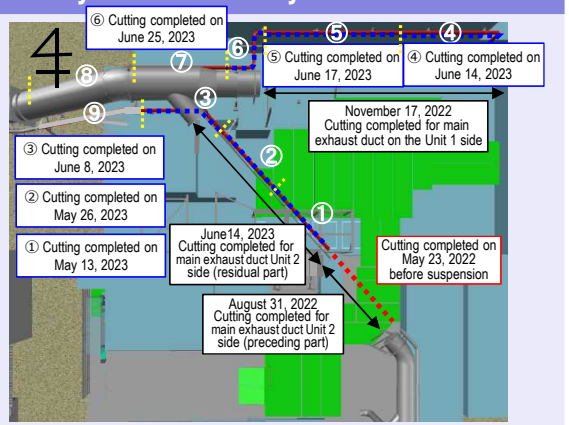
< Cutting of hatch bolts >

Units 1/2 Progress of pipe cutting for the Standby Gas Treatment System

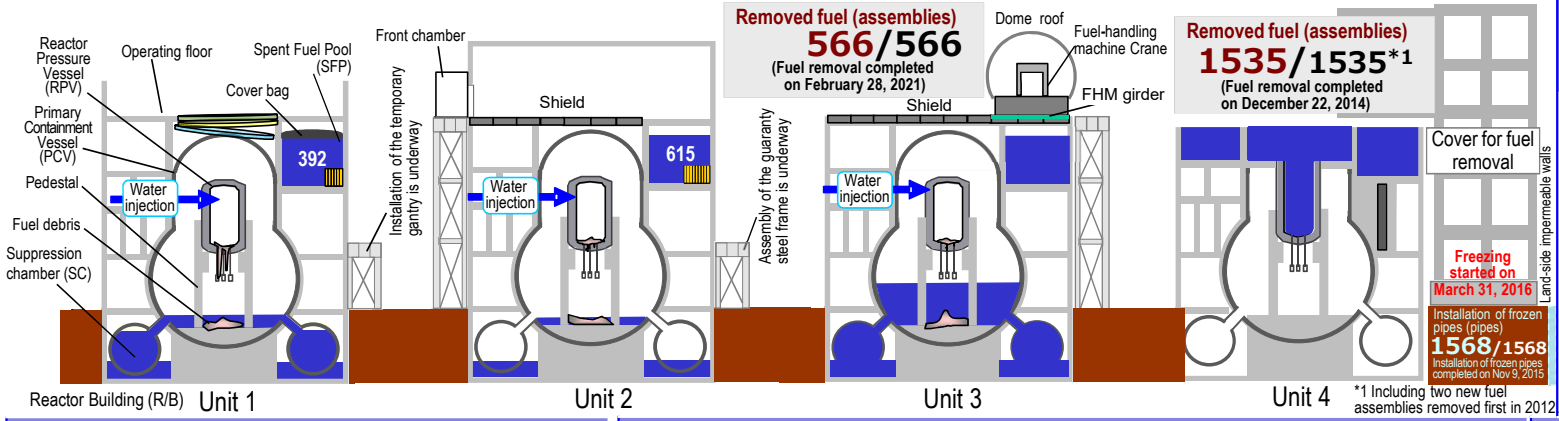
For pipes of the Units 1/2 Standby Gas Treatment System (SGTS), sections interfering with installation of the Unit 1 Reactor Building cover and other works are being removed.

Cutting of the sixth of a total of nine sections scheduled was completed on June 25. The ninth section will be cut after rearranging the process and removing rubble from the surrounding area.

Simultaneously, rubble in the area surrounding the 1/2 Radioactive Waste Treatment Building will also be removed as well as the main exhaust duct.



< Plan to cut SGTS pipes >



*1 Including two new fuel assemblies removed first in 2012

Preventive maintenance for the brine supply pipe (main pipe) of the land-side impermeable wall-related facilities

In February 2022, leakage was detected from the coupling joint at the brine supply pipe on the Units 2 and 3 mountain side. The leakage already stopped after replacing the coupling joint.

After investigating the cause, it was confirmed that uneven frost*1 heave had affected the margin*2 gap set in the pipe.

After determining the elements affecting the opening, preventive maintenance will be conducted according to the management level.

*1 Phenomenon in which moisture in the soil freezes, expands and locally causes the ground surface to increase.

*2 Gap at the pipe edge to absorb expansion and contraction of the pipes caused by the change in temperature

Unit 1 Response based on the pedestal status

The Unit 1 PCV internal investigation confirmed that concrete had been lost around almost all the lower part of the pedestal inner wall. In response, TEPCO assessed the level of external dust exposure just in case of losing the support function of the pedestal.

Based on this result, TEPCO evaluated that the site boundary would not pose any significant radiation exposure risk. Moreover, at the regular press conference on June 7, the Chairman of the Nuclear Regulation Authority stated, “Hearing the reports of a minimal impact on the environment, I think this result is reasonable.”

Furthermore, TEPCO will consider dust-scattering suppression measures in readiness for emergencies.

Unit 1 Analysis of deposits acquired in the internal investigation of the Primary Containment Vessel

Regarding the deposit samples acquired by the ROV-E investigation in the Unit 1 Primary Containment Vessel (PCV) internal investigation, deposits and supernatant in sampled PCV inclusive water will be separated and the deposits will then be transported to an external analysis institute for detailed analysis.

The external analysis institute will conduct an analysis, aiming to acquire information related to accident development by determining the types and amounts of elements and nuclides contained in samples and examining the particle generation process.

< Deposit sampling container >

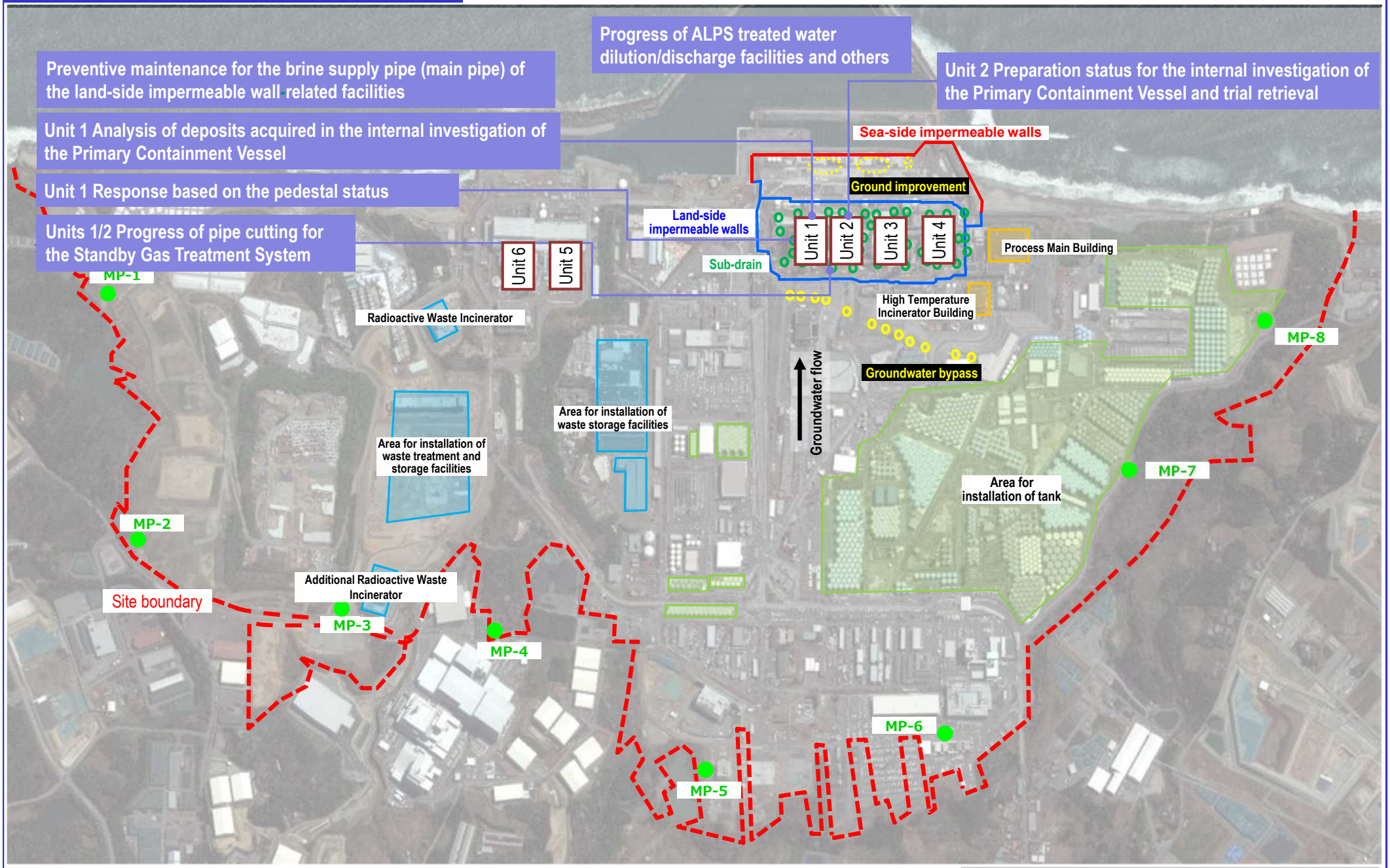
Progress of ALPS treated water dilution/discharge facilities and others

