Outline of Decommissioning, Contaminated Water and Treated Water Management

February 22, 2023
Secretariat of the Team for Countermeasures for Decommissioning, Contaminated Water and Treated Water

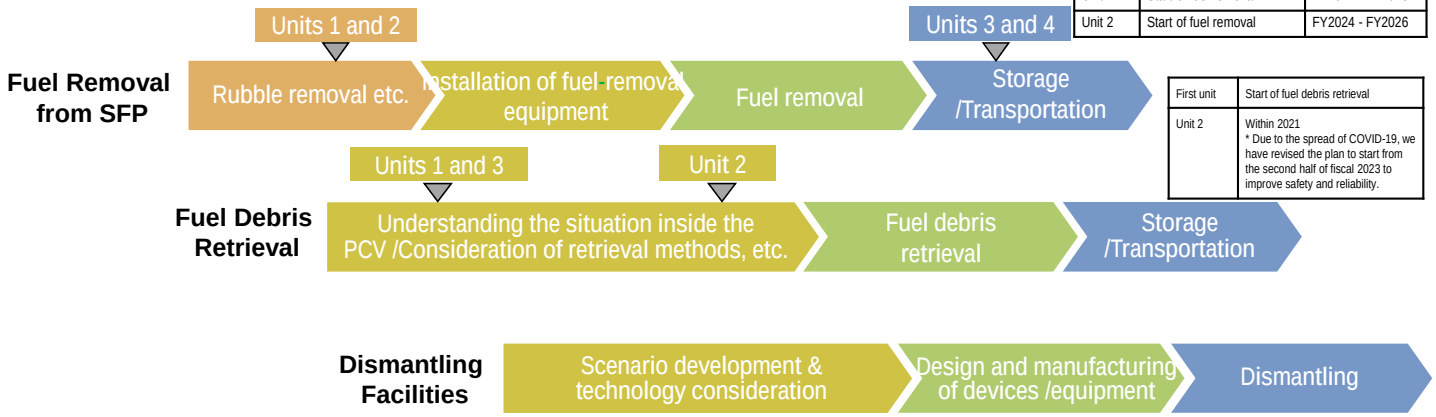
Main decommissioning work and steps

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

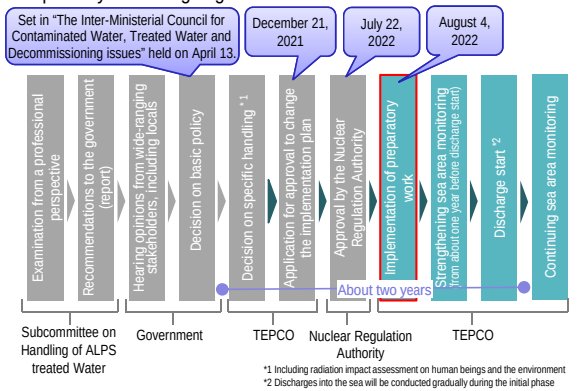


First unit	Start of fuel debris retrieval
Unit 2	Within 2021 * Due to the spread of COVID-19, we have revised the plan to start from the second half of fiscal 2023 to improve safety and reliability.

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.



*1 Including radiation impact assessment on human beings and the environment
*2 Discharges into the sea will be conducted gradually during the initial phase

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

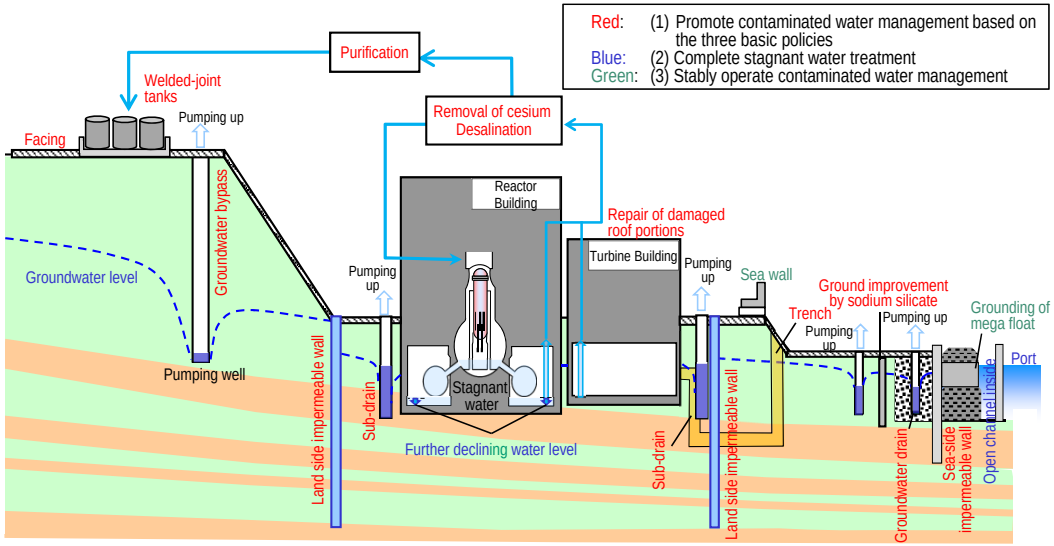
- Strontium-reduced water from other equipment is being re-treated in the Advanced Liquid Processing System (ALPS: multi-nuclide removal equipment) and stored in welded-joint tanks.
- Multi-layered contaminated water management measures, including land-side impermeable walls and sub-drains, have stabilized 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. At present, the floor surface exposure condition can be maintained except for the Unit 1-3 Reactor Buildings, Process Main Building and the High-Temperature Incinerator Building.
- In 2020, treatment of stagnant water in buildings was completed, except for the Unit 1-3 Reactor Buildings, Process Main Building and High-Temperature Incinerator Building. For Reactor Buildings, the amount of stagnant water there will be reduced to about half the amount at the end of 2020 during the period FY2022-2024.
- For zeolite sandbags on the basement floors of the Process Main Building and High-Temperature Incinerator Building, measures to reduce the radiation dose are being examined with stabilization in mind.

(3) Efforts to stably operate contaminated water management

- 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.

Partial revision of the Application Documents for Approval to Amend the Implementation Plan regarding the handling of ALPS treated water

To reflect the organizational structure for operation and maintenance management of the ALPS treated water dilution/discharge facility, the nuclides to be measured and assessed to verify the water meets the discharge criteria before discharge into the sea, and the results of the Radiological Environmental Impact Assessment regarding the discharge of ALPS treated water into the sea (construction stage), on November 14, 2022, TEPCO submitted to the Nuclear Regulation Authority (NRA) the Application Documents for Approval to Amend the Implementation Plan.

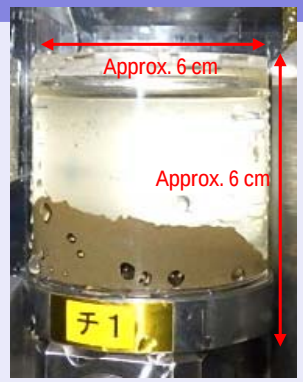
On February 14 and 20, TEPCO submitted to the NRA the partial revision of the Application Documents based on the items pointed out by the NRA in the Technical Meeting to Review the Implementation Plan for the Specified Nuclear Facility, etc. and the IAEA findings.

Unit 1 Status of the Primary Containment Vessel (PCV) internal investigation (the latter half)

The investigation to detect deposit debris using ROV-D was conducted during the period December 6-10 and detected thermal neutron fluxes and europium at all investigation points. Based on this result, it is assumed that materials separated from fuel debris spread extensively across the investigation area.

The deposit sampling using ROV-E was conducted at four points (two on January 31 and February 1 and two on February 10). Collected samples will be transported to an external analysis institute.

Future investigation will consist of 3D-mapping of deposits by ROV-B and subsequently, internal investigation of pedestal by ROV-A2.



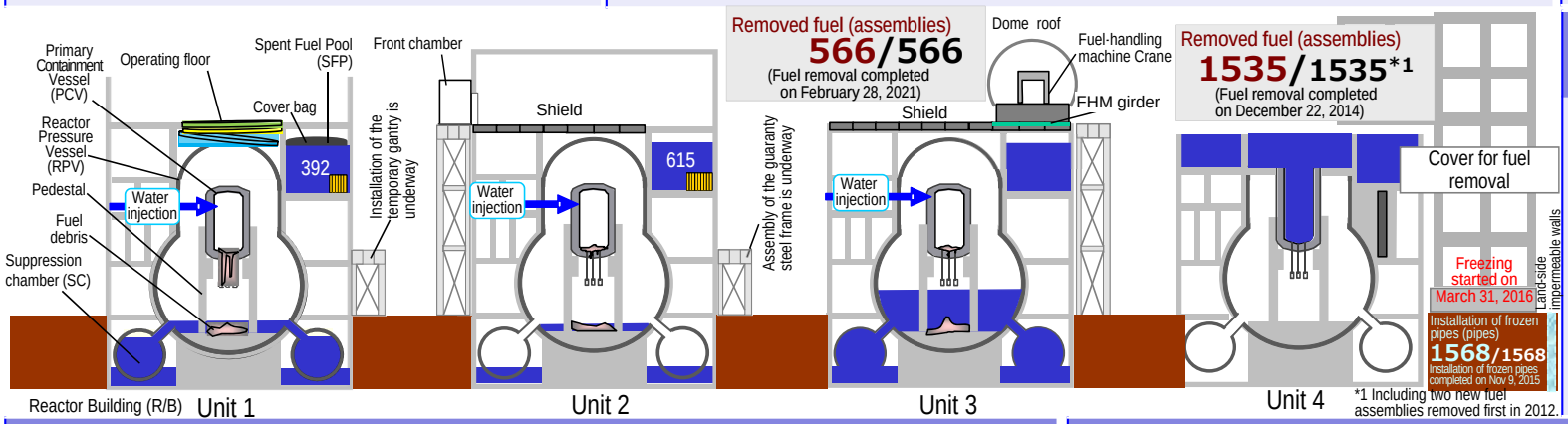
< Sample collected in ROV-E investigation >

Solid Waste Storage Management Plan (revision)

The sixth revision of the “Solid Waste Storage Management Plan,” was issued in February 2023.

Regarding “rubble and others” and “water treatment secondary waste,” the actual generation result and estimated generation amount in about next ten years were reflected. Approx. 400,000 m^3 of the estimated generation amount (approx. 800,000 m^3) will be reduced.

