Outline of Decommissioning, Contaminated Water and Treated Water Management

March 31, 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: Rubble removal etc. (Units 1 and 2) → Installation of fuel removal equipment → Fuel removal → Storage / Transportation (Units 3 and 4)

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

Fuel Debris Retrieval: Understanding of the situation inside the PCV / Consideration of retrieval methods, etc. (Units 1 and 3; Unit 2) → 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.

Subcommittee on Handling of ALPS treated Water:
- Examination from a professional perspective
- Recommendations to the government (report)

Government:
- Hearing opinions from wide-ranging stakeholders, including locals
- Decision on basic policy — Set in "The Inter-Ministerial Council for Contaminated Water, Treated Water and Decommissioning issues" held on April 13.

TEPCO:
- Decision on specific handling *1
- Application for approval to change the implementation plan — The Application Documents were submitted to the Nuclear Regulation Authority on December 21, 2021

Nuclear Regulation Authority:
- Approval by the Nuclear Regulation Authority

TEPCO:
- Implementation of preparatory work
- Strengthening sea area monitoring (from about one year before discharge start)
- Discharge start *2
- Continuing sea area monitoring

About two years (from Decision on specific handling to Discharge start)

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

Contaminated water management – triple-pronged efforts -

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

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

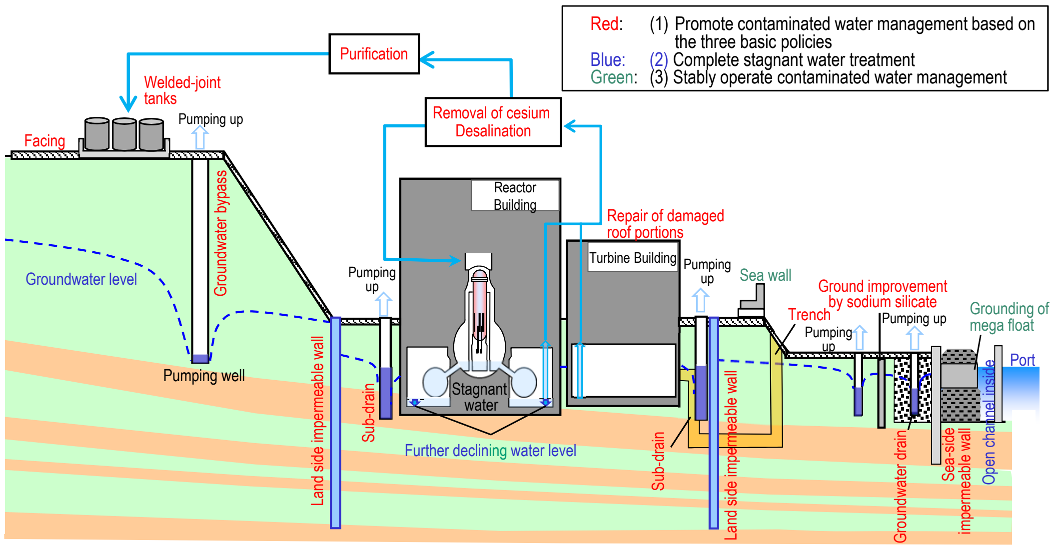
- Strontium-reduced water from other equipment is being re-treated in the Advanced Liquid Processing System (ALPS: multi-nuclide removal equipment) and stored in welded-joint tanks.
- Multi-layered contaminated water management measures, including land-side impermeable walls and sub-drains, have stabilized the groundwater at a low level and the increased contaminated water generated during rainfall is being suppressed by repairing damaged portions of building roofs, facing onsite, etc. Through these measures, the generation of contaminated water was reduced from approx. 540 m^3/day (in May 2014) to approx. 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 reduce the stagnant water levels in buildings as planned, work to install additional stagnant water transfer equipment is underway. At present, the floor surface exposure condition can be maintained except for the Unit 1-3 Reactor Buildings, Process Main Building and the High Temperature Incinerator Building.
- In 2020, treatment of stagnant water in buildings was completed, except for the Unit 1-3 Reactor Buildings, Process Main Building and High-Temperature Incinerator Building. For Reactor Buildings, the amount of stagnant water there will be reduced to about half the amount at the end of 2020 during the period FY2022-2024.
- For Zeolite sandbags on the basement floors of the Process Main Building and High-Temperature Incinerator Building, measures to reduce the radiation dose are being examined with stabilization in mind.

(3) Efforts to stably operate contaminated water management

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



Progress Status 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.

State at the Fukushima Daiichi Nuclear Power Station(NPS) after the Earthquake of March 16

On March 16, an earthquake with a hypocenter off the coast of Fukushima Prefecture occurred. As a seismic intensity of 6-weak was observed at the location of the Fukushima Daiichi NPS, the NPS determined that it was an event necessitating alert status and enhanced monitoring status.

Subsequent patrols conducted determined that the equipment troubles having been found would not impact the power station operation. Accordingly, the station returned to normal monitoring status on March 17.

The earthquake had influence on facilities (water-level decline in the Unit 1 Primary Containment Vessel (PCV), cooling of the spent fuel pool stopped, topped-over containers, tanks moved out of position and others), but there was no leakage of radioactive materials into the environment, fatal accidents, or events possibly affecting future plant operation.

Although values at dust monitors around buildings temporarily rose after the earthquake, no significant fluctuation was observed in monitoring posts or dust monitors near the site boundary, and the values subsequently returned to normal.


<State of containers>

Construction status of the Radioactive Material Analysis and Research Facility Laboratory-1

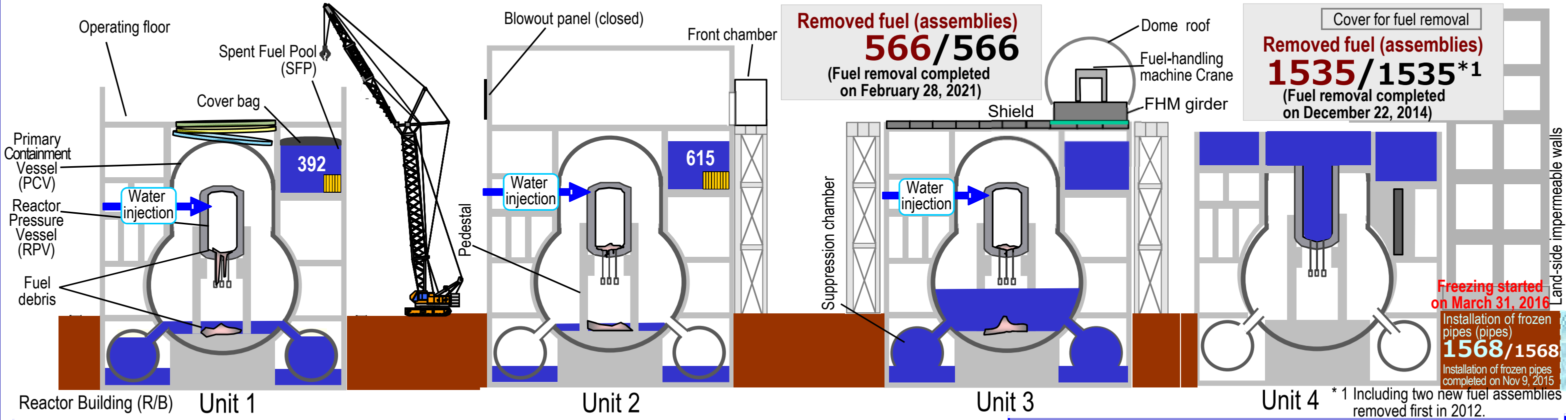
At the Radioactive Material Analysis and Research Facility Laboratory-1, third-party analysis for ALPS treated water by the government is planned as well as analysis of waste samples such as rubble.

When the air-conditioning equipment was tested in January 2021, insufficient air volume was detected. However, the evaluation confirmed that the present air volume would be able to maintain the safety function such as maintaining negative pressure.

Toward construction completion and operation start at the end of June 2022, applications to change the implementation plan and final adjustment of the air volume for air-conditioning are underway.


<Full view>


<Status of the glove box>



Operation start of the Units 5/6 sub-drain

For the Units 5/6 sub-drain facilities, restoration work had been conducted since September 2020 to suppress the groundwater inflow rate to Units 5/6.

Restoration of the Units 5/6 sub-drain pumping-up facilities and installation of facilities to transfer pumped-up groundwater to the existing sub-drain water collection facility were completed in January 2022.

Once the soundness of the facilities was confirmed in the subsequent comprehensive test in February, operation (transfer) started from March 28.

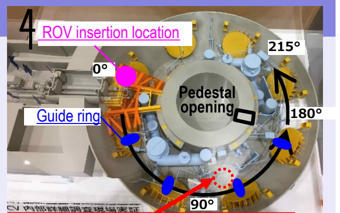
Unit 1 The second submersible vehicle was inserted into the Primary Containment Vessel (PCV)

From March14, the second submersible vehicle (ROV-A2) was inserted to commence a "detailed visual inspection of the outside perimeter of the pedestal."

This investigation until March 16 newly detected deposits and others. However, as a decline in the PCV water level was confirmed after the earthquake on March 16, the investigation was temporarily suspended.

To obtain the water level necessary for the investigation, the water injection rate into the reactor increased. The increased water level was confirmed but on March 29, the image was inappropriate due to water infiltrating the camera of the submersible ROV-A2.

As part of efforts to resume the investigation, examination is underway, including investigating the cause at the infiltration point and replacing with an alternative device.



<Status of deposit>

Unit 2 The targeted water level decrease was achieved for stagnant water in the Reactor Building

For the Units 1-3 Reactor Building (R/B), the decrease in the R/B stagnant water level in the R/B to approx. half of the end of 2020 within FY2022-2024 is specified as a milestone of the Mid-and-Long-Term Roadmap.

In the Unit 2 R/B, water is being reduced carefully while monitoring parameters such as PCV pressure and dust concentration. In March 2022, the targeted water level decrease, approx. T.P.-2800, was achieved.

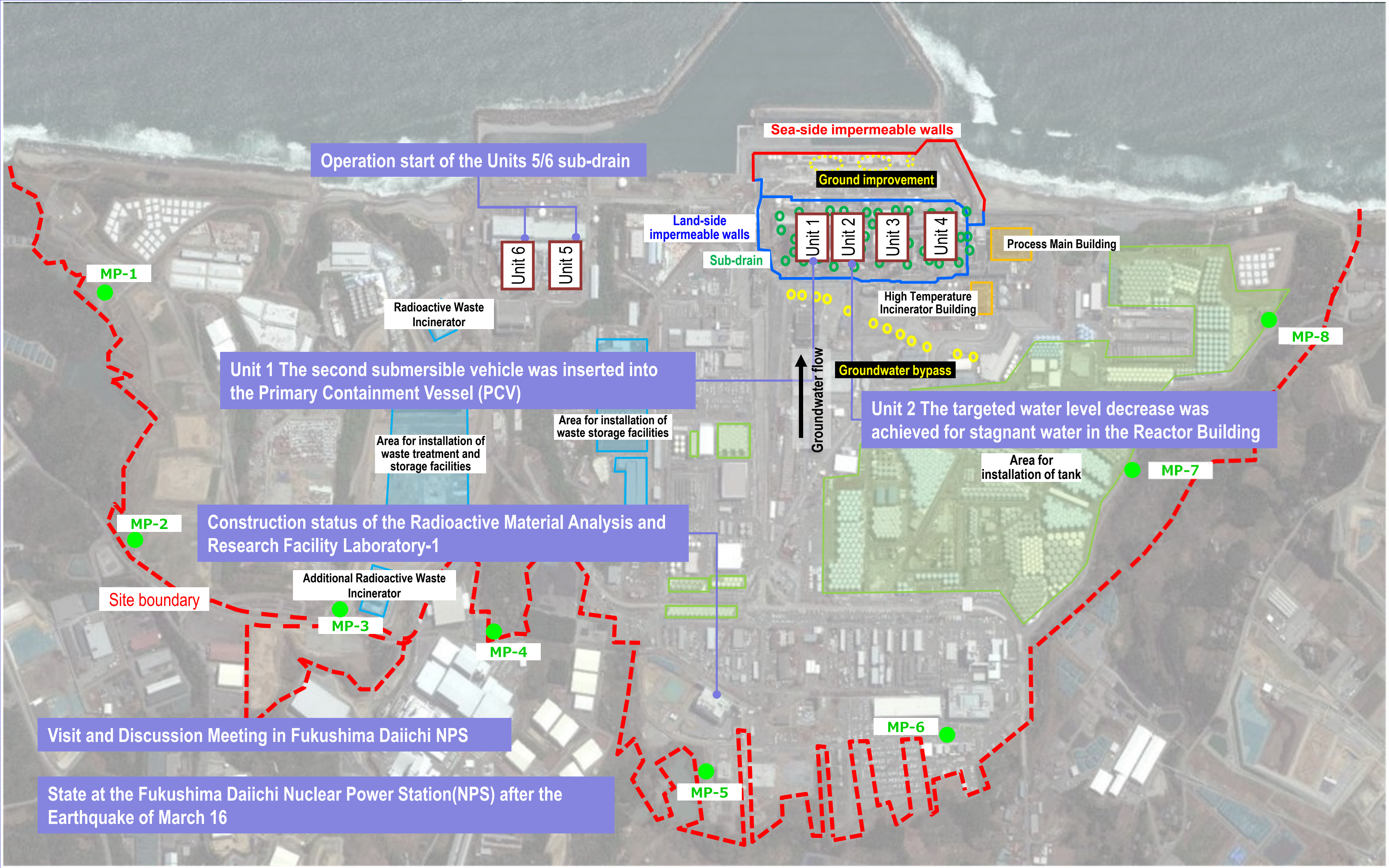
The water level in the Units 1 and 3 R/B will also be decreased on an ongoing basis to achieve the milestone of the Mid-and-Long Term Roadmap.

