Outline of Decommissioning, Contaminated Water and Treated Water Management

January 27, 2022
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.

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
Unit 3	Completion of fuel removal	Within FY2020
Unit 4	Completion of fuel removal	2014

Fuel Removal from SFP

Units 1 and 2 / Units 3 and 4

Rubble removal etc. → Installation of fuel removal equipment → Fuel removal → Storage / Transportation

First unit	Start of fuel debris retrieval
Unit 2	Within 2021 *Expected to be delayed by approximately 1 year

Fuel Debris Retrieval

Units 1 and 3 / Unit 2

Understanding of the situation inside the PCV / Consideration of retrieval methods, etc. → Fuel debris retrieval → Storage / Transportation

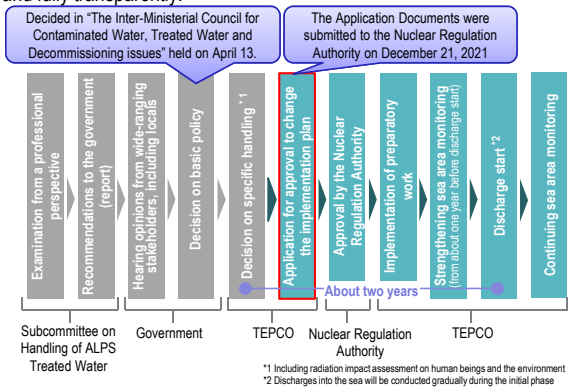
Dismantling Facilities

Scenario development & technology consideration → Design and manufacturing of devices / equipment → Dismantling

Measures of 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 continuously and fully transparently.



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

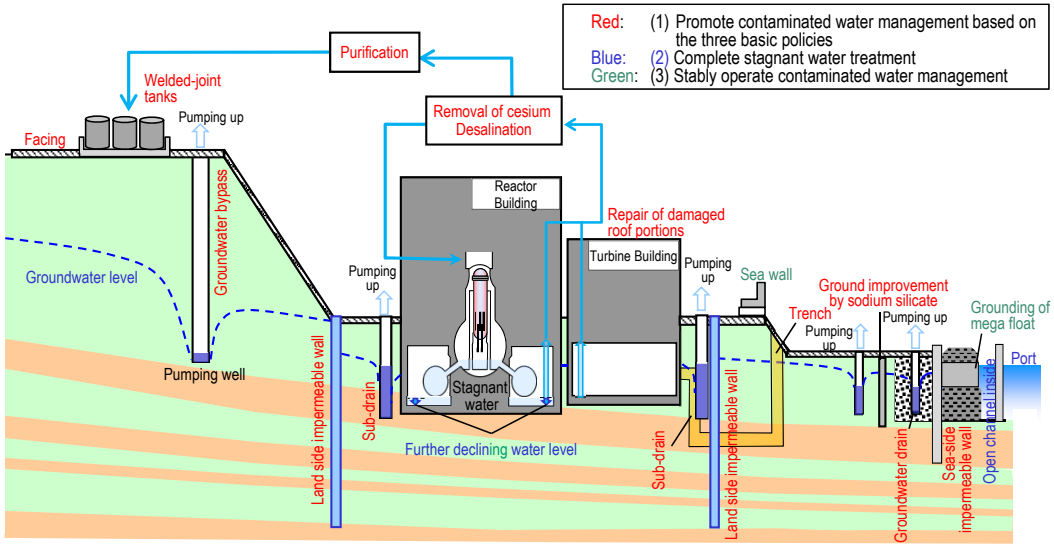
- Strontium-reduced water from other equipment is being re-treated in the Advanced Liquid Processing System (ALPS: multi-nuclide removal equipment) and stored in welded-joint tanks.
- Multi-layered contaminated water management measures, including land-side impermeable walls and sub-drains, have stabilized 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. 180 m^3/day (in FY2019) and approx. 140 m^3/day (in 2020).
- 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 lower the stagnant water levels in buildings as planned, work to install additional stagnant water transfer equipment is underway. At present, the floor surface exposure condition can be maintained except for the Unit 1-3 Reactor Buildings, Process Main Building and the High Temperature Incinerator Building.
- In 2020, treatment of stagnant water in buildings was completed, except for the Unit 1-3 Reactor Buildings, Process Main Building and High-Temperature Incinerator Building. For Reactor Buildings, the amount of stagnant water there will be reduced to about half the amount at the end of 2020 during the period FY2022-2024.
- For Zeolite sandbags on the basement floors of the Process Main Building and High-Temperature Incinerator Building, measures to reduce the radiation dose are being examined with stabilization in mind.

(3) Efforts to stably operate contaminated water management

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



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

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.

Action Plan for the Continuous Implementation of the Basic Policy on Handling of ALPS Treated Water was formulated

To embody "the Interim Measures for the Handling of ALPS Treated Water" formulated last August, manage the progress and consequently accelerate the implementation, "Action Plan for the Continuous Implementation of the Basic Policy on Handling of ALPS Treated Water" was formulated on December 28, 2021 (at the Inter-Ministerial Council Concerning the Continuous Implementation of the Basic Policy on Handling of ALPS Treated Water).

Based on the Action Plan, TEPCO will further pursue the measures, while continuously verifying the implementation status, and measures will be added or revised as necessary.

Work to construct the Japan Trench Tsunami Seawall continues, closure of building openings to prevent outflow and increase of contaminated water in buildings was completed

In association with the construction of the Japan Trench Tsunami Seawall, a T.P.+2.5m slope on the east side of Units 1-4 is being reinforced, the seawall is being installed and the road to use with it is being constructed.

Construction is progressing steadily and the seawall will be completed in the 2nd half of FY2023.

To minimize the outflow of contaminated water from buildings due to a backrush to the Unit 1-4 buildings and suppress the increase of contaminated water in buildings, openings were closed and other measures were implemented and they were completed on January 26.

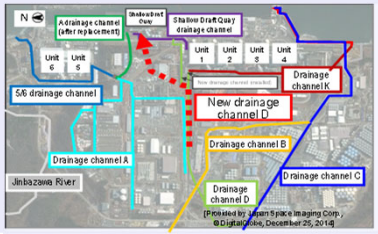
Efforts to maintain closed parts and reduce tsunami risks continue while prioritizing safety and according to the plan.

<Progress of slope reinforcement>

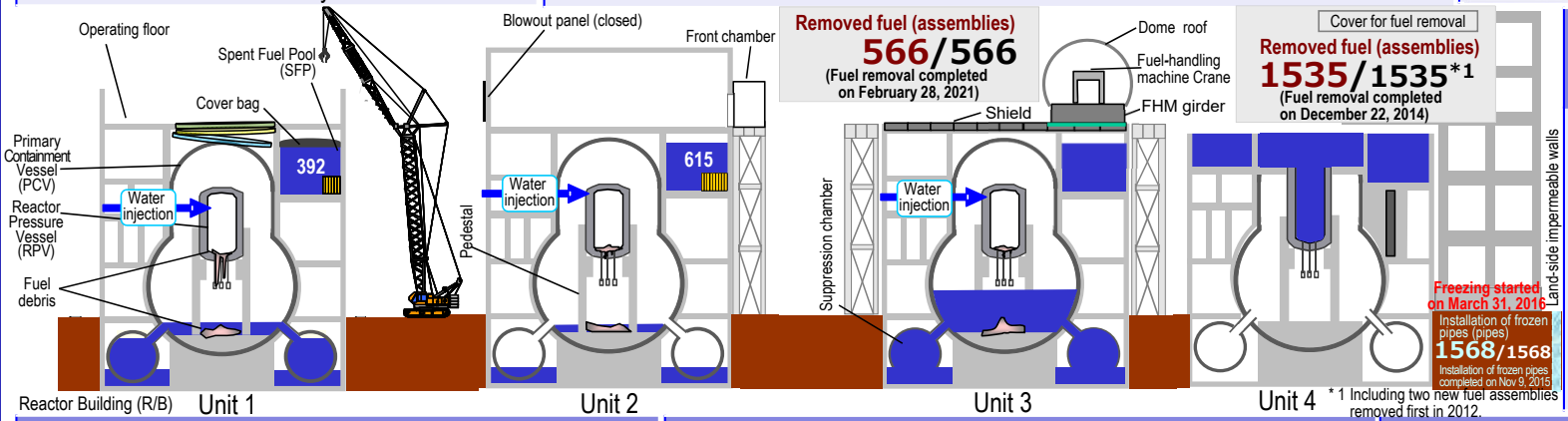
Drilling of new drainage channel D will soon reach the vertical shaft on the lower stream side

To eliminate the risk of heavy rain from an early stage, there are plans to install the new D drainage channel, a total of approx. 800m from the existing D drainage channel to the inside of the port.

From last September, drilling started using the propulsion tunnel method and will reach the vertical shaft on the lower stream side on January 28. Drilling of the second channel will start on the upper stream side and be completed in late April.



<The lower stream side of the new drainage channel D>



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

To resume the Unit 1 PCV internal investigation, measures in response to the malfunction are being implemented

On January 12, when the investigative equipment such as the underwater ROV started to be powered on sequentially as preliminary work before the PCV internal investigation, a malfunction was detected such as that data of the dosemeter incorporated in the underwater ROV was not displayed correctly.

Work was temporarily suspended and an investigation of the cause and countermeasures are being considered.

Immediately after implementing the countermeasures, the investigation will resume.

The cause of temperature increase in the temperature measuring tube 150-7S of the land-side impermeable walls continues to be investigated

Since December 18, 2021, steel sheet piles have been installed to increase the effects of water stoppage. Preparation is now underway to install them at even greater depth.

To investigate the water route to the drainage channel K, which is assumed to be a cause, a boring survey will be conducted around the temperature measuring tubes to survey the ground condition.

At the same time, damage was detected in a part of the rainwater facility of the nearby common pool. The rainwater outflow condition from the damaged part will be investigated.

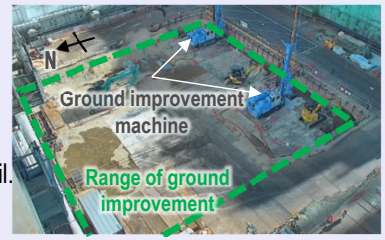
Since December 10, the temperature of the temperature measuring tubes has been below 0℃, a sufficient difference has been maintained between water levels inside and outside the land-side impermeable walls and the performance of impermeable wall is evaluated as being sustained.

Decontamination (Part 1) of the top floor of the Reactor Building was completed toward Unit 2 fuel removal

Decontamination to suppress dust scattering on the top floor of the Reactor Building was completed last December. Contamination reduction was confirmed based on the results of the smear sampling before and after decontamination. Installation of shielding will start in the range including the reactor well, which shows the highest dose, from February.

Regarding the ground improvement toward installing the gantry for fuel removal, approx. 34% was completed as of January 26 and will be completed in April.

Work continues while prioritizing safety.