With recycling of future waste (approx. 450,000 m^3) which is estimated to be generated in fuel debris preliminary work and others in mind, descriptions were included about the examination policy on new waste management classification for more appropriate storage and management.



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

Progress toward resuming work to remove a portion of the Unit 1/2 SGTS pipes

Toward resuming work to remove a portion of the pipes of the Standby Gas Treatment System (SGTS) in the upper part of the Unit 1/2 Radioactive Waste Treatment Building, measures to improve reliability are being implemented.

As measures to further prevent dust scattering, preparation to inject additional urethane into the SGTS pipes is underway.

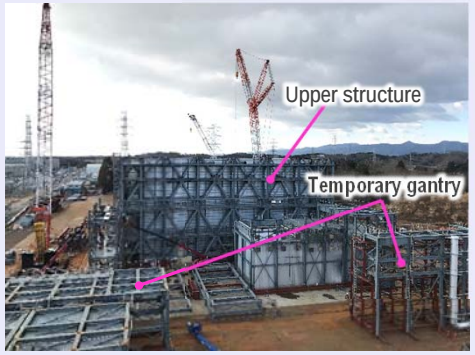
Moreover, to ensure more safe and efficient work on-site, a cutting test is also underway using mockup pipes, which simulates the on-site condition as much as possible. Pipe cutting work will be resumed in early March.

Unit 1 Progress of work to install a large cover to help spent fuel removal

Outside the site, the ground assembly of steel frames and others has been underway as part of efforts to install a large cover, which was completed for the temporary gantry and lower structure and approx. 83% for the upper structure.

Inside the site, work to install anchors and baseplates has been underway to support the large cover, which was completed approx. 31%. A temporary gantry is also being installed from the portion where anchors and base plates were installed, which was completed approx. 60%.

Before forthcoming drilling to install anchors near the top floor (operating floor) in the Reactor Building, work to remove rubble overflowing from walls, which may hinder the work, will start from March.



< Ground assembly of steel frame (February 20, 203) >

Unit 2 Progress of work to help spent fuel removal

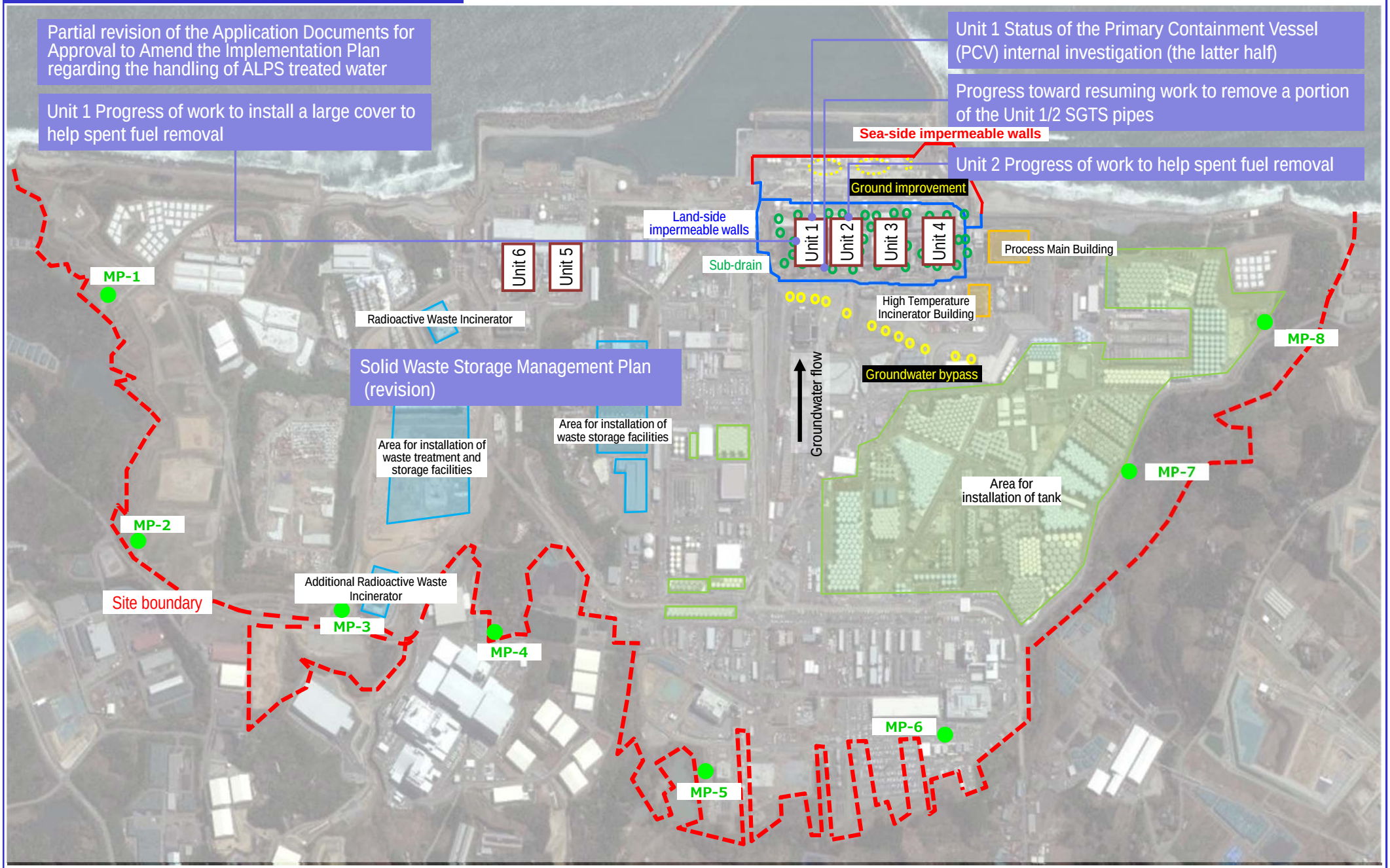
Inside the building, work to remove the control room of the fuel-handling machine which could interfere the installation of the new fuel-handling machine was completed on November 29. Rubble transfer of dismantled room was completed on January 31. Since February 6, removal of other interferences inside the building (existing facilities on the south side of the pool) has been underway.

Outside the building, steel structure having been assembled in a low-dose area outside the site was transferred into the site and work to assemble the steel structure for the gantry of fuel removal started from January 23 on the south side of the Reactor Building.

Work continues with prioritizing safety above all.

< Whole view of Unit 2 Reactor Building south yard (February 10, 2023) >

Major initiatives – Locations on site

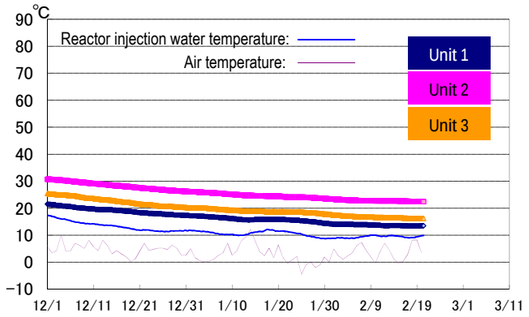


Provided by Japan Space Imaging Corp., photo taken on April 8, 2021
Product (C) [2020] DigitalGlobe, Inc., a Maxar company

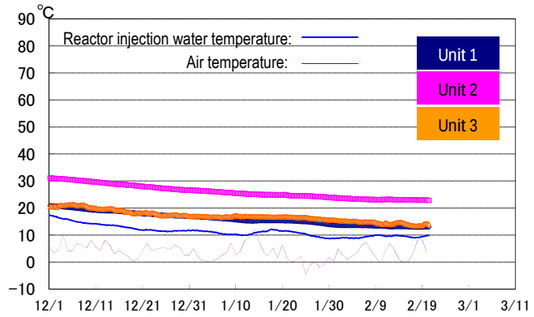
I. Confirmation of the reactor conditions

Temperatures inside the reactors

Through continuous reactor cooling by water injection, the temperatures of the Reactor Pressure Vessel (RPV) bottom and the Primary Containment Vessel (PCV) gas phase were maintained within the range of approx. 10 to 25°C for the past month, though it varied depending on the unit and location of the thermometer.

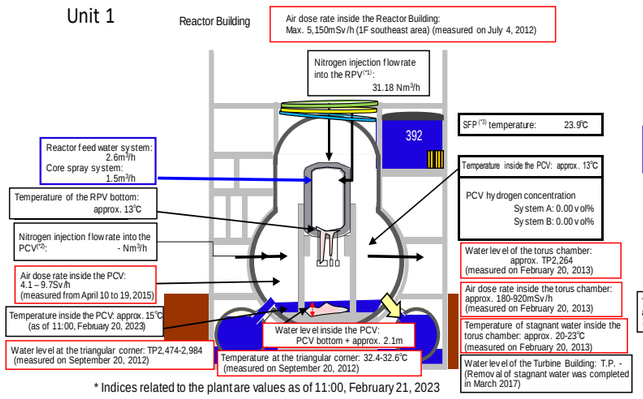


RPV bottom temperatures (recent quarter)

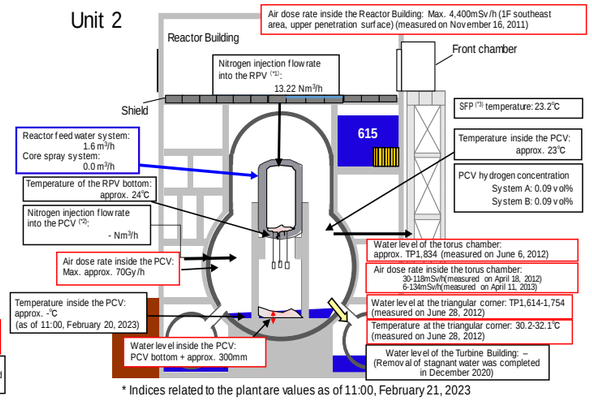


PCV gas phase temperatures (recent quarter)

*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, February 21, 2023



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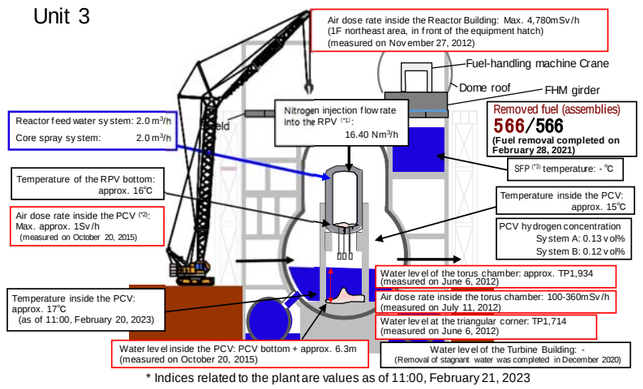


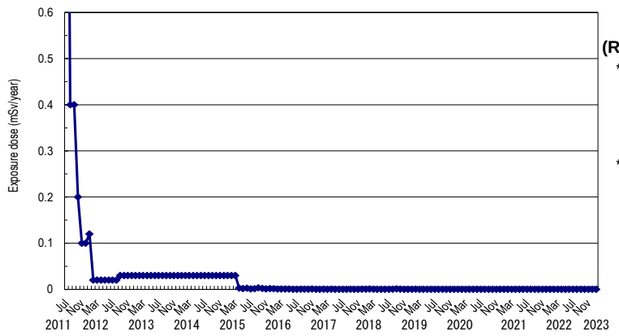
* Indices related to the plant are values as of 11:00, February 21, 2023

(*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 January 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/cm^3 and 2.1×10^{-12} Bq/cm^3 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 1-4



(Reference)

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

* Data of Monitoring Posts (MP1-MP8).
Data of Monitoring Posts (MPs) measuring the air dose rate around the site boundary showed 0.292 – 1.065 μSv/h (January 25 – February 20, 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.