On June 26, removal of the arrival pipe (shield machine) and installation of the discharge lid were completed. With this, the installation of all facilities (for measurement and confirmation, transfer, dilution and discharge) of the ALPS treated water dilution/discharge facilities was completed. From June 28, the pre-service inspection by the Nuclear Regulation Authority started.

For System B of the measurement and confirmation facilities, acquired samples were analyzed. Based on the results, it was confirmed and publicized that before diluting and discharging ALPS treated water, the discharge criteria of the government had been met.

It was also confirmed and publicized that in the third-party analysis by JAEA, the discharge criteria of the government had been met.

Major initiatives – Locations on site



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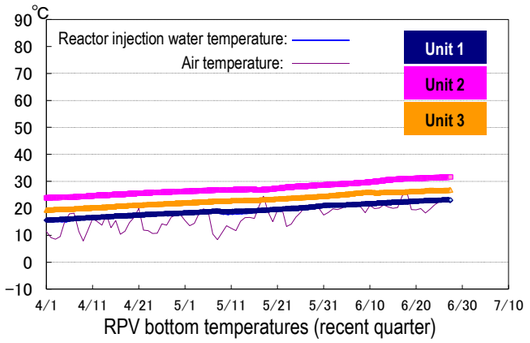
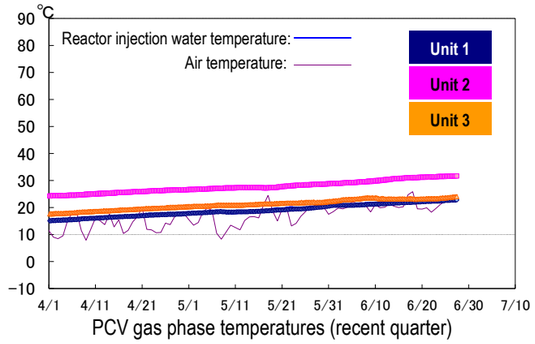
I. Confirmation of the reactor conditions

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.

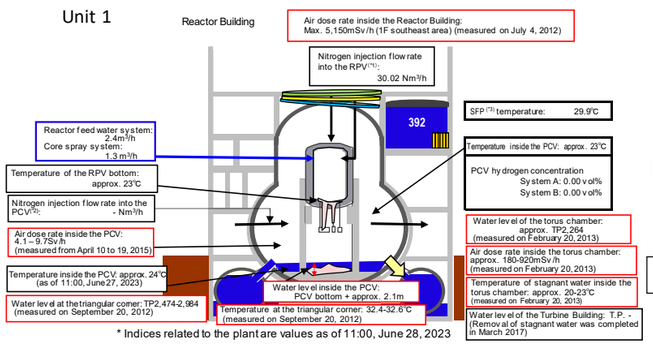


RPV bottom temperatures (recent quarter)

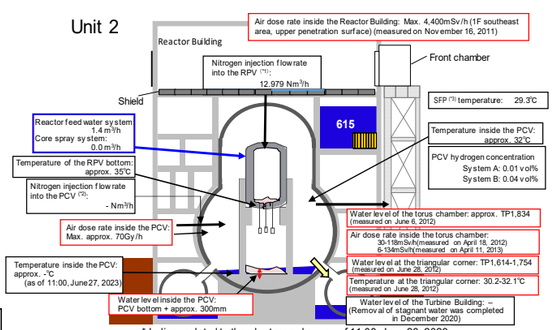


PCV gas phase temperatures (recent quarter)

*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, June 28, 2023



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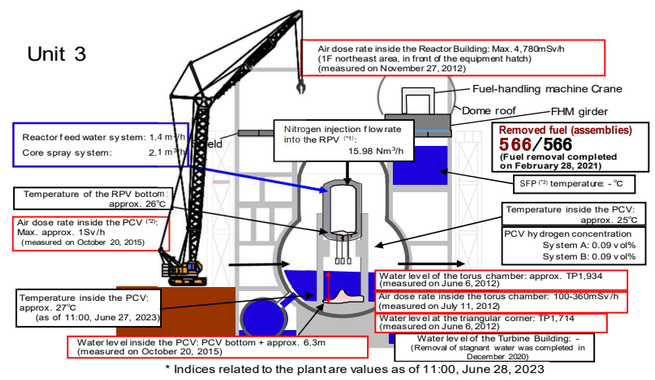


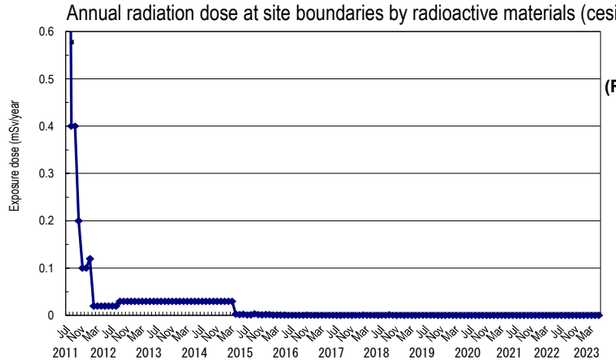
* Indices related to the plant are values as of 11:00, June 28, 2023

(*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 May 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 1.4×10^{-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 0.310– 1.015 μSv/h (May 24 – June 27, 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.

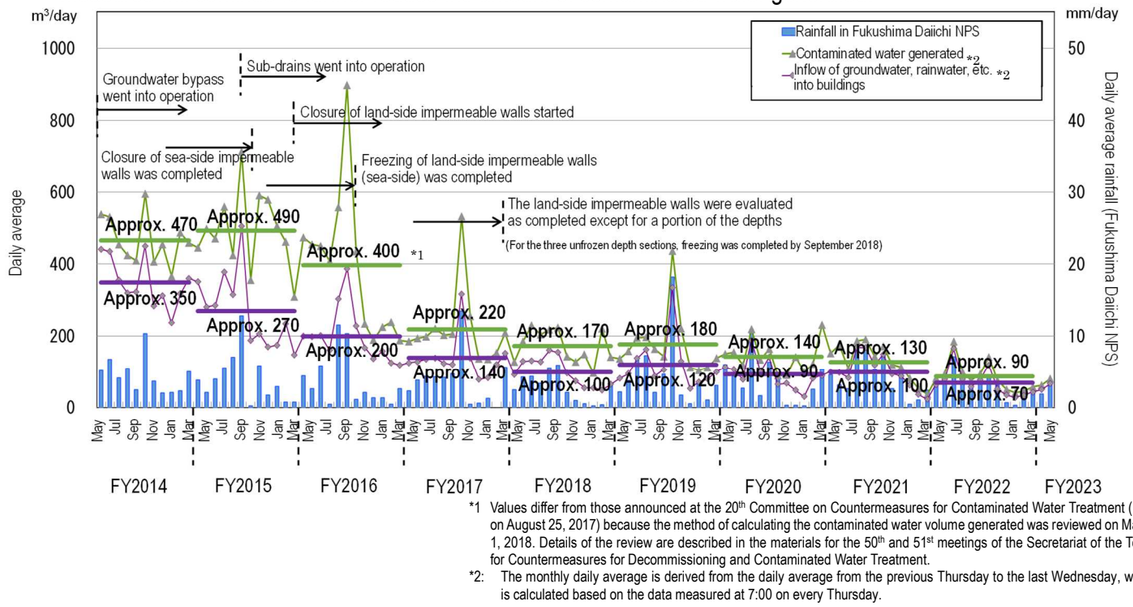
Based on the above, it was confirmed that the comprehensive cold shutdown condition had been maintained and the reactors remained in a stabilized condition.