Visit and Discussion Meeting in Fukushima Daiichi NPS

To deepen the understanding of residents in Fukushima Prefecture about the current status of decommissioning, contaminated water and treated water management, "Visits and Discussion Meetings of TEPCO's Fukushima Daiichi NPS" will be held more frequently in the next fiscal year.

* Monthly for residents in the following 13 municipalities (Tamura City, Minamisoma City, Kawamata Town, Hirono Town, Naraha Town, Tomioka Town, Kawauchi Village, Okuma Town, Futaba Town, Namie Town, Katsurao Village, Iitate Village, Iwaki City) and five times per year for residents elsewhere in Fukushima Prefecture.

Major initiatives – Locations on site

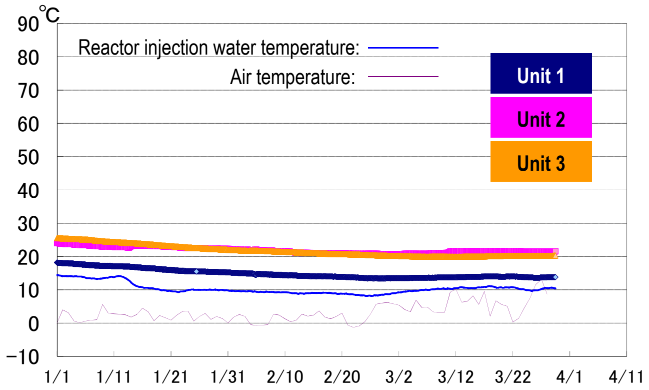


Provided by Japan Space Imaging Corp., photo taken on April 8, 2021
Product (C) [2020] DigitalGlobe, Inc., a Maxar company

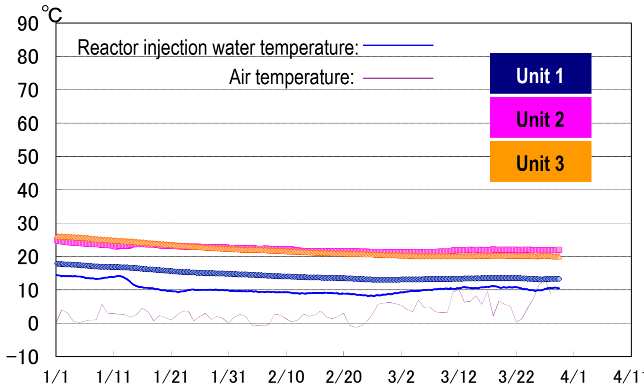
I. Confirmation of the reactor conditions

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 25°C for the past month, though it varied depending on the unit and location of the thermometer.

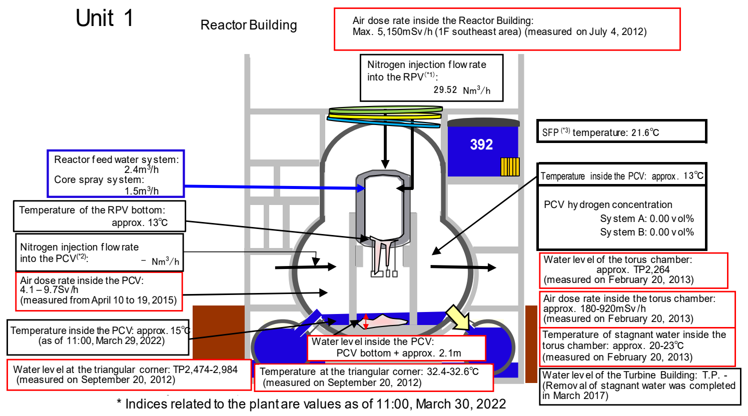


RPV bottom temperatures (recent quarter)

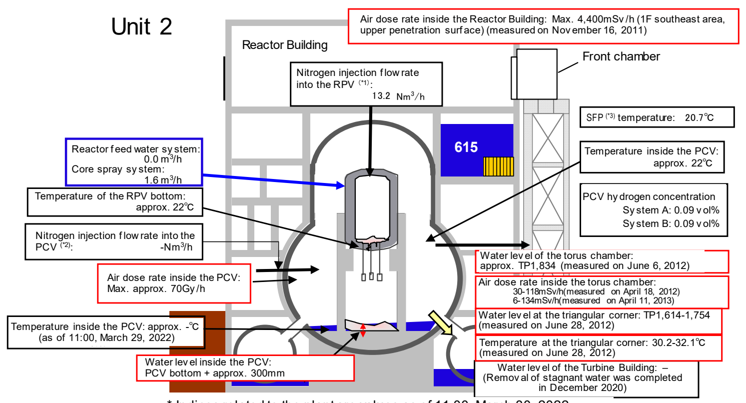


PCV gas phase temperatures (recent quarter)

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



* Indices related to the plant are values as of 11:00, March 30, 2022



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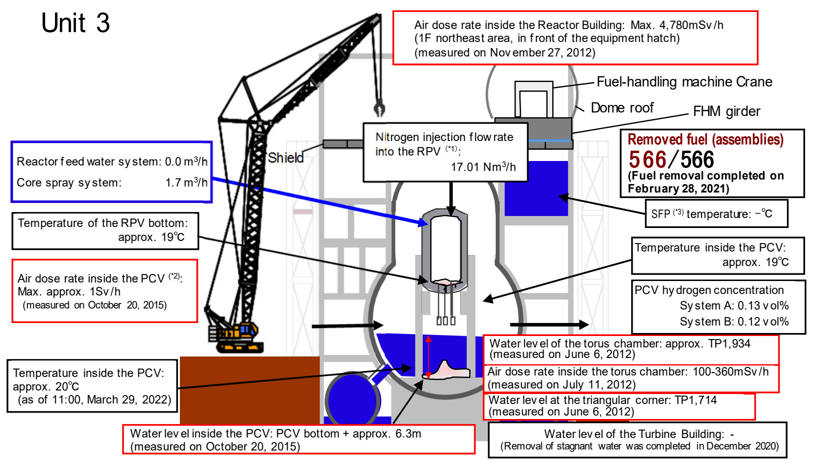


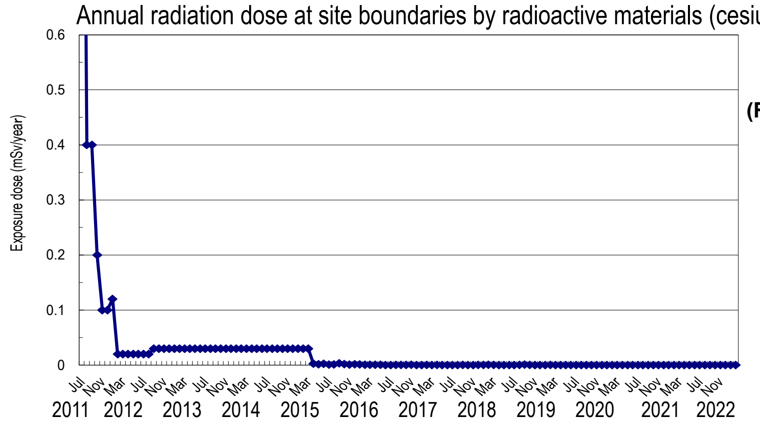
* Indices related to the plant are values as of 11:00, March 30, 2022

(*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 February 2022, the concentration of radioactive materials newly released from Reactor Building Units 1-4 into the air and measured at the site boundary was evaluated at approx. 1.7×10^{-12} Bq/cm³ and 1.4×10^{-12} Bq/cm³ for Cs-134 and -137 respectively, while the radiation exposure dose due to the release of radioactive materials there was less than 0.00003 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]: 2×10^{-5} Bq/cm³
  [Cs-137]: 3×10^{-5} Bq/cm³
* Data of Monitoring Posts (MP1-MP8).
  Data of Monitoring Posts (MPs) measuring the air dose rate around the site boundary showed 0.305 – 1.102 μSv/h (February 22 -March 29, 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.

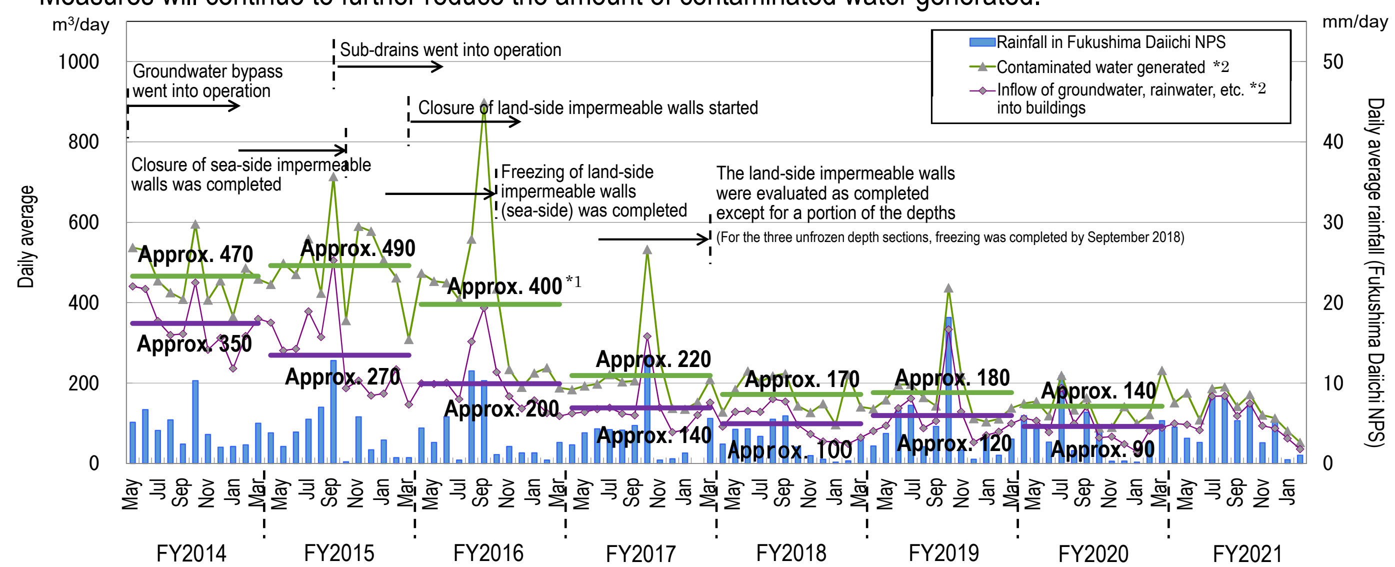
Based on the above, it was confirmed that the comprehensive cold shutdown condition had been maintained and the reactors remained in a stabilized condition.

II. Progress status by each plan_

Progress and others concerning ALPS treated water and others

➢ 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 and up until March 17, 2022, 1,797 releases were conducted.
- The water quality of all temporary storage tanks satisfied the operation target.