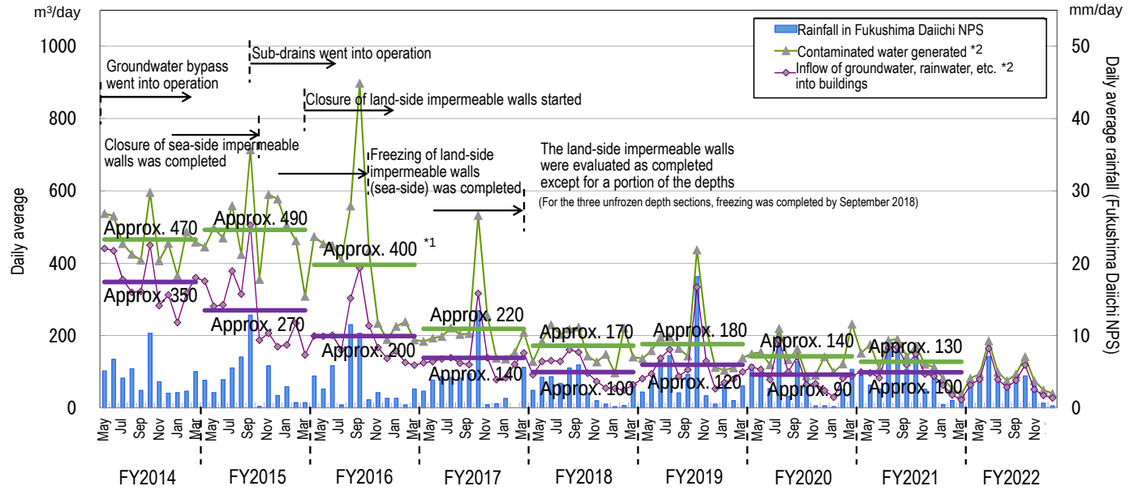
Based on the above, it was confirmed that the comprehensive cold shutdown condition had been maintained and the reactors remained in a stabilized condition.

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, the amount of contaminated water generated within FY2021 declined to approx. 130 m^3/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 February 13, 2023, 2,095 release operations had been conducted.
  The water quality of all temporary storage tanks satisfied the operational target.

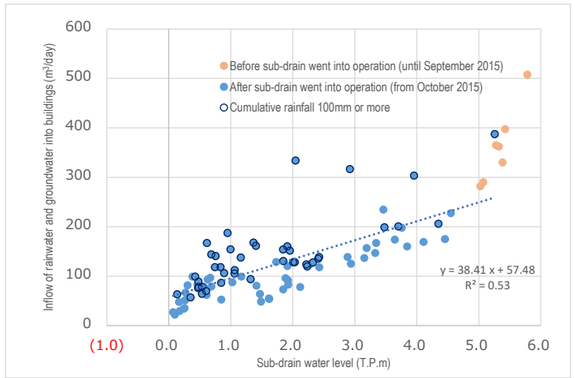


Figure 2: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Units 1-4 sub-drains

➢ 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 January 2023, 95% of the planned area (1,450,000 m^2 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 January 2023, 40% of the planned area (60,000 m^2) 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 mountainside, 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

- Regarding the multi-nuclide removal equipment (existing), hot tests using radioactive water are ongoing (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 and the entire pre-service inspection was completed. The (additional) multi-nuclide removal equipment went into full-scale operation from October 16, 2017. Regarding the (high-performance) multi-nuclide removal equipment, hot tests using radioactive water have been underway (from October 18, 2014).
- As of February 16, 2023, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 494,000, 751,000 and 104,000 m^3, respectively (including approx. 9,500 m^3 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 February 16, 2023, approx. 704,000 m^3 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 February 16, 2023, approx. 871,000 m^3 had been treated.

As of February 16, 2023

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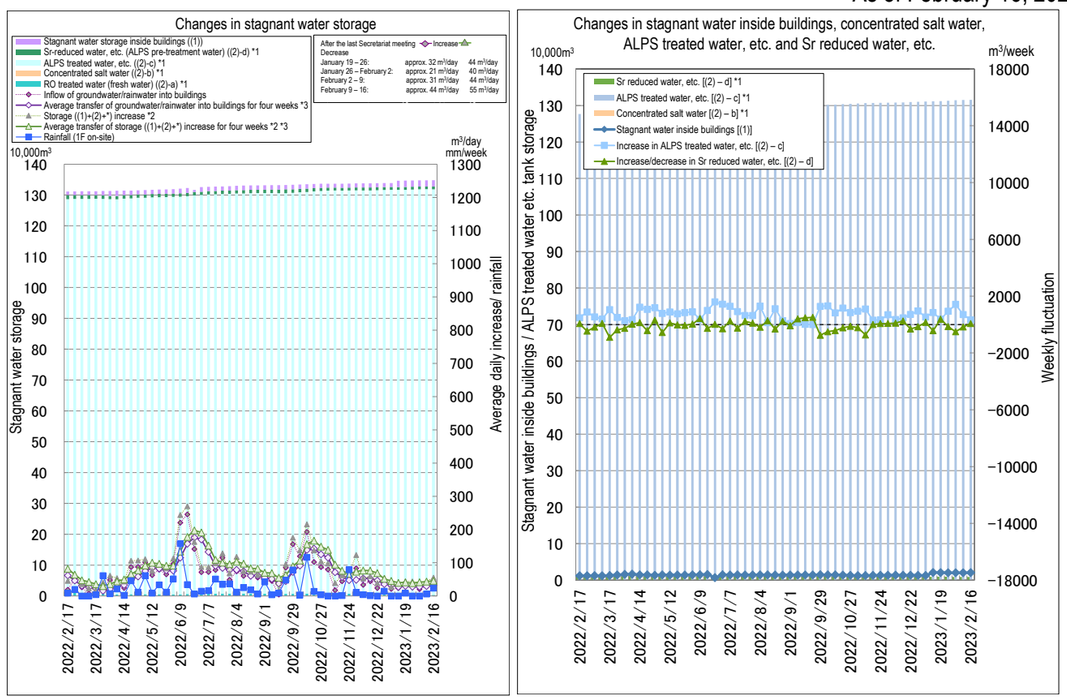


(1): Stagnant water storage inside buildings (Units 1-4, Process Main Building, High Temperature Incinerator Building, Waste Liquid Supply Tank, SPT (A), SPT (B), Units 1-3 CST, buffer tank)
(2): Units 1-4 tank storage ([(2)-a RO treated water (fresh water)] + [(2)-b Concentrated salt water] + [(2)-c 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 year and 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 for the past year and at new measurement points and 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 for the past year and 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 year within the fluctuation range of seawater in Japan*.

* : The range of the minimum – maximum values detected during April 2019 – March 2021 were 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 for the past year. The concentration of tritium in fish sampled at new sampling points, including where the analytical value was verified, remained low within a similar fluctuation range for seawater in Japan*. Other measurement data of fish and measurement data of seaweed are being verified.

  * : The range of the minimum – maximum values detected during April 2019 – March 2021 was as follows in the database below:

  In Japan (including off the coast of Fukushima Prefecture)
  Tritium concentration: 0.064 – 0.12 Bq/L
- The concentration of iodine 129 in seaweed sampled since July 2022 had been below the lower detection limit (< 0.1 Bq/kg (raw)). The concentration of tritium had not been analyzed due to a lack of sufficient sample population for reanalysis via the improved method following a review of the analytical procedures based on the verification results of fish tritium analysis data. The fluctuation range of iodine 129 in seaweed in Japan had been within the range of minimum – maximum values detected during April 2019 – March 2021 in the database above.

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

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

- To eliminate concerns and reassure those in society, a rearing test of marine organisms (flounder and abalones) in seawater with ALPS treated water added and normal seawater for comparison is underway.
- Regarding the test of flounder, each day on February 6 and 10, 2023, in the series 2 tank (normal seawater), one flounder died. Since February 10, no further death or abnormality was detected (as of February 18).
- Regarding the test of abalones, since the test started on October 25, 2022, 19 deaths were detected in “normal seawater” and 41 deaths, in “ALPS treated water diluted by seawater” (as of February 18).
- The timing for starting the rearing test of seaweed will be announced as soon as it has been decided.
- Subsequently, the tritium concentration will be measured for abalones having been reared in diluted ALPS treated water (less than 1,500 Bq/L) in October - November 2022 and flounder, (approx. 30 Bq/L) in November - December 2022.