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 June 20 2023, 2,183 release operations had been conducted.
  The water quality of all temporary storage tanks satisfied the operational target.

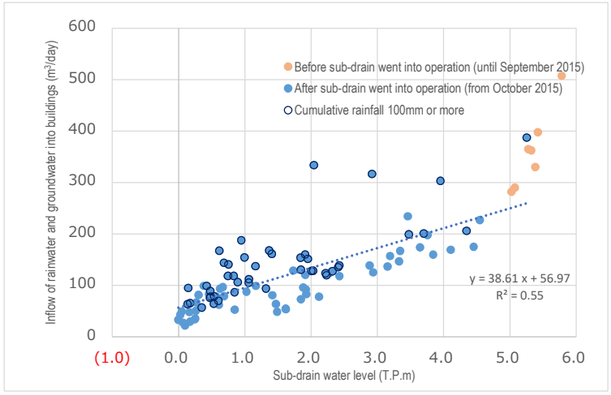


Figure 2: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Units 1-4 sub-drains

➢ 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 May 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 May 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.

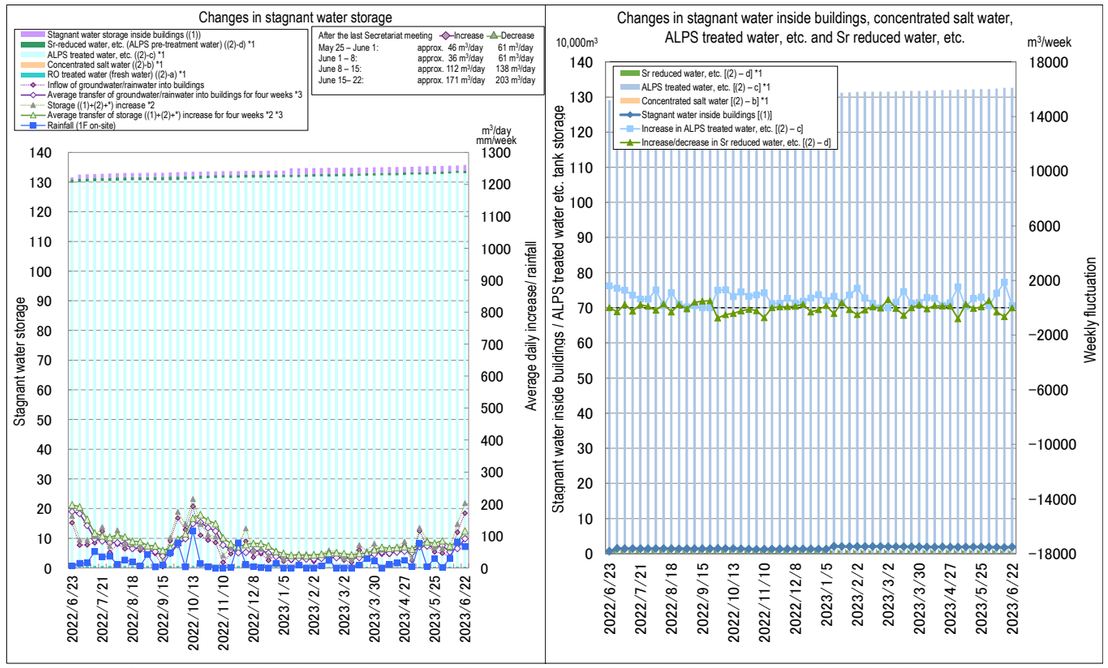
➢ Operation of the multi-nuclide removal equipment and other water-treatment facilities

- 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 June 22, 2023, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 500,000, 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 June 22, 2023, approx. 720,000 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 June 22, 2023, approx. 888,000 m³ had been treated.

As of June 22, 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 low 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 low 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 low within the fluctuation range of seawater in Japan*.
- The concentration of tritium in seawater further than 20km from the coast remained low, 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 had 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 and 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)

- In December 2022, eight electroconcentrators were installed in the Chemical Analysis Building. Concentration tests were conducted in March 2023, and comparison tests using actual samples were completed in June. Application started sequentially from samples collected in June.

➢ 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 June 22).
- For abalones, since the test started on October 25, 2022, 60-70% had survived (71% in normal seawater and 64% in ALPS treated water diluted by seawater) (as of June 22).
- 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.

➢ Progress status of work to install the ALPS treated Water Dilution/Discharge Facility and related facilities

- For the measurement and confirmation/transfer facilities, work to install the measurement and confirmation facilities, the pipe support, piping and other elements of these facilities was completed. The pre-service test started from January 16, 2023, a pre-service inspection certificate was granted by the Nuclear Regulation Authority on March 15, and the entire pre-service inspection was completed.
- For the discharge shaft (upstream pool) of the dilution facility, installation and assembly of blocks (manufactured outside the site), concrete placement of the bottom plate (bottom) and others, waterproof coating and verification of water filling in the tank were completed. Construction of the weir was also completed on June 9.
- For the dilution facility, installation of the foundation pile for seawater transfer pipes, construction of the foundation frame, and work to install pipes and others were completed.
- In the seaside area for Units 5 and 6, building of the partition bank and removal of a portion of the anti-permeation work were completed. Removal of sedimentation inside the intake open channels (dredging) was completed on June 22.
- For the discharge facility, drilling of the discharge tunnel was completed on April 26, 2023. Removal of the arrival pipe and installation of the discharge lid (over the discharge outlet caisson) were completed on June 26.
- With this, installation of all facilities (for measurement and confirmation, transfer, dilution and discharge) of the ALPS treated water dilution/discharge facilities was completed. From June 28, the pre-service inspection by the Nuclear Regulation Authority started.

Fuel removal from the spent fuel pools

Work to help remove spent fuel from the pool is progressing steadily while ensuring seismic capacity and safety.

➢ Main work to help spent fuel removal at Unit 1

- 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. The ground assembly was completed for the temporary gantry and lower structure, approx. 83%, for the upper structure and approx. 7%, for the box ring.
- A work yard was prepared around the Reactor Building and preliminary work to install a large cover started from August 2021.
- A temporary gantry is being installed from the portion where anchors and base plates near the top of the temporary gantry were installed. Installation was completed in March for the north, west and east sides.
- Moreover, removal of “overflowing rubble” on the north, west and east sides was completed and anchor drilling for base plates, including on the top stair, is underway.

➢ Main work to help spent fuel removal 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.

➢ Status of on-site transportation of spent fuel from the common pool to the Temporary Cask Custody Area

- To make space in the common pool to accommodate the Unit 6 spent fuel, work has been underway to load spent fuel having been stored in the common pool with the dry casks and transport them on site to the Temporary Cask Custody Area.
- In FY2022, due to foreign substance adhering to fuel, the criteria were not met when the airtightness of the dry casks was checked. As countermeasures, procedures including cleaning each fuel assembly with water and replacing water inside the dry casks were added from April 2023.
- As of June 29, transportation of seven of the 22 casks had been completed.

