Outline of Decommissioning, Contaminated Water and Treated Water Management

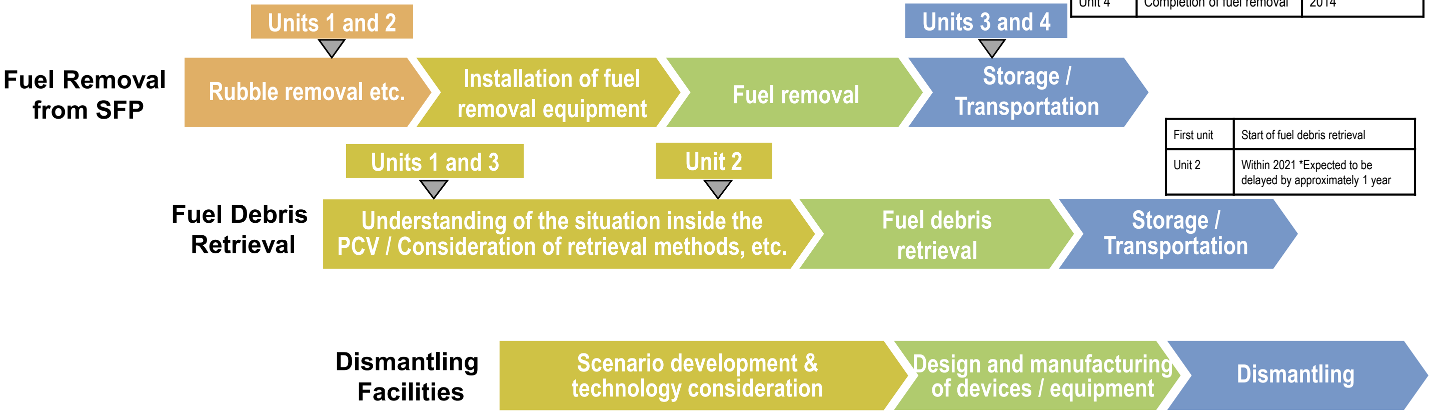
June 30, 2022
Secretariat of the Team for Countermeasures for
Decommissioning, Contaminated Water and Treated Water

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

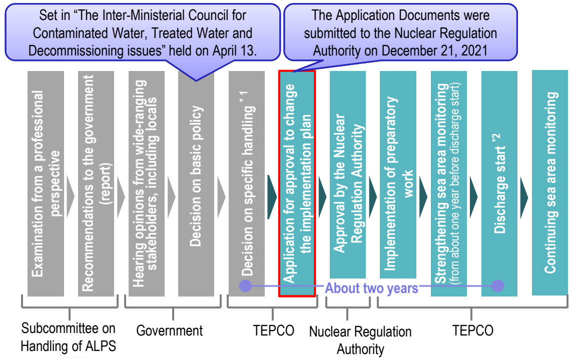


First unit	Start of fuel debris retrieval
Unit 2	Within 2021 *Expected to be delayed by approximately 1 year

Measures for treated water

Handling of ALPS treated water

Regarding the discharge of ALPS treated water into the sea, TEPCO must comply with regulatory and other safety standards to safeguard the public, the surrounding environment and agricultural, forestry and fishery products. To minimize adverse impacts on reputation, monitoring will be further enhanced and objectivity and transparency ensured by engaging with third-party experts and having safety checked by the IAEA. Moreover, accurate information will be disseminated with full transparency on an ongoing basis.



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

Contaminated water management – triple-pronged efforts -

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

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

- Strontium-reduced water from other equipment is being re-treated in the Advanced Liquid Processing System (ALPS: multi-nuclide removal equipment) and stored in welded-joint tanks.
- Multi-layered contaminated water management measures, including land-side impermeable walls and sub-drains, have stabilized the groundwater at a low level and the increased contaminated water generated during rainfall is being suppressed by repairing damaged portions of building roofs, facing onsite, etc. Through these measures, the generation of contaminated water was reduced from approx. 540 m^3/day (in May 2014) to approx. 130 m^3/day (in FY2021).
- Measures continue to further suppress the generation of contaminated water to 100 m^3 /day or less within 2025.

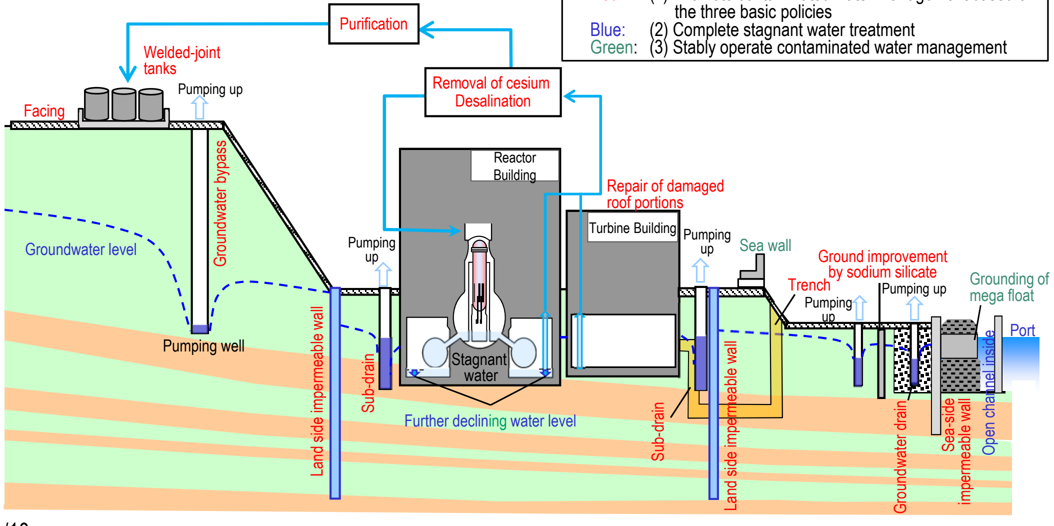
(2) Efforts to complete stagnant water treatment

- To reduce the stagnant water levels in buildings as planned, work to install additional stagnant water transfer equipment is underway. At present, the floor surface exposure condition can be maintained except for the Unit 1-3 Reactor Buildings, Process Main Building and the High-Temperature Incinerator Building.
- In 2020, treatment of stagnant water in buildings was completed, except for the Unit 1-3 Reactor Buildings, Process Main Building and High-Temperature Incinerator Building. For Reactor Buildings, the amount of stagnant water there will be reduced to about half the amount at the end of 2020 during the period FY2022-2024.
- For zeolite sandbags on the basement floors of the Process Main Building and High-Temperature Incinerator Building, measures to reduce the radiation dose are being examined with stabilization in mind.

(3) Efforts to stably operate contaminated water management

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

Red:	(1) Promote contaminated water management based on the three basic policies
Blue:	(2) Complete stagnant water treatment
Green:	(3) Stably operate contaminated water management



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

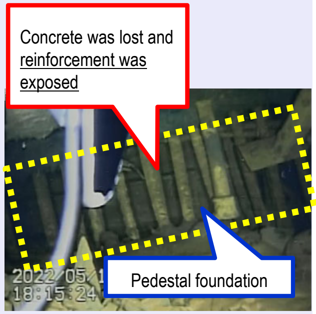
Progress status

◆ 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.

Unit 1 Consideration concerning the exposure of pedestal reinforcement

The status of the pedestal peripheral inside the Primary Containment Vessel (PCV) was investigated. The results showed that on the wall of the pedestal opening, a table-shaped deposit was detected and on the wall under the deposit, concrete was lost and reinforcement and others were exposed.

Based on the present information and others, The Impact of pedestal damage on the plant was considered. The results showed that the potential of an earthquake to cause significant damage was low. Also considered was the fact that even if the support capability of the pedestal decreased, the risk of significant radiation exposure would not be presented to those in surrounding areas. We will continue the PCV internal investigation and accumulate more knowledge.