➢ 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 a pipe support, piping and others for these facilities started from August 4, 2022 from around the K4 area tanks. The pre-service test started from January 16, 2023.
- For the discharge facility, a bedrock layer is being drilled by the shield machine from August 4, 2022, to start construction of the discharge tunnel. At present, no water leakage or other phenomena have been detected within the drilling range. Previously, construction of the downstream pool started from December 18.
- For the dilution facility, placing of the foundation pile for seawater transfer pipes was completed and work to construct the foundation frame is underway. From January 12, 2023, installation and assembly of blocks (manufactured outside the site) started, and from February 9, concrete placement at the bottom started.
- In the seaside area for Units 5 and 6, scaffolding for heavy-duty machines was completed on December 29, 2022 and the scaffold has been utilized, mainly to construct the upper stream pool from January 5 2023. Sedimentation inside the intake open channels is being removed simultaneously and after installing the partition weir, anti-permeation work will be removed.
- At sea, antiwashout under water mortar and concrete were placed around the outlet caisson from the concrete plant ship for backfill. Work started from December 8, 2022 and placement of the mortar was completed on January 7, 2023 and concrete, on February 7. Subsequently, based on the results of bathymetry and marine surveys, it was determined that the backfill was completed on February 14.
- When preparation is completed, the temporary surveying tower, which is equipped with a caisson, will be removed, followed by the arrival pipe after the shield machine arrives.

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 late 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 and approx. 83%, for the upper structure.
- 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 are installed.
- Before the forthcoming drilling of anchors near the operating floor level, removal of rubble which interferes with the drilling will start from March 2023.

➢ Main work to help spent fuel removal at Unit 2

- Work to remove the control room of the fuel-handling machine (hereinafter FHM control room), which started from August 2022, was completed in November 2022. (Work to transport dismantled rubble was completed on January 31)
- From February 6, 2023, work to dismantle the existing facility on the south side commenced.
- Outside the building, the erection of a steel structure commenced from January 23, 2023.
- Outside the site, before erecting the steel structure on-site, ground assembly continues.

Retrieval of fuel debris

➢ Unit 1 PCV internal investigation (the latter half)

- Regarding the deposit sampling using ROV-E, as countermeasures in response to the investigation suspension on January 12, reproducibility was verified on January 31. As no reproduction was confirmed, it was considered a temporary event attributable to foreign matter.
- Subsequently, the investigation was resumed. As the planned first investigation was completed on February 1, ROV-E was uninstalled the same day.
- In the following second investigation, as the investigation of planned points was completed on February 10 and 11, ROV-E was uninstalled on February 11.
- As planned, deposit samples were acquired from four points and the acquired samples will be transported to an analytical institute off site. Following the PCV internal investigation, samples will be separated by the glove box.
- At present, carrying-in of the equipment, operation verification and other preparation toward 3D-mapping of deposits by ROV-B is underway.

➢ 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 contact risk during the fuel debris retrieval, correction of the control program and other improvements (*) are currently underway. (* Improvements: correcting and improving the accuracy of the control program, increasing the arm operation speed, improving the cable mounting tool, increasing visibility, improving the gripper, etc.)
- As preliminary work of the Unit 2 site, work to install the isolation room toward opening the X-6 penetration hatch

commenced from November 2021. In response to the damage to the rubber box in the isolation room, bending of the guide roller (earthquake response) and others having occurred during the work, countermeasures were completed. At present, inspection, adjustment and others of the isolation room pressing mechanism are underway. (Simultaneously, remanufacturing of the isolation room is being examined.) Subsequently, opening of X-6 penetration hatch, removal of deposits inside X-6 penetration and other work are scheduled. Work needs to proceed safely and carefully.

➢ Response to stagnant gas detected in the inlet header of the Unit 1 RCW heat exchanger

- Regarding the Reactor Building Closed Cooling Water System (RCW), which is a high-dose source inside the Unit 1 Reactor Building (R/B), work related to inclusive water sampling to reduce dosage has been underway since October.
- Regarding the inlet header of the RCW heat exchanger to be used for the sampling, the pipe was subject to electrolytic perforation to check for stagnant gas and hydrogen (approx. 72%) was detected.
- During the ongoing nitrogen injection and stagnant gas exhaust to date, the hydrogen concentration was reduced and subsequently the penetration was drilled. On February 15, the concentration of hydrogen and other gases inside the pipe after drilling was measured and a concentration at an equivalent level to the ratio within air was confirmed. (Hydrogen 0%, oxygen approx. 21%, hydrogen sulfide 0 ppm)
- Toward STEP 3 (inclusive water sampling), work will continue carefully; prioritizing safety above all.

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 January 2023, the total storage volume for concrete and metal rubble was approx. 328,000m^3 (-1,200 m^3 compared to the end of December with an area-occupation rate of 88%). The total storage volume of trimmed trees was approx. 120,900m^3 (-4,400 m^3 with an area-occupation rate of 69%). The total storage volume of used protective clothing was approx. 13,900m^3 (-2,100m^3, with an area-occupation rate of 26%). The increase in rubble was attributable to decontamination of flanged-tanks, work related to the port and transfer for area arrangement. As of the end of January 2023, there were six temporary deposits with storage capacity exceeding 1,000m^3, storage 60,700m^3.

➢ Management status of secondary waste from water treatment

- As of February 2, 2023, the total storage volume of waste sludge was 467 m^3 (area-occupation rate: 67%), while that of concentrated waste fluid was 9,474 m^3 (area-occupation rate: 92%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment and other vessels, was 5,507 (area-occupation rate: 87%).

➢ Corrosion and penetration hole detected in the exhaust gas filter casing of the Radioactive Waste Incinerator

- The Radioactive Waste Incinerator went into operation in March 2016. On February 10, 2023, during the annual inspection, when the inside of the casing was checked for the replacement of the exhaust gas filter B, deposit of a rust-like powder was detected in the lower part of the casing for all five filters and when the powder was cleaned, corrosion and thinning were also detected, mainly in the four corners of the casing bottom plate.
- Moreover, in one of these filters, one hole penetrating the casing was detected.
- In response to the phenomenon in System B, the exhaust gas filter casing of System A was checked on February 11. Although no penetrating hole was found, corrosion and thinning were detected, as in System B.
- Both incinerators in Systems A and B were suspended for the inspection and during operation, filters were maintained at negative pressure. Moreover, the point where the penetrating hole was detected was located downstream of the filter and no contamination was detected around the casing, so no external influence was expected.
- As the next measure, the inside of pipes and equipment on upstream and downstream sides will be inspected and status of all factors, such as corrosion, will be checked. Methods of repair and recurrence-prevention measures will be examined and implemented based on the cause investigation results.

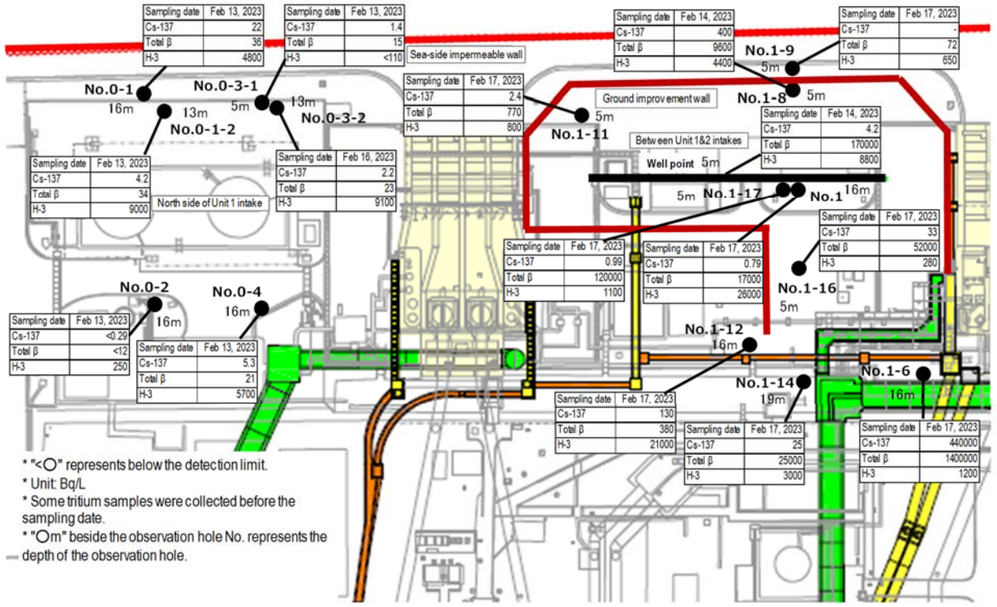
Reduction in radiation dose and mitigation of contamination

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

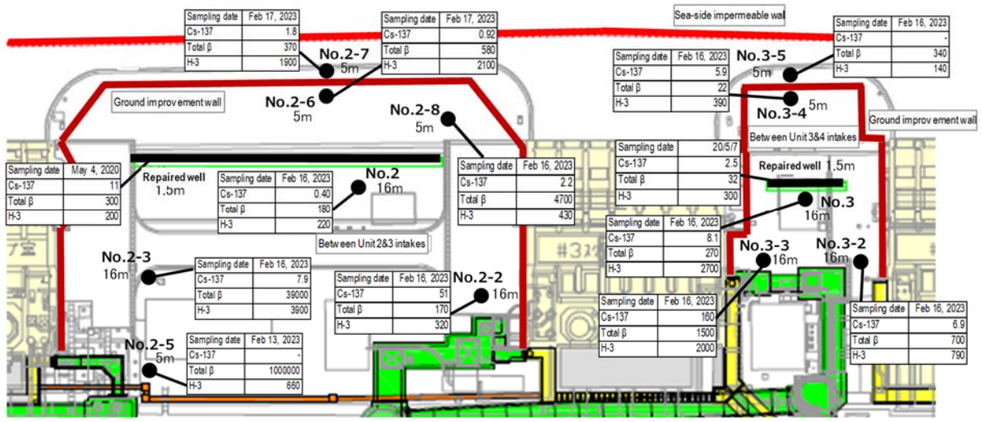
➢ Status of the groundwater and seawater on the east side of Turbine Building Units 1-4

- 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 monitored carefully.
- 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 and 1-17 but has otherwise remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall but 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 monitored carefully.
- 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 been increasing or declining at No. 2-5. The trend continues to be monitored carefully.
- 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 monitored carefully.
- 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 will be installed and drainage around the Units 1 and 2 switch yard will start 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 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 has remained slightly higher in front of the south-side impermeable walls and slightly lower on the north side of the east breakwater since March 20, 2019, when the silt fence was transferred to the center of the open channel due to mega float-related construction.
- In the port area, the concentration of radioactive materials in seawater has remained below the legal discharge limit and 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