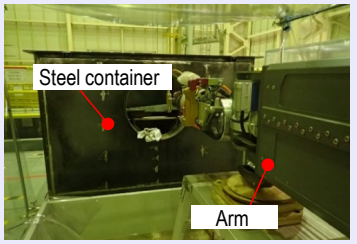
<Ground improvement (as of January 8)>

The performance verification test of the equipment for the Unit 2 PCV trial retrieval (robot arm) was completed

The ongoing performance verification test and operation training in a domestic factory (Kobe), which started last August, finished on January 21. The robot arm will be transported to the Naraha mockup facility and the performance verification test will be conducted as soon as it gets ready.

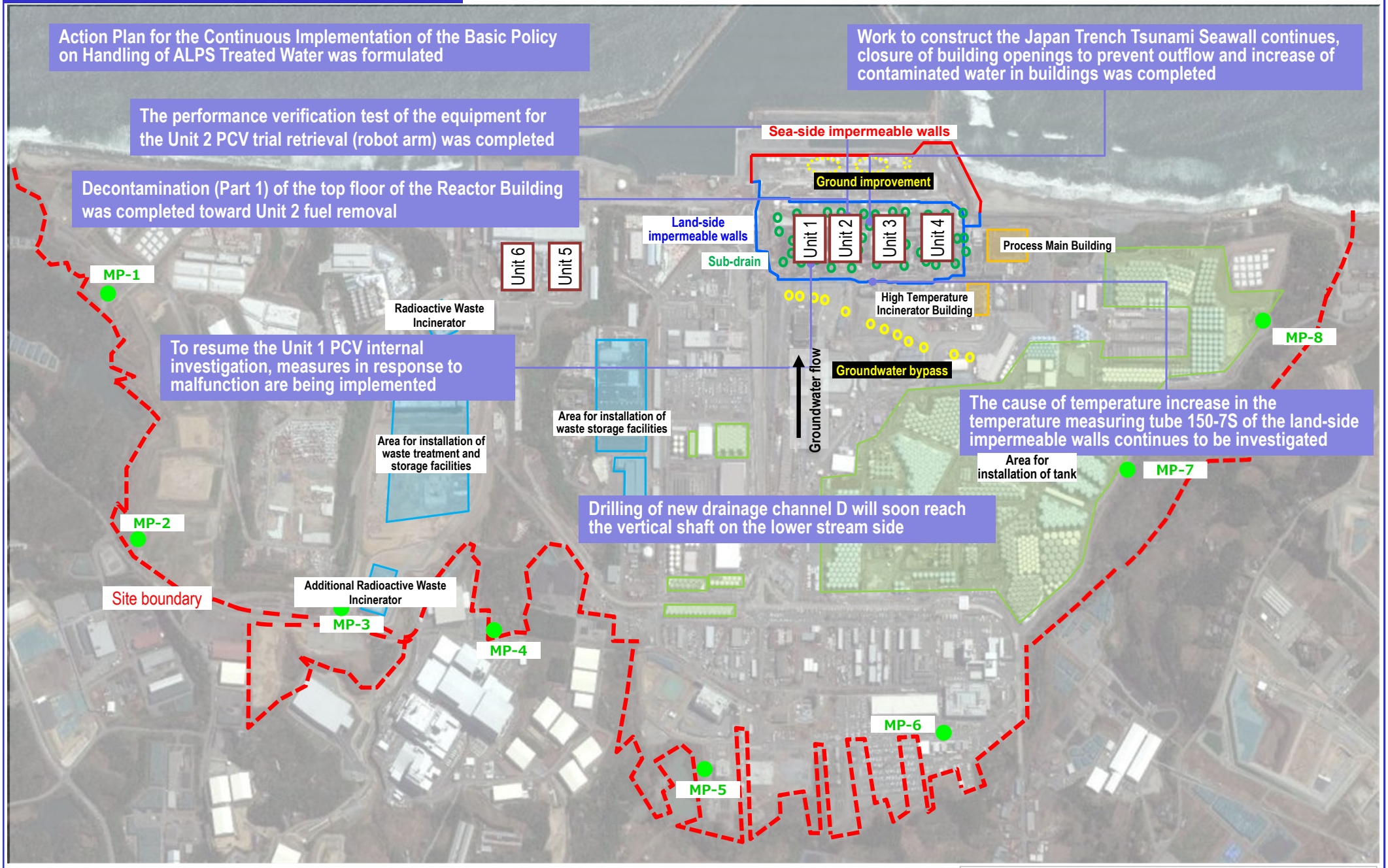
During work to install the isolation room in association with the opening of the X-6 penetration hatch, unevenness was detected on the area surface. After considering measures to suppress dust and others, work to remove it started from January 26.

Work continues while prioritizing safety.



<Exterior of the trial equipment>

Major initiatives – Locations on site

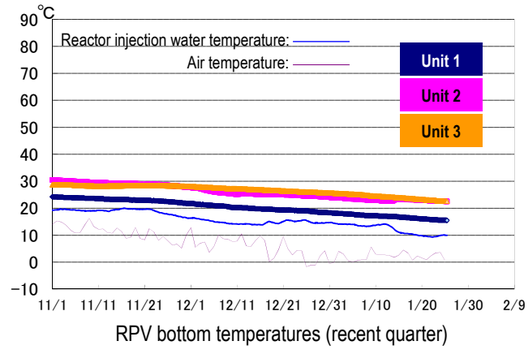


Provided by Japan Space Imaging Corp., photo taken on April 8, 2021
Product (C) [2020] DigitalGlobe, Inc., a Maxar company

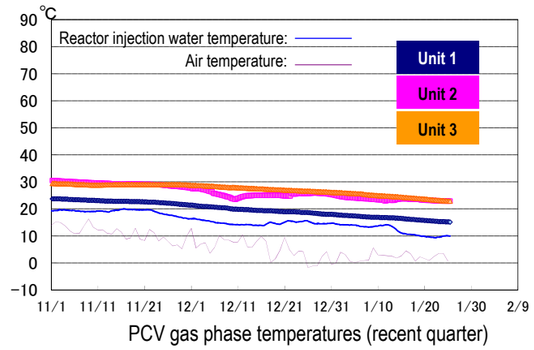
I. Confirmation of the reactor conditions

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. 15 to 30°C for the past month, though it varied depending on the unit and location of the thermometer.

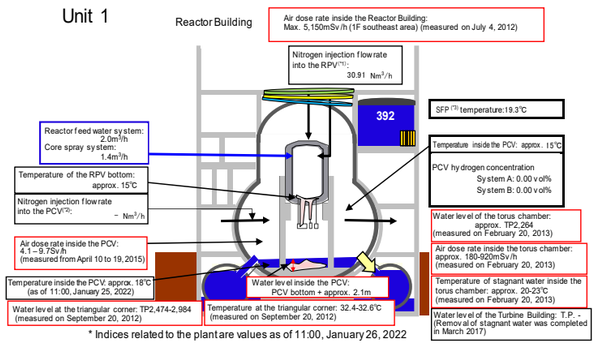


RPV bottom temperatures (recent quarter)

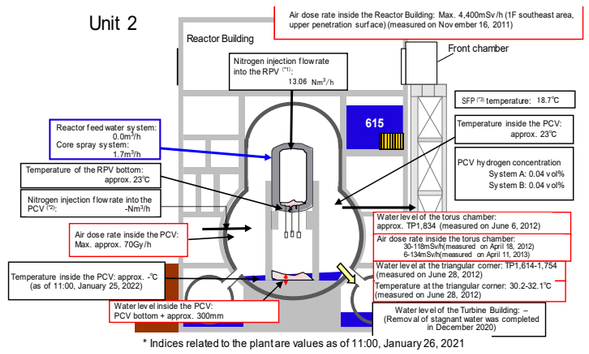


PCV gas phase temperatures (recent quarter)

*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, January 26, 2022



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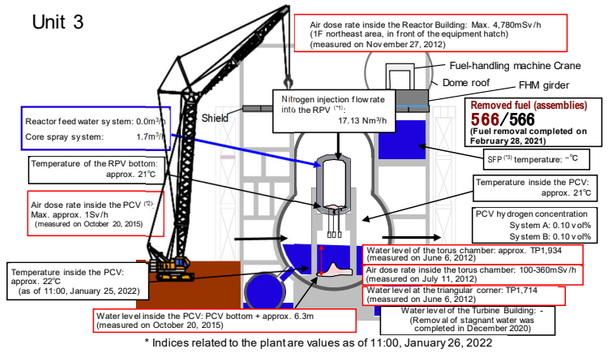


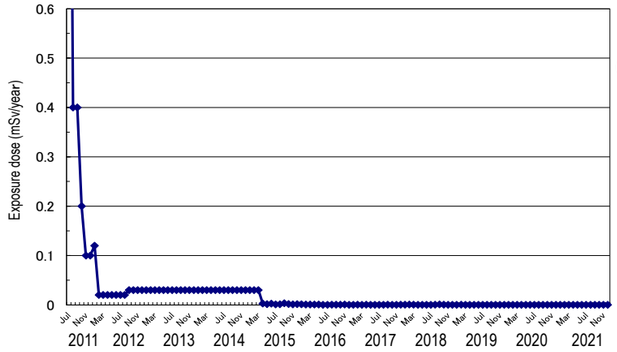
* Indices related to the plant are values as of 11:00, January 26, 2022

(*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 December 2021, the concentration of radioactive materials newly released from Reactor Building Units 1-4 into the air and measured at the site boundary was evaluated at approx. 2.1×10^{-12} Bq/cm^3 and 1.8×10^{-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$^{3\text{Marc}}$
[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 0.343 – 1.093 μSv/h (December 22, 2021 – January 25, 2022).
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

Handling of ALPS treated water

➢ Homogenization of radioactivity concentration of ALPS treated water in tanks before discharge into the sea

- During the stirring verification test of a tank for measurement and verification of ALPS treated water conducted last November, the stirring effect of the tank was validated. Subsequently, during the period February 7-13, a circulation verification test will be conducted in ten connected tanks.
- Under the present plan, it will take two months to analyze ALPS treated water before discharge. The concentration distribution of reagent after stopping the circulation stirring will also be verified.

➢ Completion of the geological survey in the sea area needed to examine facilities regarding ALPS treated water

- Regarding the handling of ALPS treated water and with the Basic Policy decided by the Japanese government (in April 2021) in mind, TEPCO has been specifically reviewing facility design, operation and others to ensure safety as a major premise and has thoroughly implemented measures to minimize reputational damage. TEPCO announced a review of the status on August 25, 2021.
- Among these measures, for intake and discharge facilities a plan to take seawater from outside the port and discharge it through an undersea tunnel (approx. 1 km) was adopted and the review continues while listening to stakeholder opinions.
- To review details of the facilities and ensure the safety of the work, a prior “magnetic survey” was conducted in the sea area needed to acquire geographical data on November 27 and no interference on the seabed of the survey area was confirmed.
- Based on the survey, geological sampling and tests to measure the hardness of the ground were conducted sequentially between December 14-24 at three site.