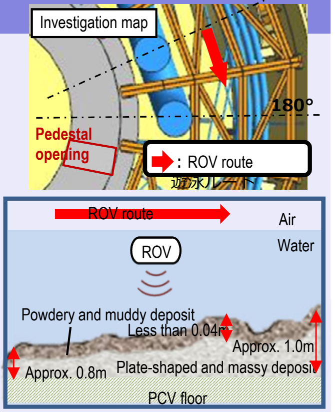


<Status near the pedestal foundation>

Unit 1 As part of the PCV internal investigation, the deposit thickness was measured

During June 7-11, the thickness of deposits was measured using the remotely operated robot, the submersible ROV-C.

In this investigation, to detect where deposits with different characteristics, such as powdery, muddy, plate-shaped or massy were located and how thick they were, measurement was made at 13 points within the pedestal peripheral. At present, evaluation of three points was completed and the process continues.



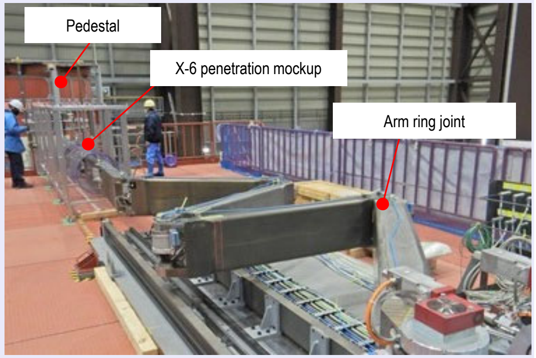
<Status of deposits near the pedestal opening>

Unit 2 Trial fuel debris retrieval equipment is being improved

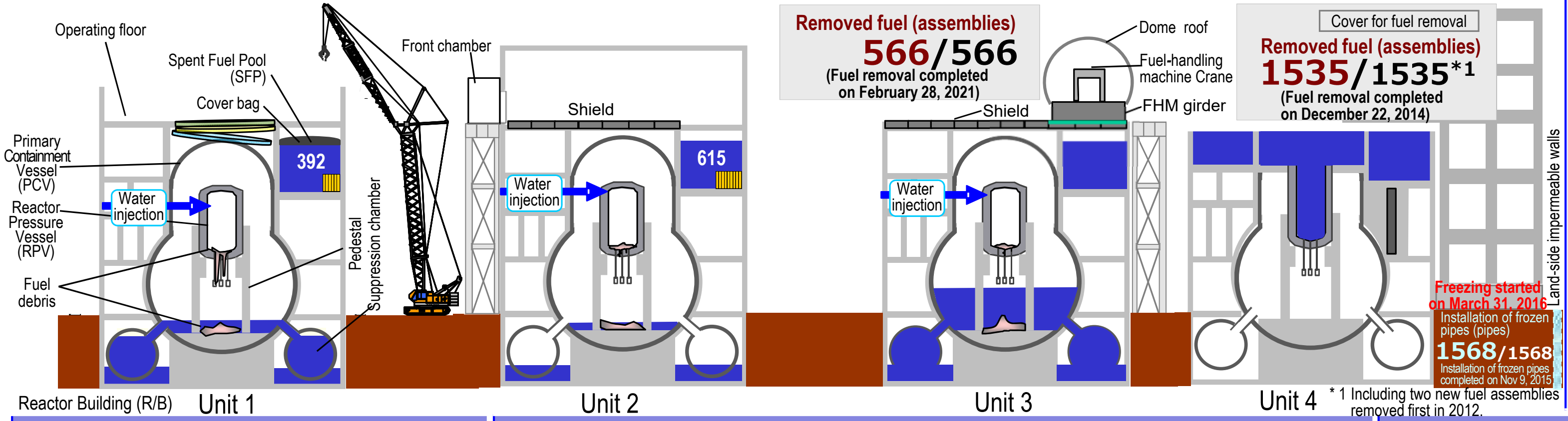
During the test to verify the performance of the trial retrieval equipment, points for which improvement is expected are being checked.

For the robot arm, to reduce the contact risk detected in the test to verify the capability to penetrate the X-6 penetration, the operational accuracy and other aspects are being improved. For the dual arm manipulator, other improvements made include modifying the tool structure.

In response to damage detected in the isolation room, the isolation room was removed and other measures are being examined, including structural modification.



<Test to verify the capability to penetrate the X-6 penetration>



Status of work to remove a portion of pipes for Units 1 and 2 standby gas treatment system

On June 10, cutting of the second of 16 sections of the SGTS pipes started. When about 90% of the cutting had been completed, biting of the wire saw was detected.

On June 14, during work toward resuming the cutting, a problem occurred with the temporary dust monitor and the winch of the wire saw. Work was suspended without cutting.

After identifying the cause and implementing recurrence prevention measures, cutting will resume.

Toward fuel removal from the Unit 2 spent fuel pool, mockup of work to remove interferences is underway

Inside the building, the existing fuel-handling machine having been installed over the spent fuel pool was transferred to the north side of the Reactor Building by June 13. Moreover, a mockup toward removing the fuel-handling machine, which is scheduled from July, started from June 7. The feasibility of the dismantling method, rubble treatment, dust scattering prevention and others is being verified and proficiency training is underway.

Outside the building, toward installing the gantry foundation, work to excavate the area for the installation in the yard on the south side of the building was completed on June 9. To complete in around November, work for the installation proceeds.

<Mockup to remove the fuel handling machine room>

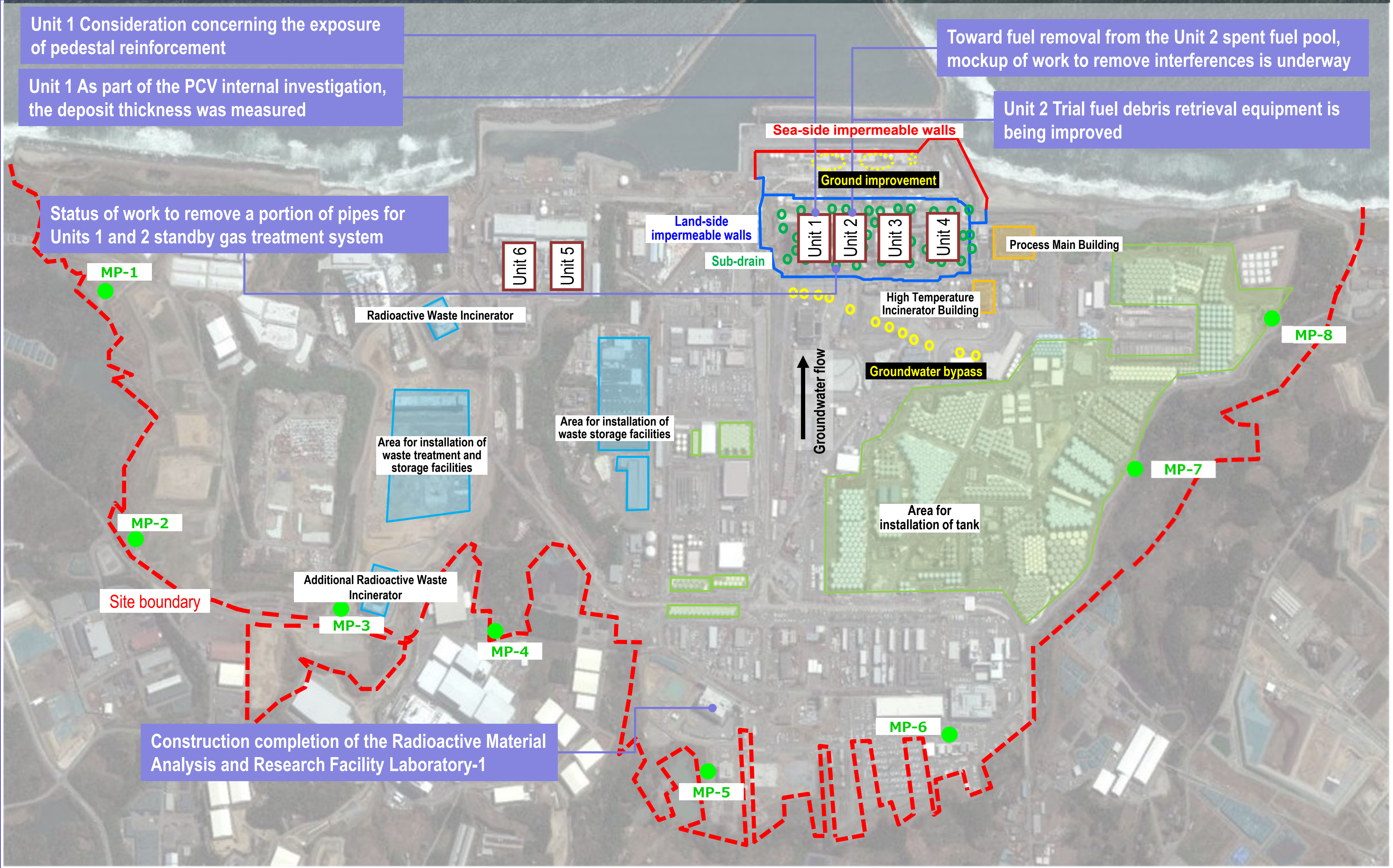
Construction completion of the Radioactive Material Analysis and Research Facility Laboratory-1

The Japan Atomic Energy Agency (JAEA) had been constructing the Radioactive Material Analysis and Research Facility Laboratory-1 within the site of the Fukushima Daiichi Nuclear Power Station, as part of research and development into waste treatment and handling. After finishing the comprehensive functional test and others, construction was completed on June 24.