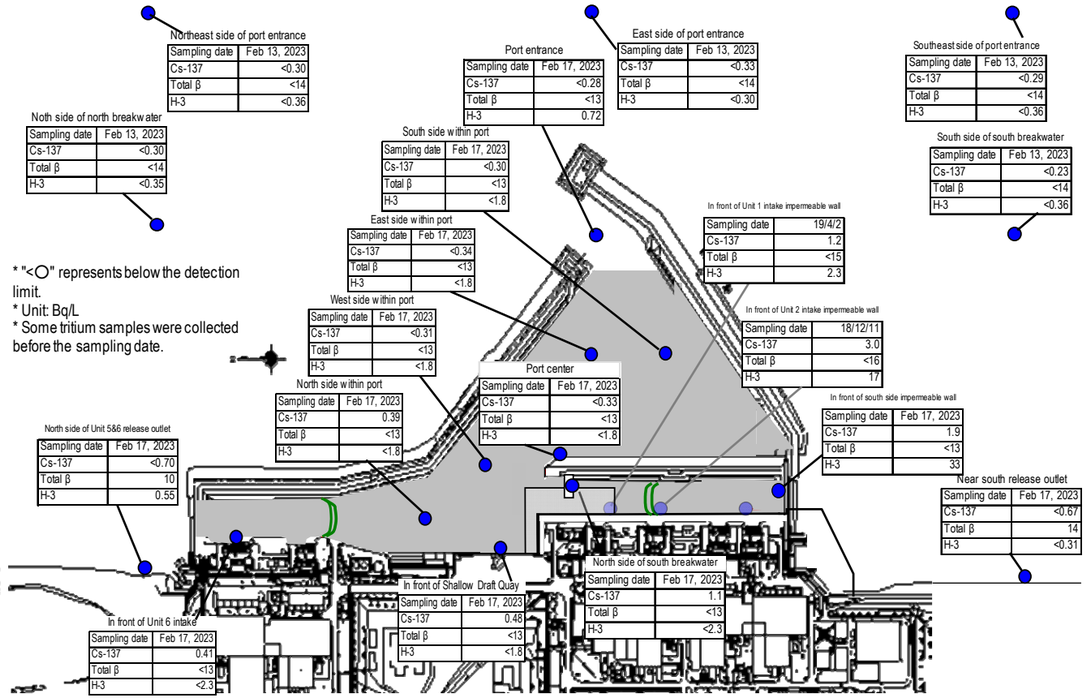


Figure 5: Seawater concentration around the port

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 October to December 2022 was approx. 9,600 (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 March 2023 (approx. 5,020 workers per day: cooperating company workers and TEPCO HD employees) would be secured at present. The average numbers of workers per day for each month (actual values) for the most recent 2 years were maintained, with approx. 3,000 to 4,600.
- The number of workers from within Fukushima Prefecture remained constant and the number outside remained constant. The local employment ratio (cooperating company workers and TEPCO HD employees) as of January 2023 remained constant at around 70%.
- The average exposure doses of workers were approx. 2.54 and 2.60 and 2.51 mSv/person-year during FY2019, 2020 and 2021, respectively (The legal exposure dose limits are 100 mSv/person and 50 mSv/person-year 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.

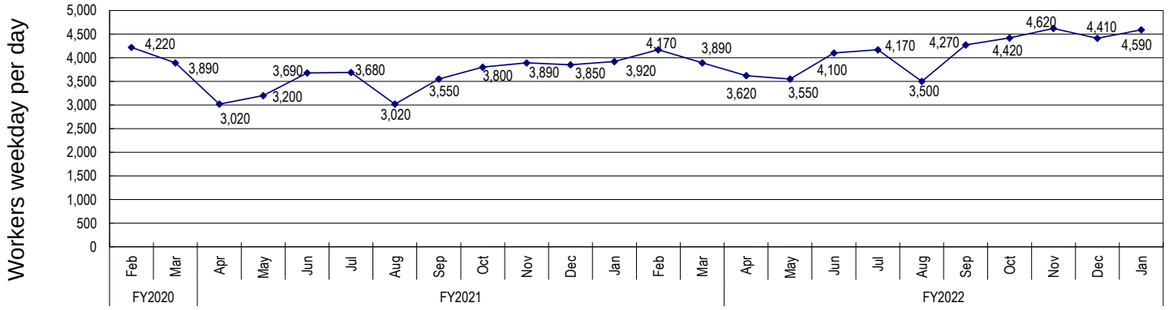


Figure 6: Changes in the average number of workers weekday per day for each month of the most recent 2 years (actual values)

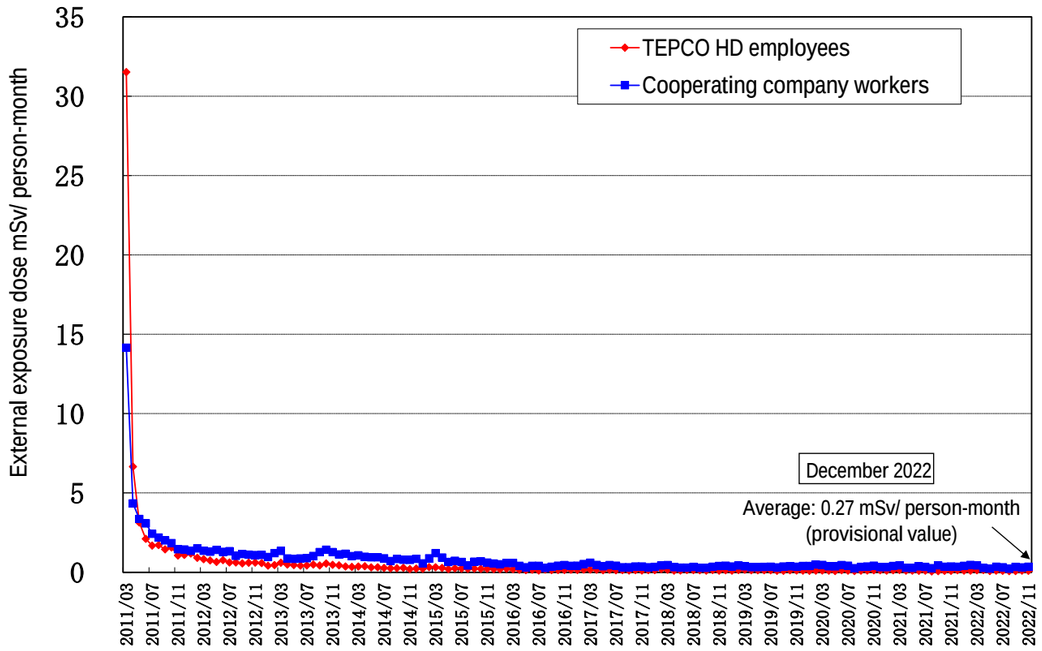


Figure 7: Changes in monthly average exposure dose of individual worker
(monthly exposure dose since March 2011)

➢ Introduction of anorak for improved full-face mask

- For work under the environment highly contaminated by radioactive materials, an anorak and full-face mask are worn. However, there were many cases in which contaminated materials adhered to the mask surface during work and when the mask was removed after work, contaminated materials adhered to the face.
- In response, from FY2021, as part of measures to prevent contamination of the face, an anorak capable of covering the full-face mask was manufactured and introduced.
- In FY2022, the anorak for the full-face mask previously introduced was refined and reshaped, allowing it to accommodate two types of full-face mask and changed to materials that could prevent fogging on the face part. A new anorak was also manufactured, capable of accommodating a full-face mask and with an electric fan.
- The new anorak was used under an environment simulating the site in terms of temperature and humidity. As it was confirmed that problems of wearing condition and fogging were solved, the anorak will be used from March 2023.

➢ Countermeasures to suppress the spread of COVID-19 infections

- Infections have been decreasing across Japan and Fukushima Prefecture and the infection status at the Fukushima Daiichi Nuclear Power Station has also stabilized. However, ongoing basic countermeasures to prevent infection spreading, such as requiring employees to take their temperature before coming to the office, wear masks at all times, avoid the “Three Cs” by using the rest house in shifts, eat silently and carefully select business travel, have been continued to be properly implemented to proceed with decommissioning work, prioritizing safety above all.
- As of February 21, 2023, 1,743 workers (including 278 TEPCO HD employees, 1,460 cooperating company workers, 3 business partner company employees and 2 temporary workers) of the Fukushima Daiichi Nuclear Power Station had been infected by COVID-19, an increase in 40 workers (including 5 TEPCO HD employees and 35 cooperating company workers) from the figures in the previous published material (as of January 25, 2023).
- No significant influence on decommissioning work, such as a corresponding delay to work processes due to this infection, had been identified.

➢ Measures to prevent infection and expansion of influenza and norovirus

- Since November 2022, measures for influenza and norovirus have been implemented, including free influenza vaccinations (subsidized by TEPCO HD) at medical clinics around the site (from October 11, 2022 to January 28, 2023) for cooperating company workers. As of January 28, 2023, a total of 4,696 workers had been vaccinated. In addition, a comprehensive range of other measures is also being implemented, including daily actions to prevent infection and expansion (measuring body temperature, health checks and monitoring infection status) and response after detecting possible infections (swift exit of possible patients and control of entry, mandatory wearing of masks in working spaces, etc.).

➢ Status of influenza and norovirus cases

- Until the 7th week of 2023 (February 13-19, 2023), 23 influenza and three norovirus infections were recorded. The totals for the same period for the previous season also showed no influenza and five norovirus infections.