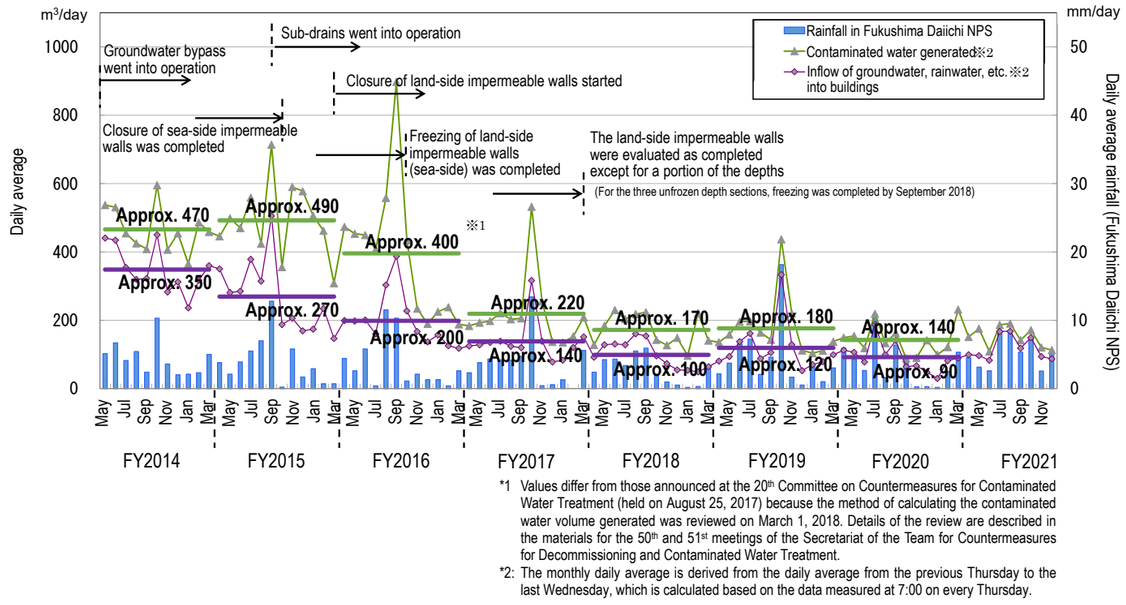
- To review the details of the discharge facilities and ensure the safety of the work, the characteristics of the ground hardness and physical properties of geological samples collected by boring (specific gravity, particle size distribution and others) will be verified.
- Moreover, during the survey, the concentration of cesium in seawater was monitored around the work area before and after work. None of the monitoring results detected cesium, nor was any significant variation in association with the survey identified.

Handling of ALPS treated water

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

➢ Status of contaminated water generated

- Multi-layered measures, including pumping up by sub-drains and land-side impermeable walls, which were implemented to control the continued generation of contaminated water, suppressed the groundwater inflow into buildings.
- After implementing "redirecting" measures (groundwater bypass, sub-drains, land-side impermeable walls and others) and rainwater prevention measures, including repairing damaged portions of building roofs, the amount of contaminated water generated within FY2020 declined to approx. 140 m³/day.
- Measures will continue to further reduce the amount of contaminated water generated.



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

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

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

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

- At the Water-Treatment Facility special for Sub-drain & Groundwater drains, release started from September 14, 2015 up until January 18, 2022 and 1,769 releases were conducted.
- The water quality of all temporary storage tanks satisfied the operation target.

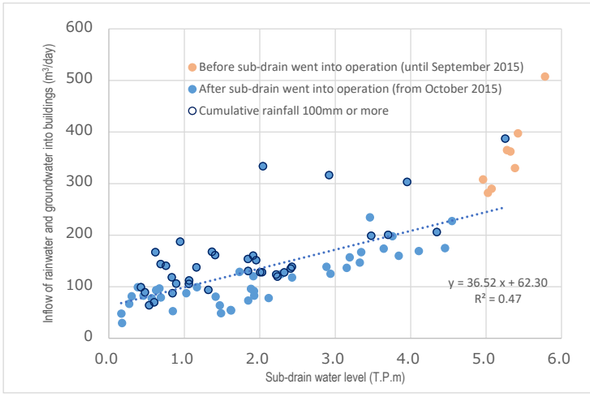


Figure 2: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Units 1-4 sub-drains

➢ Implementation status of facing

- Facing is a measure involving asphalting the on-site surface to reduce the radiation dose, prevent rainwater infiltrating the ground and decrease the amount of underground water flowing into buildings. As of the end of December 2021, 95% of the planned area (1,450,000 m² on site) had been completed. For the area inside the land-side impermeable walls, implementation proceeds appropriately after constructing a yard from implementable zones that leave the decommissioning work unaffected. As of the end of December 2021, 25% of the planned area (60,000 m²) had been completed.

➢ Status of groundwater level around buildings

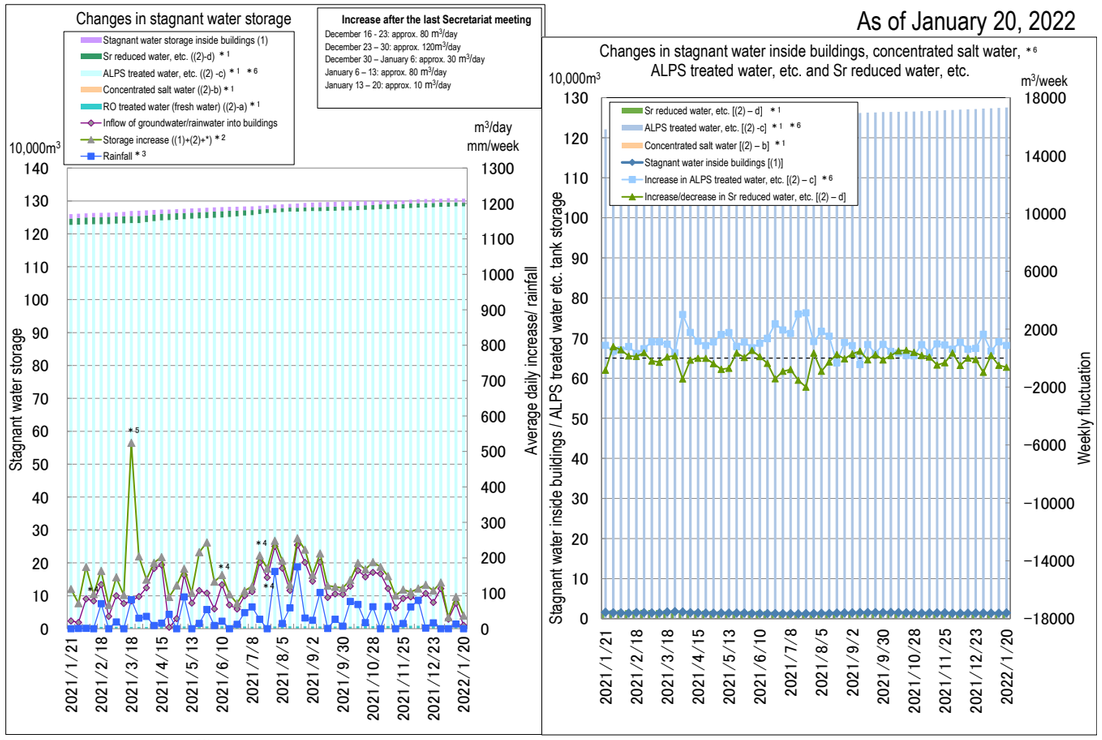
- The groundwater level in the area inside the land-side impermeable walls has been declining every year. On the mountain side, the difference between the inside and outside was maintained, despite varying during rainfall. The water level of the groundwater drain observation well has been maintained at approx. T.P. +1.4 m, sufficiently below the ground surface (T.P. +2.5 m).

➢ Operation of multi-nuclide removal equipment

- Regarding the multi-nuclide removal equipment (existing and high-performance), hot tests using radioactive water are underway (for existing equipment, System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013; and for high-performance equipment, from October 18, 2014). The additional multi-nuclide removal equipment went into full-scale operation from October 16, 2017.
- As of January 20, 2022, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 481,000, 726,000 and 103,000 m³, respectively (including approx. 9,500 m³ stored in the J1(D) tank, which contained water with highly concentrated radioactive materials at the System B outlet of the existing multi-nuclide removal equipment).
- 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 January 20, 2022, approx. 667,000 m³ had been treated.

➢ Risk reduction of strontium-reduced water

- To reduce the risks of strontium-reduced water, treatment using existing, additional and high-performance multi-nuclide removal equipment is underway. Up until January 20, 2022, approx. 831,000 m³ had been treated.



*1: Water amount for which the water-level gauge indicates 0% or more
*2: To detect storage increases more accurately, the calculation method was reviewed as follows from February 9, 2017: (The revised method was applied from March 1, 2018)
[(Inflow of groundwater/rainwater into buildings) + (other transfer) + (chemical injection into ALPS)]
*3: Changed from December 13, 2018 from rainfall in Namie to that within the site.
*4: Considered attributable to the fluctuation inflow of groundwater, rainwater, and others to buildings due to the decline in the level of contaminated water in buildings.
(February 4-11, June 3-10 and July 8-22, 2021)
*5: Stored amount increased due to transfer to buildings in association with decommissioning work on March 18, 2021.
(Major breakdown of the transferred amount: (1) Contaminated water inside the tank fences (water transferred from the Shallow Draft Quay drainage channel) was transferred to the Process Main Building: approx. 390 m3/day, (2) Contaminated water inside the tank fences (water transferred from the Shallow Draft Quay drainage channel) was transferred to the High Temperature Incinerator Building: approx. 10 m3/day, (3) Transfer from the Unit 3 additional FSTR to the Unit 3 Radioactive Waste Treatment Building: approx. 10 m3/day and others)
*6: The notation of treated water by the multi-nuclide removal equipment and others was reviewed in accordance with redefining of ALPS treated water by the Government (April 27, 2021)

Figure 3: Status of stagnant water storage

➢ Measures to reduce contamination of reused tanks

- From tanks to store strontium-reduced water and others to tanks to store ALPS treated water and others, the reuse of welded-joint tanks proceeds.
- To minimize the sum of ratios of the legally required concentrations, based on the condition inside the tanks after treating residual water and the storage record, reused tank areas are classified into three categories (1)-(3), with measures being implemented and examination, underway in each case.
- Among them, tanks in the Category (1) (removal of sludge inside the tank + replacement of connecting pipes and valves) area became full and the analytical results of stored water showed that a portion of tanks exceeded one in the sum of ratios of the legally required concentrations (water undergoing treatment).
- Before discharging into the sea, the water will be purified until the sum becomes less than 1.