Following the operation test and others, analytical work will commence.

<Radioactive Material Analysis and Research Facility Laboratory-1 >

Major initiatives – Locations on site



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

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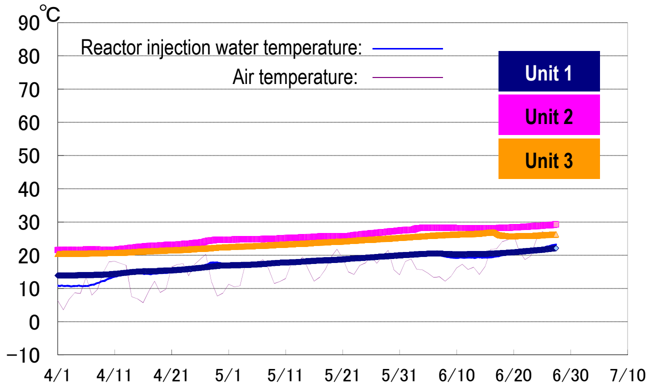
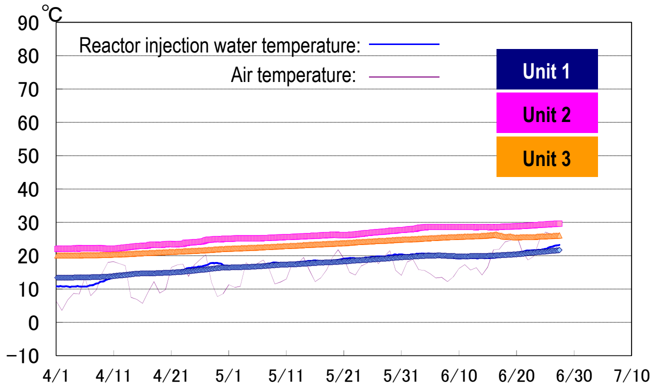
I. Confirmation of the reactor conditions

Temperatures inside the reactors

Through continuous reactor cooling by water injection, the temperatures of the Reactor Pressure Vessel (RPV) bottom and the Primary Containment Vessel (PCV) gas phase were maintained within the range of approx. 20 to 35°C for the past month, though it varied depending on the unit and location of the thermometer.

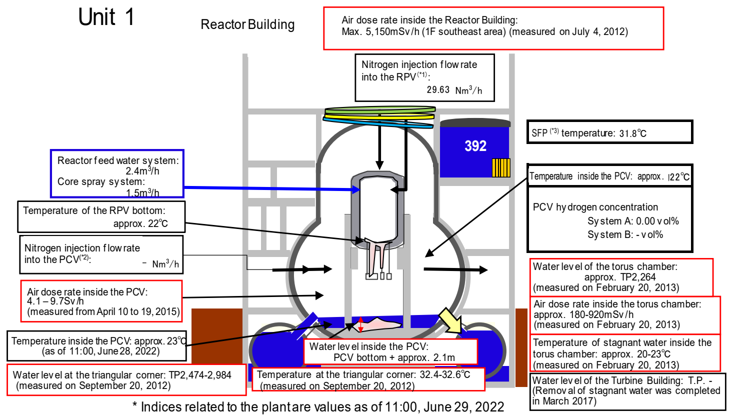


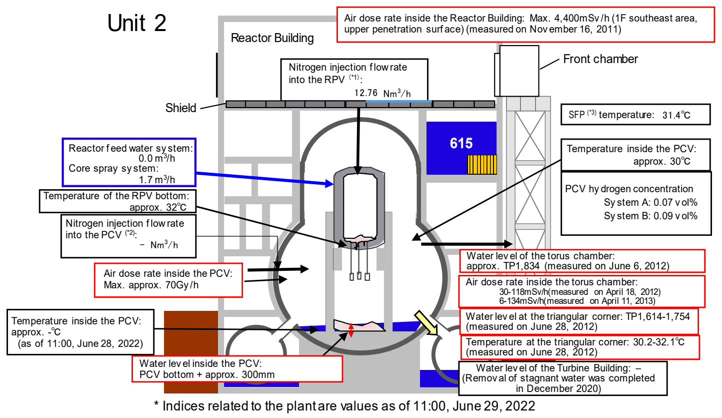
RPV bottom temperatures (recent quarter)

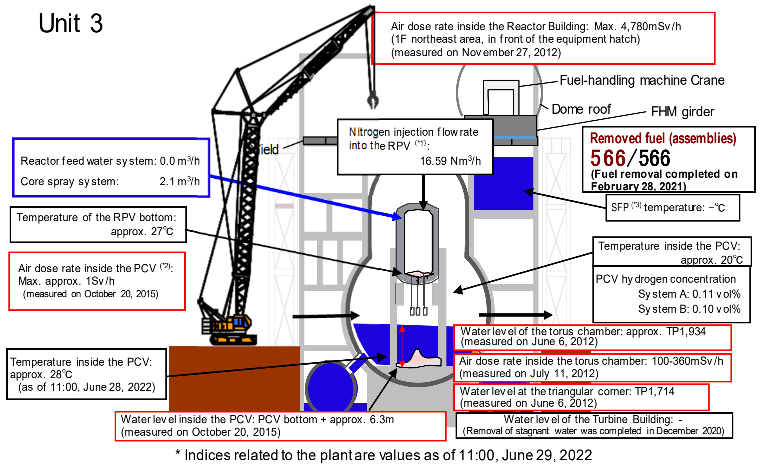


PCV gas phase temperatures (recent quarter)

*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.





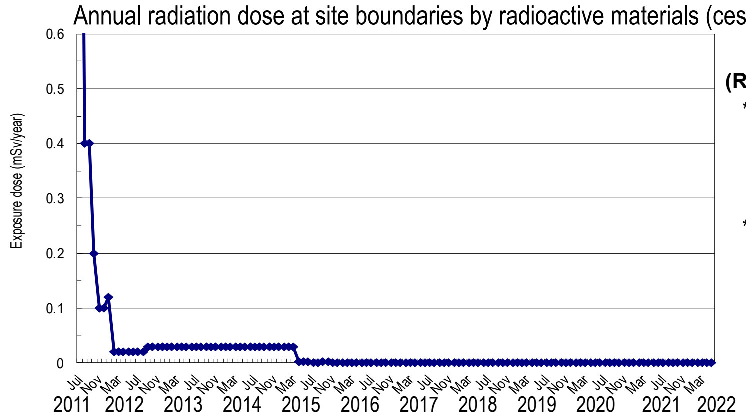


（*1）RPV (Reactor Pressure Vessel)
（*2）PCV (Primary Containment Vessel)
（*3）SFP (Spent Fuel Pool)

Release of radioactive materials from the Reactor Buildings

As of May 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. 3.5 × 10^{-12} Bq/cm³ and 3.3 × 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 0.00007 mSv/year.