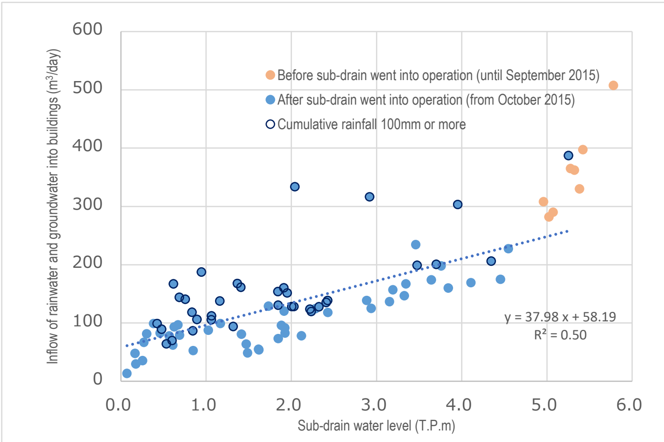


Figure 2: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Units 1-4 sub-drains

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 reduce the amount of underground water flowing into buildings. As of the end of February 2022, 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 February 2022, 30% of the planned area (60,000 m²) had been completed.

Status of the groundwater level around buildings

- The groundwater level in the area inside the land-side impermeable walls has been declining every year. On the mountain side, however, the difference between 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).

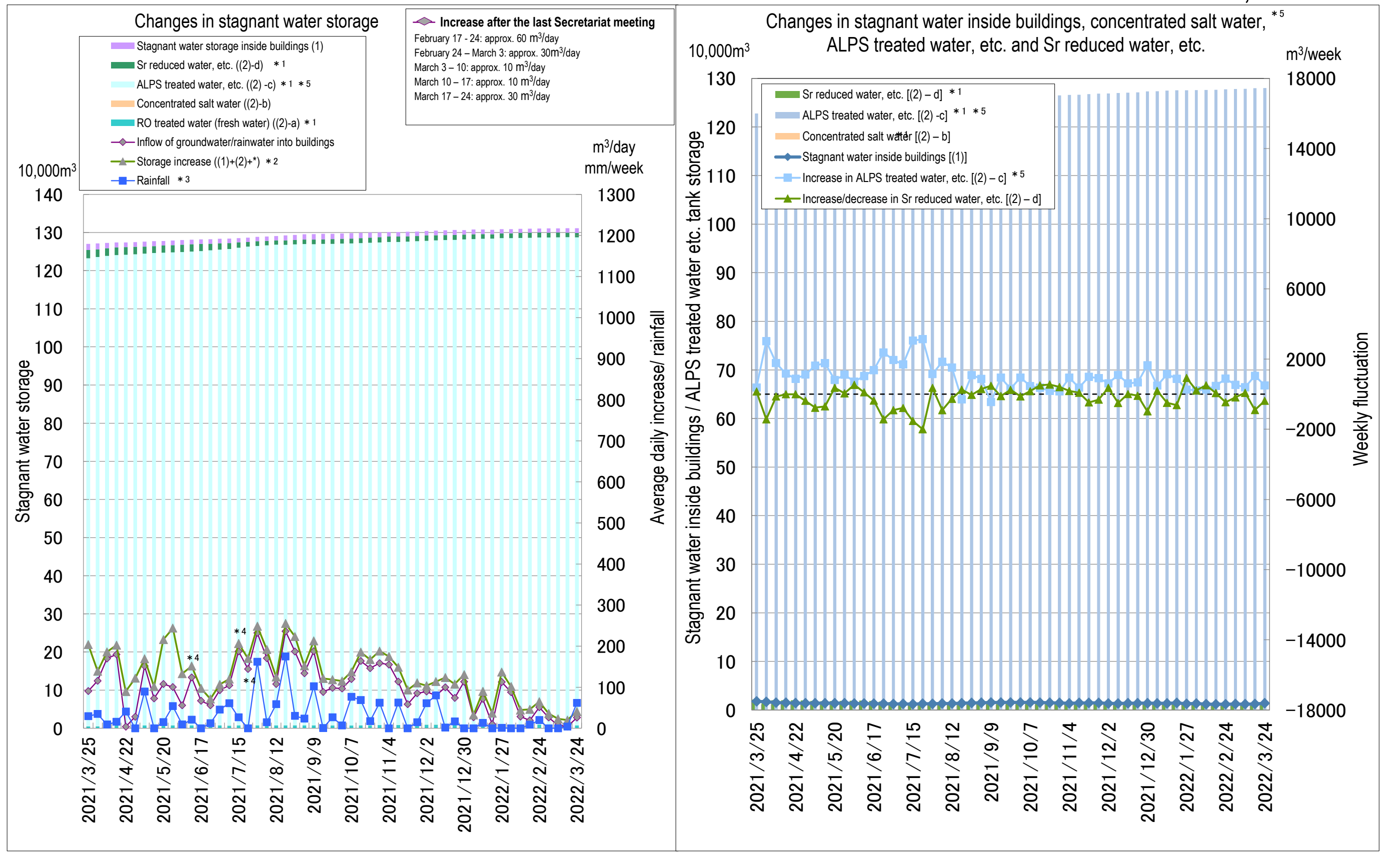
Operation of multi-nuclide removal equipment

- Regarding the multi-nuclide removal equipment (existing), hot tests using radioactive water are conducted (System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013). On March 23, 2022, a pre-service inspection certificate was granted by the Nuclear Regulation Authority and the entire pre-service inspection was completed. The multi-nuclide removal equipment (additional) went into full-scale operation from October 16, 2017. Regarding the multi-nuclide removal equipment (high-performance), hot tests using radioactive water are underway (from October 18, 2014).
- As of March 24, 2022, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 481,000, 730,000 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 March 24, 2022, approx. 670,000 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 March 24, 2022, approx. 836,000 m³ had been treated.

As of March 24, 2022



*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: 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

Temperature increase in the temperature measuring tube 150-7S of the land-side impermeable walls

- Before implementing work for the trail water stoppage, nine steel sheet piles to the muddy depth were installed during the period February 22 – March 2.
- Regarding the underground temperature in the temperature measuring tube 150-7S after February 23 when the installation of steel sheet piles started, the temperature of T.P.+8.5 - T.P.+5.5m started to recover in strata and T.P.+3.5m - T.P.-0.5m shifted to decline.
- Immediately after the earthquake on March 16, when the brine supply was suspended, the underground temperature increased. However, as the brine supply recovered, the temperature began declining again and has continued to decline.
- As effects were identified in multiple items, the water-stoppage effects of installing steel sheet piles were confirmed and at this time, the underground temperature increase was considered attributable to the formation of new water routes and the inflow of groundwater at a higher temperature than that in the surrounding area.
- Temperature monitoring will continue, while measures to add frozen pipes to around the temperature measuring tube 150-7S and stop water in unclosed parts under the pipes of the spent fuel pool will be implemented if deemed necessary.

Decline of the liquid level in the brine tanks in the land-side impermeable walls

- On February 15, when the brine supply pump was stopped for the test to reduce the risk of refrigerant (brine*) leakage at the land-side impermeable walls in the event of the Chishima-Trench tsunami arrival, a decline in the brine tank liquid level was detected. The valve was closed as an emergency measure, and the decline stopped.
  * Refrigerant (brine): Liquid calcium chloride (the same ingredients as the snow melting agent sprayed on roads during snow fall)

- Later, leakage from the brine pipe connection was detected. The rubber ring of that connection was replaced and brine supply resumed in all areas on February 21.
- In the on-site investigation, the coupling joint at the leakage part was removed and subsequently found to be misaligned. The cause of this misalignment is being investigated, but given the on-site conditions, it is considered largely attributable to the influence of freezing.
- Some spare parts have already been procured and further procurement of spare parts continues to be examined and responded. With the specific characteristics of each area in mind, examination will proceed, including a future inspection plan.

➢ Future policy toward dismantling E area tanks

- In the E area, there are E-D1 tanks, for which sludge collection will start from April 2022 and E-D2 tanks, for which treatment of residual water will start from end of March 2022.
- For sludge collection from E-D1 tanks, as the sludge contains considerable α-nuclide, strict countermeasures to α-contamination (to prevent internal intake and dispersal) will be implemented and proceed carefully.
- In treatment of residual water to be implemented for both E-D1 and E-D2 tanks, water-sprinkling hoses will be injected from the top-panel manhole to clean the internal tank walls. Workers will then enter the tanks from the side manholes to treat residual water in the tank bottom, collect clads and clean the bottom. Residual water inside the tanks will be transferred to the Process Main Building.
- Regarding workers' equipment, given the environment inside the tanks, extra equipment supplementing the regular R-equipment to counter α-nuclide and high-level β will be worn during work. Further additional equipment to prevent any intake of α-nuclide and exposure to high-level β will also be introduced.

➢ Operation progress report of the high-performance multi-nuclide removal equipment and preparation of pre-service inspection

- For the continued generation of contaminated water, from the viewpoint of the amount of water that can be processed and the ease of adjustment, and other factors, the additional and existing ALPSs were operated until September 2021 and the high-performance ALPS on stand-by.
- Given that considerable time has elapsed from the performance verification operation in FY2015, toward future secondary treatment of "water treated with multi-nuclide removal equipment, etc.," to optimize facility operation, including the high-performance ALPS, as well as the additional and the existing ALPSs, preparation to operate the high-performance ALPS proceeded from November 2021.
- In FY2015, it was confirmed that regarding the water quality of Sr-reduced water (RO concentrated water) at the time, for nuclides except for tritium, the high-performance ALPS could reduce the sum of concentration ratios required by law to less than 1. To further improve system operation, more operational insights and data are being collected.
- This time, to refine the system operation, more data regarding the configuration of adsorption vessels was being collected. After reconfiguring some adsorption vessels, the high-performance ALPS was operated for the period February 8-14 and its removal performance for the present Sr-reduced water (RO concentrated water) was confirmed.
- When the adsorption vessels tested this time were configured, the sum of concentration ratios required by law exceeded 1. In a configuration that can reduce the sum of concentration ratios required by law to less than 1, data necessary for the pre-operation inspection will be collected.
- The related analytical results are being disclosed on the website of TEPCO Holdings, Inc. as "Daily Analysis Results on Radioactive Material at Fukushima Daiichi Nuclear Power Station."

➢ Collection status of resin leaking from the Reactor Water Clean-up System spent resin tank room in the Unit 3 Filter Sludge Tank Room (FSTR) building

- On September 1, 2020, leakage of waste liquid and spent resin was detected from pipes connected with the Reactor Water Clean-up System spent resin storage tanks on the basement floor of the Unit 3 Filter Sludge Tank Room (FSTR) building.
- Spent resin having leaked started to be collected from June 2021 and was then transferred to the waste sludge storage tank (B) of the FSTR building. Approx. 20% of the resin was collected but since a portion could not be collected via the initially planned method, work was suspended in July 2021.
- The collection method was reviewed and work resumed from December 15, 2021. Collection outside the tanks was almost completed but as issues were identified inside the tanks, new methods are being examined. After an on-site investigation, mockup tests and others, the target is to collect the resin by the end of June 2022.

➢ Status of review about the handling of zeolite sandbags

- On the second basement level (lowest floor) of the Process Main Building (PMB) and High-Temperature Incinerator Building (HTI), a high radiation dose was measured at zeolite and activated carbon sandbags, which had been installed to adsorb radioactive materials in contaminated water in buildings. In response, countermeasures are being examined, centering on underwater collection, with which water shielding effect is expected.
- For zeolite sandbags and others on the lowest floor of PMB and HTI, collection will commence within FY2023. To commence at an earlier stage and allow more effective work, the collection will be divided into two works: "accumulation" and "enclosure in containers."
- Accumulation and enclosure in containers will be remotely controlled using a remotely operated vehicle (ROV) and others. Each of the Zeolite sandbags and others will be dehydrated within buildings and then enclosed in containers. Subsequently, they will be transported and stored in temporary storage in an area 33.5m above sea level.
- As PMB and HTI may be used to temporarily store contaminated water from Units 1-4 buildings during heavy rain, accumulation and enclosure in containers of zeolite sandbags and others on the lowest floor will not be conducted simultaneously but in order. The target for work completion is within 2024 and after that, floors of PMB and HTI will be exposed.