➢ Response to the Unit 1/2 exhaust stack drain sump pit

- For the Unit 1/2 exhaust stack drain sump pit, in which highly concentrated contaminated water was detected, drain facilities were installed to prevent any leakage outside the system and measures implemented to suppress inflow to the pit. However, the inflow continued.
- An investigation around the pit revealed a manhole in the area southeast of the pit. After installing a lid over the manhole, the water level in the pit increased during rainfall.
- In response, to locate inflow points to the manhole after implementing rainwater prevention measures, water was sprinkled around the pit on December 7, 2021 and its water level increased when sprinkling in the area on the southeast side, as in the past sprinkling.
- On December 22, 2021, when the manhole conditions were investigated, a space was detected in the manhole lid. On December 23, when sprinkling around the manhole, sprinkled water flew into the manhole and the water level of the pit increased.
- No decline in the water level was confirmed, except for when the drain pump was operated, nor any leakage outside the system.
- Moreover, a method for future internal investigation of the pit is being examined. Like the previous internal investigation (July 2020), the next investigation will be conducted by camera. Equipment is being selected to also investigate the portion of the east-side wall of the pit, which was a blind spot of the camera in the previous investigation. During the internal investigation, water will be sprinkled over the manhole to locate inflow points inside of pit.

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.
- A work yard was prepared around the Reactor Building and work to install a large cover started from August 2021.
- Before installing the anchor of the large cover, the exterior walls of the Reactor Building were investigated. An investigation of representative parts on the west side of the building revealed that both cracks and concrete strength were within the assumed range and that the anchor would be installable as planned.

➢ Main work to help spent fuel removal at Unit 2

- Decontamination to suppress dust scattering on the top floor of the Reactor Building was completed last December. Contamination reduction was confirmed based on the smear sampling results. Installation of shielding will start from February within the range including the reactor well, which shows the highest dose.
- From October 28, 2021, ground improvement work started toward installing the gantry for fuel removal. Approx. 34% was completed as of January 26 and will be completed in April 2022.

➢ Results of the visual inspection of non-irradiated fuel assemblies removed from Unit 3 at the common pool

- For fuel assemblies removed from Unit 3, an visual inspection will be conducted before examining future dry storage, transportation and others.
- In March 2020, during the visual inspection of a fuel assembly at the common pool, the channel box (CB) could not be removed. This time, after lifting non-irradiated fuel assemblies in the air, the CB was removed and its appearance inspected.
- Regarding the non-irradiated fuel assemblies inspected this time (two assemblies), rubble was mixed but no damage or deformation of fuel rods and other parts were detected. Based on the insights obtained in this inspection and the results of future visual inspections of spent fuel assemblies, future handling will be examined for fuel assemblies affected by the accident.

Retrieval of fuel debris

➢ Progress status toward Unit 1 PCV internal investigation

- To acquire information related to the construction plan to collect deposits toward fuel debris retrieval, a remotely operated underwater vehicle (ROV) will be inserted into the basement within the PCV from X-2 penetration to investigate inside and outside the pedestal.
- From November 5, preliminary work is underway, such as covering the work area and installing equipment and materials in the on-site headquarters and the remote-control room, as part of the PCV internal investigation.

- On January 12, when the investigative equipment such as the underwater ROV started to be powered on sequentially, a malfunction was detected, whereby the dosimeter data incorporated in the underwater ROV was not displayed correctly.
- Work was temporarily suspended and efforts to investigate the cause and devise countermeasures are being considered. Immediately after implementing the countermeasures, the investigation will resume.

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

- The trial retrieval equipment for Unit 2 fuel debris, which had been developed in the UK, arrived in Japan on July 10.
- The ongoing performance verification test in a domestic factory (Kobe), which started from August, finished on January 21. The equipment will then be transported to the Naraha mockup facility.

➢ Start to remove a portion of pipes for the Unit 1 and 2 standby gas treatment system

- On November 3, 2021, during preliminary work to remove pipes for the Unit 1 and 2 standby gas treatment system (SGTS), an abnormal sound was detected near bearings for two of three swivel reducers (hereinafter referred to as "reducers") in the monthly inspection of the crawler crane and the reducers were overhauled. To reduce the risk of future crane troubles, the annual inspection was implemented ahead of schedule and completed on January 11, 2022.
- Following the annual inspection, the preliminary work was resumed from January 12, 2022 and the removal of pipes for the Unit 1 and 2 SGTS will start from early February 2022.

➢ Completion of retained gas purge related to work to install the Unit 3 PCV intake facilities

- When the vent valve around the heat exchanger of the Residual Heat Removal (RHR) system was opened, as preliminary work before constructing facilities to reduce the water level of the Primary Containment Vessel (PCV), combustible gas and long half-life radionuclide Kr-85 having originated from the accident were detected in the retained gas.
- Following the purge of retained gas on the RHR heat exchanger and the inlet pipe sides (nitrogen was filled), emission concentrations of the retained gas declined (hydrogen: approx. 20 → 0%, hydrogen sulfide: approx. 20 → 0 ppm). Moreover, gas and others during work were measured, analyzed and the lack of any influence on the environment and others was confirmed.
- As the purge of the retained gas was completed, work to cut pipes and others resumed. A response to the installation of other facilities and others proceeding at the same time will be issued after confirming the influence on the whole process, including future interference and coordinating as required.

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

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

➢ Management status of the rubble and trimmed trees

- As of the end of December 2021, the total storage volume for concrete and metal rubble was approx. 313,900 m^3 (+1,400 m^3 compared to the end of November with an area-occupation rate of 76%). The total storage volume of trimmed trees was approx. 140,800 m^3 (registering a slight increase, with an area-occupation rate of 80%). The total storage volume of used protective clothing was approx. 26,600 m^3 (-2,300 m^3, with an area-occupation rate of 51%). The increase in rubble was mainly attributable to decontamination of flanged tanks and work around Units 1-4. As of the end of December 2021, there were 15 temporary deposits with storage capacity exceeding 1,000m^3 and a total storage volume of 55,900 m^3.

➢ Management status of secondary waste from water treatment

- As of January 6, 2022, the total storage volume of waste sludge was 438 m^3 (area-occupation rate: 63%), while that of concentrated waste fluid was 9,300 m^3 (area-occupation rate: 90%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment and other vessels, was 5,280 (area-occupation rate: 83%).

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

- For sludge of the decontamination equipment, which has been stored in storage tank D in the Process Main Building, 3.11 tsunami countermeasures, including closure of the building entrance and the pipe penetrations, are implemented to prevent any leakage outside the system. However, other countermeasures need to be added immediately to prepare for the risk of external leakage due to a larger tsunami (tsunami for consideration (T.P. +24.9m or more), cracks of the storage tank and others.
- In line with the above measures, sludge of the decontamination equipment will be transferred to storage containers to ensure stable storage in a high-ground area (T.P. +33.5m).
- As preliminary work before carrying in the sludge collection equipment, work to install a temporary gantry and create an opening on the external wall of the Process Main Building was implemented.
- The opening will be used to carry in the remote-control heavy equipment, which will be involved in measures to reduce the dose in the Process Main Building (eliminate interferences) and the sludge retrieval equipment and serve as an access entrance for workers. Before creating the opening, to ensure an indoor stage that tolerates SS900 gal, the structure and the quake resistance are currently being evaluated.
- Work to create the opening will be completed at the end of December 2022.

Reduction in radiation dose and mitigation of contamination

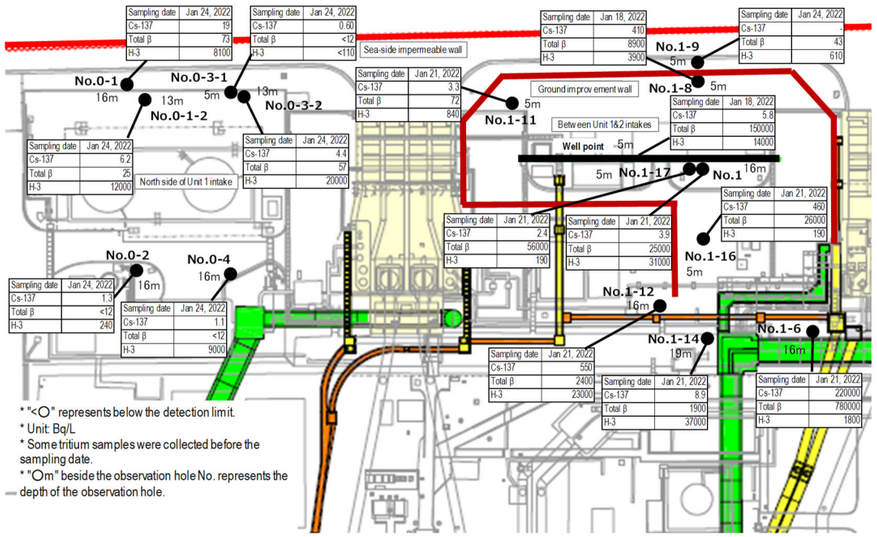
Effective dose-reduction at site boundaries and purification of port water to mitigate the impact of radiation on the external environment

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

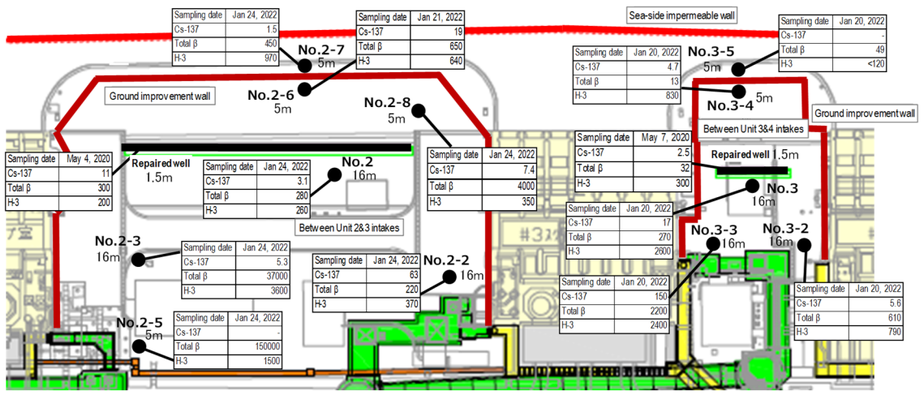
- In the Unit 1 intake north side area, the H-3 concentration was below the legal discharge limit of 60,000 Bq/L at all observation holes and remained constant or has been declining overall. The concentration of total β radioactive materials has remained constant overall but increased temporarily from April 2020 and is even increasing or declining at many observation holes at present, including Nos. 0-1-2, 0-3-2 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 No. 1-17 but has remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall but been increasing at No. 1-6 and increasing or declining at many observation holes including Nos. 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 and has remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall but been increasing at Nos. 2-2 and 2-5 and increasing or declining at Nos. 2-3 and 2-6. 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. It has been increasing or declining at No. 3-3 but has remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall or been declining overall but been increasing or declining at many observation holes including Nos. 3, 3-2, 3-4 and 3-5. The trend continues to be monitored carefully.
- In the groundwater on the east side of the Turbine Buildings, the same as that of total β radioactive materials, the concentration of cesium has also remained constant but been increasing or declining and exceeding the previous highest record at some observation holes. Investigations are underway.
- The concentration of radioactive materials in drainage channels has remained constant overall, despite increasing during rainfall.
- 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 has been observed since last year 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