Annual radiation dose at site boundaries by radioactive materials (cesium) released from Reactor Building Units 1-4



(Reference)

- * The concentration limit of radioactive materials in the air outside the surrounding monitoring area:
  [Cs-134]: 2 x 10^{-5} Bq/cm$^{3\text{Marc}}$
  [Cs-137]: 3 x 10^{-5} Bq/cm³
- * Data of Monitoring Posts (MP1-MP8).
  Data of Monitoring Posts (MPs) measuring the air dose rate around the site boundary showed 0.321 – 1.052 μSv/h (May 25 – June 28, 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.

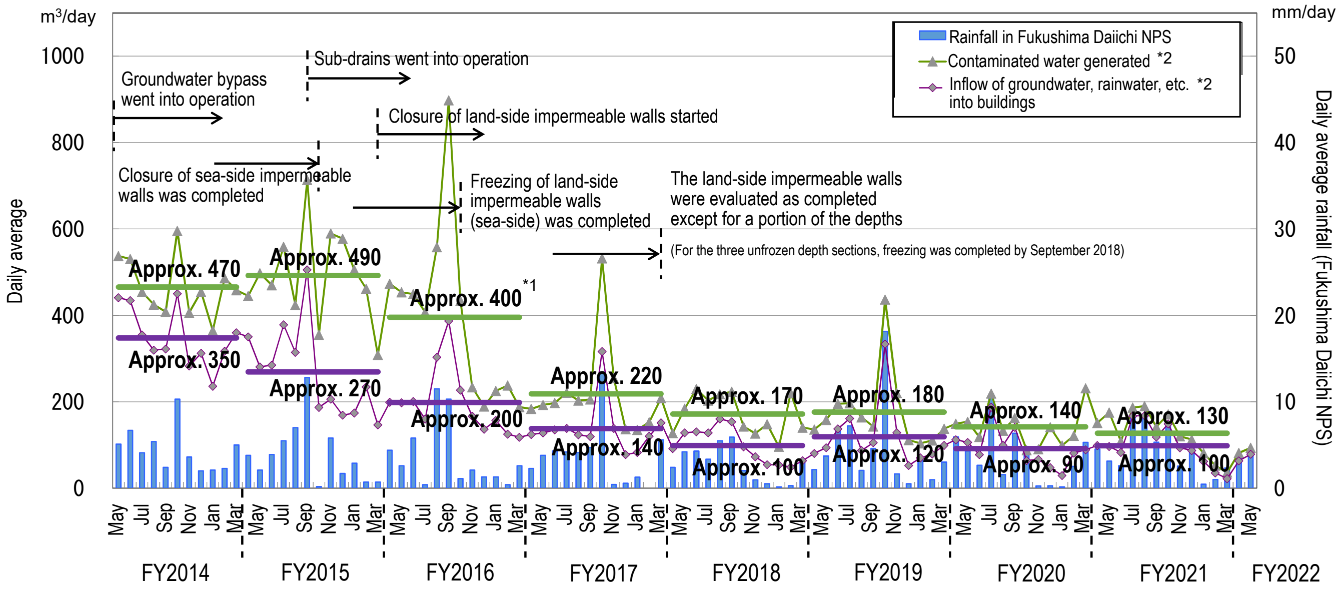
Based on the above, it was confirmed that the comprehensive cold shutdown condition had been maintained and the reactors remained in a stabilized condition.

II. Progress status by each plan

Measures for contaminated water and treated water

➢ Status of contaminated water generated

- Multi-layered measures, including pumping up by sub-drains and land-side impermeable walls, which were implemented to control the continued generation of contaminated water, suppressed the groundwater inflow into buildings.
- After implementing “redirecting” measures (groundwater bypass, sub-drains, land-side impermeable walls and others) and rainwater prevention measures, including repairing damaged portions of building roofs, the amount of contaminated water generated within FY2021 declined to approx. 130 m³/day.
- Measures will continue to further reduce the amount of contaminated water generated.



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

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

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

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

- At the Water-Treatment Facility special for Sub-drain & Groundwater drains, release started from September 14, 2015 and up until June 21, 2022, 1,884 releases had been conducted.
- The water quality of all temporary storage tanks satisfied the operation target.

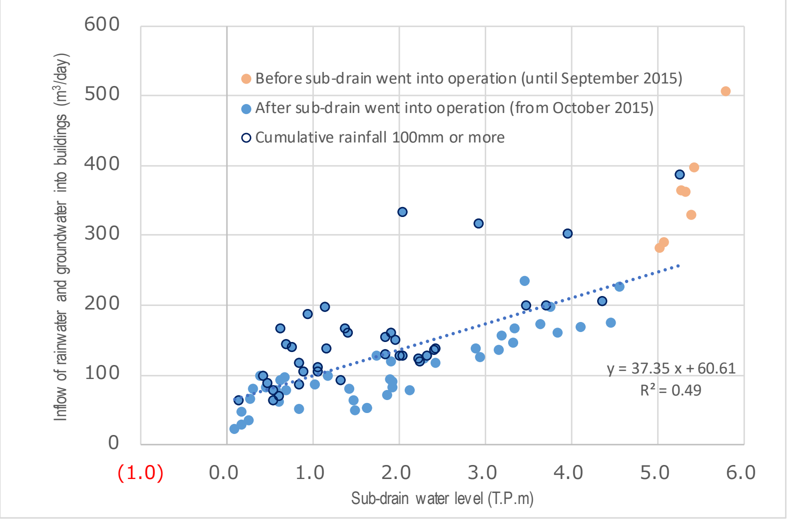


Figure 2: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Units 1-4 sub-drains

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

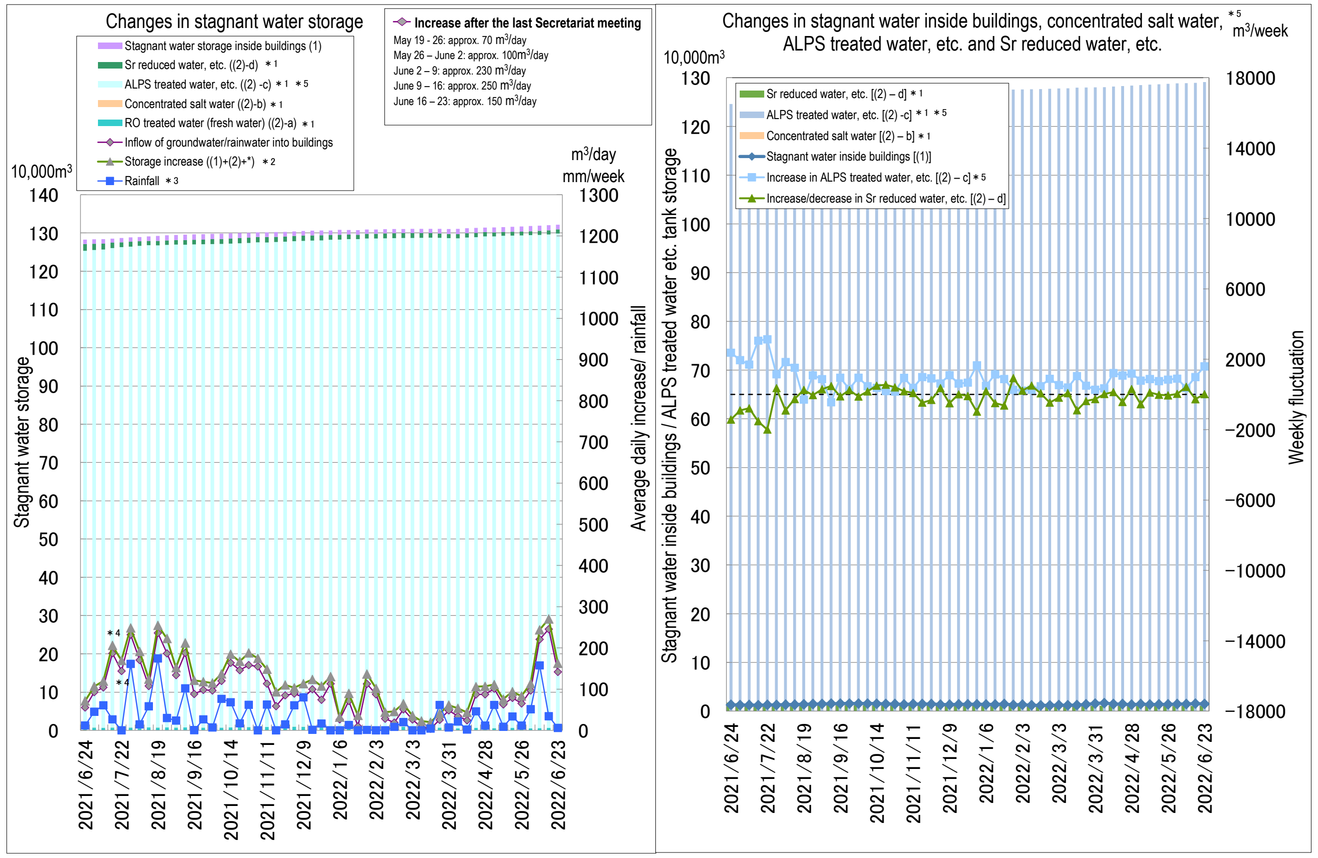
Operation of multi-nuclide removal equipment