Retrieval of fuel debris

➢ Unit 1 PCV internal investigation (the latter half)

- During the period March 4-8, 2023, the underwater robot ROV-B was injected at the bottom of the Unit 1 Primary Containment Vessel (PCV) for deposit 3-D mapping outside the pedestal.
- When comparing the results of this deposit 3-D mapping and the deposit thickness measurement by ROV-C in June 2022, a correlation was identified between both data of deposit heights from the PCV bottom.
- In the deposit thickness measurement by ROV-C, the heights of some deposits were evaluated. During this investigation, data of 34 points was acquired, which provided a wider range of continuous data, which gave insights into the deposit height.
- For deposit samples, deposits and supernatant in sampled PCV inclusive water will be separated. Deposits will then be transported to an external analysis institute for detailed analysis.

➢ Sampling of S/C inclusive water to reduce water level in the Unit 1 PCV

- To decrease the water level in the Unit 1 Primary Containment Vessel (PCV), intake facilities utilizing the existing Reactor Water Clean-up System (CUW) will be installed.
- While examining the design, to check the quality of inclusive water in the Suppression Chamber (S/C), sampling from

the CUW pipe (the water intake) was scheduled during the period November 2022 – January 2023. However, highly-concentrated stagnant hydrogen gas in the Unit 1 Reactor Building Closed Cooling Water System (RCW) was detected in November 2022. Considering the presence of potentially similar stagnant gas in the CUW pipe, the method to open the CUW check valve, which was planned as preliminary work for sampling, was reviewed.

- As the prospect of preliminary work was confirmed, the CUW check valve will be opened and sampling conducted after July.

➢ 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 trial debris retrieval, cutting of hatch bolts is underway. After completing the cutting, 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 May 2023, the total storage volume for rubble of concrete and metal etc. was approx. 389,600 m³ (+600 m³ compared to the end of April with an area-occupation rate of 76%). The total storage volume of trimmed trees was approx. 116,800 m³ (-1,900 m³, with an area-occupation rate of 67%). The total storage volume of used protective clothing was approx. 17,700 m³ (+1,000 m³, with an area-occupation rate of 70%). 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, work related to the port and construction related to areas around the Units 1-4 buildings and others.

➢ Management status of secondary waste from water treatment

- As of June 1, 2023, the total storage volume of waste sludge was 487 m³ (area-occupation rate: 70%), while that of concentrated waste fluid was 9,458 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 5,583 (area-occupation rate: 86%).

➢ Status of response to the Radioactive Waste Incinerator

- On February 10 and 11, during the annual inspection, a rust-like powder deposit was detected in the lower part of the exhaust gas filter casing as well as corrosion and thinning in the casing base material under the powder. Moreover, a hole penetrating the casing was also detected in one of these filters.
- Analytical results of the powder confirmed sulfuric acid and chloride ions in addition to iron oxide of the base material. The corrosion was considered to have intensified due to condensation containing acid having been generated in parts where the exhaust gas temperature tended to decrease.
- Inspection inside the system also detected similar corrosion and parts of other equipment requiring repair.
- The exhaust gas filter casing and each part will be repaired in early July to restore System B by mid-July.

➢ Work to create a carry-in entrance in the Process Main Building to retrieve sludge of the decontamination equipment

- For sludge of the decontamination equipment, which has been stored in storage tank D in the Process Main Building, 3.11 tsunami countermeasures, including closure of the building entrance and the pipe penetrations, have been implemented to prevent any leakage outside the system. However, other countermeasures need to be added immediately to prepare for the risk of external leakage due to a larger tsunami (tsunami for consideration), cracks of the storage tank and others.
- In line with the above measures, sludge of the decontamination equipment will be transferred to storage containers to ensure stable storage in areas of high ground (T.P. +33.5m).
- As the installation of the carry-in entrance for large machines in the Process Main Building was completed in May, work to eliminate hindrances and reduce the radioactive dose inside the Process Main Building to facilitate the use of remote-control heavy machines has been underway since June.

➢ Delay of completion due to air-conditioning imbalance in the volume reduction facility

- The volume reduction treatment facility is a system to cut metal in rubble and break concrete. To prevent leakage of radioactive materials outside buildings, a negative pressure is maintained in some rooms.
- Since April 10, 2023, despite adjucting the balance of the air-conditioning equipment, the design value could not be achieved and a positive balance was confirmed by some room pressure gauges.
- This was attributable to an air-conditioning imbalance due to a larger in-leak rate from the building than assumed. To counter this, the air-conditioning balance will be adjusted to ensure the total air supply and in-leak rate is almost equal to the exhaust air rate.
- The pre-service inspection is scheduled in December 2023 and the facility should be completed by the end of January 2024.

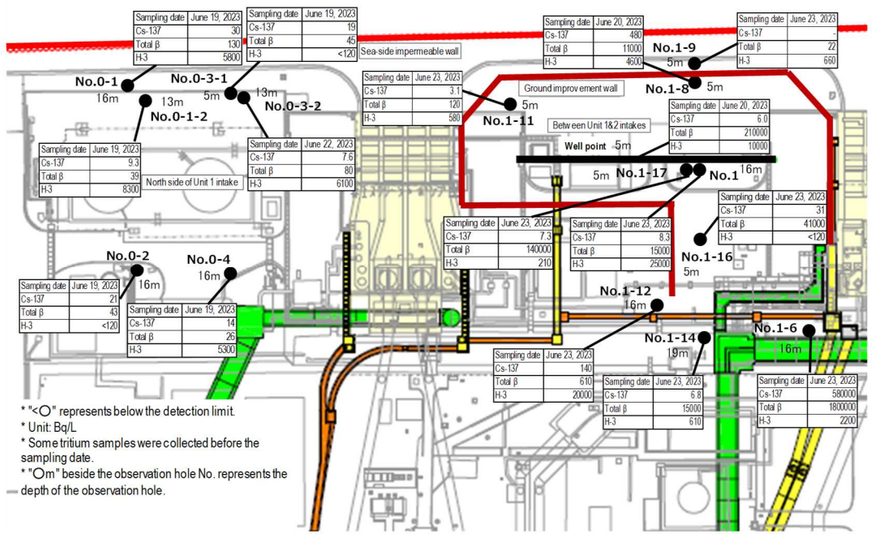
Reduction in radiation dose and mitigation of contamination

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

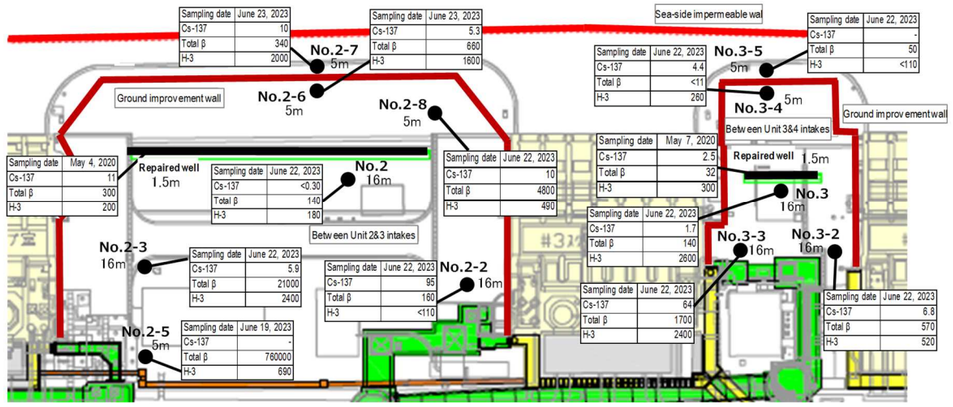
➢ Status of the groundwater and seawater on the east side of Turbine Building Units 1-4