➢ Status of work to transfer slurry of the High Integrity Container (HIC)

- Slurry generated from the existing and additional multi-nuclide equipment is contained and stored in High Integrity Containers (HICs).
- Among HICs affected by the β-ray irradiation of slurry, for those whose integral dose was evaluated as exceeding 5,000kGy*, slurry was being transferred.

* Cumulative absorbed dose of which structural soundness in the event of a fall is confirmed

- In the slurry transfer, the validity of measures to reduce exposure was confirmed for two HICs with low Sr-90 concentration. Based on these results, the third and later transfer was conducted in February 2022 for HICs whose cumulative absorbed dose exceeded 5,000kGy.
- During the transfer for the third HIC, no significant exposure or intake of workers were detected.
- For HICs whose cumulative absorbed dose exceeds 5,000kGy, work continues while introducing appropriate improvement as necessary, based on the work status and with safety first.
- For these HICs, transfer to HICs is targeted to be completed within FY2023.
- The number of HICs for transfer is increasing over time until the slurry stabilization equipment goes into operation. They will be responded to continuously after FY2024.

➢ Status of 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 covering the manhole, the water level in the pit increased during rainfall.
- 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 flowed into the manhole and the water level of the pit rose.
- On March 29, 2022, the inside of the pit was investigated while sprinkling water around the manhole and the inflow

point was located.

- As measures to correct the space in the manhole, which is the inflow point to the pit and suppress the inflow, the manhole lid will be replaced. Subsequently, water will again be sprinkled and the inside will be re-investigated to very the effectiveness of the measure.
- No decline in the water level was confirmed, except for when the drain pump was operated, nor any leakage outside the system.

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 cracking 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 in December 2021. Contamination reduction was confirmed based on the smear sampling results. Installation of shielding started from February within the range including the reactor well, where the highest dose was observed.
- From October 28, 2021, ground improvement work started before installing the gantry for fuel removal. Approx. 34% was completed as of January 26 and the remainder will be completed by April 2022.

Retrieval of fuel debris

➢ Progress status toward Unit 1 PCV internal investigation

- To acquire information related to the construction plan to collect deposits and others 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, before the PCV internal investigation.
- On January 12, when powering on the investigative equipment such as the submersible ROV sequentially, a malfunction was detected, whereby the dosimeter data incorporated in the submersible ROV was not displayed correctly. Work was temporarily suspended.
- For February 4-7, after implementing countermeasures for the above event, operation was verified and no recurrence of the event was confirmed. Work to resume the investigation was conducted.
- On February 8, the submersible ROV-A was inserted into the PCV and guide rings were installed at four points by February 9.
- With these preparations completed, on March 14, the submersible ROV-A2 was inserted as part of efforts to commence a detailed visual inspection of the outside pedestal perimeter.
- After the Fukushima Prefecture Off-coast Earthquake on March 16, the PCV water level declined. To obtain the water level necessary for the investigation, the water injection rate into the reactor was increased.
- On March 29, the water level was checked by the submergible ROV-2. An increase in water level was confirmed but due to transparency loss of the mounted camera and others, it was considered that the investigation could not continue. Replacement with another ROV-A2 and the schedule to resume the investigation will be examined.

➢ 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 was transported from January 28 and the robot arm arrived on January 31 and the enclosure, on February 4, at the Naraha Center for Remote Control Technology Development of the Japan Atomic Energy Agency (JAEA) (hereinafter referred to as the "Naraha mockup facility").
- From February 14, the performance verification test and operational training started at the Naraha mockup facility.

➢ Response regarding residual gas detected in pipes of the Unit 3 residual heat removal (RHR) system

- The structural outline around the RHR heat exchanger and assumed gas inflow mechanism immediately after the earthquake to present were estimated.

➢ Status of work to remove a portion of the pipes of the Units 1 and 2 standby gas treatment system (SGTS)

- As countermeasures to malfunctions detected up to March 2, parameters like oil pressure and flow rate, which can ensure stable cutting, were identified and the hydraulic oil was maintained at a temperature of 30-40°C, the value recommended by the manufacturer. From March 27, pipe cutting via the remotely operated cutter started.
- Subsequently, cutting of SGTS pipes proceeded carefully but the same day, the wire saw blade of the cutter bit into the pipe and the wire saw could not operate. Despite efforts made to resolve the problem, the biting issue remained. On March 27, operation was suspended, pipe gripping of the cutter was released and the cutter was lifted down by the crane.
- The cause of the wire saw blade biting into the pipe is being investigated and remains unclear at present. Following prompt identification of the cause, recurrence prevention measures will be examined.

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 February 2022, the total storage volume for concrete and metal rubble was approx. 318,500 m^3 (+2,800 m^3 compared to the end of January with an area-occupation rate of 85%). The total storage volume of trimmed trees was approx. 140,500 m^3 (-400 m^3, with an area-occupation rate of 80%). The total storage volume of used protective clothing was approx. 28,000 m^3 (+1,000 m^3, with an area-occupation rate of 53%). The increase in rubble was mainly attributable to work around Units 1-4. As of the end of February 2022, there were 13 temporary deposits with storage capacity exceeding 1,000m^3 and a total storage volume of 54,100 m^3.

➢ Management status of secondary waste from water treatment

- As of March 3, 2022, the total storage volume of waste sludge was 438 m^3 (area-occupation rate: 63%), while that of concentrated waste fluid was 9,311 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 5,312 (area-occupation rate: 83%).

➢ Progress status of the Additional Radioactive Waste Incinerator

- For the period from March 1-4, 2022, a hot test was conducted by incinerating actual waste.
- The test results confirmed no abnormality in the incineration performance and parameters including the prescribed incinerator capacity and exhaust gas radiation monitor values were the same as measured during the cold test. This meant the waste could be supplied and the incinerator ash filled without any issue.
- After the earthquake on March 16, negative pressure was maintained inside the incinerator and no external leakage of radioactive materials, such as dispersal of ash, was detected. When visually inspecting the facility after the earthquake, although some malfunctions were found, no significant safety damage that would affect the function or performance of the incinerator was detected.

- Among the detected malfunctions, all related to the incinerator were restored. As no abnormality was found in the verification of equipment operation, construction of the incinerator was completed in March 31.
- Restoring building-related malfunctions (fireproof board separating off the wall) will take time. The operational start schedule will be reviewed based on the construction period for restoration.

Reactor cooling

The cold shutdown condition will be maintained by cooling the reactor by water injection and measures to complement the status monitoring continue

➢ Results regarding reduction in the water injection rate into Unit 2 and 3 reactors

- Based on the results of tests to stop water injection and the temperature evaluation of the Reactor Pressure Vessel (RPV) and the Primary Containment Vessel (PCV), the water injection rate has room in terms of maintaining stable cooling. As part of work to reduce the volume of contaminated water generated in buildings by suppressing the ground water inflow, the possible amount of freshwater (source water) generated will also decline, there will be the need to reduce the water-injection rate.
- Therefore, for Units 2 and 3, which maintain stable PCV water levels, the water injection rate was reduced in steps, from the existing 3.0 m^3/h to the target figure of 1.7 m^3/h.
- As no abnormality was confirmed in parameters such as the RPV bottom temperature, PCV temperature and dust concentration of the PCV gas control facility, Units 2 and 3 were migrated to production operation from March 10 and January 6 respectively.

➢ Test to stop water injection into the Unit 3 reactor

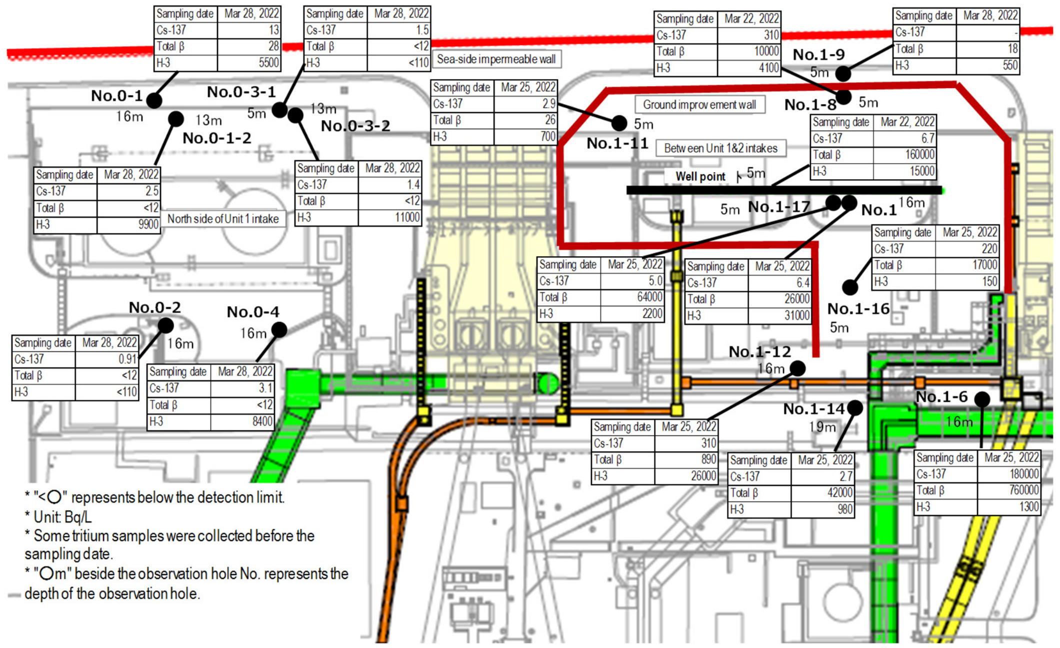
- Regarding Unit 3, in the previous test to stop water injection into the reactor (which was stopped for seven days in April 2021), leakage from the PCV was below the experience water level. To ensure safety while retrieving debris, leakage points need to be identified.
- Moreover, as a concrete method for retrieving future debris is being examined, the feasibility of air cooling for fuel debris and the lowest water injection rate for water cooling must also be identified.
- A test involving stop of water injection for a longer period (three months) than in the previous test will be conducted to identify whether there is any leakage during the course of decline in the PCV water level and detect any influence during long-term water injection stoppage.
- As the RPV and PCV temperatures and dust concentration may rise by the water injection stoppage, measures such as setting a management target temperature and enhancing the monitoring of dust concentration via a continuous dust monitor, will be implemented during the test. Moreover, for PCV water-level decline, the test will be conducted at a water level above the lower end of the PCV new thermometer / water-level gauge.
- After setting the continuous dust monitor, conducting trial operation and confirming the background, the water injection stoppage test will start from May 2022.

Reduction in radiation dose and mitigation of contamination

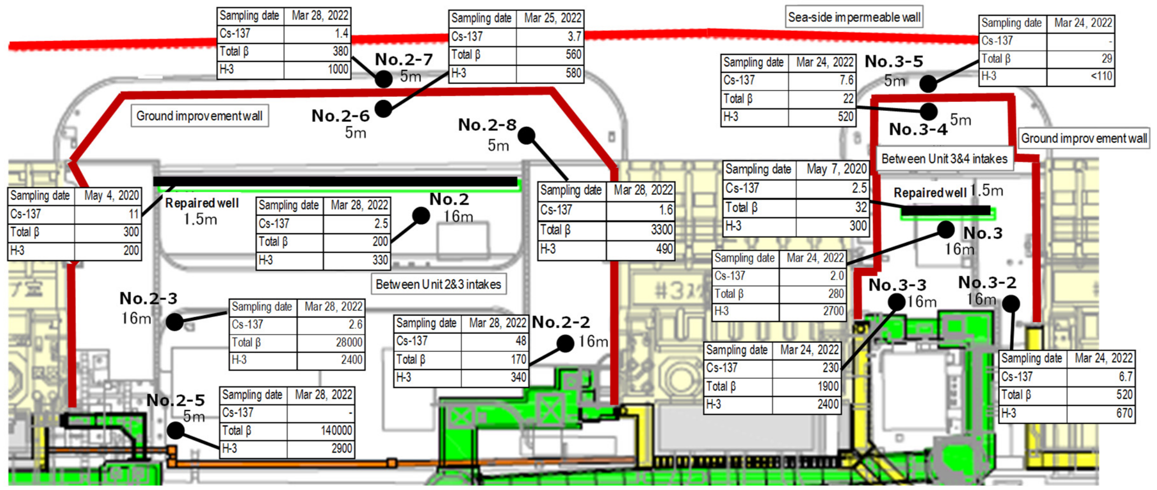
Effective dose-reduction at site boundaries and purification of port water to mitigate the impact of radiation on the external environment