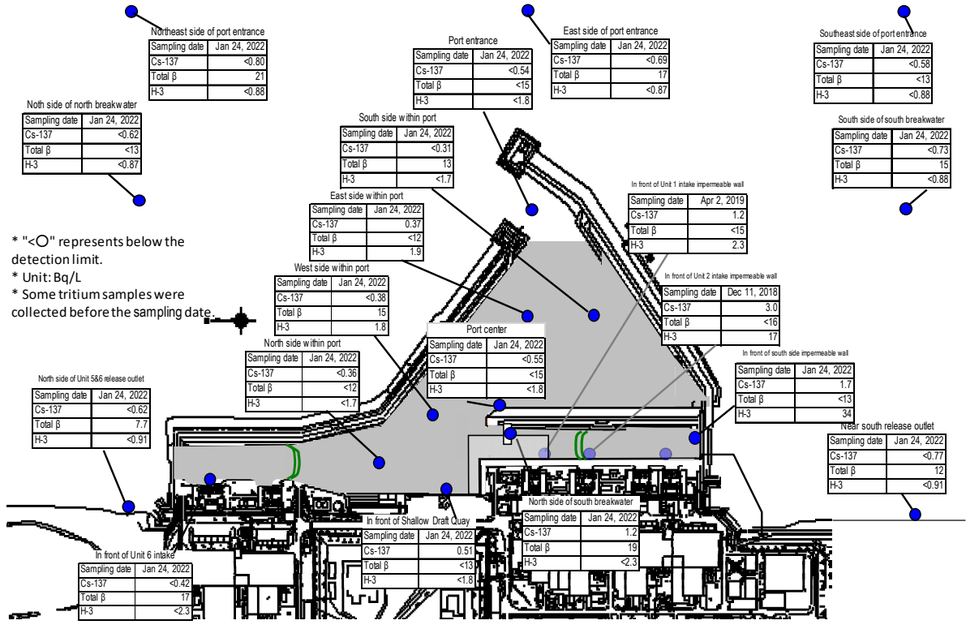


Figure 5: Seawater concentration around the port

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 September to November 2021 was approx. 8,800 (cooperating company workers and TEPCO HD employees), which exceeded the monthly average workforce (approx. 6,600). Accordingly, sufficient personnel are registered to work on site.
- It was confirmed with the prime contractors that the estimated manpower necessary for the work in February 2022 (approx. 4,000 workers per day: cooperating company workers and TEPCO HD employees) would be secured at present. The average numbers of workers per day for each month (actual values) for the most recent 2 years were maintained, with approx. 3,000 to 4,200.
- The number of workers from within Fukushima Prefecture decreased slightly and that from outside increased slightly. The local employment ratio (cooperating company workers and TEPCO HD employees) as of December 2021 remained constant at around 65%.
- The average exposure doses of workers were at approx. 2.44, 2.54 and 2.60 mSv/person-year during FY2018, 2019 and 2020, 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.

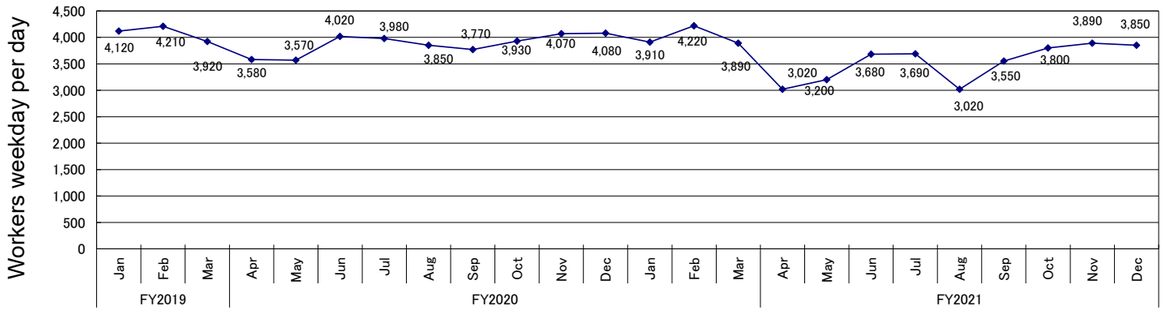


Figure 6: Changes in the average number of workers weekday per day for each month of the past 2 years (actual values)

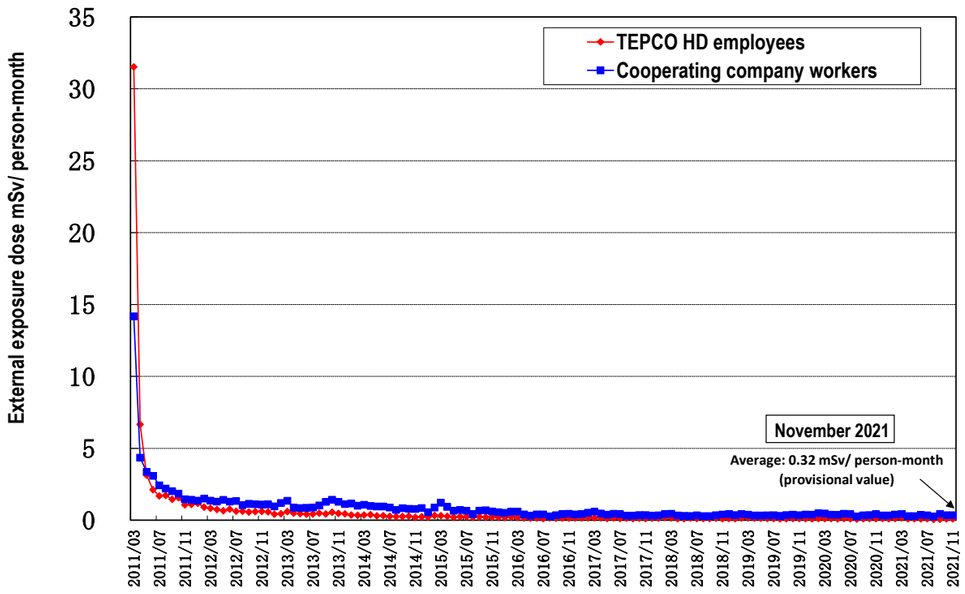


Figure 7: Changes in monthly average exposure dose of individual worker
(monthly exposure dose since March 2011)

➢ Countermeasures to suppress the spread of COVID-19 infections

- In response to the rapid increase in the Omicron variant infections and based on the request by the Minister of Economy, Trade and Industry to each designated public institution that they should implement business continuity plans to function well, even during the COVID-19 crisis, ongoing countermeasures to suppress the spread of COVID-19 infections were enhanced from January 25 to ensure well functioned operation in the NPS.
- As the Omicron variant is more infectious than conventional ones, at-home infections are increasing and the time to onset tends to be short, countermeasures were enhanced, including carefully selecting unnecessary moves outside Fukushima Prefecture. In addition, those who move outside the prefecture must refrain from coming to the NPS on the day after they return to the prefecture (taking leave or working from home), confirm that they are negative by antigen test and strictly check their physical conditions, including their family members, before coming to work and determine whether or not they can do so.
- Countermeasures to prevent the infection spreading, such as requiring employees to take their temperature before coming to the office, wear masks at all times, avoid the “Three Cs” (Closed spaces, Crowded places, Close-contact settings) by using the rest house in shifts, eat silently and carefully select business travel, will continue to be properly implemented and decommissioning work will proceed with safety first.
- As of 15:00, January 26, 2022, 112 TEPCO HD employees and cooperating company workers (including 13 TEPCO HD employees) of the Fukushima Daiichi NPS had contracted COVID-19.
- No significant influence on decommissioning work, such as a corresponding delay to work processes due to this infection, had been identified.
- Work began to examine the viability of a third workplace vaccination of COVID-19.
- Acceptance of visitors has been suspended temporarily from January 25.

➢ Results of the 12th questionnaire survey for workers to improve the work environment

- With the aim of improving the work environment, the 12th questionnaire survey was conducted, to which approx. 4,200 workers (approx. 94%) responded. The results showed that many respondents evaluated their work in this NPS as rewarding and that the concerns of workers and their family members about radiation had been alleviated.
- On the other hand, the number of workers who intended to continue working in this NPS and those who considered their work rewarding had declined.
- Efforts to create “a safe and easy-to-work workplace” continue.

➢ Health management of workers in the Fukushima Daiichi NPS

- As health management measures in line with the guidelines of the Ministry of Health, Labour and Welfare (issued in August 2015), a scheme was established and operated, whereby prime contractors confirmed reexamination at medical institutions and the subsequent status of workers who were diagnosed as requiring “detailed examination and treatment” in the health checkup, with TEPCO confirming the operation status by the prime contractors.
- The recent report on the management status of the health checkup during the second quarter (July – September) in FY2021 confirmed that the prime contractors had provided appropriate guidance and managed operations properly under the scheme. The report on the follow-up status during the first quarter in FY2021 and before confirmed that responses to workers, which had not been completed by the time of the previous report, were being provided on an ongoing basis and checking of operations will continue.

➢ Measures to prevent infection and expansion of influenza and norovirus

- Since November, measures for influenza and norovirus have been implemented, including free influenza vaccinations (subsidized by TEPCO HD) at medical clinics around the site (from October 11, 2021 to January 29, 2022) for cooperating company workers. As of January 22, 2022, a total of 4,817 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 3rd week of 2022 (January 17-23, 2022), no influenza and three norovirus infections were recorded. The totals for the same period for the previous season showed one influenza and one norovirus infection respectively.