- 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

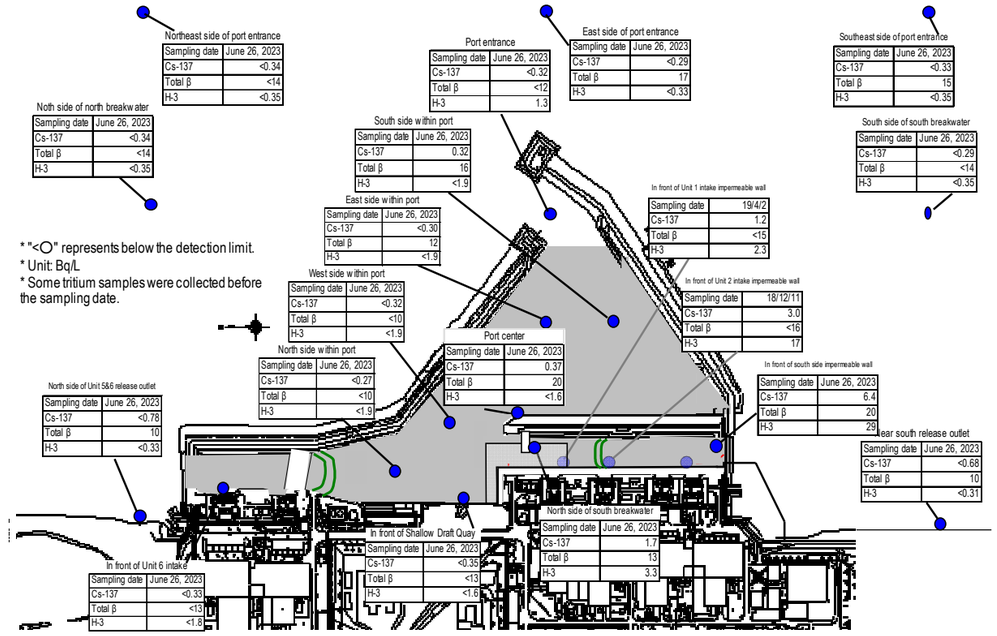


Figure 5: Seawater concentration around the port

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 February to April 2023 was approx. 9,500 (cooperating company workers and TEPCO HD employees), which exceeded the monthly average workforce (approx. 7,700). 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 July 2023 (approx. 4,000 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 both within and outside Fukushima Prefecture remained constant. The local employment ratio (cooperating company workers and TEPCO HD employees) as of May 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.

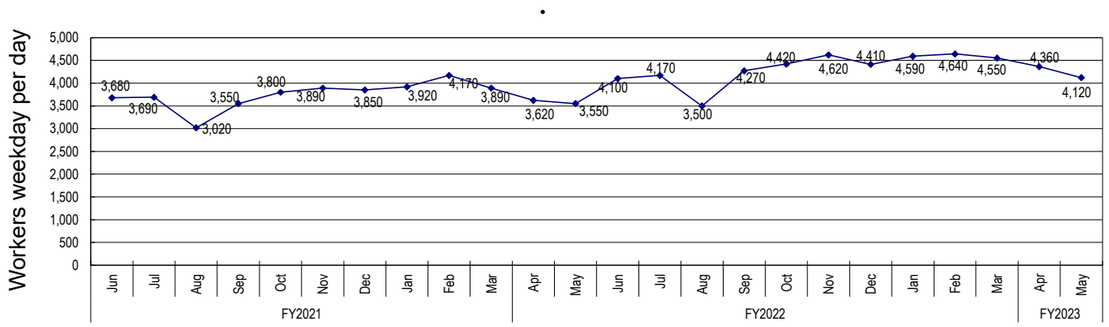


Figure 6: Changes in the average number of workers weekday per day for each month of the most recent 2 years (actual values)

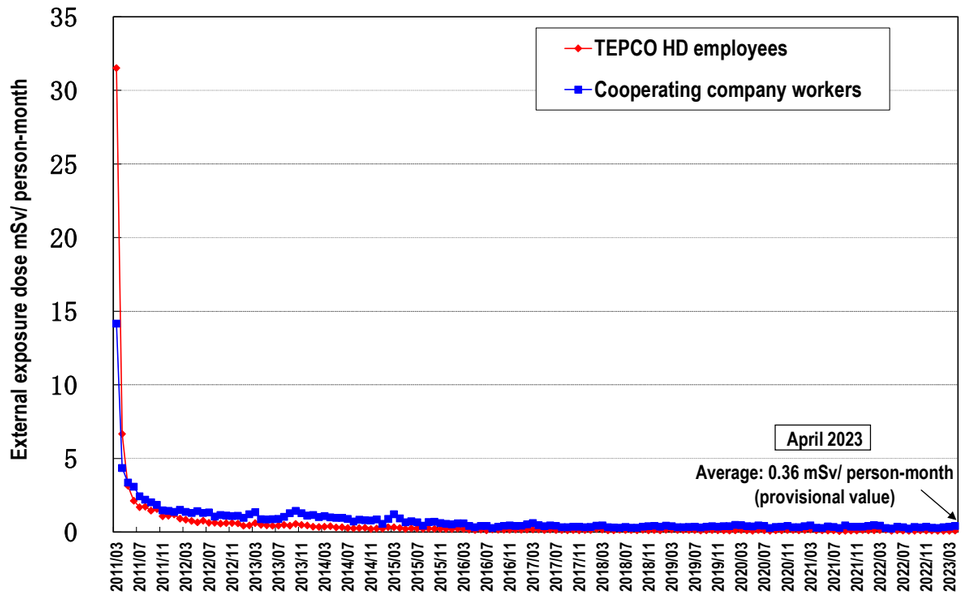


Figure 7: Changes in monthly average exposure dose of individual worker
(monthly exposure dose since March 2011)

➢ 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, one worker suffered heat stroke due to work up until June 27 (in FY2022, one worker up until the end of June). Continued measures will be taken to prevent heat stroke.

7. Others

➢ Progress status of the Mid- and Long-Term Plan of accident investigation in the Fukushima Daiichi Nuclear Power Station

- As part of efforts to investigate and analyze the accident in the Fukushima Daiichi Nuclear Power Station (hereinafter referred to as 1F), many matters were clarified in the “Internal Accident Report” and “Examination of Unsolved Issues” and others and including instructions provided by internal and external accident investigation committees and others, reflected in the safety measures appropriately. To ensure no recurrence and acquire information to help clarify the whole picture (an in-depth study of the accident progress) and make power reactors even safer, many insights need to be drawn by acquiring on-site information (confirming the actual accident situation) and utilizing and subsequently reflecting these insights in safety measures.
- At the same time, steady decommissioning in 1F is also important. New useful insights for accident investigation and analysis may be acquired in the course of on-site work. However, inadequate data sampling may modify on-site conditions and result in valuable information being lost. The results of the accident investigation and analysis need to be appropriately organized and shared to proceed with on-site work.
- Therefore, to help implement future investigations of the accident in 1F according to plan and substantially by TEPCO HD, the Mid-and-Long-Term Plan of the 1F accident investigations was formulated in November 2021 and is being revised based on the latest work progress and status.

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 June 5-26)"; unit (Bq/L); ND represents a value below the detection limit

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

Summary of TEPCO data as of June 27, 2023

Cesium-134	:	ND(0.31)		
Cesium-137	:	0.37		
Total β	:	20		
Toritium	:	ND(1.7)		*1

Cesium-134	:	3.3 (H25/12/24)	→	ND(0.34)	Below 1/9
Cesium-137	:	7.3 (H25/10/11)	→	ND(0.32)	Below 1/20
Total β	:	69 (H25/8/19)	→	ND(12)	Below 1/5
Toritium	:	68 (H25/8/19)	→	0.79	Below 1/80

Cesium-134	:	3.3 (H25/10/17)	→	ND(0.36)	Below 1/9
Cesium-137	:	9 (H25/10/17)	→	ND(0.30)	Below 1/30
Total β	:	74 (H25/8/19)	→	12	Below 1/6
Toritium	:	67 (H25/8/19)	→	ND(1.9)	Below 1/30