➢ 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, 0-3-1, 0-3-2 and 0-4. The trend continues to be monitored carefully.
- In the area between the Unit 1 and 2 intakes, the H-3 concentration has remained below the legal discharge limit of 60,000 Bq/L at all observation holes. It has been increasing or declining at Nos. 1-14, 1-16 and 1-17 but has otherwise remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall but 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. It has been increasing and declining at Nos. 2-3 and 2-5 but has remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall but been increasing or declining at Nos. 2-3, 2-5 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 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.
- In the radioactivity trend of the groundwater on the east side of the Turbine Buildings, as record high values were indicated at many points after March 2020, groundwater fluctuations were investigated for the period January to February 2022. The subject points were checked by the underwater camera but no deposit was confirmed at the bottom and the sampling height. From the results of Cs-134 and -137 radioactivity concentration measured after filtration, all investigated groundwater contained much more soluble cesium than insoluble cesium. Regarding the total β radioactivity concentration, as time passed until measurement after filtration from sampling, values exceeding those at the time of sampling were indicated due to the generation of Y-90. Data will be re-collected for a month or so after April and the investigation will continue.
- During the recent two months, the record high data was not updated. From now on, when record high data is indicated, it will be compared with data obtained in this investigation and evaluated.
- 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 the 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

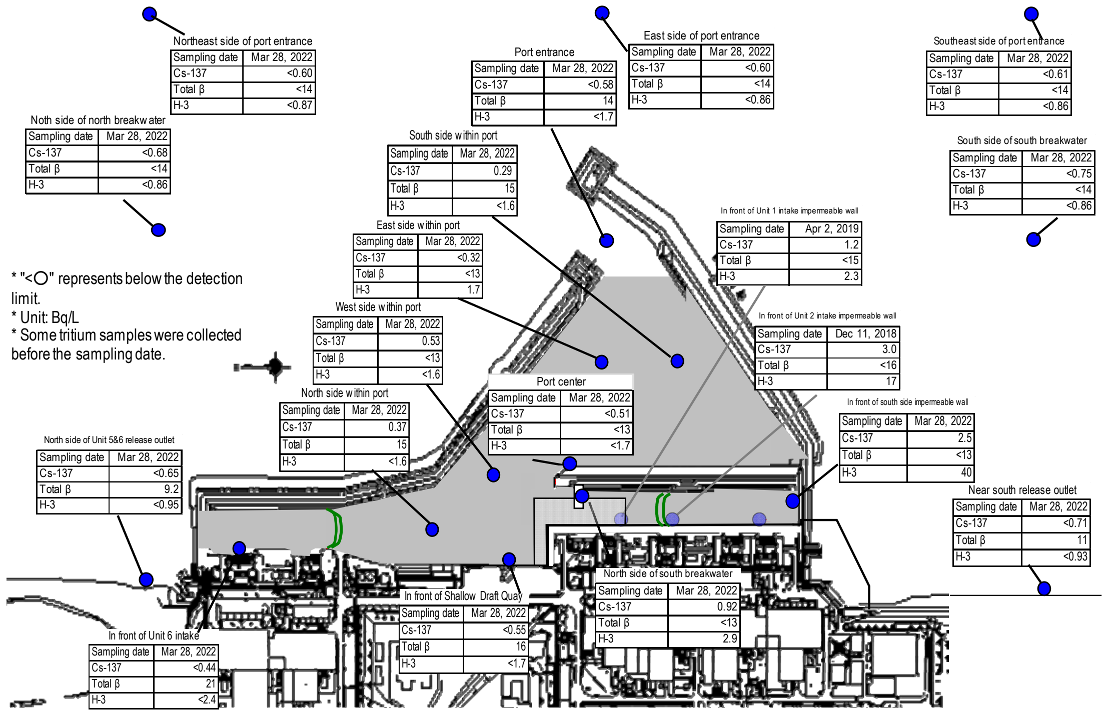


Figure 5: Seawater concentration around the port

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 November 2021 to January 2022 was approx. 9,000 (cooperating company workers and TEPCO HD employees), which exceeded the monthly average workforce (approx. 6,800). Accordingly, sufficient personnel are registered to work on site.
- It was confirmed with the prime contractors that the estimated manpower necessary for the work in April 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 both from within and outside Fukushima Prefecture decreased slightly. The local employment ratio (cooperating company workers and TEPCO HD employees) as of February 2022 remained constant to around 70%.
- 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.

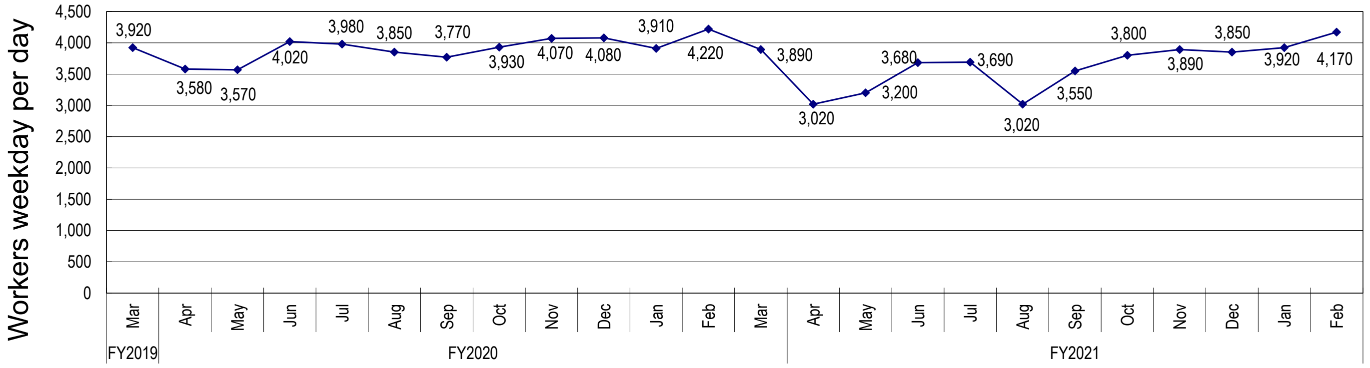


Figure 6: Changes in the average number of workers weekday per day for each month of the past 2 years (actual values)

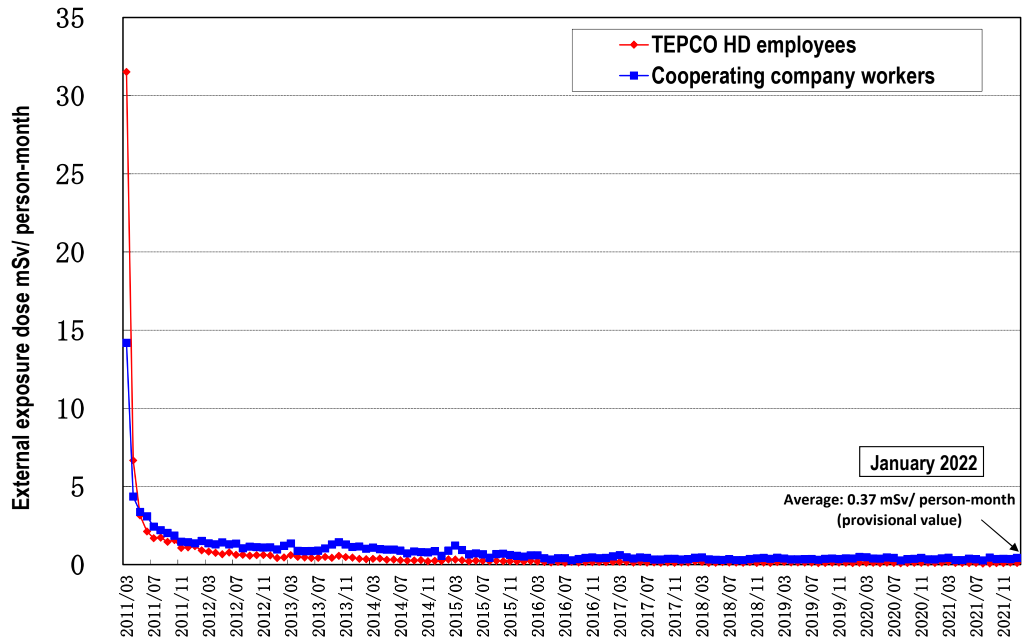


Figure 7: Changes in monthly average exposure dose of individual worker
(monthly exposure dose since March 2011)

➢ Countermeasures to suppress the spread of COVID-19 infections

- The semi-state of emergency COVID-19 measures applied to 18 prefectures including Tokyo was totally lifted on March 21. However, for TEPCO HD employees and cooperating company workers at the Fukushima Daiichi Nuclear Power Station, 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. In addition, they must strictly check their physical conditions, including of their family members, before coming to the company at the beginning of the week, report to their supervisors and managers whether they have contact of “Three Cs,” many people or unspecified number of people or not and receive an antigen test when they return to Fukushima prefecture from the outside to proceed decommissioning work with safety first.
- As of 15:00, March 30, 2022, 232 workers (including 36 TEPCO HD employees, one temporary worker, 193 cooperating company workers and 2 business partner company employees) of the Fukushima Daiichi NPS had contracted COVID-19. Since January 2022, a total of 128 workers (including 26 TEPCO HD employees, 101 cooperating company workers and 1 business partner company employee) 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.
- The third workplace vaccination of COVID-19 was implemented for the period March 28-30 to 27 TEPCO HD employees and 52 cooperating company workers.
- Acceptance of inspectors resumed from March 22.

➢ Measures to prevent infection and expansion of influenza and norovirus

- Since November 2021, 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 29, 2022, a total of 4,866 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 12th week of 2022 (March 21-27, 2022), no influenza and six 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 Units 5 and 6

➢ Status of spent fuel storage in Units 5 and 6

- Regarding Unit 5, fuel removal from the reactor was completed in June 2015. A total of 1,374 spent and 168 non-irradiated fuel assemblies, respectively, were stored in the spent fuel pool (storage capacity: 1,590 assemblies).
- Regarding Unit 6, fuel removal from the reactor was completed in November 2013. A total of 1,456 spent and 198 non-irradiated fuel assemblies (180 of which transferred from the Unit 4 spent fuel pool) are stored in the spent fuel pool (storage capacity: 1,654), while 230 non-irradiated fuel assemblies are stored in the storage facility of non-irradiated fuel assemblies (storage capacity: 230).

➢ Status of stagnant water treatment in Units 5 and 6

- Stagnant water in Units 5 and 6 buildings is transferred from Unit 6 Turbine Building to the outdoor tanks and sprinkled after undergoing oil separation and RO treatment and confirming the concentration of the radioactive materials.