- Regarding the multi-nuclide removal equipment (existing), hot tests using radioactive water are ongoing (System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013). On March 23, 2022, a pre-service inspection certificate was granted by the Nuclear Regulation Authority and the entire pre-service inspection was completed. The (additional) multi-nuclide removal equipment went into full-scale operation from October 16, 2017. Regarding the (high-performance) multi-nuclide removal equipment, hot tests using radioactive water have been underway (from October 18, 2014).
- As of June 23, 2022, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 484,000, 738,000 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 June 23, 2022, approx. 680,000 m³ had been treated.

Risk reduction of strontium-reduced water

- To reduce the risks of strontium-reduced water, treatment using existing, additional and high-performance multi-nuclide removal equipment is underway. Up until June 23, 2022, approx. 845,000 m³ had been treated.

As of June 23, 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. (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

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

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

* : Range of the minimum – maximum values detected during April 2018 – March 2020 in the database below

In Japan (including off the coast of Fukushima Prefecture)

Tritium concentration:	0.043 - 20 Bq/L
Cesium-137 concentration:	0.0010 - 0.38 Bq/L

Off the coast of Fukushima Prefecture

Tritium concentration:	0.043 - 0.89 Bq/L

Cesium-137 concentration: 0.0013 - 0.38 Bq/L

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

- For the status of fish and seaweed, samples were not collected in April, but measurement is underway for samples collected in May.

➢ Measures to reduce contamination of reused tanks in E area, residual water transfer inside the flanged tank D2 was completed and sludge collection from D1 was started

- In response to an equivalent level of α-nuclide to contaminated water in the buildings, which was detected from the sludge inside E area D1/D2 tanks, as a measure to reduce the leakage risk, supernatant water inside the tanks was transferred to the Process Main Building.
- For the D2 tank, residual water 10 cm from the tank bottom was transferred to D1 tank by June 3.
- For the D1 tank, the facilities necessary to collect sludge (including to prevent dust scattering and protect against radiation) were installed and sludge collection started from June 23. The process will be refined based on the amount of sludge collected and the measured internal dose.

➢ Measures to reduce contamination of reused tanks

- From tanks to store strontium-reduced water and others to tanks to store ALPS treated water and others, the reuse of welded-joint tanks proceeds.
- To minimize the sum of concentration ratios required by law, based on the condition inside the tanks after treating residual water and the storage record, reused tank areas are classified into three categories (1)-(3), with measures being implemented and examination underway in each case.
- Among them, tanks in the Category (3) (accepting “water undergoing treatment” without decontamination) area became full and the analytical results of the stored water conducted as STEP1 showed that the sum of concentration ratios required by law of 7 nuclides (water undergoing treatment) exceeded 1.
- Before being discharged into the sea, the water will be purified until the sum of 62 nuclides + Carbon-14 becomes less than 1.
- As the next STEP2, by accepting ALPS treated water to the emptied “source tanks,” the sum of concentration ratios required by law is expected to decline to under 1.

➢ In-service of G4-North and G5 tanks

- Among tanks installed for the “long-term storage of ALPS treated water” (1,340,000 m^3), the use of K4 tank area (approx. 30,000 m^3) will be changed to a “discharge facility necessary to strictly measure and evaluate the radioactivity concentration.”
- Accordingly, the K4 tank area needs to be modified to realize the change. As a substitute to the K4 tank area, new tank areas of equivalent capacity (G4-North and G5) will be installed.
- Among the newly installed tank areas, for G4-North, pre-service inspection was completed (on June 3, 2022,), the completion certificate was granted (on June 21, 2022) and in-service became ready.
- To modify the K4 tank area to a “discharge facility necessary to strictly measure and evaluate radioactivity concentration,” examination was made based on the “circulation and stirring test (conducted in February 2022)” and the review in the “review meeting concerning the implementation plan on handling of ALPS treated water” and others. As the results suggested that removal of the entire K4 tank area would not be needed, only the minimum amount of approx. 1,650m^3, necessary for circulation and stirring, will be removed.

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

- At present, among HICs whose integral dose was evaluated as exceeding 5,000kGy, the transfer was completed for seven units.
- For the 4th HIC, which marked the highest Sr-90 concentration, transfer was completed on May 19. The dust concentration was below the management value in the work area and no internal exposure of workers was detected. Work was completed with exposure of workers below the management value (γ-ray: 0.8 mSv, β-ray: 5 mSv).
- During transfer for the 5th HIC, the set value (high alert) to detect any abnormal status of dust concentration inside the work house at an early stage was exceeded. Work was suspended in accordance with predefined procedures.
- After investigating the cause, the dust increase was considered attributable to dust adhering to the floor cover sheet and the hose inside the house. As a countermeasure, covers were added over the hose and others to suppress scattering. Transfer for the 5th HIC was completed on June 9.
- For the 6th and following HICs, after implementing the above measures, work was completed with the dust concentration below the management value.

➢ Environmental preparation for the facility to dilute and discharge ALPS treated water at the Fukushima Daiichi Nuclear Power Station

- Regarding the excavation, work started from May 5 when weather and marine meteorology conditions had recovered and as of June 27, approx. 7,300m^3 had been excavated. At present, no significant values were detected in the seawater sampling, seawater turbidity measurement and analysis of the excavated seabed soil.
- Initially, around 10,000 m^3 of excavation was assumed, including over excavation*, but the planned depth was reached. Using the results of the deep and shallow survey conducted on June 28, whether the excavation proceeded as planned was verified. Based on the results, installation of the discharge outlet caisson was deemed available and the excavation of the seabed had been completed. Subsequently, to cover the seabed after excavation, rubble stone will be injected over the seabed by crane ships to level the rubble stone surface.

  * Over excavation: With evacuation accuracy affected by ship motion and evacuation by the bucket in mind, conducted in addition to the depth and cross-section required by design and generally used in marine construction.
- As environmental preparation on land, soil retaining and excavation and others for the shaft (upstream pool) have been underway since June 2. Subsequently, the environmental preparation for the shaft (downstream pool) will be conducted.
- Construction of the discharge tunnel and others will be implemented based on the approval of the implementation plan and others.

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.
- From April 13, 2022, drilling to install an anchor in the building started. Work has proceeded carefully, mitigating the exposure risk of workers using a remotely operated anchor drilling equipment and suctioning dust.
- Moreover, during work, the dust concentration is monitored by on-site dust monitors to check for any significant fluctuation.

➢ 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 and contamination reduction was confirmed based on smear sampling results. Installation of shielding started from February within the range including above the reactor well, where the dose was observed to peak and will be completed at the end of May.
- From October 28, 2021, ground improvement work started before installing the gantry for fuel removal and was completed on April 19, 2022. Work to install the gantry foundation will then proceed.

- Outside the site, work to prepare a yard for ground assembly of steel frames was completed on March 18. Before the ground assembly from July, preparation will proceed.

➢ Results of the investigation toward removing high-dose equipment inside the Unit 4 spent fuel pool and others

- Inside the Unit 4 dryer separator pool (DSP), reactor well and spent fuel pool (SFP), high-dose equipment and others, which were used in the core during operation, are stored. With the aim of examining methods to remove these high-dose pieces of equipment and locations to store them and confirming new concerns over deformation and damage, the status inside the pools was investigated and the dose was measured.
- In the investigation, the storage status of equipment inside the pools were checked by an underwater drone and camera. The dose near the subjects (0-0.2m) was also measured by the underwater dosimeter (without collimating).
- The investigative results showed no new concerns that would affect removal of the high-dose equipment. Based on the results, detailed examination will proceed to start removal from the 2nd half of FY2024.