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 17-24)"; unit (Bq/L); ND represents a value below the detection limit

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

Summary of TEPCO data as of January 24, 2022

Cesium-134	ND(0.35)			
Cesium-137	ND(0.55)			
Total β	ND(15)			
Toritium	ND(1.8)			

※1

Cesium-134	3.3 (H25/12/24)	→	ND(0.53)	Below 1/6
Cesium-137	7.3 (H25/10/11)	→	ND(0.54)	Below 1/10
Total β	69 (H25/8/19)	→	ND(15)	Below 1/4
Toritium	68 (H25/8/19)	→	ND(1.8)	Below 1/30

Cesium-134	3.3 (H25/10/17)	→	ND(0.32)	Below 1/10
Cesium-137	9 (H25/10/17)	→	0.37	Below 1/20
Total β	74 (H25/8/19)	→	ND(12)	Below 1/6
Toritium	67 (H25/8/19)	→	1.9	Below 1/30

Cesium-134	3.5 (H25/10/17)	→	ND(0.25)	Below 1/10
Cesium-137	7.8 (H25/10/17)	→	ND(0.31)	Below 1/20
Total β	79 (H25/8/19)	→	13	Below 1/6
Toritium	60 (H25/8/19)	→	ND(1.7)	Below 1/30

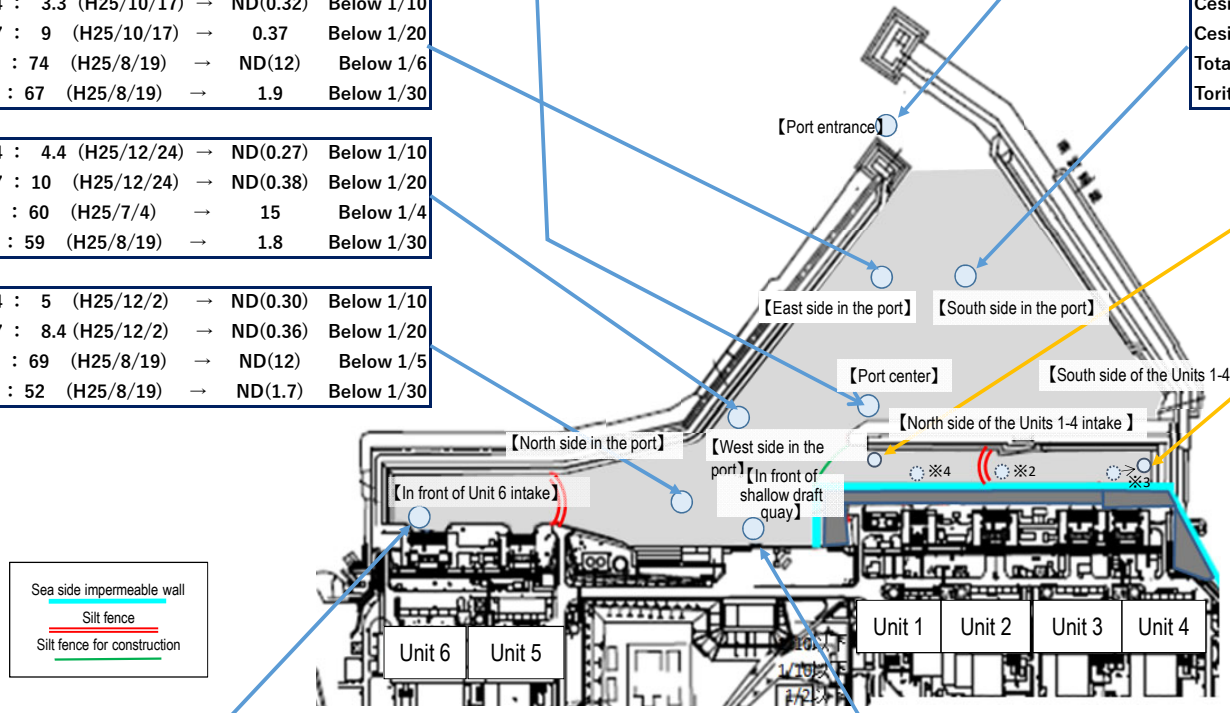
Cesium-134	4.4 (H25/12/24)	→	ND(0.27)	Below 1/10
Cesium-137	10 (H25/12/24)	→	ND(0.38)	Below 1/20
Total β	60 (H25/7/4)	→	15	Below 1/4
Toritium	59 (H25/8/19)	→	1.8	Below 1/30

Cesium-134	32 (H25/10/11)	→	ND(0.38)	Below 1/80
Cesium-137	73 (H25/10/11)	→	1.2	Below 1/60
Total β	320 (H25/8/12)	→	19	Below 1/10
Toritium	510 (H25/9/2)	→	ND(2.3)	Below 1/200

Cesium-134	5 (H25/12/2)	→	ND(0.30)	Below 1/10
Cesium-137	8.4 (H25/12/2)	→	ND(0.36)	Below 1/20
Total β	69 (H25/8/19)	→	ND(12)	Below 1/5
Toritium	52 (H25/8/19)	→	ND(1.7)	Below 1/30

Cesium-134	ND(0.47)			
Cesium-137	1.7			
Total β	ND(13)			
Toritium	34			

※1



Cesium-134	2.8 (H25/12/2)	→	ND(0.59)	Below 1/4
Cesium-137	5.8 (H25/12/2)	→	ND(0.42)	Below 1/10
Total β	46 (H25/8/19)	→	17	Below 1/2
Toritium	24 (H25/8/19)	→	ND(2.3)	Below 1/10

Cesium-134	5.3 (H25/8/5)	→	ND(0.51)	Below 1/10
Cesium-137	8.6 (H25/8/5)	→	0.51	Below 1/10
Total β	40 (H25/7/3)	→	ND(13)	Below 1/3
Toritium	340 (H25/6/26)	→	ND(1.8)	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.

※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 January 17-24)

Summary of TEPCO data as of January 24, 2022

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

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

Cesium-134	: ND	(H25)	→	ND(0.59)	
Cesium-137	: ND	(H25)	→	ND(0.80)	
Total β	: ND	(H25)	→	21	
Toritium	: ND	(H25)	→	ND(0.88)	

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

Cesium-134	: ND	(H25)	→	ND(0.66)	
Cesium-137	: 1.6	(H25/10/18)	→	ND(0.69)	Below 1/2
Total β	: ND	(H25)	→	17	
Toritium	: 6.4	(H25/10/18)	→	ND(0.87)	Below 1/7

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

Cesium-134	: ND	(H25)	→	ND(0.87)	
Cesium-137	: ND	(H25)	→	ND(0.58)	
Total β	: ND	(H25)	→	ND(13)	
Toritium	: ND	(H25)	→	ND(0.88)	

Cesium-134	: ND	(H25)	→	ND(0.67)	
Cesium-137	: ND	(H25)	→	ND(0.62)	
Total β	: ND	(H25)	→	ND(13)	
Toritium	: 4.7	(H25/8/18)	→	ND(0.87)	Below 1/5

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

【Port entrance】

Cesium-134	: 3.3	(H25/12/24)	→	ND(0.53)	Below 1/6
Cesium-137	: 7.3	(H25/10/11)	→	ND(0.54)	Below 1/10
Total β	: 69	(H25/8/19)	→	ND(15)	Below 1/4
Toritium	: 68	(H25/8/19)	→	ND(1.8)	Below 1/30

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

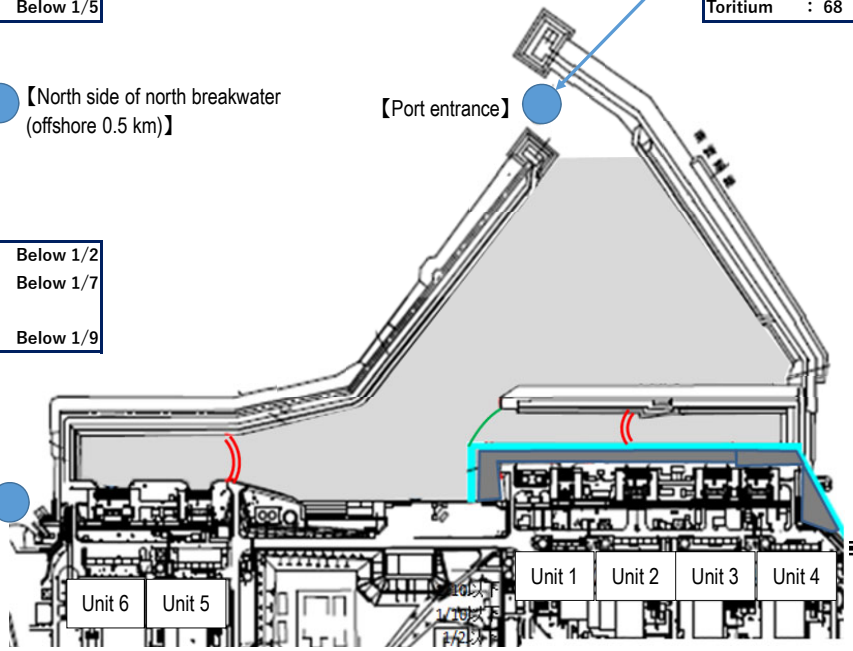
Cesium-134	: ND	(H25)	→	ND(0.75)	
Cesium-137	: ND	(H25)	→	ND(0.73)	
Total β	: ND	(H25)	→	15	
Toritium	: ND	(H25)	→	ND(0.88)	

Cesium-134	: 1.8	(H25/6/21)	→	ND(0.85)	Below 1/2
Cesium-137	: 4.5	(H25/3/17)	→	ND(0.62)	Below 1/7
Total β	: 12	(H25/12/23)	→	7.7	
Toritium	: 8.6	(H25/6/26)	→	ND(0.91)	Below 1/9

【North side of Unit 5 and 6 release outlet】

Cesium-134	: ND	(H25)	→	ND(0.80)	
Cesium-137	: 3	(H25/7/15)	→	ND(0.77)	Below 1/3
Total β	: 15	(H25/12/23)	→	12	
Toritium	: 1.9	(H25/11/25)	→	ND(0.91)	Below 1/2

【Near south release outlet】



Sea side impermeable wall

Silt fence

Silt fence for construction

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

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

TEPCO Holdings Fukushima Daiichi Nuclear Power Station Site Layout

Appendix 2

January 27, 2022

- 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

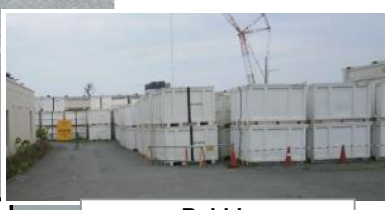
Rubble (outdoor accumulation)

Rubble storage tent

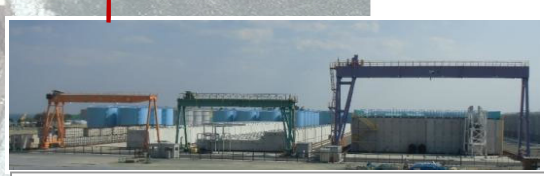
Inside the rubble storage tent

Rubble (covered by sheet)

Solid waste storage facility



Rubble (container storage)



Spent adsorption vessel temporary storage facility

Temporary waste sludge storage

Tank installation status

Futaba town

Okuma town

MP-1 Temporary trimmed trees storage pool

MP-2

MP-3 Trimmed trees

MP-4 Trimmed trees

MP-5 JAEA Analytical Facility Management Building

MP-6 Temporary rest house outside the site

MP-7 Water desalinations (evaporative concentration)