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

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 January 23 - February 17)"; unit (Bq/L); ND represents a value below the detection limit

Summary of TEPCO data as of February 18, 2023

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

Cesium-134	:	ND(0.35)		
Cesium-137	:	ND(0.33)		
Total β	:	ND(13)		
Toritium	:	ND(1.8)		*1

Cesium-134	: 3.3 (H25/12/24)	→	ND(0.28)	Below 1/10
Cesium-137	: 7.3 (H25/10/11)	→	ND(0.28)	Below 1/20
Total β	: 69 (H25/8/19)	→	ND(13)	Below 1/5
Toritium	: 68 (H25/8/19)	→	0.67	Below 1/100

Cesium-134	: 3.3 (H25/10/17)	→	ND(0.27)	Below 1/10
Cesium-137	: 9 (H25/10/17)	→	ND(0.34)	Below 1/20
Total β	: 74 (H25/8/19)	→	ND(13)	Below 1/5
Toritium	: 67 (H25/8/19)	→	ND(2.0)	Below 1/30

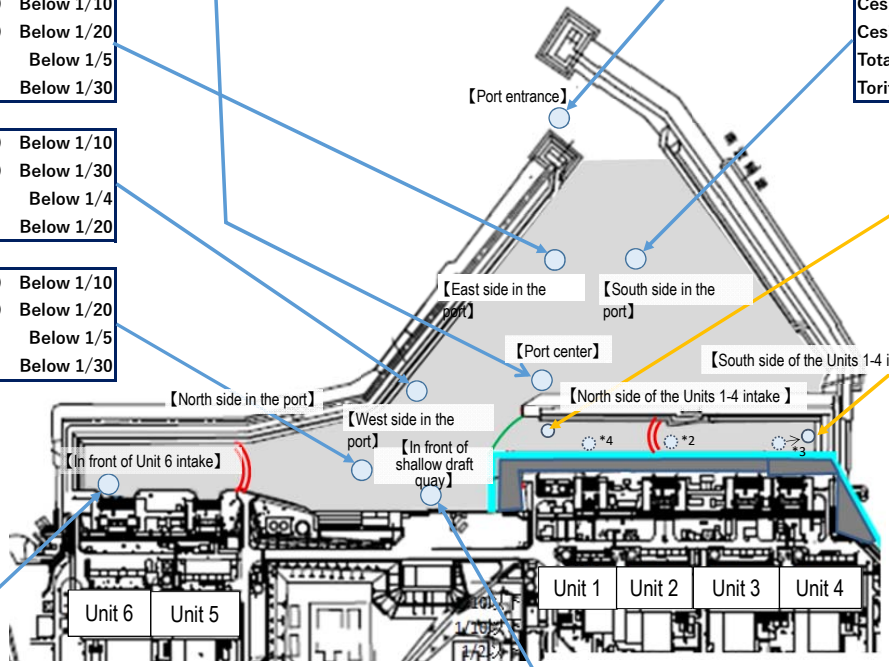
Cesium-134	: 3.5 (H25/10/17)	→	ND(0.28)	Below 1/10
Cesium-137	: 7.8 (H25/10/17)	→	ND(0.30)	Below 1/20
Total β	: 79 (H25/8/19)	→	ND(13)	Below 1/6
Toritium	: 60 (H25/8/19)	→	ND(1.7)	Below 1/30

Cesium-134	: 4.4 (H25/12/24)	→	ND(0.33)	Below 1/10
Cesium-137	: 10 (H25/12/24)	→	ND(0.31)	Below 1/30
Total β	: 60 (H25/7/4)	→	ND(13)	Below 1/4
Toritium	: 59 (H25/8/19)	→	ND(2.0)	Below 1/20

Cesium-134	: 32 (H25/10/11)	→	ND(0.30)	Below 1/100
Cesium-137	: 73 (H25/10/11)	→	1.1	Below 1/60
Total β	: 320 (H25/8/12)	→	ND(13)	Below 1/20
Toritium	: 510 (H25/9/2)	→	2.6	Below 1/100

Cesium-134	: 5 (H25/12/2)	→	ND(0.32)	Below 1/10
Cesium-137	: 8.4 (H25/12/2)	→	ND(0.39)	Below 1/20
Total β	: 69 (H25/8/19)	→	ND(13)	Below 1/5
Toritium	: 52 (H25/8/19)	→	ND(1.7)	Below 1/30

Cesium-134	:	ND(0.31)		
Cesium-137	:	1.9		
Total β	:	ND(13)		
Toritium	:	49		*1



Sea side impermeable wall
Silt fence
Silt fence for construction

Cesium-134	: 2.8 (H25/12/2)	→	ND(0.28)	Below 1/10
Cesium-137	: 5.8 (H25/12/2)	→	0.41	Below 1/10
Total β	: 46 (H25/8/19)	→	ND(13)	Below 1/3
Toritium	: 24 (H25/8/19)	→	2.4	Below 1/10

Cesium-134	: 5.3 (H25/8/5)	→	ND(0.35)	Below 1/10
Cesium-137	: 8.6 (H25/8/5)	→	0.48	Below 1/10
Total β	: 40 (H25/7/3)	→	ND(13)	Below 1/3
Toritium	: 340 (H25/6/26)	→	2.0	Below 1/100

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

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

*3: For the point, monitoring point was moved from February 6, 2019 due to preparatory work for transfer of mega float. The point was further moved to the outside of the silt fence from January 20, 2023, to install the silt fence to the Drainage Channel K outlet as a measure for fish in the port. (The sampling point was moved to approx.. 3m east side)

*4: For the point, monitoring was finished from April 3, 2019 due to preparatory work for transfer of mega float.

	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 December 26 - January 21)

Summary of TEPCO data as of February 18, 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)	→	_
Cesium-137	:	ND	(H25)	→	_
Total β	:	ND	(H25)	→	_
Toritium	:	ND	(H25)	→	ND(0.36)

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

Cesium-134	:	ND	(H25)	→	_	
Cesium-137	:	1.6	(H25/10/18)	→	_	
Total β	:	ND	(H25)	→	_	
Toritium	:	6.4	(H25/10/18)	→	ND(0.32)	Below 1/20

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

Cesium-134	:	ND	(H25)	→	_
Cesium-137	:	ND	(H25)	→	_
Total β	:	ND	(H25)	→	_
Toritium	:	ND	(H25)	→	ND(0.36)

Cesium-134	:	ND	(H25)	→	_	
Cesium-137	:	ND	(H25)	→	_	
Total β	:	ND	(H25)	→	_	
Toritium	:	4.7	(H25/8/18)	→	ND(0.35)	Below 1/10

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

Cesium-134	:	3.3	(H25/12/24)	→	ND(0.28)	Below 1/10
Cesium-137	:	7.3	(H25/10/11)	→	ND(0.28)	Below 1/20
Total β	:	69	(H25/8/19)	→	ND(13)	Below 1/5
Toritium	:	68	(H25/8/19)	→	0.67	Below 1/100

【Port entrance】

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

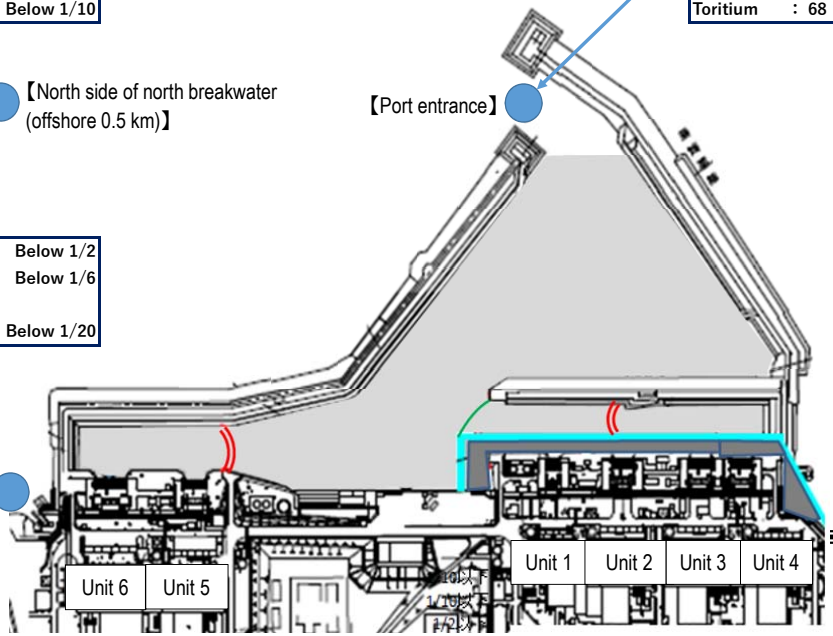
Cesium-134	:	ND	(H25)	→	_
Cesium-137	:	ND	(H25)	→	_
Total β	:	ND	(H25)	→	_
Toritium	:	ND	(H25)	→	ND(0.36)

Cesium-134	:	1.8	(H25/6/21)	→	ND(0.77)	Below 1/2
Cesium-137	:	4.5	(H25/3/17)	→	ND(0.70)	Below 1/6
Total β	:	12	(H25/12/23)	→	_	
Toritium	:	8.6	(H25/6/26)	→	ND(0.31)	Below 1/20

Cesium-134	:	ND	(H25)	→	ND(0.61)	
Cesium-137	:	3	(H25/7/15)	→	ND(0.67)	Below 1/4
Total β	:	15	(H25/12/23)	→	14	
Toritium	:	1.9	(H25/11/25)	→	ND(0.32)	Below 1/2

【North side of Unit 5 and 6 release outlet】

【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.

Note: Because safety of the sampling points was unassured due to the influence of Typhoon No. 10 in 2016, samples were taken from approx. 330 m south of the Unit 1-4 release outlet.
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

February 22, 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
- 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 storage tent

Inside the rubble storage tent

Rubble (covered by sheet)

Solid waste storage facility

Rubble (container storage)

Tank installation status

Spent adsorption vessel temporary storage facility

Temporary waste sludge storage

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

0m 100m 500m 1000m

MP-1 MP-2 MP-3 MP-4 MP-5 MP-6 MP-7 MP-8

Rubble
Used protective clothing
Temporary trimmed trees storage pool
Trimmed trees
Additional Radioactive Waste Incinerator
Large Waste Storage
Radioactive Waste Incinerator
Futaba town
Unit 6
Unit 5
Unit 1
Unit 2
Unit 3
Unit 4
Town boundary
Okuma town
Mega float
Vehicles maintenance site
Water treatment facility for Sub-drain
Water treatment facility for Sub-drain and others
Periodical Inspection Material Storage (cutting of flanged-tanks)
Temporary Cask Custody Area
Main Anti-Earthquake Building
JAEA Analytical Facility Management Building
JAEA Analytical Facility Laboratory-1
Vehicle screening and decontamination site
Multi-nuclide removal equipment
Additional multi-nuclide removal equipment
High-performance multi-nuclide removal equipment
Spent absorption vessel temporary storage
Large equipment decontamination facility
Land-side impermeable walls with frozen soil
Land-side impermeable walls freezing plant
Underground reservoirs
Pipe route
Sea side impermeable wall
Water desalinations (RO)
Cesium absorption apparatus (Incineration Workshop Building)
Decontamination instruments (Process Building)
3rd cesium adsorption apparatus (Onsite Bunker Building)
2nd cesium adsorption apparatus (HTI Building)
Cesium absorption vessel temporary storage
Common pool
Partner Companies' Building
Groundwater bypass temporary storage tank
Temporary rest house outside the site
New Administration Office Building
Heliport
Large rest house
Access control facility
Water desalinations (evaporative concentration)
Water desalinations (RO)
Site boundary
Temporary trimmed trees storage pool
H1 H2 H3 H4 H5 H6 H8 H9
J1 J2 J3 J4 J5 J6 J7 J8 J9
K1 K2 K3 K4
G1 G1 South G3・G4・G5 G6 G7
B C D E F