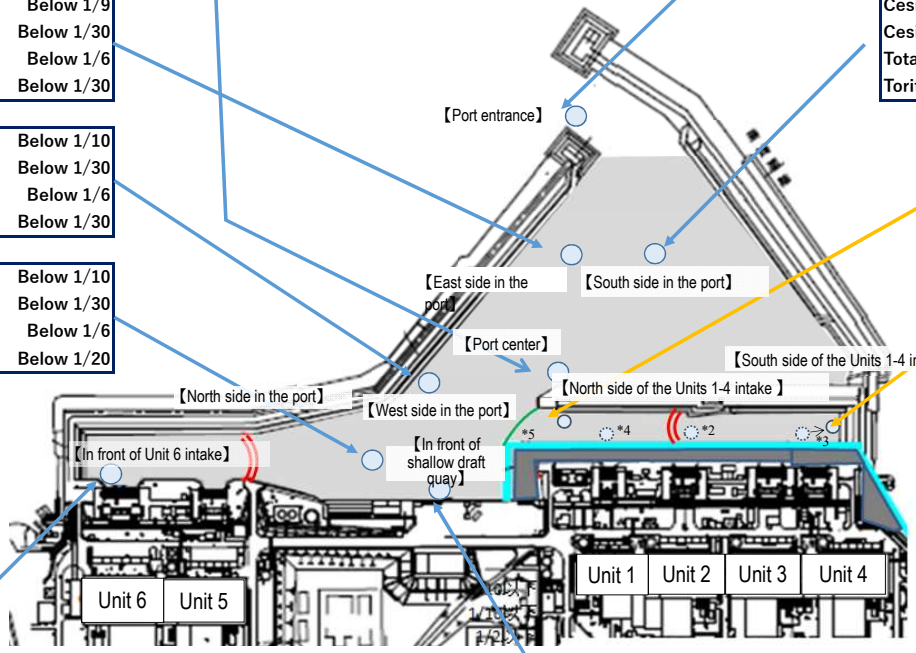
Cesium-134	:	3.5 (H25/10/17)	→	ND(0.38)	Below 1/9
Cesium-137	:	7.8 (H25/10/17)	→	0.32	Below 1/20
Total β	:	79 (H25/8/19)	→	16	Below 1/4
Toritium	:	60 (H25/8/19)	→	ND(1.8)	Below 1/30

Cesium-134	:	4.4 (H25/12/24)	→	ND(0.31)	Below 1/10
Cesium-137	:	10 (H25/12/24)	→	ND(0.32)	Below 1/30
Total β	:	60 (H25/7/4)	→	ND(10)	Below 1/6
Toritium	:	59 (H25/8/19)	→	ND(1.9)	Below 1/30

Cesium-134	:	32 (H25/10/11)	→	ND(0.35)	Below 1/90
Cesium-137	:	73 (H25/10/11)	→	1.7	Below 1/40
Total β	:	320 (H25/8/12)	→	13	Below 1/20
Toritium	:	510 (H25/9/2)	→	4.0	Below 1/100

Cesium-134	:	5 (H25/12/2)	→	ND(0.37)	Below 1/10
Cesium-137	:	8.4 (H25/12/2)	→	ND(0.27)	Below 1/30
Total β	:	69 (H25/8/19)	→	ND(10)	Below 1/6
Toritium	:	52 (H25/8/19)	→	1.9	Below 1/20

Cesium-134	:	ND(0.30)		
Cesium-137	:	6.4		
Total β	:	20		
Toritium	:	28		*1



Sea side impermeable wall
Silt fence
Silt fence for construction

Cesium-134	:	2.8 (H25/12/2)	→	ND(0.30)	Below 1/9
Cesium-137	:	5.8 (H25/12/2)	→	ND(0.33)	Below 1/10
Total β	:	46 (H25/8/19)	→	ND(13)	Below 1/3
Toritium	:	24 (H25/8/19)	→	ND(1.7)	Below 1/10

Cesium-134	:	5.3 (H25/8/5)	→	ND(0.34)	Below 1/10
Cesium-137	:	8.6 (H25/8/5)	→	ND(0.35)	Below 1/20
Total β	:	40 (H25/7/3)	→	ND(13)	Below 1/3
Toritium	:	340 (H25/6/26)	→	ND(1.7)	Below 1/200

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

*2: For the point, monitoring was finished from December 12, 2018 due to preparatory work for transfer of mega float.

*3: For the point, monitoring point was moved from February 6, 2019 due to preparatory work for transfer of mega float. 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.

	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 June 5-26)

Summary of TEPCO data as of June 27, 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(0.30)
Cesium-137	: ND	(H25)	→	ND(0.34)
Total β	: ND	(H25)	→	ND(14)
Toritium	: ND	(H25)	→	_

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

Cesium-134	: ND	(H25)	→	ND(0.31)	
Cesium-137	: 1.6	(H25/10/18)	→	ND(0.29)	Below 1/2
Total β	: ND	(H25)	→	17	
Toritium	: 6.4	(H25/10/18)	→	_	

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

Cesium-134	: ND	(H25)	→	ND(0.34)
Cesium-137	: ND	(H25)	→	ND(0.33)
Total β	: ND	(H25)	→	15
Toritium	: ND	(H25)	→	_

Cesium-134	: ND	(H25)	→	ND(0.34)
Cesium-137	: ND	(H25)	→	ND(0.34)
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(0.34)	Below 1/9
Cesium-137	: 7.3	(H25/10/11)	→	ND(0.32)	Below 1/20
Total β	: 69	(H25/8/19)	→	ND(12)	Below 1/5
Toritium	: 68	(H25/8/19)	→	0.79	Below 1/80

【Port entrance】

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

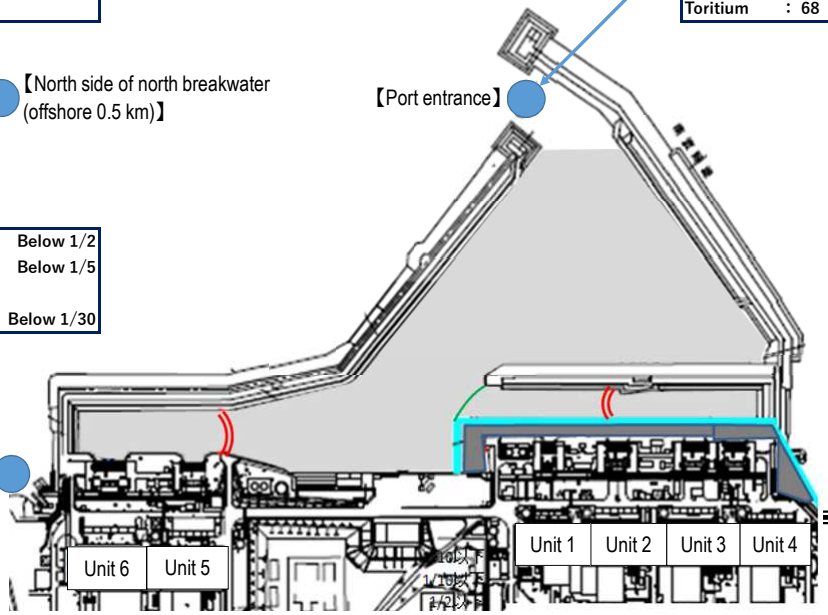
Cesium-134	: ND	(H25)	→	ND(0.37)
Cesium-137	: ND	(H25)	→	ND(0.29)
Total β	: ND	(H25)	→	ND(14)
Toritium	: ND	(H25)	→	_

Cesium-134	: 1.8	(H25/6/21)	→	ND(0.81)	Below 1/2
Cesium-137	: 4.5	(H25/3/17)	→	ND(0.78)	Below 1/5
Total β	: 12	(H25/12/23)	→	10	
Toritium	: 8.6	(H25/6/26)	→	ND(0.28)	Below 1/30

【North side of Unit 5 and 6 release outlet】

Cesium-134	: ND	(H25)	→	ND(0.84)	
Cesium-137	: 3	(H25/7/15)	→	ND(0.68)	Below 1/4
Total β	: 15	(H25/12/23)	→	10	
Toritium	: 1.9	(H25/11/25)	→	ND(0.28)	Below 1/2

【Near south release outlet (*)】



Sea side impermeable wall

Silt fence

Silt fence for construction

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.