MP-8 Temporary trimmed trees storage pool

Rubble

Used protective clothing

Additional Radioactive Waste Incinerator

Large Waste Storage

Radioactive Waste Incinerator

Vehicles maintenance site

Water treatment facility for Sub-drain

Water treatment facility for Sub-drain and others

Unit 6

Unit 5

Unit 1

Unit 2

Unit 3

Unit 4

Town boundary

Periodical Inspection Material Storage (cutting of flanged-tanks)

Temporary Cask Custody Area

Main Anti-Earthquake 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

Mega float

Pipe route

Underground reservoirs

Groundwater bypass temporary storage tank

Partner Companies' Building

New Administration Office Building

Heliport

Large rest house

Access control facility

Common pool

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

Water desalinations (RO)

Site boundary

K1 K2 K3 K4

H1 H2 H3 H4 H5 H6 H8 H9

J1 J2 J3 J4 J5 J6 J7 J8 J9

B C D E F G1 G1 South G3・G4・G5 G6 G7

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

0m 100m 500m 1000m

1-1 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)

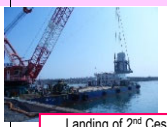
Reference
January 27, 2022
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment

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

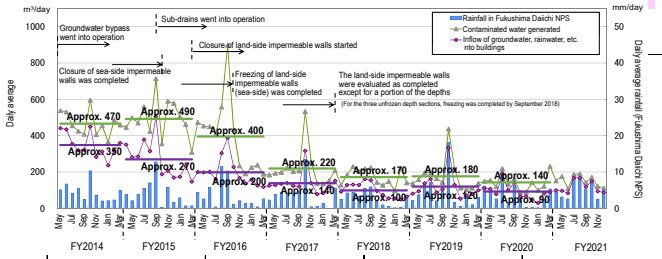
Contaminated water management【Remove】

Contaminated water treatment facility
- ▽Reception start of contaminated water to Central Waste Treatment Building
- ▽Decontamination equipment (AREVA)
- ▽Evaporative concentration equipment
- ▽Cesium Adsorption Apparatus (KURION)
- ▽2nd Cesium Adsorption Apparatus (SARRY)
- ▽Treatment of RO-condensed salt water complete
- ▽Purification of strontium-reduced water in flanged tanks complete
- ▽Purification of strontium-reduced 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)
- ▽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)


Cesium Adsorption Apparatus (KURION)


Landing of 2nd Cesium Adsorption Apparatus (SURRY)


Multi-nuclide removal equipment (ALPS)



Removal of contaminated water from seawater pipe trench
- ▽Trench Purification by mobile equipment
- ▽Completion of tunnel filling
- ▽Transfer of stagnant water complete
- ▽Completion of shaft filling
- 【Removal of contaminated water in seawater pipe trench】
- Unit 2
  - ▽Completion of tunnel filling
  - ▽Transfer of stagnant water complete
  - ▽Completion of shaft filling (except for upper part of
- Unit 3
  - ▽Completion of tunnel filling
  - ▽Filling of openings II and III complete
  - ▽Transfer stagnant water complete
  - ▽Completion of filling parts running ove
- Unit 4


Unit 2 seawater pipe trench Shaft D filling work

Contaminated water management【Redirect】

Groundwater bypass
- ▽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. 140 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
- **▽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
- ▽Start of maintenance operation on north and south sides
- ▽Freezing completion
- ▽Start of maintenance operation in all sections
- ▽Installation start of land-side impermeable walls
- **▽Freezing start**
- Start of maintenance operation ▽
- **▽Freezing completion (except for some parts)**

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

Contaminated water management【Retain】

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

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

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


Pumping well


Sub-drain purification system


Land-side impermeable wall brine (refrigerant) circulation pipe

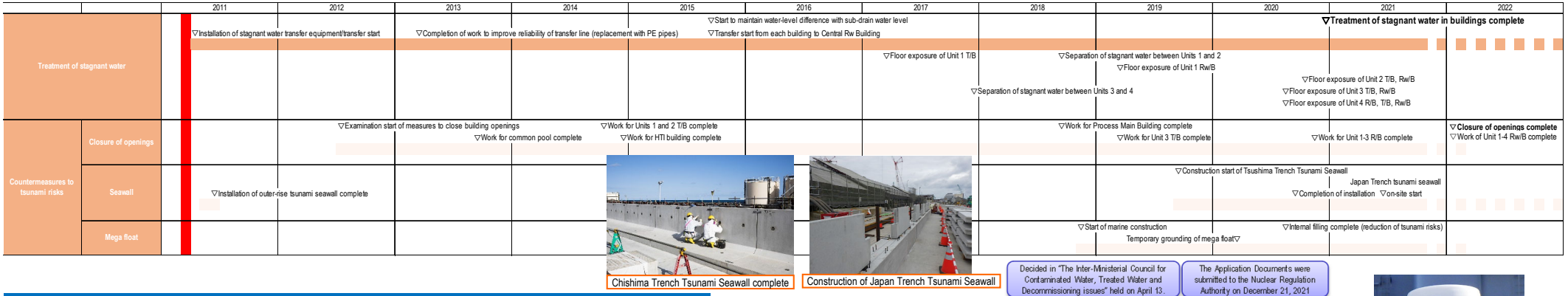

Construction of welded-joint tanks


Placement of seaside impermeable walls complete


Flanged and welded-joint tanks

1-2 Contaminated water management

Milestones of the Mid- and-Long-Term Roadmap (major target processes)
- [Completed] Treatment of contaminated water in buildings* (within 2020)
  * Except for Unit 1-3 Reactor Buildings, Process Main Building and High-Temperature Incinerator Building
- Reducing contaminated water in Reactor Buildings to about half the amount at the end of 2020 (FY2022-2024)



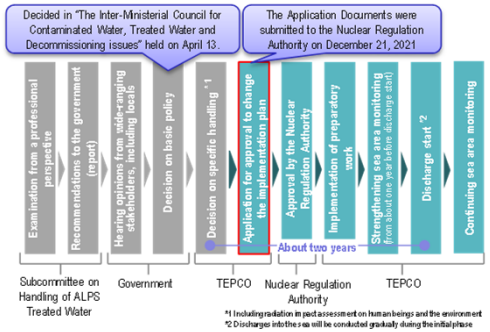
Chishima Trench Tsunami Seawall complete

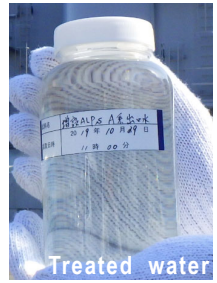
Construction of Japan Trench Tsunami Seawall

2 Handling of ALPS treated water

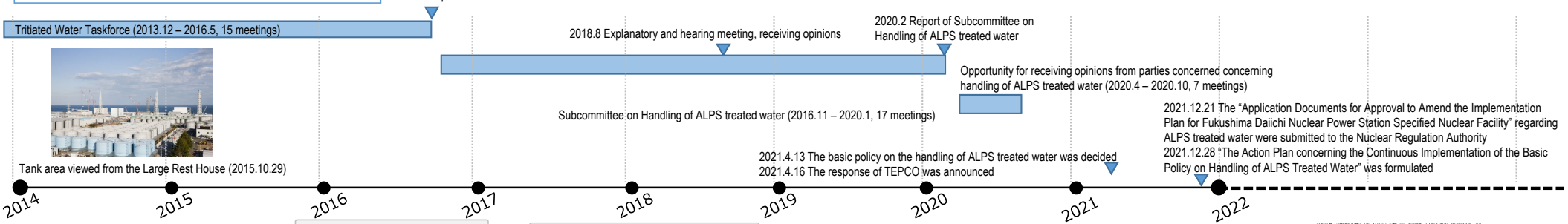
In “The Inter-Ministerial Council for Contaminated Water, Treated water and Decommissioning” held on April 13, the basic policy on how to handle ALPS treated water was decided. Based on this, the response of TEPCO was announced on April 16.

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.



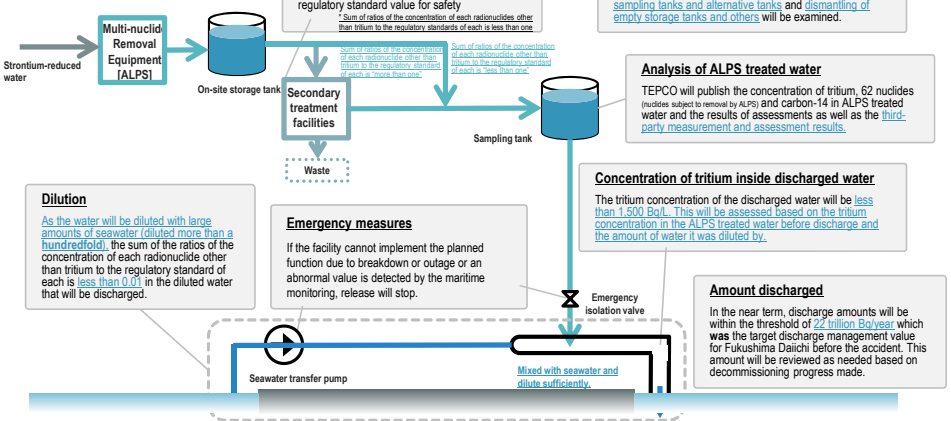


Examination concerning handling of ALPS treated water



Tank area viewed from the Large Rest House (2015.10.29)

[Conceptual diagram of facilities for releasing ALPS treated water into the sea]



Secondary treatment
Secondary treatment will be conducted as necessary to ensure the level of radioactive materials, excluding tritium, is lower* than the regulatory standard value for safety
* Sum of ratios of the concentration of each radionuclides other than tritium to the regulatory standards of each is less than one

Site use plan
To stably discharge ALPS treated water and construct facilities necessary for decommissioning, construction of sampling tanks and alternative tanks and dismantling of empty storage tanks and others will be examined.

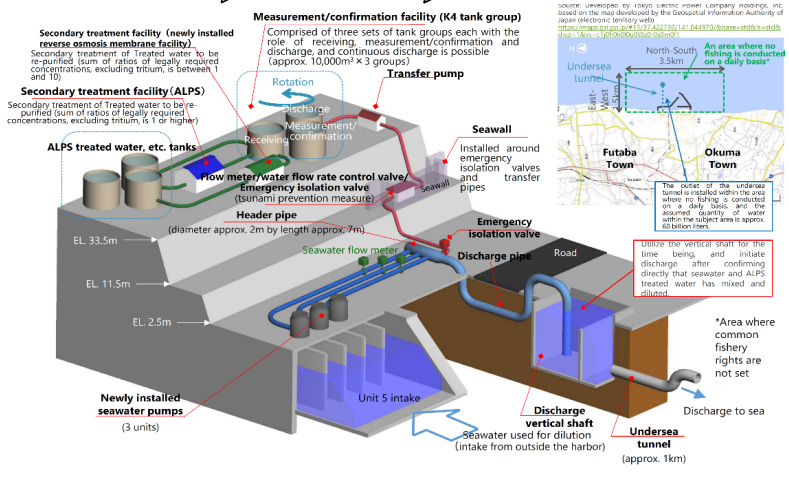
Analysis of ALPS treated water
TEPCO will publish the concentration of tritium, 62 nuclides (nuclides subject to removal by ALPS) and carbon-14 in ALPS treated water and the results of assessments as well as the third-party measurement and assessment results.