➢ Effort status toward fuel removal at Unit 6

- Inside the Unit 6 spent fuel pool, 1,456 spent fuel assemblies are stored. They will be contained in the transportation casks used in the previous transfer and transported to the common pool.
- To secure space in the common pool to accept the assemblies, the existing spent fuel stored in the common pool will be contained in the dry cask and transported inside the site from the common pool building to a Temporary Cask Custody Area to store the assemblies.
- Removal of Unit 6 spent fuel will start around the end of August and be completed around the end of FY2023.

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 from X-2 penetration into the basement within the PCV to investigate inside and outside the pedestal.
- During June 7-11, the thickness of deposits was measured using the remotely operated ROV-C robot submersible.

➢ 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, 2021.
- The ongoing performance verification test in a domestic factory (Kobe), which started from August 2021, finished on January 21, 2022.
- The equipment was transported from January 28, 2022 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, 2022, the performance verification test and operational training started at the Naraha mockup facility.

➢ Investigation in the control room of the Unit 2 fuel-handling machine-

- As an “assumption about the status of the Units 1-3 core and Primary Containment Vessel at the Fukushima Daiichi Nuclear Power Station and examination of unsolved issues,” efforts to clarify the accident progress continue.
- In the control room of the Unit 2 fuel-handling machine (FHM control room) located on the top floor (operating floor) of the Unit 2 Reactor Building, the window glass on the second floor was broken and previous investigation confirmed contamination inside the room.
- As the FHM control room had remained almost untouched since the accident and is located near the shield plug, which is assumed to be the main release route of radioactive materials, the area will be investigated to acquire information related to radioactive materials released at the time of the accident.
- On the operating floor, preliminary work is underway toward dismantling the FHM control room. The investigation will be conducted before the dismantling, which is scheduled after August, while avoiding interference with work on the operating floor.

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 May 2022, the total storage volume for concrete and metal rubble was approx. 325,600 m^3 (+200 m^3 compared to the end of April with an area-occupation rate of 87%). The total storage volume of trimmed trees was approx. 133,400 m^3 (-6,600 m^3, with an area-occupation rate of 76%). The total storage volume of used protective clothing was approx. 30,300 m^3 (+700 m^3, with an area-occupation rate of 58%). The decrease in rubble was attributable to concrete at the BG level to be reused being excluded from the calculation and the increase, decontamination of flanged tanks, work around Units 1-4 buildings and others. As of the end of May 2022, there were 11 temporary deposits with storage capacity exceeding 1,000m^3 and a total storage volume of 51,500 m^3.

➢ Management status of secondary waste from water treatment

- As of June 2, 2022, the total storage volume of waste sludge was 422 m^3 (area-occupation rate: 60%), while that of concentrated waste fluid was 9,357 m^3 (area-occupation rate: 91%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment and other vessels, was 5,375 (area-occupation rate: 84%).

➢ Status of inspection and restoration regarding the Radioactive Waste Incinerator after the influence of the earthquake on March 16 and others

- Regarding the Radioactive Waste Incinerator, multiple damage were detected due to the influence of the earthquake on March 16, for which detailed inspection and restoration are underway.
- Moreover, the response to light oil leakage from the light oil line pressure-reducing valve, which occurred in April, remains ongoing.
- For System B, restoration work was finished by June 27, with restart from June 29.
- For System A, restoration will be completed and it will be restarted in late July.

➢ Operation status of the additional Radioactive Waste Incinerator

- On May 23, the operation of the additional Radioactive Waste Incinerator resumed.
- On June 10, during the incineration operation, before filling the container with fly ash, when the inside of the fly ash filling equipment was checked, water dripping from the fly ash filling inlet was detected. As water was also detected inside the fly ash hopper located upstream of the water dripping, the incineration operation was suspended. No external leakage of radioactive materials was identified. At present, the inside of the incinerator is being inspected to investigate the cause.
- On June 18, during patrol, two cracks were detected: namely, in the plate connecting the secondary burner and stoker and the seal welded part of the rotary kiln joint. As when the cracks were detected, the incineration operation was suspended, a negative pressure was maintained in the area within the system where the cracks were detected by a blower and no radioactive material was deemed to have leaked outside. At present, an on-site inspection and others are underway to investigate the cause.

➢ Policy for seismic resistance of the 10th solid waste storage facility

- Rubble generated in the decommissioning work at the Fukushima Daiichi Nuclear Power Station is temporarily stored within the site (outdoor). In future, however, the rubble will be accumulated in the additional solid waste storage facility (stored inside the buildings).
- An application for approval to amend the implementation plan was submitted on November 5, 2021.

- Based on the earthquake in February 2021, the policy for the new seismic resistance assessment was presented at the "FY2021 30th Nuclear Regulation Authority" as shown in the following two steps:
  (1) Categorization into classes according to the exposure influence on the public when all safety functions are lost in an earthquake;
  (2) Based on (1), after considering the influence on decommissioning work, seismic motion is set and the necessary measures are determined according to the characteristics of the facility and others;
- The 10th solid waste storage facility (the present design is the seismic resistance C-class), in which waste with a surface dose rate of 1 mSv/h or less is stored, is categorized into the seismic resistance B+ class according to the above (1).
- However, to reduce risks at an early stage by eliminating the outdoor waste storage, the above (2) is applied and installation proceeds in the present design. For the period until transfer to the 11th and following new solid waste storage facilities, waste with a surface dose rate 1mSv/h or less will be temporarily stored, followed by waste satisfying the C-class seismic resistance.

Reactor cooling

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

➢ Test to stop water injection into the Unit 3 reactor

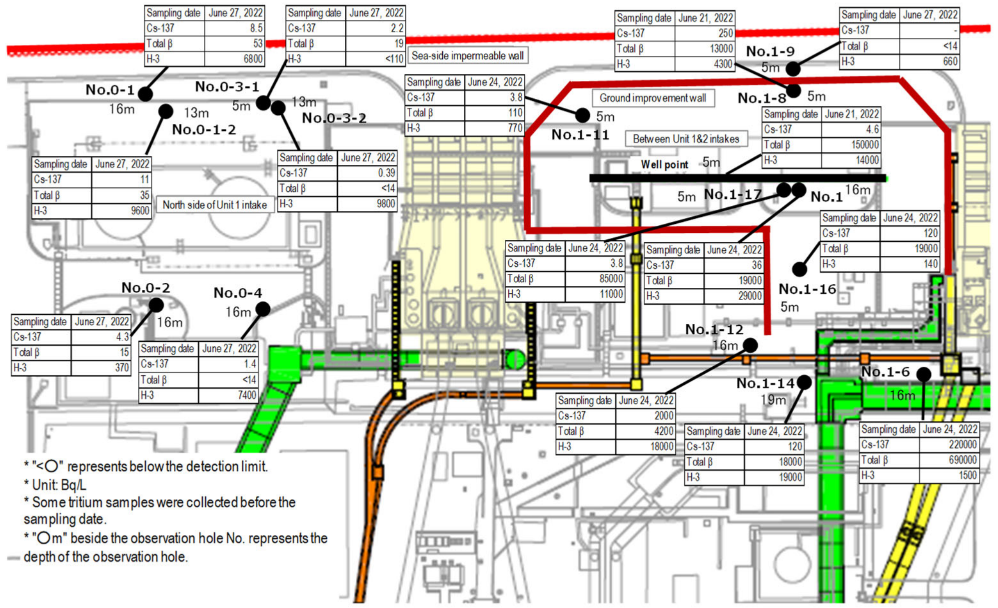
- Regarding Unit 3, in the previous test to stop water injection into the reactor (which was stopped for seven days in April 2021), leakage from the PCV was below the experience water level.
- To ensure safety while retrieving debris, the leakage points need to be identified.
- Moreover, as a concrete method for retrieving future debris is being examined, the feasibility of air cooling for fuel debris and the minimum water injection rate during water cooling must also be identified.
- Water injection stopped during June 14-19, 2022 and resumed from June 19. The water injection rate increased from June 20. At present, checks to ascertain the transition after water injection test is underway.
- The PCV water level has been declining at a constant ratio after water injection stopped. As on June 19, the level declined below the lower end of the PCV new thermometer / water level gauge, water injection resumed., Subsequently, although the decline in the water level almost ceased, it was not fully restored and the water injection rate was increased on June 20.
- At present the PCV water level exceeds the lower end of the PCV new thermometer (T.P.8264) and has been increasing.
- No significant increase or change in the RPV bottom temperature and PCV temperature have been detected. It was confirmed that temperatures in some thermometers were declining.
- No significant fluctuation was detected in dust concentration and others.