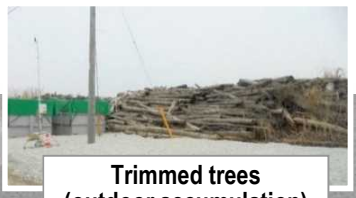
*: Because safety of the sampling points was unassured due to the influence of Typhoon No. 10 in 2016, samples were taken from approx. 330 m south of the Unit 1-4 release outlet.
Samples were also taken from a point approx. 280m south from the same release outlet from January 27, 2017 and approx. 320m 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
June 29, 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)

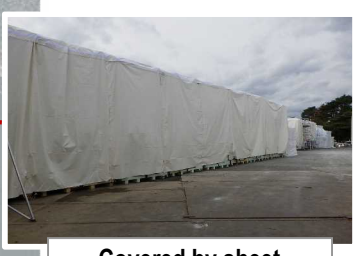
Temporary trimmed trees storage pool

Temporary soil-covered type

Rubble (outdoor accumulation)

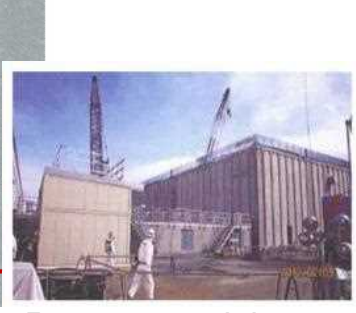
Rubble (covered by sheet)

Solid waste storage facility



Covered by sheet (container storage)

Tank installation status



Temporary waste sludge storage

Spent adsorption vessel temporary storage facility

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】

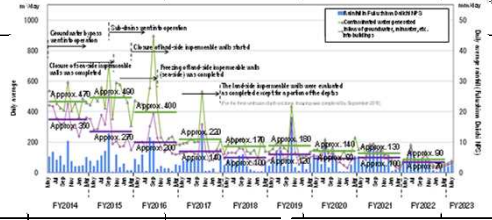
Contaminated water treatment facility
- ▽Reception start of contaminated water to Central Waste Treatment Building
- ▽Decontamination equipment (AREVA)
- ▽Evaporative concentration equipment
- ▽Cesium Adsorption Apparatus (KURION)
- ▽2nd Cesium Adsorption Apparatus (SARRY)
- Cesium Adsorption Apparatus (KURION)
- ▽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)
- ▽In-service inspection granted (2023.3.2)


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
- 【Removal of contaminated water in seawater pipe trench】
- ▽Completion of tunnel filling
- ▽Transfer of stagnant water complete
- ▽Completion of shaft filling
- Unit 3
  - ▽Completion of tunnel filling
  - ▽Transfer of stagnant water complete
  - ▽Completion of shaft filling (except for upper part of Shaft D)
  - ▽Completion of tunnel filling
  - ▽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. 90 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
- Start of maintenance operation on east side▽
- ▽Start of land-side impermeable walls
- ▽Freezing start
- ▽Freezing completion (except for some parts)
- Although no influence was detected on the impermeable function of the land-side impermeable walls but test investigation is underway for the stoppage effect


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)

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)


Placement of seaside impermeable walls complete

Storage facility
- ▽Completion of purification treatment of RO concentrated salt water
- ▽Storage in steel square tanks
- ▽Completion of replacement of steel square tanks
- ▽Water leakage (300L) from flanged tank
- ▽Water leakage (100t) from flanged tank
- ▽Storage in flanged cylindrical tanks
- ▽Water leakage (10L) from flanged tank
- ▽Completion of fence to prevent leakage expanding
- ▽Work to raise fence height complete
- ▽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
- ▽Sprinkling start of rainwater within tank fences by rainwater treatment facility (from 2014.5.21)


Construction of welded-joint tanks

- ▽Purification of strontium-reduced water in flanged tanks complete
- ▽Transfer and storage of all treated water in welded-joint tanks


Flanged and welded-joint tanks

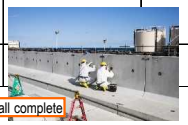
- ▽Purification of strontium-reduced water complete

Treatment of stagnant water
- ▽Start to maintain water-level difference with sub-drain water level
- ▽Transfer start from each building to Central Rw Building
- ▽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
- ▽Installation of stagnant water transfer equipment/transfer start
- ▽Completion of work to improve reliability of transfer line (replacement with PE pipes)
- ▽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
- ▽Unit 2 R/B Completion of reduction to the target level
- ▽Units 1 and 3 R/B Completion of reduction to the target level

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


Chishima Trench Tsunami Seawall complete


Construction of Japan Trench Tsunami Seawall

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

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**

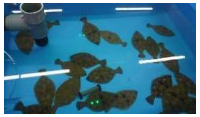
To solve people’s questions, TEPCO invites their visits to the power station and answer their questions on site. From people who participated in the visit gave feedbacks such as “by directly seeing the decommission site and having dialogues, they could obtain deeper understanding about the present situation, 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>

- **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

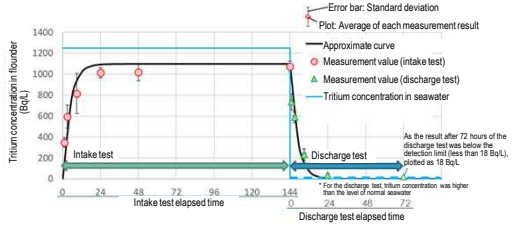

Overall view of mockup tanks

- **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

Examination concerning handling of ALPS treated water

Tritiated Water Taskforce (2013.12 – 2016.5, 15 meetings)

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)

2021.12.21 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

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)

2023.5.10 Approval


Tank area viewed from the Large Rest House (2015.10.29)

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

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

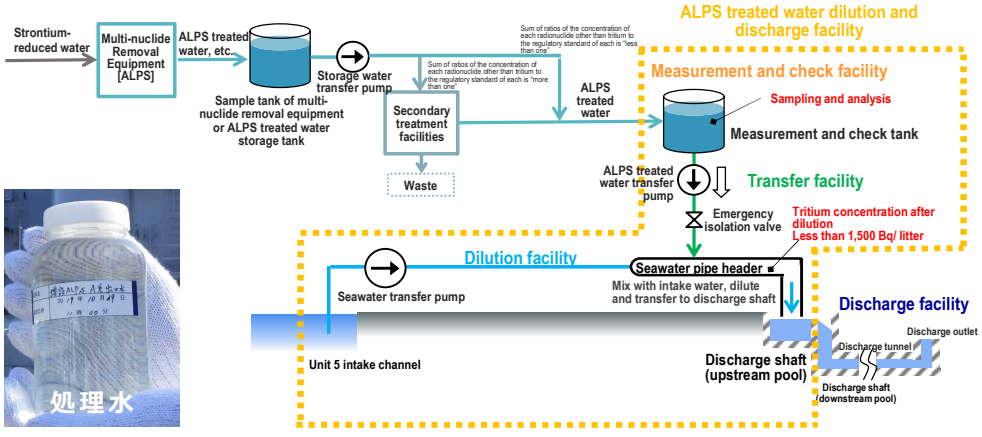
2022.8.4 Work has commenced

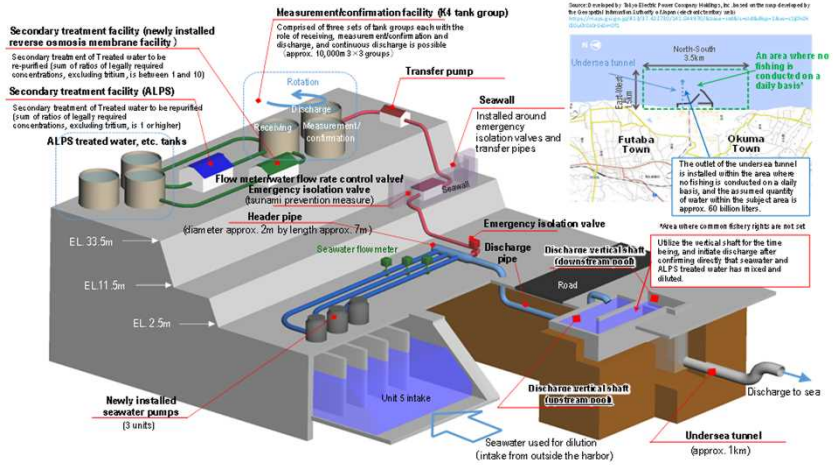
2022/8/30 The "Approach to Strengthening and Expansion of Measures in the Handling of ALPS Treated Water" was summarized