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.
- 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

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)

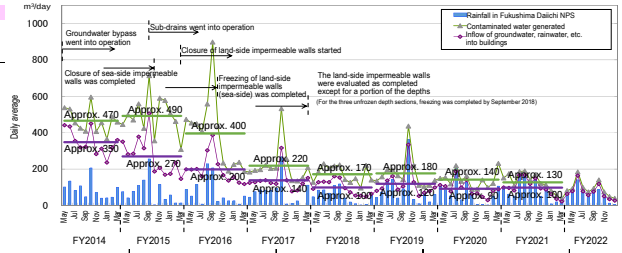

Cesium Adsorption Apparatus (KURION)
▽Treatment of RO-condensed salt water complete
▽Reduction of strontium by Cesium Adsorption Apparatus (KURION) (from 2015.1.6)
▽Reduction of strontium by 2nd Cesium Adsorption Apparatus (SARRY) (from 2014.12.26)
▽Purification of strontium-reduced water in flanged 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)

Multi-nuclide removal equipment (ALPS)

Removal of contaminated water from seawater pipe trench

ification by mobile equipment
▽Completion of tunnel filling
▽Transfer of stagnant water complete
▽Completion of shaft filling
Unit 2
▽Completion of tunnel filling
▽Transfer of stagnant water complete
▽Completion of shaft filling (except for upper part of Shaft D)
【Removal of contaminated water in seawater pipe trench】
Unit 3
▽Completion of tunnel filling
▽Filling of openings II and III complete
▽Transfer stagnant water complete
▽Completion of filling parts running over drainage c
Unit 4

Unit 2 seawater pipe trench Shaft D filling work



Contaminated water management【Redirect】

Groundwater bypass


Pumping well
▽Installation start of groundwater bypass
▽Operation start of groundwater bypass (drainage started from 2014.5.21)
Suppressing the average amount of contaminated water generated to approx. 130 m³/day ▽

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

Sub-drain purification system
▽Operation start of sub-drain (drainage started from 2015.9.14)
(Treatment capacity: 1000 m³/day)
▽Enhancement of treatment capacity
(2000 m³/day)

Land-side impermeable wall


Land-side impermeable wall brine (refrigerant) circulation pipe
▽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▽
▽Installation 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

Facing

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

Placement of seaside impermeable walls complete
▽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)

Storage facility

▽RO濃縮塩水の浄化処理完了
▽Storage in steel square tanks
▽鋼製角形タンクのリプレース完了
▽Removal of steel horizontal tanks complete (except for condensed waste liquid storage tank)
▽Water leakage (300L) from flanged tank
▽Water leakage (100l) from flanged tank
▽Storage in flanged cylindrical tanks
▽Completion of fence to prevent leakage expanding
▽Water leakage (10L) from flanged tank
▽Work to raise fence height complete

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
▽Leakage of contaminated water from underground reservoir => Start of transfer to tanks
▽Transfer of contaminated water to tanks complete
▽Storage in cylindrical steel welded-joint tanks
▽Purification of strontium-reduced water complete
▽Sprinkling start of rainwater within tank fences by rainwater treatment facility (from 2014.5.21)

Treatment of stagnant water

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

Countermeasures to tsunami risks

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

Chishima Trench Tsunami Seawall complete

Construction of Japan Trench Tsunami Seawall
▽Construction start of Tsushima Trench Tsunami Seawall
Japan Trench tsunami seawall
▽Completion of installation ▽On-site start

Mega float

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

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.


Overall view of mockup tanks


Flounder in rearing preparation tank

Enhancement of communication activities

- 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.

● Information dissemination via media in Japan and overseas and others
- To help deliver information based on scientific evidence, press release, press conference, disclosure of power plant site, briefing and others are held.
- For overseas major media, diplomatic corps and others, briefing and press tour are held. Information dissemination to neighboring countries is also being enhanced. Information dissemination to overseas media and information provision to embassies is focused.
  Ex.) May 10, 2022 Diplomatic corps and others, overseas media and others


Press conference

Completely revised in January 2022

"Understand by video. ALPS Treated Water" series
Now available on youtube (Japanese and English)

● Safety review of International Atomic Energy IAgency (IAEA)
- In February 2022, IAEA officials and international professionals (US/ UK/ France/ Russia/ China/ others) visited Japan to conduct technical inspection based on the international safety standard and on April 29, the report of safety assessment was published.
- The report states that in regards to the safety of the facility, the IAEA has found that, "TEPCO successfully incorporated prevention measures in the design of the facility as well as in the associated operating procedures." In regards to the Radiological Environmental Impact Assessment, "it acknowledged that the doses to the assumed representative person are expected to be very low and significantly below the dose constraint set by the Japanese regulatory body."


IAEA onsite investigation

● Communication with related parties taking various opportunities
- Efforts to explain about policies and safety measures for handling of ALPS treated water, countermeasures to rumors and others to people in the Metropolitan area, local residents and related parties and hear their opinions proceed. (In FY2021, approx. 3,000 times)
- Visits and Discussion Meetings of the Fukushima Daiichi Nuclear Power Station have been held since FY2019 for 13 municipalities in Hamadori. In FY2021 and FY2022, the Visits and Discussion Meetings were expanded to within Fukushima Prefecture. (In FY2022, a total of 17 times are scheduled)
- Moreover, online visits (connecting visitors and guide online) utilizing the "Fukushima Daiichi Virtual Tour" video, which is now being published on the TEPCO web site, and others are also offered in response to the need of people in Japan and overseas.
  (From August 2020 to July 2022 Online visitors: 59 organizations, 2,250 persons including overseas organizations)


Discussion meeting (face-to-face dialogue)

● 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.
- Froom March 2022, practice to rear flounder started using coastal seawater around the nuclear power station to learn how to rear marine organisms, verify the equipment design and others.
- From September 30, the stage was shifted to the next "rearing test" and on October 3, ALPS treated water was added.

- From March 17, daily rearing status is published on the TEPCO HD homepage and twitter.
  - Homepage address: http://www.tepco.co.jp/decommission/information/newsrelease/breedingtest/index-j.html
  - Twitter address: 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


Tank area viewed from the Large Rest House (2015.10.29)

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)

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

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

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

2022.8.4 Work has commenced

2021.4.13 The basic policy on the handling of ALPS treated water was set

2021.4.16 The response of TEPCO was announced

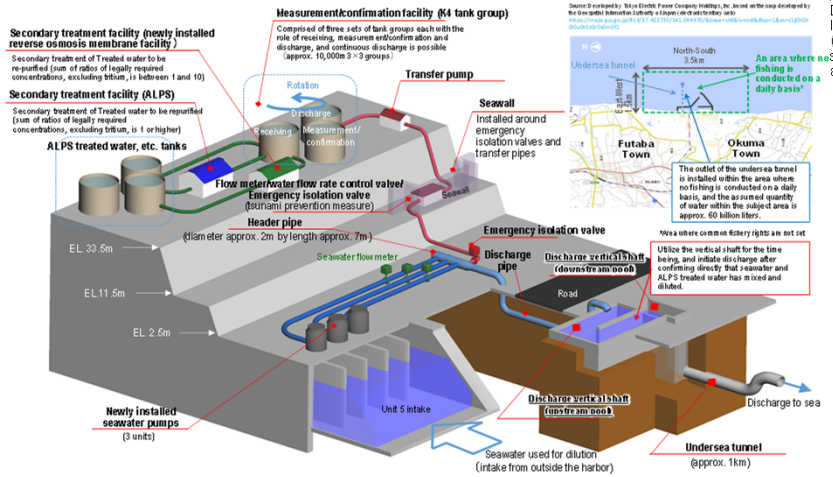
2022/8/30 The "Approach to Strengthening and Expansion of Measures in the Handling of ALPS Treated Water" was summarized

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

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

2014 2015 2016 2017 2018 2019 2020 2021 2022

【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)

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

▼ 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

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


<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

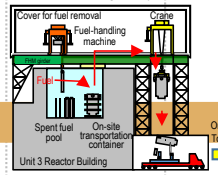
Unit 4 ▼ 2014.12.22 Fuel removal was completed (1533 assemblies)

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

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.

▼ 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

Overview of the fuel-handling facility inside the cover



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

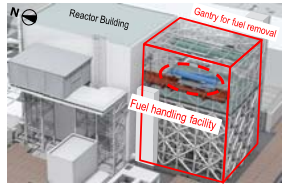
Unit 3 ▼ 2021.2.28 Fuel removal completed (566 assemblies)

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.

▼ 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
▼ 2021.10-2022.4 Ground improvement work


<Unit 2 Construction of gantry for fuel removal>

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



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.

<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 ▼ 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

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

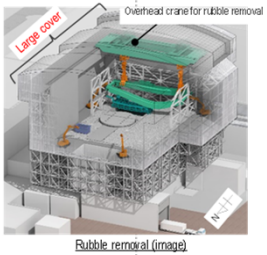
▼ 2017.12 Completion of building cover dismantling and windbreak fence installation
▼ 2018.1-2020.12 Rubble removal on the north side of Reactor Building
▼ 2018.9-12 Removal of X-braces
▼ 2021.8 Start of large cover pre-work

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.

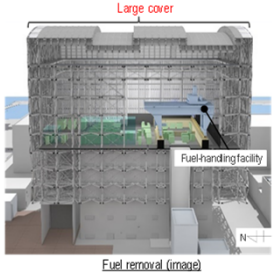
<Reference> Progress to date
Rubble removal on the north side of the operating floor started from January 2018 and has been implemented sequentially. In July and August 2019, the well plug, which was misaligned, was investigated, followed in August and September by the conditions of the overhead crane. 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.