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 March 21-28)"; 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

Summary of TEPCO data as of March 28, 2022

Cesium-134	:	ND(0.54)
Cesium-137	:	ND(0.51)
Total β	:	ND(13)
Tritium	:	ND(1.7)

※1

Cesium-134	: 3.3	(H25/12/24)	→	ND(0.41)	Below 1/8
Cesium-137	: 7.3	(H25/10/11)	→	ND(0.58)	Below 1/10
Total β	: 69	(H25/8/19)	→	14	Below 1/4
Tritium	: 68	(H25/8/19)	→	ND(1.7)	Below 1/40

Cesium-134	: 3.3	(H25/10/17)	→	ND(0.31)	Below 1/10
Cesium-137	: 9	(H25/10/17)	→	ND(0.32)	Below 1/20
Total β	: 74	(H25/8/19)	→	ND(13)	Below 1/5
Tritium	: 67	(H25/8/19)	→	1.7	Below 1/30

Cesium-134	: 3.5	(H25/10/17)	→	ND(0.36)	Below 1/9
Cesium-137	: 7.8	(H25/10/17)	→	ND(0.29)	Below 1/20
Total β	: 79	(H25/8/19)	→	15	Below 1/5
Tritium	: 60	(H25/8/19)	→	ND(1.6)	Below 1/30

Cesium-134	: 4.4	(H25/12/24)	→	ND(0.34)	Below 1/10
Cesium-137	: 10	(H25/12/24)	→	0.53	Below 1/10
Total β	: 60	(H25/7/4)	→	ND(13)	Below 1/4
Tritium	: 59	(H25/8/19)	→	ND(1.6)	Below 1/30

Cesium-134	: 32	(H25/10/11)	→	ND(0.27)	Below 1/100
Cesium-137	: 73	(H25/10/11)	→	0.92	Below 1/70
Total β	: 320	(H25/8/12)	→	ND(13)	Below 1/20
Tritium	: 510	(H25/9/2)	→	2.9	Below 1/100

Cesium-134	: 5	(H25/12/2)	→	ND(0.29)	Below 1/10
Cesium-137	: 8.4	(H25/12/2)	→	0.37	Below 1/20
Total β	: 69	(H25/8/19)	→	15	Below 1/4
Tritium	: 52	(H25/8/19)	→	ND(1.6)	Below 1/30

Cesium-134	:	ND(0.55)
Cesium-137	:	2.5
Total β	:	ND(13)
Tritium	:	40

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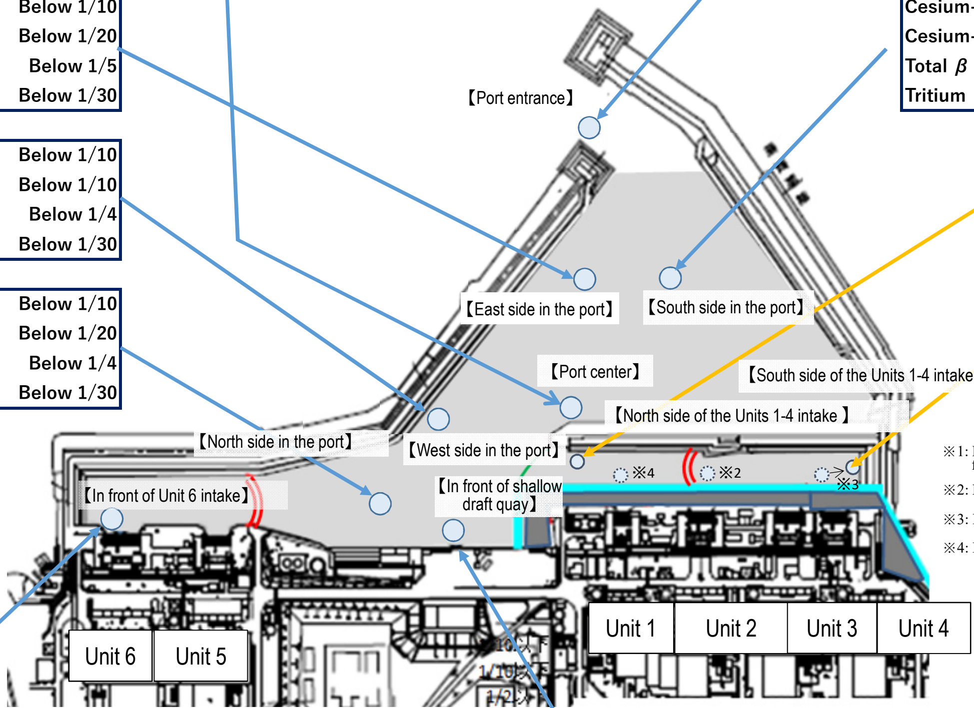


Tritium

※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.

Sea side impermeable wall
Silt fence
Silt fence for construction

	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

Cesium-134	: 2.8	(H25/12/2)	→	ND(0.51)	Below 1/5
Cesium-137	: 5.8	(H25/12/2)	→	ND(0.44)	Below 1/10
Total β	: 46	(H25/8/19)	→	21	Below 1/2
Tritium	: 24	(H25/8/19)	→	ND(2.4)	Below 1/10

Cesium-134	: 5.3	(H25/8/5)	→	ND(0.42)	Below 1/10
Cesium-137	: 8.6	(H25/8/5)	→	ND(0.55)	Below 1/10
Total β	: 40	(H25/7/3)	→	16	Below 1/2
Tritium	: 340	(H25/6/26)	→	ND(1.7)	Below 1/200

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 March 21-28)

Summary of TEPCO data as of March 28, 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(0.82)	
Cesium-137	ND	(H25)	→	ND(0.60)	
Total β	ND	(H25)	→	ND(14)	
Tritium	ND	(H25)	→	ND(0.87)	

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

Cesium-134	ND	(H25)	→	ND(0.72)	
Cesium-137	1.6	(H25/10/18)	→	ND(0.60)	Below 1/2
Total β	ND	(H25)	→	ND(14)	
Tritium	6.4	(H25/10/18)	→	ND(0.86)	Below 1/7

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

Cesium-134	ND	(H25)	→	ND(0.58)	
Cesium-137	ND	(H25)	→	ND(0.61)	
Total β	ND	(H25)	→	ND(14)	
Tritium	ND	(H25)	→	ND(0.86)	

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

Cesium-134	ND	(H25)	→	ND(0.95)	
Cesium-137	ND	(H25)	→	ND(0.68)	
Total β	ND	(H25)	→	ND(14)	
Tritium	4.7	(H25/8/18)	→	ND(0.86)	Below 1/5

【Port entrance】

Cesium-134	3.3	(H25/12/24)	→	ND(0.41)	Below 1/8
Cesium-137	7.3	(H25/10/11)	→	ND(0.58)	Below 1/10
Total β	69	(H25/8/19)	→	14	Below 1/4
Tritium	68	(H25/8/19)	→	ND(1.7)	Below 1/40

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

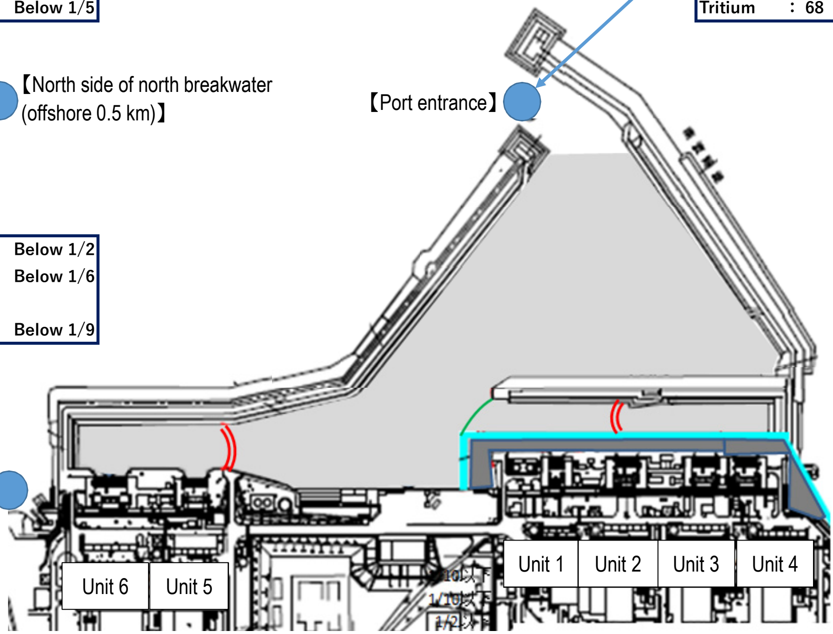
Cesium-134	ND	(H25)	→	ND(0.88)	
Cesium-137	ND	(H25)	→	ND(0.75)	
Total β	ND	(H25)	→	ND(14)	
Tritium	ND	(H25)	→	ND(0.86)	

【North side of Unit 5 and 6 release outlet】

Cesium-134	1.8	(H25/6/21)	→	ND(0.64)	Below 1/2
Cesium-137	4.5	(H25/3/17)	→	ND(0.65)	Below 1/6
Total β	12	(H25/12/23)	→	9.2	
Tritium	8.6	(H25/6/26)	→	ND(0.95)	Below 1/9

【Near south release outlet】

Cesium-134	ND	(H25)	→	ND(0.76)	
Cesium-137	3	(H25/7/15)	→	ND(0.71)	Below 1/4
Total β	15	(H25/12/23)	→	11	
Tritium	1.9	(H25/11/25)	→	ND(0.95)	Below 1/2



Sea side impermeable wall

Silt fence

Silt fence for construction

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

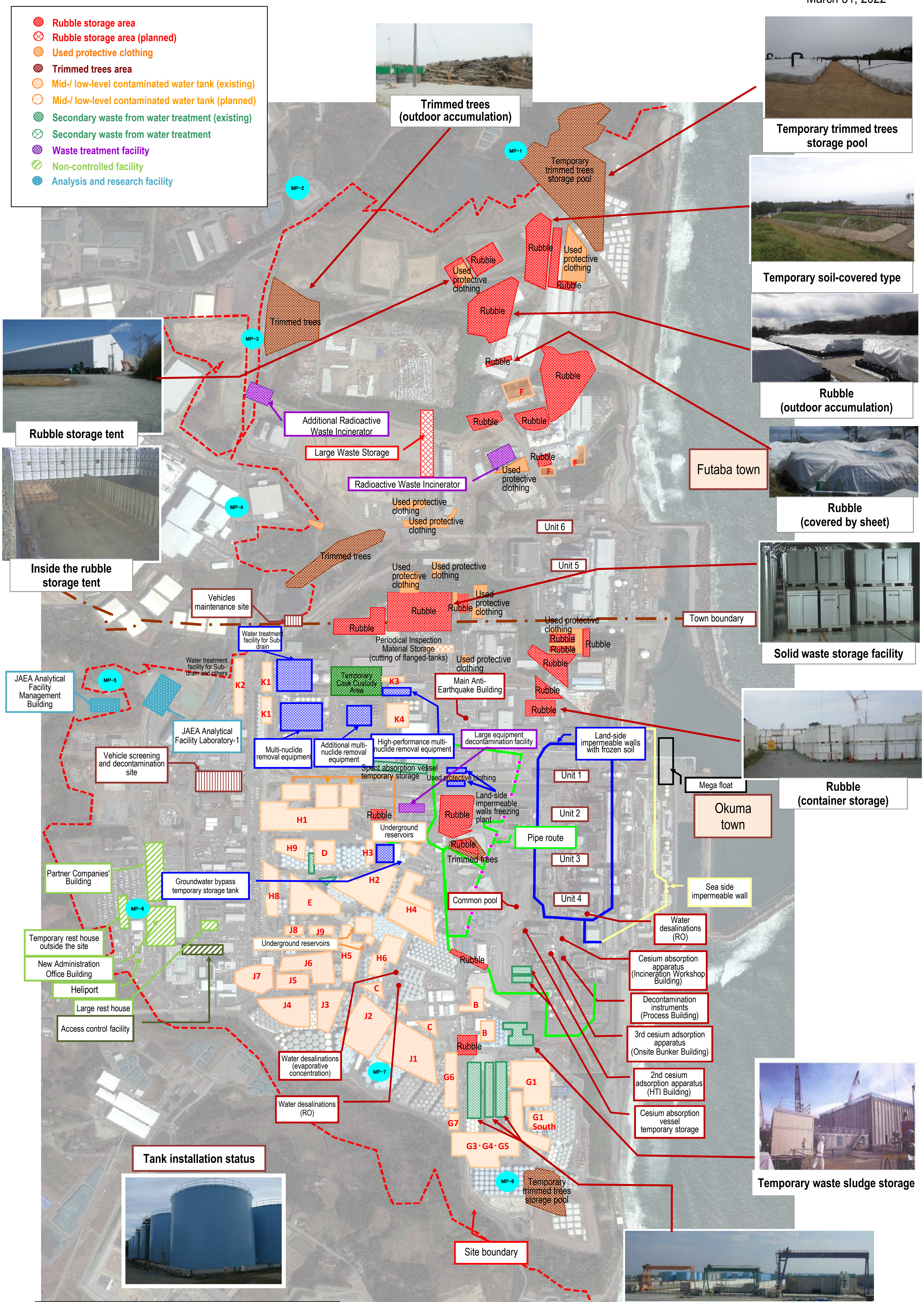
Note: Because safety of the sampling points was unassured due to the influence of Typhoon No. 10 in 2016, samples were taken from approx. 330 m south of the Unit 1-4 release outlet.
Samples were also taken from a point approx. 280m south from the same release outlet from January 27, 2017 and approx. 320m from March 23, 2018.