Concentration of tritium inside discharged water
The tritium concentration of the discharged water will be less than 1,500 Bq/L. This will be assessed based on the tritium concentration in the ALPS treated water before discharge and the amount of water it was diluted by.

Dilution
As the water will be diluted with large amounts of seawater (diluted more than a hundredfold), the sum of the ratios of the concentration of each radionuclide other than tritium to the regulatory standard of each is less than 0.01 in the diluted water that will be discharged.

Emergency measures
If the facility cannot implement the planned function due to breakdown or outage or an abnormal value is detected by the maritime monitoring, release will stop.

Amount discharged
In the near term, discharge amounts will be within the threshold of 22 trillion Bq/year which was the target discharge management value for Fukushima Daiichi before the accident. This amount will be reviewed as needed based on decommissioning progress made.



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.

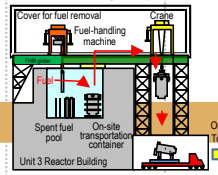

Fuel removal

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

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

▼ 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>

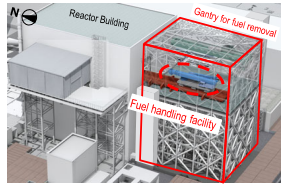
Before installing a cover for fuel removal, the process of removing large rubble from the spent fuel pool was completed in November 2015. To ensure safe and steady fuel removal, training via remote control was conducted at the factory using the actual fuel-handling machine to be installed on site (February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

Unit 3 ▼ 2021.2.28 Fuel removal completed (566 assemblies)

▼ 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 Start of ground improvement work


<Unit 2 Construction of gantry for fuel removal>

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



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.

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.

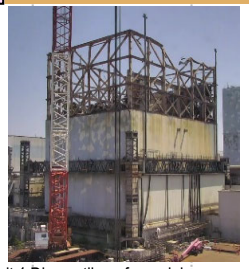
Unit 2 ▼ 2020.3-6 Installation of spent fuel pool cover
▼ 2020.9-11 Measures to prevent and alleviate rubble falling
▼ 2020.11-2021.6 Dismantling of remaining cover
▼ 2017.12 Completion of building cover dismantling and windbreak fence installation
▼ 2018.1-2020.12 Rubble removal on the north side of Reactor Building
▼ 2018.9-12 Removal of X-braces
▼ 2021.8 Start of large cover pre-work

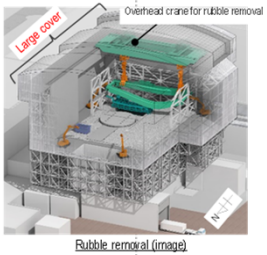
For Unit 1, a large cover will be installed over the whole building, within which rubble will be removed.

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.

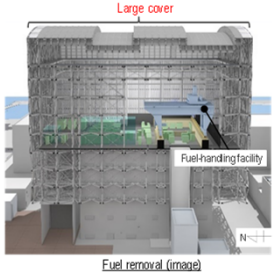
<Reference> Progress to date
Rubble removal on the north side of the operating floor started from January 2018 and has been implemented sequentially. In July and August 2019, the well plug, which was misaligned, was investigated, followed in August and September by the conditions of the overhead crane.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

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

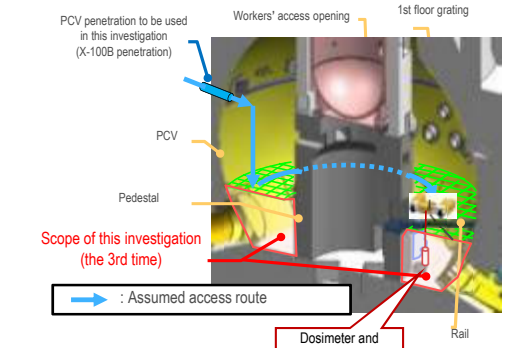
Start of fuel debris retrieval from the first unit (Unit 2). Expanding the scale in stages (within 2021 * The schedule will be extended for about 1 year due to the spread of COVID-19 infections)

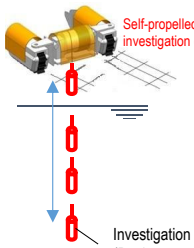
Before removing fuel debris, investigations inside the Primary Containment Vessel (PCV) are conducted to inspect the conditions there, including locations of fuel debris.

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>

<Image near the bottom>

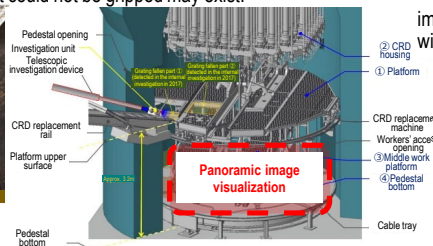
Unit 2 Investigation overview

・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.

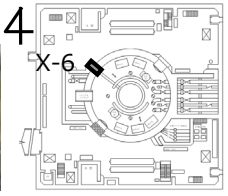
Bottom of the pedestal (after being processed in panoramic image visualization)



・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

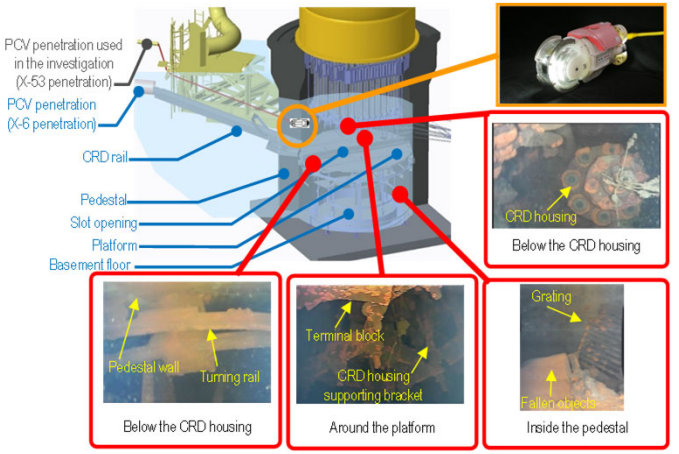
・In October 2014, the conditions of X-53 penetration, which may be under water and which is scheduled for use to investigate the inside of the PCV, was investigated via remote-controlled ultrasonic test equipment. The results showed that the penetration was not under water.

・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

Reference
January 27, 2022
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
5／6

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)

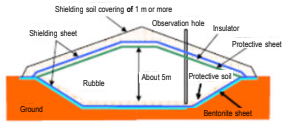
▼ 2012.9 Transfer start of rubble to the soil-covered temporary storage facility

▼ 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

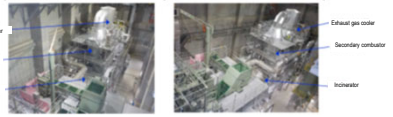

Control room

▼ 2017.4 Start of pre-work
Additional Solid Waste Incinerator


External view of
Large Equipment Decontamination Facility

2017.10 Installation work gets

▼ 2018.5 Operation start
Large Equipment Decontamination Facility



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

▼ 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)

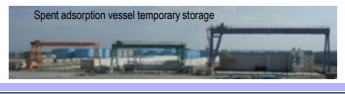
Rubble (metal, concrete, others)

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 → (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 (scheduled for completion in FY2021)


Work of main part

2021.3
The installation process was reviewed
Toward an operation launch within FY2021, installation work continues

Volume reduction

Compaction Facility
(scheduled for completion in FY2022)


Concrete crusher example


Metal cutter example

Melting

Melting equipment


Electric furnace example

(*3) Approx. **270,000** m³ (*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 → Stored and managed in Solid Waste Storage as done for rubble

(*1) (A) Approx. 60,000 m³ → **Additional Solid Waste Storage**
10th-11th
(Scheduled for completion after FY2022)

(B) 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

To (B)

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. 250,000 m³ of waste will be stored in Solid Waste Storage at the end of FY2028.

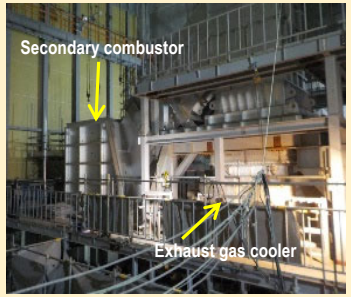
Note: Used protective clothing before incineration and BG-level concrete waste for which treatment and reuse is decided at present are not included.

- 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

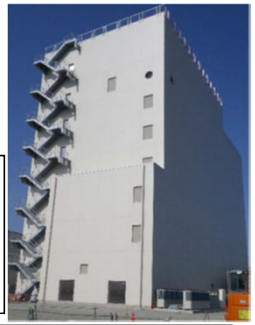


Main equipment

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.

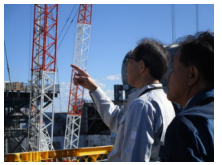
In February 2017, operation started at the Partner Companies' Building next to the New Administration Office Building.

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.

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.



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)

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.

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.

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

Changes in operation of controlled area

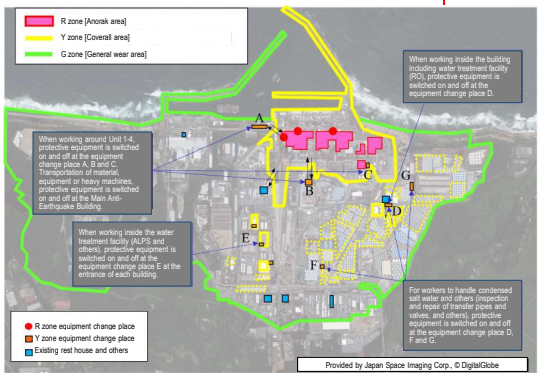
From May 2013, full-face mask unnecessary area was expanded sequentially.

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

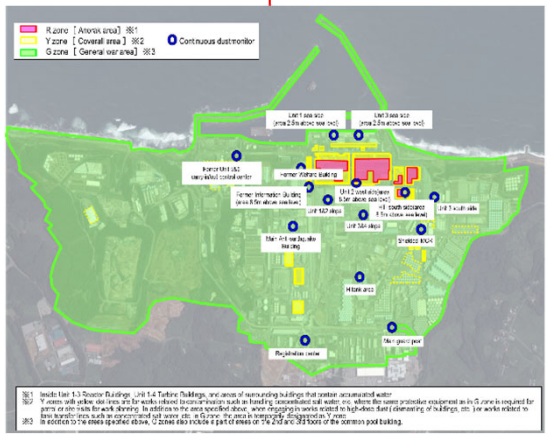
In March 2017, the G-zone area was expanded (to cover 95% of the whole site).

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



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.

Measured in August 2016

Measured in August 2018

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