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 and 1-17 but has otherwise remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall but been increasing or declining at many observation holes, including Nos. 1-6, 1-9, 1-11, 1-12, 1-14, 1-16 and 1-17. The trend continues to be monitored carefully.
- In the area between the Unit 2 and 3 intakes, the H-3 concentration has been below the legal discharge limit of 60,000 Bq/L at all observation holes. It has been increasing and declining at Nos. 2-3, 2-5 and 2-6 but has remained constant 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 but has been increasing or declining at many observation holes, including Nos. 3-4 and 3-5. The trend continues to be monitored carefully.
- In the groundwater on the east side of the Turbine Buildings, as with the total β radioactive materials, the concentration of cesium has also remained constant but been increasing or declining and exceeded the previous highest record at some observation holes. Investigations into fluctuation are underway for Nos. 0-3-2, 1, 1-6, 2-6 and 3-3.
- The concentration of radioactive materials in drainage channels has remained constant overall, despite increasing during rainfall.
- In the open channel area of seawater intake for Units 1 to 4, the concentration of radioactive materials in seawater has remained below the legal discharge limit and been declining long term, despite temporary increases in Cs-137 and Sr-90 noted during rainfall. They have also been declining following the completed installation and the connection of steel pipe sheet piles for the sea-side impermeable walls. The concentration of Cs-137 has remained slightly higher in front of the south side impermeable walls and slightly lower on the north side of the east breakwater since March 20, 2019, when the silt fence was transferred to the center of the open channel due to mega float-related construction.
- In the port area, the concentration of radioactive materials in seawater has remained below the legal discharge limit and been declining long term, despite temporary increases in Cs-137 and Sr-90 observed during rainfall. They have remained below the level of those in the Units 1-4 intake open channel area and been declining following the completed installation and connection of steel pipe sheet piles for the sea-side impermeable walls.
- In the area outside the port, regarding the concentration of radioactive materials in seawater, those of Cs-137 and Sr-90 declined and remained low after steel pipe sheet piles for the sea-side impermeable walls were installed and connected. Regarding the concentration of Cs-137, a temporary increase was sometimes observed on the north side of the Unit 5 and 6 outlets and near the south outlet due to the influence of weather, marine meteorology and other factors. Regarding the concentration of Sr-90, variation has been observed since last year in the area outside the port (north and south outlets). Monitoring of the tendency continues, including the potential influence of the weather, marine meteorology and others.



Sampling date	June 27, 2022
Cs-137	8.5
Total β	53
H-3	6800

Sampling date	June 27, 2022
Cs-137	2.2
Total β	19
H-3	<110

Sampling date	June 21, 2022
Cs-137	250
Total β	13000
H-3	4300

Sampling date	June 27, 2022
Cs-137	-
Total β	<14
H-3	660

Sampling date	June 24, 2022
Cs-137	3.8
Total β	110
H-3	770

Sampling date	June 21, 2022
Cs-137	4.6
Total β	150000
H-3	14000

Sampling date	June 27, 2022
Cs-137	11
Total β	35
H-3	9600

Sampling date	June 27, 2022
Cs-137	0.39
Total β	<14
H-3	9800

Sampling date	June 24, 2022
Cs-137	120
Total β	19000
H-3	140

Sampling date	June 24, 2022
Cs-137	3.8
Total β	85000
H-3	11000

Sampling date	June 24, 2022
Cs-137	36
Total β	19000
H-3	29000

Sampling date	June 27, 2022
Cs-137	4.3
Total β	15
H-3	370

Sampling date	June 27, 2022
Cs-137	1.4
Total β	<14
H-3	7400

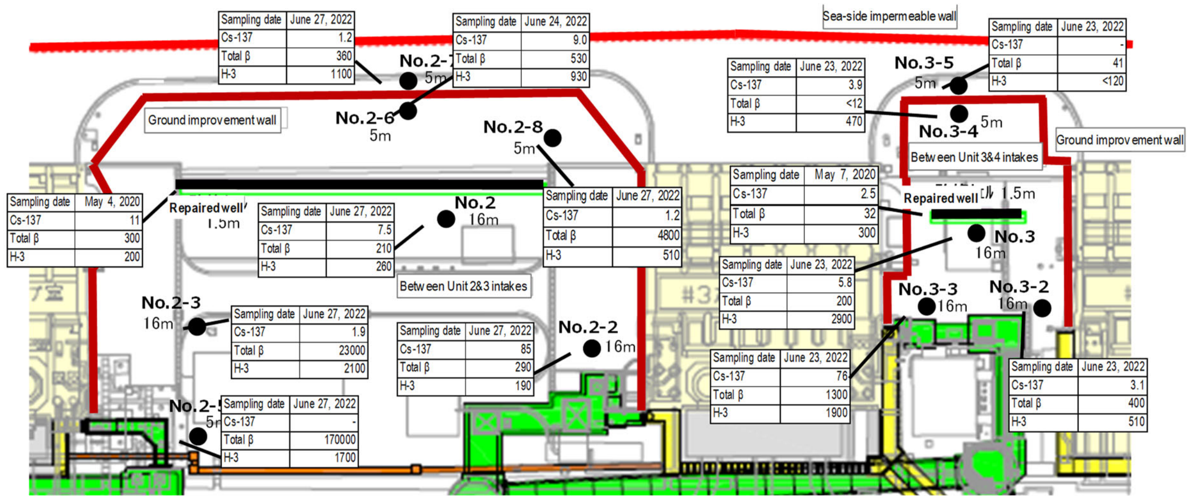
Sampling date	June 24, 2022
Cs-137	2000
Total β	4200
H-3	18000

Sampling date	June 24, 2022
Cs-137	120
Total β	18000
H-3	19000

Sampling date	June 24, 2022
Cs-137	220000
Total β	690000
H-3	1500

* "<○" represents below the detection limit.
* Unit: Bq/L
* Some tritium samples were collected before the sampling date.
* "○m" beside the observation hole No. represents the depth of the observation hole.