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

Appendix 2

March 31, 2022

TEPCO Holdings Fukushima Daiichi Nuclear Power Station Site Layout



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

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 m^3/day or less (within 2020)
- Suppressing the amount of contaminated water generated to 100 m^3/day or less (within 2025)

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

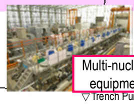
Contaminated water management [Remove]

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
- ▽Reduction of strontium by Cesium Adsorption Apparatus (KURION) (from 2015.1.6)
- ▽Reduction of strontium by 2nd Cesium Adsorption Apparatus (SARRY) (from 2014.12.26)
- ▽Purification of strontium-reduced water in flanged tanks complete
- ▽Purification of strontium-reduced water complete
- ▽Reduction of strontium by 3rd Cesium Adsorption Apparatus (SARRY II) (from 2019.7.12)
- ▽Treatment start of strontium-reduced water (ALPS: from 2015.12.4, additional: from 2015.5.27, high-performance: from 2015.4.15)
- ▽Multi-nuclide Removal Equipment (ALPS) (System A: from 2013.3.30, System B: from 2013.6.13, System C: from 2013.9.27, hot tests conducted)
- ▽Multi-nuclide Removal Equipment (additional ALPS)
- ▽Start of full-scale operation (from 2017.10.16)
- ▽Multi-nuclide Removal Equipment (high performance ALPS) (from 2014.10.18, hot tests conducted)

Cesium Adsorption Apparatus (KURION)

Landing of 2nd Cesium Adsorption Apparatus (SURRY)



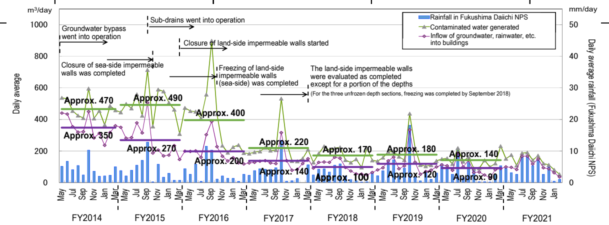
Multi-nuclide removal equipment (ALPS)

Removal of contaminated water from seawater pipe trench

【Removal of contaminated water in seawater pipe trench】

- ▽Trench Purification by mobile equipment
- Unit 2
  - ▽Completion of tunnel filling
  - ▽Transfer of stagnant water complete
  - ▽Completion of shaft filling
- Unit 3
  - ▽Completion of tunnel filling
  - ▽Transfer of stagnant water complete
  - ▽Completion of shaft filling (except for upper part of …)
- Unit 4
  - ▽Completion of tunnel filling
  - ▽Filling of openings II and III complete
  - ▽Transfer stagnant water complete
  - ▽Completion of filling parts running ove…

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

- ▽Installation start of land-side impermeable walls
- **▽Freezing start**
- Start of maintenance operation ▽
- ▽Start of maintenance operation on north and south sides
- ▽Freezing completion
- ▽Start of maintenance operation in all sections
- **▽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)

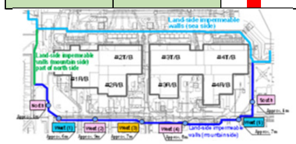
Contaminated water management [Retain]

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
- **▽Purification of strontium-reduced water in flanged tanks complete**
- ▽Water leakage (10L) from flanged tank
- ▽Work to raise fence height 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)



Legend	Range	Start day
	1st Stage Phase 1 freezing range	Mar.31,2016
	1st Stage Phase 2 freezing range	Jun.6,2016
	2nd Stage partial closure (i) freezing range	Dec.3,2016
	2nd Stage partial closure (ii) freezing range	Mar.3,2017
	3rd Stage freezing range	Aug.22,2017

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)

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Treatment of stagnant water		▽Installation of stagnant water transfer equipment/transfer start		▽Completion of work to improve reliability of transfer line (replacement with PE pipes)		▽Start to maintain water-level difference with sub-drain water level; ▽Transfer start from each building to Central Rw Building	▽Floor exposure of Unit 1 T/B	▽Separation of stagnant water between Units 3 and 4	▽Separation of stagnant water between Units 1 and 2; ▽Floor exposure of Unit 1 Rw/B		▽Floor exposure of Unit 2 T/B, Rw/B; ▽Floor exposure of Unit 3 T/B, Rw/B; ▽Floor exposure of Unit 4 R/B, T/B, Rw/B	▽Treatment of stagnant water in buildings complete	
Countermeasures to tsunami risks	Closure of openings			▽Examination start of measures to close building openings		complete; ▽Work for Units 1 and 2 T/B complete; ▽Work for HTI building complete			▽Work for Process Main Building complete; ▽Work for Unit 3 T/B complete		▽Work for Unit 1-3 R/B complete	▽Closure of openings complete; ▽Work of Unit 1-4 Rw/B complete	
	Seawall	▽Installation of outer-rise tsunami seawall complete								▽Construction start of Tsushima Trench Tsunami Seawall	Japan Trench tsunami seawall; ▽Completion of installation ▽on-site start		
	Mega float								▽Start of marine construction	Temporary grounding of mega float▽	▽Internal filling complete (reduction of tsunami risks)		

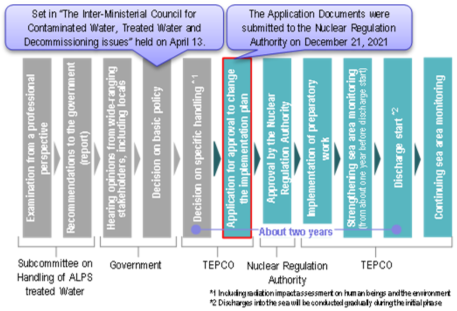
Chishima Trench Tsunami Seawall complete

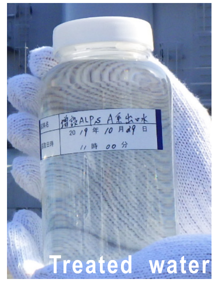
Construction of Japan Trench Tsunami Seawall

2 Handling of ALPS treated water

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

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





Examination concerning handling of ALPS treated water

2016.6 Report of Tritiated Water Taskforce

Tritiated Water Taskforce (2013.12 – 2016.5, 15 meetings)

Tank area viewed from the Large Rest House (2015.10.29)

2018.8 Explanatory and hearing meeting, receiving opinions

2020.2 Report of Subcommittee on Handling of ALPS treated water

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

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

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

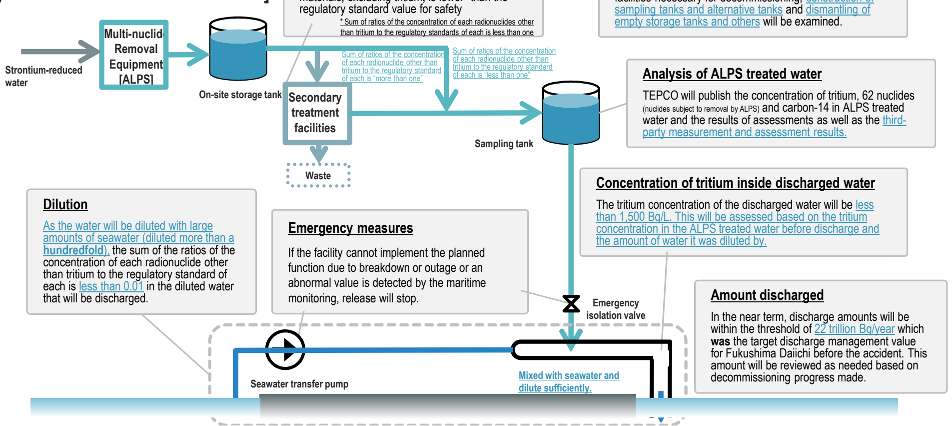
2021.12.21 The "Application Documents for Approval to Amend the Implementation Plan for Fukushima Daiichi Nuclear Power Station Specified Nuclear Facility" regarding ALPS treated water were submitted to the Nuclear Regulation Authority

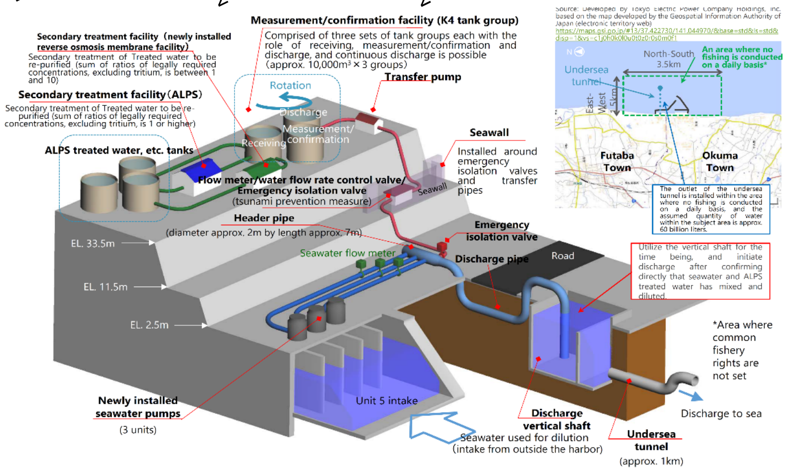
2021.12.28 "The Action Plan concerning the Continuous Implementation of the Basic Policy on Handling of ALPS Treated Water" was formulated

Review meeting concerning the implementation plan on handling of ALPS treated water (from 2021.7)

2014 2015 2016 2017 2018 2019 2020 2021 2022

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





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

Unit 4

▼ 2011.11- 2012.7 Removal of rubble on the Reactor Building top floor

▼ 2012.4-2013.3 Ground improvement and foundation work

▼ 2013.4-2013.7 Installation of external walls and roof panels

▼ 2013.6-2013.10 Installation of overhead crane and fuel-handling machine

▼ 2013.8-2013.10 Removal of rubble inside the reactor well and pool

▼ 2013.11.18 Start of fuel removal

▼ 2014.12.22 Fuel removal was completed (1533 assemblies)

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 3

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

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

▼ 2013.10 Completion of removal of large rubble on the Reactor Building top floor

▼ 2015.8 Completion of removal of the fuel-handling machine B within the spent fuel pool

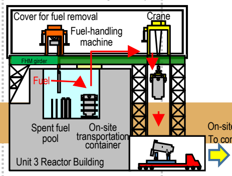
▼ 2016.12 Completion of shielding on the Reactor Building top floor

▼ 2017.1 Installation start of a cover for fuel removal

▼ 2019.4.15 Start of fuel removal

▼ 2021.2.28 Fuel removal completed (566 assemblies)

Overview of the fuel-handling facility inside the cover



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

Unit 2

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

▼ 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

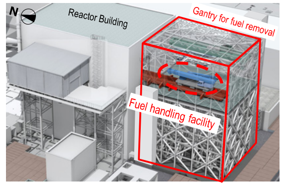
▼ 2018.8-2020.12 Moving and containment of remaining objects

▼ 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)



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 1

▼ 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

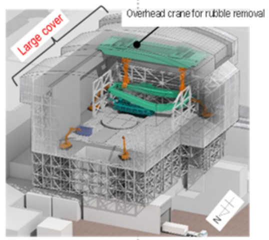
▼ 2021.8 Start of large cover pre-work

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

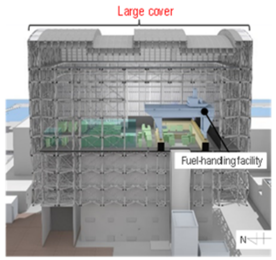
As part of efforts to remove fuel from the Unit 1 spent fuel pool, investigations are underway to ascertain the conditions of the fallen roof on the south side and the contamination of the well plug. Based on the results, “the method initially installing a large cover over the Reactor Building, then 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 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)

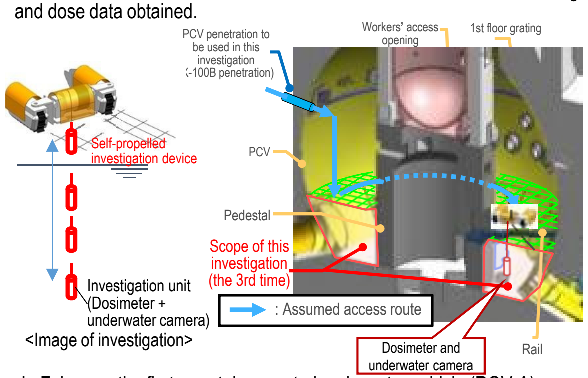
Start of fuel debris retrieval from the first unit (Unit 2). Expanding the scale in stages (within 2021 * The schedule will be extended for about 1 year due to the spread of COVID-19 infections)

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

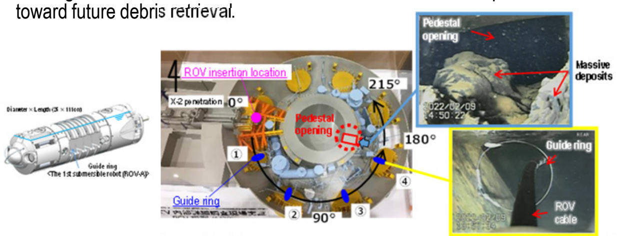
・In April 2015, a device having entered the inside of the PCV via a narrow opening (bore:φ100 mm) collected information such as images and airborne dose inside the PCV 1st floor.