Unit 1


<Unit 1 Dismantling of remaining cover>



Rubble removal (image)



Fuel removal (image)

2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

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

4 Work toward fuel debris retrieval

February 22, 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)

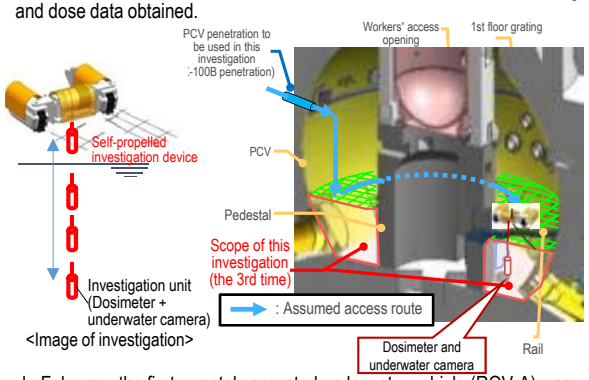
Start of fuel debris retrieval from the first unit (Unit 2). Expanding the scale in stages (within 2021 * The schedule will be extended for about 1 year due to the spread of COVID-19 infections)

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

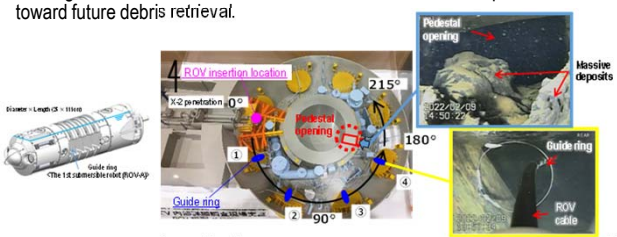
・In April 2015, a device having entered the inside of the PCV via a narrow opening (bore:φ100 mm) collected information such as images and airborne dose inside the PCV 1st floor.

・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, the first remotely operated underwater vehicle (ROV-A) was inserted to install "guide rings" which will facilitate the investigation. As installation of guide rings has been completed, then a detailed investigation will be implemented.
In this investigation, distribution of deposits outside the pedestal and their characteristics or others will also be investigated. The results of these investigations will be utilized in the examination of method and procedures toward future debris retrieval.



<Status inside the PCV (February 9)>

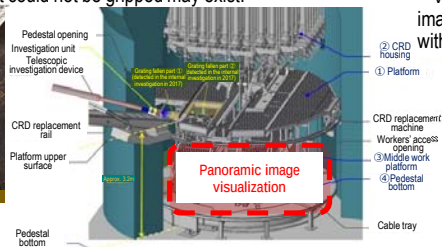
Unit 2 Investigation overview

・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.

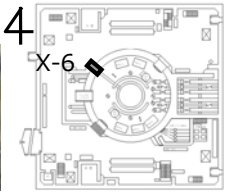

Bottom of the pedestal (after being processed in panoramic image visualization)



・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

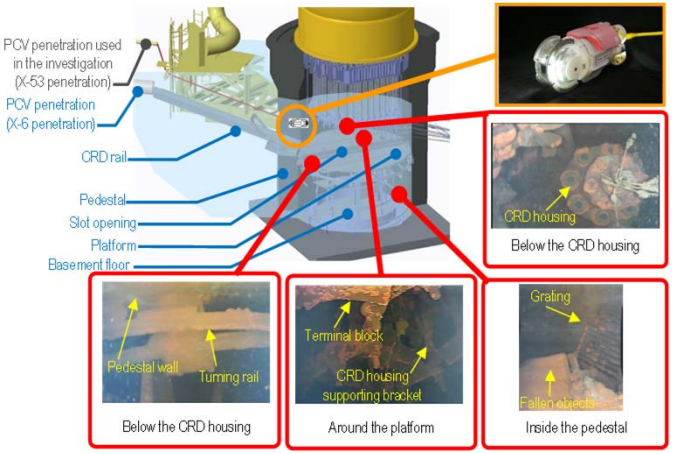
・In October 2014, the conditions of X-53 penetration, which may be under water and which is scheduled for use to investigate the inside of the PCV, was investigated via remote-controlled ultrasonic test equipment. The results showed that the penetration was not under water.

・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
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)

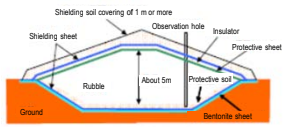
▼ 2012.9 Transfer start of rubble to the soil-covered temporary storage facility

▼ 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

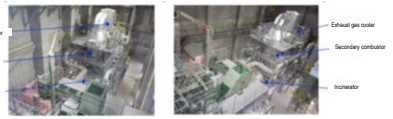
▼ 2016.3 Operation start

▲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

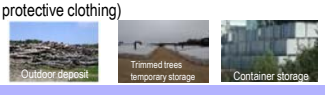
Site of Volume Reduction Faciility

Present status Note

Storage of rubble and others

Present storage Approx.480,000 m³ (as of 2021.3)

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.790,000 m³ (*2)

Approx. 290,000 m³ → To (A) (*1) → Incineration

Approx. 60,000 m³ → Stored and managed in Solid Waste Storage as done for rubble

Approx. 60,000 m³ → Additional Radioactive Waste Incinerator (A)

Approx. 60,000 m³ → (B)

Approx. 170,000 m³ → To (A) (*1) → Volume reduction

Approx. 220,000 m³ → Volume reduction

Approx. 6,500 tanks → Treatment measures and others will be examined

Status after a decade

Legend : Newly installed equipment and facility

Incineration

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


Crusher example

Radioactive Waste Incinerator

Additional Radioactive Waste Incinerator

Volume reduction

Compaction Facility (scheduled for completion in FY2022)


Concrete crusher example


Metal cutter example

Melting

Melting equipment


Electric furnace example

To (B)

Approx. 270,000 m³ (*3) (*2)

Storage /management

Approx. 20,000 m³

Solid Waste Storage (Storage capacity: approx. 260,000 m³)

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

Approx. 60,000 m³

Approx. 60,000 m³ (*1)

Additional Solid Waste Storage
10th-11th
(Scheduled for completion after FY2022)

Approx. 60,000 m³

Approx. 70,000 m³

Based on the estimates for the amount of waste to be generated, the storage capacity (approx. 260,000 m³) will be reached in around 2032. Scope to install an additional solid waste facility and others will be examined

(*1)

Reuse will be examined

Spent Adsorption Vessel Temporary Storage

Large Waste Storage (scheduled for completion in FY2022)
Toward an operation launch within FY2022, installation work is underway


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.

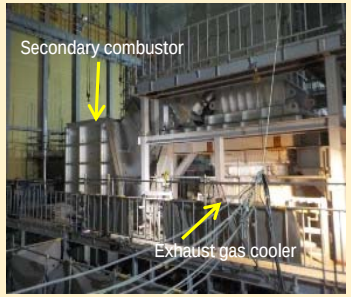
Note: Used protective clothing before incineration and BG-level concrete waste for which treatment and reuse is decided at present are not included.

- 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.

●Efforts to eliminate temporary outdoor storage of rubble and others

To incinerate trimmed trees and combustible rubble (woods, packing materials, paper and others), work to install the Additional Solid Waste Facility is underway.


Whole view of the Additional Solid Waste Incinerator Building



Main equipment

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.

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

External view of Access Control Facility

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

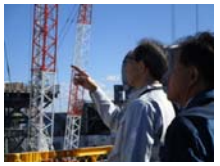
From March 12, 2011, in response to the increased airborne concentration of radioactive materials, instructions were issued to wear full-face masks throughout the Fukushima Daiichi NPS site, excluding the Main Anti-Earthquake Building and the rest house.

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 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)

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

Changes in operation of controlled area

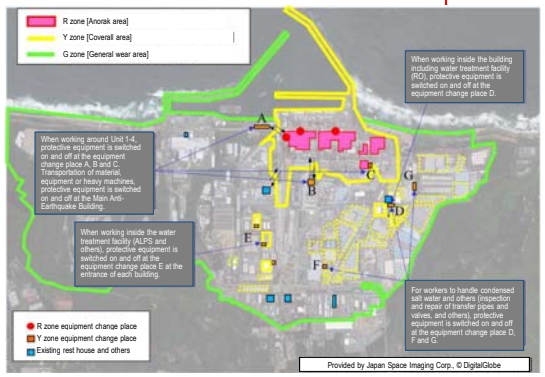
From May 2013, full-face mask unnecessary area was expanded sequentially.

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

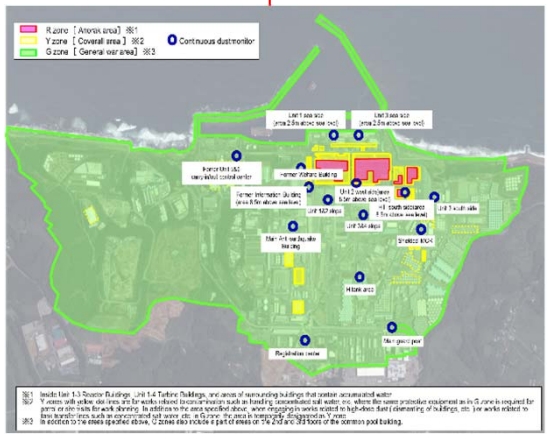
In May 2015, full-face mask unnecessary area was expanded to cover about 90% of the site.

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

In 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).



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

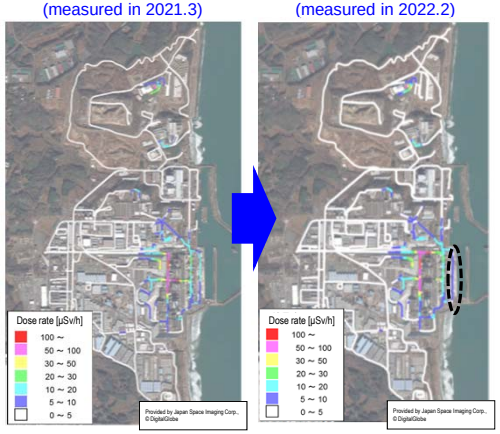


In May 2018, within about 96% of the site, workers are allowed to wear light equipment such as general workwear and disposable dust-protective masks.

<Travel survey results of major roads within the site>
The dose rate has been declining every year.
In particular, in the area on the east side of the Turbine Building shown a black dotted line, the dose rate declined by facing related to installation of the seawall as the countermeasure to the Japan Trench tsunami.

FY2020 4th Quarter (measured in 2021.3)

FY2021 4th Quarter (measured in 2022.2)



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