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)

2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

【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)

June 29, 2023
Secretariat of the Team for Countermeasures for Decommissioning, Contaminated Water and Treated Water

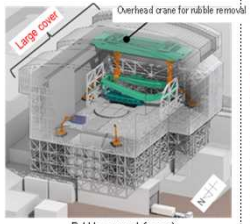
Legend: Rubble removal, etc. | Installing a fuel removal machine | Fuel removal | Storage and handling of fuel

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

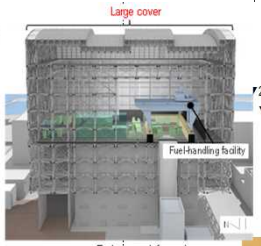
Unit 1

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.

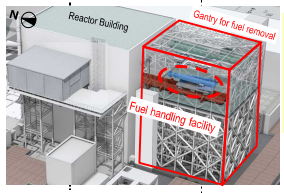

<Unit 1 northwest side 2023.2.9>

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

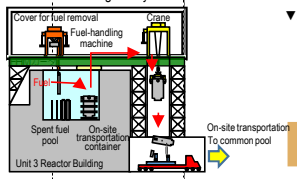

<Unit 2 Construction of gantry for fuel removal>

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

June 29, 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)

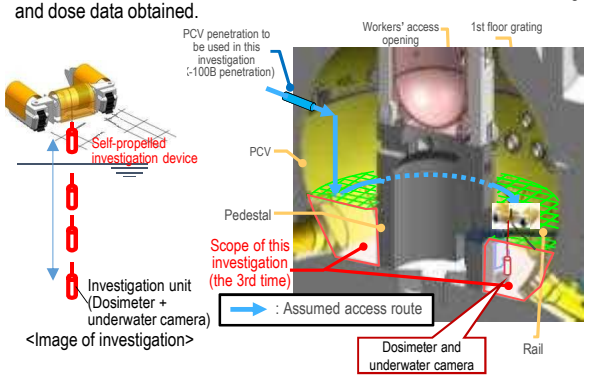
Start of fuel debris retrieval from the first unit (Unit 2). Expanding the scale in stages (within 2021 * The schedule will be extended for about 1 year due to the spread of COVID-19 infections)

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

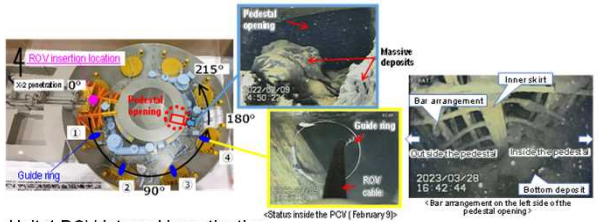
・In April 2015, a device having entered the inside of the PCV via a narrow opening (bore:φ100 mm) collected information such as images and airborne dose inside the PCV 1st floor.

・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.



<Status inside the PCV (February 9)>
< Bar arrangement on the left side of the pedestal opening >

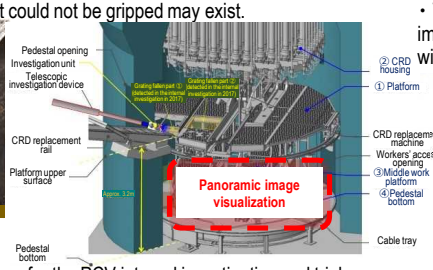
Unit 2 Investigation overview

・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.

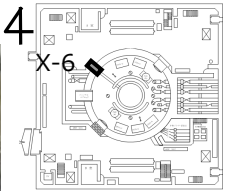

Bottom of the pedestal (after being processed in panoramic image visualization)



・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

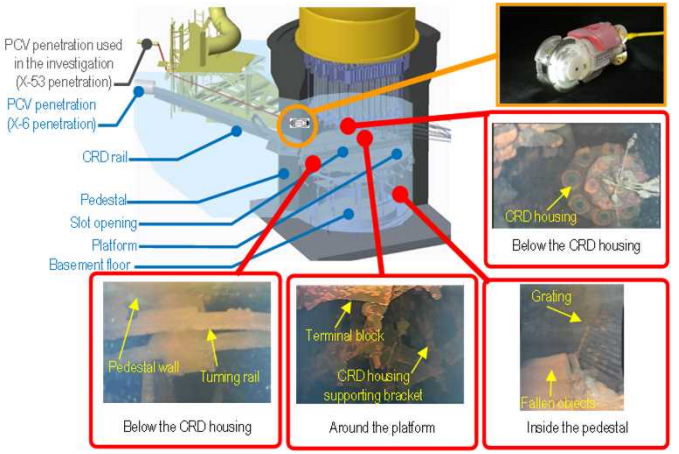
・In October 2014, the conditions of X-53 penetration, which may be under water and which is scheduled for use to investigate the inside of the PCV, was investigated via remote-controlled ultrasonic test equipment. The results showed that the penetration was not under water.

・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)

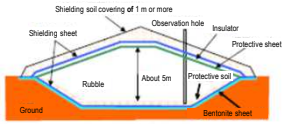
▼ 2012.9 Transfer start of rubble to the soil-covered temporary storage facility

▼ 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

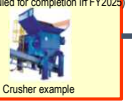
Status after a decade

(*3) Legend : Newly installed equipment and facility

Approx. **270,000** m³ (*2)

Incineration

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



Radioactive Waste Incinerator

Additional Radioactive Waste Incinerator (Completion in May 2022)

To (A) (*1)

Stored and managed in Solid Waste Storage as done for rubble

Volume reduction

Compaction Facility (scheduled for completion in FY2022)

To (A) (*1)

Melting

Melting equipment (under consideration)

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

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.

▼ 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.

External view of Access Control Facility

Large rest house under construction (2014.9.30)

Access Control Facility (2014.11.7)

▼ 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.

▼ 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.

▼ 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.

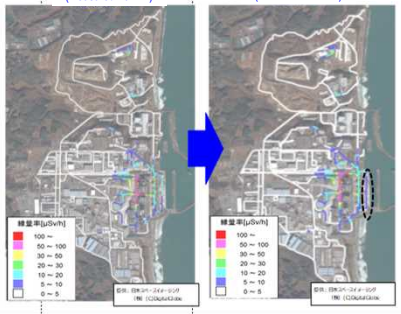
Visit by Governor of Fukushima Prefecture to the Fukushima Daiichi NPS (2018.11.1)

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).

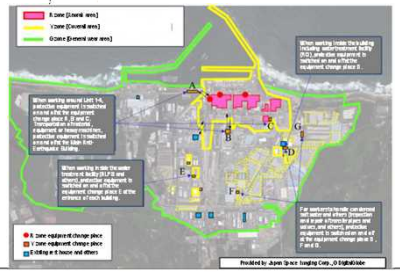
<FY2021 4th Quarter> (Measured 2022.2) <FY2022 4th Quarter> (Measured 2023.2)



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

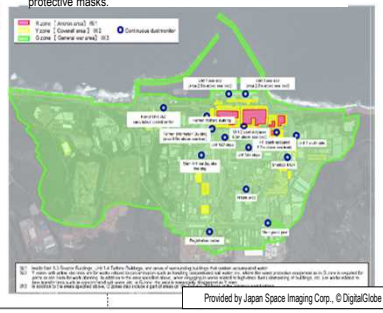
▼ In May 2015, full-face mask unnecessary area was expanded to cover about 90% of the site.

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

▼ 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)