・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>

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



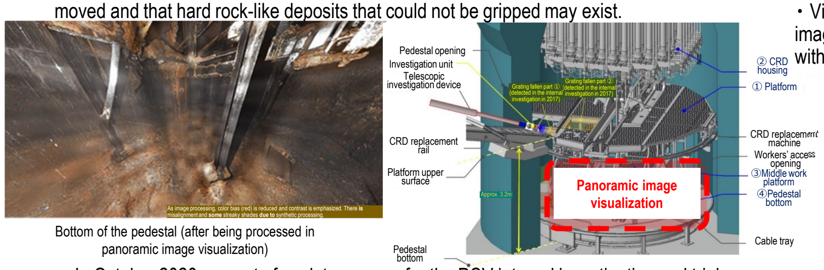
<Status inside the PCV (February 9)>

Unit 2 Investigation overview

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

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

・In February 2019, an investigation touching the deposits at the bottom of the pedestal and on the platform was conducted and confirmed that the pebble-shaped deposits, etc. could be moved and that hard rock-like deposits that could not be gripped may exist.

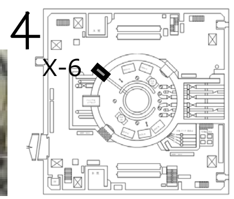


Bottom of the pedestal (after being processed in panoramic image visualization)

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

<Conditions of deposits before and after contact>

<Work in front of the penetration>



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

Unit 3 Investigation overview

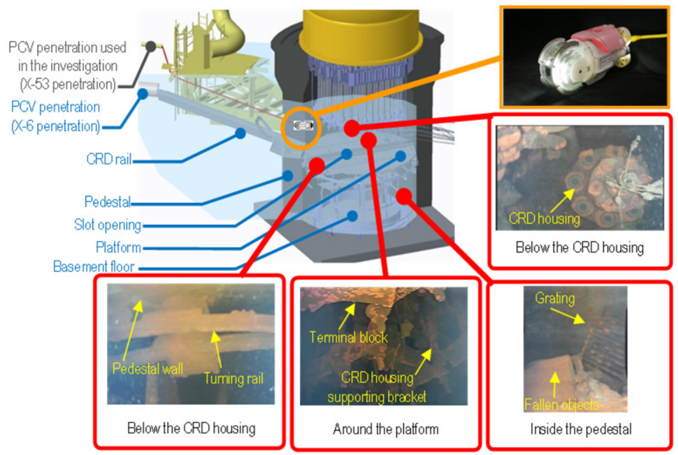
・In October 2014, the conditions of X-53 penetration, which may be under water and which is scheduled for use to investigate the inside of the PCV, was investigated via remote-controlled ultrasonic test equipment. The results showed that the penetration was not under water.

・In October 2015, to confirm the conditions inside the PCV, an investigative device was inserted into the PCV from X-53 penetration to obtain images, data on dosage and temperature and sample stagnant water. No damage to the structure and walls inside the PCV was identified and the water level was almost identical to estimated values. In addition, the dose inside the PCV was confirmed to be lower than in other Units.

・In July 2017, the inside of the PCV was investigated using the underwater ROV (remotely operated underwater vehicle) to inspect the inside of the pedestal. Analysis of the imagery obtained in the investigation identified damage to multiple structures and the supposed core internals.

・Videos obtained in the investigation were reproduced in 3D. Based on the reproduced images, the relative positions of the structures, such as the rotating platform slipping off the rail with a portion buried in deposits, were visually understood.

<Conditions inside the pedestal>



Unit 1 PCV internal investigation

Investigations inside the PCV	1st (2012.10)	- Acquiring images - Measuring the air temperature and dose rate - Measuring the water level and temperature - Sampling stagnant water - Installing permanent monitoring instrumentation
	2nd (2015.4)	Confirming the status of the PCV 1st floor - Acquiring images - Measuring the air temperature and dose rate - Replacing permanent monitoring instrumentation
	3rd (2017.3)	Confirming the status of the PCV 1st basement floor - Acquiring images - Measuring the dose rate - Sampling deposit - Replacing permanent monitoring instrumentation
Leakage points from PCV	- PCV vent pipe vacuum break line bellows (identified in 2014.5) - Sand cushion drain line (identified in 2013.11)	
Evaluation of the location of fuel debris inside the reactor by measurement using muons Confirmed that there was no large fuel in the reactor core. (2015.2-5)		

Unit 2 PCV internal investigation

Investigations inside the PCV	1st (2012.1)	- Acquiring images - Measuring the air temperature
	2nd (2012.3)	- Confirming water surface - Measuring the water temperature - Measuring the dose rate
	3rd (2013.2 – 2014.6)	- Acquiring images - Sampling stagnant water - Measuring water level - Installing permanent monitoring instrumentation
	4th (2017.1-2)	- Acquiring images - Measuring the dose rate - Measuring the air temperature
	5th (2018.1)	- Acquiring images - Measuring the dose rate - Measuring the air temperature
	6th (2019.2)	- Acquiring images - Measuring the dose rate - Measuring the air temperature - Determining characteristics of a portion of deposit
Leakage points from PCV	- No leakage from the torus chamber rooftop - No leakage from any internal/external surfaces of S/C	
Evaluation of the location of fuel debris inside the reactor by measurement using muons The existence of high-density materials, which were considered to constitute fuel debris, was confirmed at the bottom of RPV and in the lower part and outer periphery of the reactor core. It was assumed that a significant portion of fuel debris existed at the bottom of RPV. (2016.3-7)		

Unit 3 PCV internal investigation

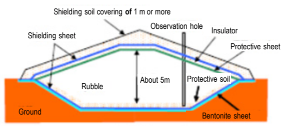
Investigations inside the PCV	1st (2015.10-12)	- Acquiring images - Measuring the air temperature and dose rate - Measuring the water level and temperature - Sampling stagnant water - Installing permanent monitoring instrumentation (2015.12)
	2nd (2017.7)	- Acquiring images - Installing permanent monitoring instrumentation (2017.8)
Leakage points from PCV	- Main steam pipe bellows (identified in 2014.5)	
Evaluation of the location of fuel debris inside the reactor by measurement using muons The evaluation confirmed that no large lump existed in the core area where fuel had been placed and that a portion of the fuel debris potentially existed at the bottom of the RPV. (2017.5-9)		

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

5 Management of solid radioactive waste

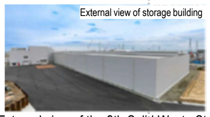
Milestones of the Mid- and-Long-Term Roadmap (major target processes)
Eliminating temporary outdoor storage of rubble and others * Except for secondary waste of water treatment and materials for reuse or recycling (within FY2028)

★ 2016.3 Announcement of Storage Management Plan of Solid Waste (Ver. 1)
★ 2017.6 Revision ★ 2018.6 Revision ★ 2019.6 Revision ★ 2020.7 Revision ★ 2021.7 Revision



<Outline of soil-covered temporary storage facility>

▼ 2012.9 Transfer start of rubble to the soil-covered temporary storage facility
▼ 2013.1 Start of volume reduction of trimmed trees and storage in temporary storage tank A
▼ 2015.6 Transfer start of rubble to the soil-covered temporary storage facility (Tank 3)



External view of the 9th Solid Waste Storage

▼ 2014.7 Start of pre-work
9th Solid Waste Storage
▼ 2018.2 Operation start


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

▼ 2019.6 Start of building construction
1st Large Waste Storage

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

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)

▼ 2017.4 Start of pre-work
Additional Solid Waste Incinerator
2017.10 Installation work gets
▼ 2018.5 Operation start
Large Equipment Decontamination Facility


External view of Large Equipment Decontamination Facility

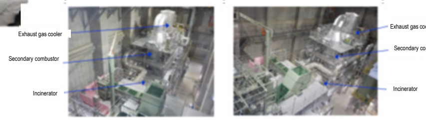
▼ 2020.9 Start of pre-work
Compaction Facility

Site of Volume Reduction Facility


Whole view of Solid Waste Incinerator


Electrical room


Control room



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

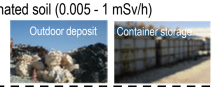
Present status Note

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

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

Estimate for the next decade (or so) Approx.**790,000** m³ (*2)

- Approx. 290,000 m³
- Approx. 60,000 m³
- Approx. 60,000 m³
- Approx. 170,000 m³
- Approx. 220,000 m³
- Approx. 6,500 tanks

Status after a decade

Legend: Newly installed equipment and facility

Incineration

To (A) (*1)

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


Crusher example

Radioactive Waste Incinerator

Additional Radioactive Waste Incinerator (scheduled for completion in FY2021)
2021.3 The installation process was reviewed
Toward **an operation launch** within FY2021, installation work continues


Work of main part

Stored and managed in Solid Waste Storage as done for rubble

Volume reduction

To (A) (*1)

Compaction Facility (scheduled for completion in FY2022)


Concrete crusher example


Metal cutter example

Melting

Melting equipment


Electric furnace example

To (B)

Treatment measures and others will be examined

(*3) Approx. **270,000** m³ (*2)

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

Storage /management

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

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

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

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

Reuse will be examined

Spent Adsorption Vessel Temporary Storage

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


Work of main part

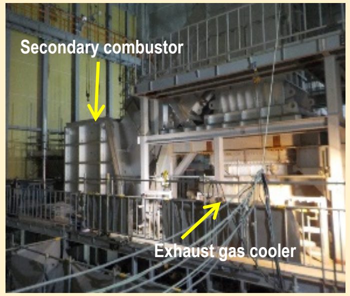
(*1) Items for which incineration, compaction, melting or reuse is difficult are stored directly in Solid Waste Storage without being treated
(*2) As values less than 10,000 m³ are rounded, they may not be consistent with the total of breakdown
(*3) In the estimate, approx. 250,000 m³ of waste will be stored in Solid Waste Storage at the end of FY2028.

● 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.

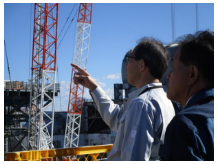
External view of Access Control Facility

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

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

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

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



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.

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.

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

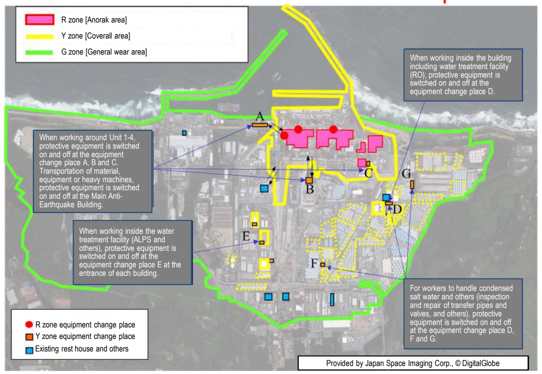
From May 2013, full-face mask unnecessary area was expanded sequentially.

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

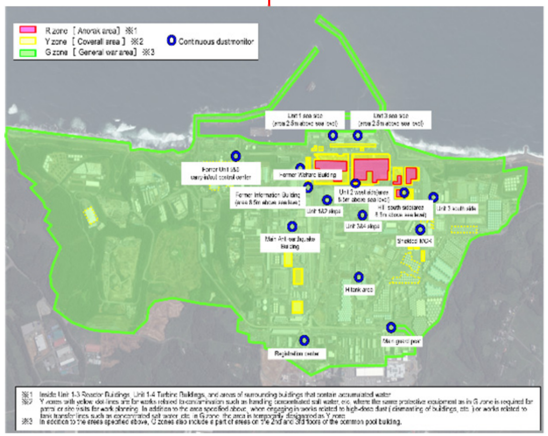
In March 2017, the G-zone area was expanded (to cover 95% of the whole site).

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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