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



Sampling date	June 27, 2022
Cs-137	1.2
Total β	360
H-3	1100

Sampling date	June 24, 2022
Cs-137	9.0
Total β	530
H-3	930

Sampling date	June 23, 2022
Cs-137	3.9
Total β	<12
H-3	470

Sampling date	June 23, 2022
Cs-137	-
Total β	41
H-3	<120

Sampling date	May 4, 2020
Cs-137	11
Total β	300
H-3	200

Sampling date	June 27, 2022
Cs-137	7.5
Total β	210
H-3	260

Sampling date	June 27, 2022
Cs-137	1.2
Total β	4800
H-3	510

Sampling date	May 7, 2020
Cs-137	2.5
Total β	32
H-3	300

Sampling date	June 23, 2022
Cs-137	5.8
Total β	200
H-3	2900

Sampling date	June 27, 2022
Cs-137	1.9
Total β	23000
H-3	2100

Sampling date	June 27, 2022
Cs-137	85
Total β	290
H-3	190

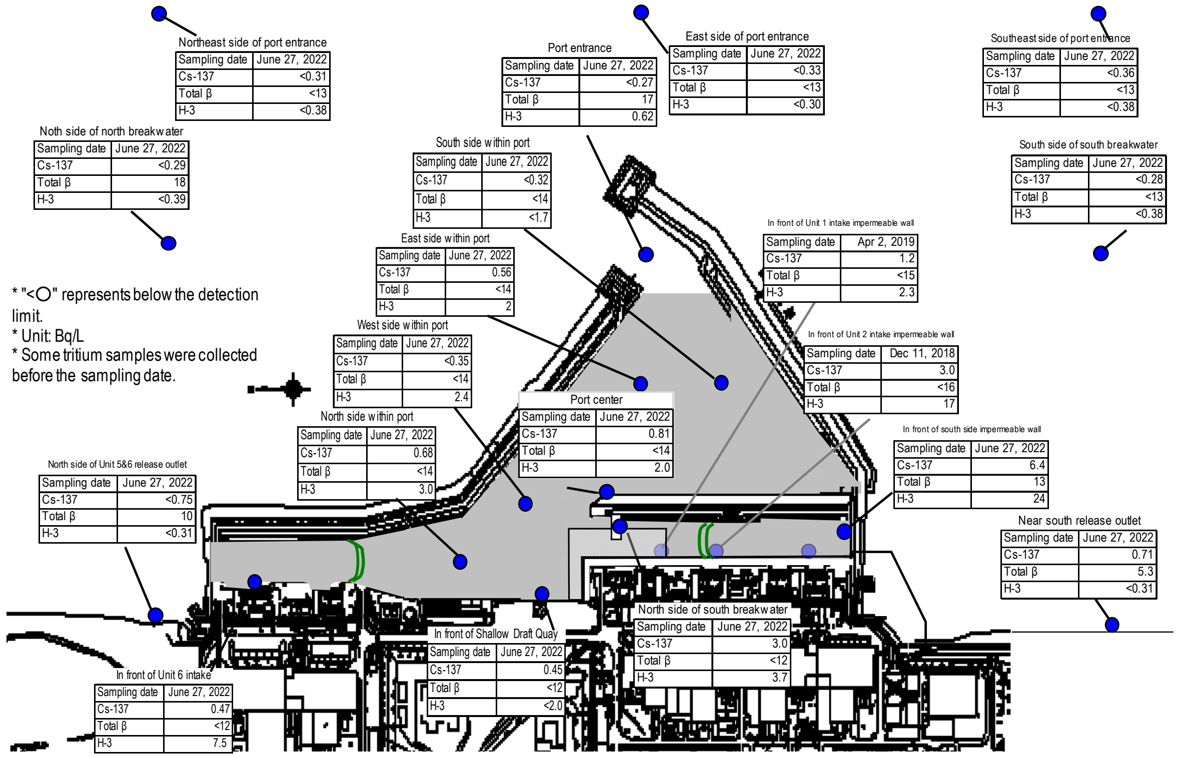
Sampling date	June 23, 2022
Cs-137	76
Total β	1300
H-3	1900

Sampling date	June 23, 2022
Cs-137	3.1
Total β	400
H-3	510

Sampling date	June 27, 2022
Cs-137	-
Total β	170000
H-3	1700

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

Figure 4: Groundwater concentration on the Turbine Building east side



Northeast side of port entrance

Sampling date	June 27, 2022
Cs-137	<0.31
Total β	<13
H-3	<0.38

Port entrance

Sampling date	June 27, 2022
Cs-137	<0.27
Total β	17
H-3	0.62

East side of port entrance

Sampling date	June 27, 2022
Cs-137	<0.33
Total β	<13
H-3	<0.30

Southeast side of port entrance

Sampling date	June 27, 2022
Cs-137	<0.36
Total β	<13
H-3	<0.38

Noth side of north breakwater

Sampling date	June 27, 2022
Cs-137	<0.29
Total β	18
H-3	<0.39

South side within port

Sampling date	June 27, 2022
Cs-137	<0.32
Total β	<14
H-3	<1.7

South side of south breakwater

Sampling date	June 27, 2022
Cs-137	<0.28
Total β	<13
H-3	<0.38

In front of Unit 1 intake impermeable wall

Sampling date	Apr 2, 2019
Cs-137	1.2
Total β	<15
H-3	2.3

East side within port

Sampling date	June 27, 2022
Cs-137	0.56
Total β	<14
H-3	2

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

West side within port

Sampling date	June 27, 2022
Cs-137	<0.35
Total β	<14
H-3	2.4

In front of Unit 2 intake impermeable wall

Sampling date	Dec 11, 2018
Cs-137	3.0
Total β	<16
H-3	17

Port center

Sampling date	June 27, 2022
Cs-137	0.81
Total β	<14
H-3	2.0

North side within port

Sampling date	June 27, 2022
Cs-137	0.68
Total β	<14
H-3	3.0

In front of south side impermeable wall

Sampling date	June 27, 2022
Cs-137	6.4
Total β	13
H-3	24

North side of Unit 5&6 release outlet

Sampling date	June 27, 2022
Cs-137	<0.75
Total β	10
H-3	<0.31

Near south release outlet

Sampling date	June 27, 2022
Cs-137	0.71
Total β	5.3
H-3	<0.31

North side of south breakwater

Sampling date	June 27, 2022
Cs-137	3.0
Total β	<12
H-3	3.7

In front of Shallow Draft Quay

Sampling date	June 27, 2022
Cs-137	0.45
Total β	<12
H-3	<2.0

In front of Unit 6 intake

Sampling date	June 27, 2022
Cs-137	0.47
Total β	<12
H-3	7.5

Figure 5: Seawater concentration around the port

Outlook of the number of staff required and efforts to improve the labor environment and conditions

Adequate number of staff will be secured in the long-term, while firmly implementing radiation control of workers. The work environment and labor conditions will be continuously improved by responding to the needs on the site.

➢ Staff management

- The monthly average total of personnel registered for at least one day per month to work on site during the past quarter from February to April 2022 was approx. 9,100 (cooperating company workers and TEPCO HD employees), which exceeded the monthly average workforce (approx. 6,700). 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 July 2022 (approx. 3,700 workers per day: cooperating company workers and TEPCO HD employees) would be secured at present. The average numbers of workers per day for each month (actual values) for the most recent 2 years were maintained, with approx. 3,000 to 4,200.
- The number of workers from within Fukushima Prefecture increased slightly and that outside remained constant. The local employment ratio (cooperating company workers and TEPCO HD employees) as of May 2022 increased slightly at around 70%.
- The average exposure doses of workers were at approx. 2.54 and 2.60 and 2.51 mSv/person-year during FY2019, 2020 and 2021, respectively. (The legal exposure dose limits are 100 mSv/person and 50 mSv/person-year over five years, the TEPCO HD management target is 20 mSv/person-year).
- For most workers, the exposure dose was sufficiently within the limit and allowed them to continue engaging in radiation work.

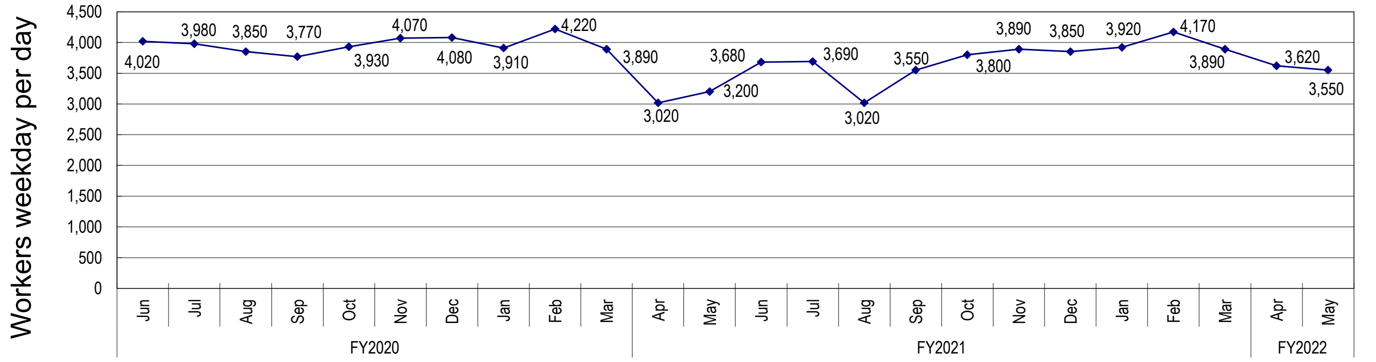


Figure 6: Changes in the average number of workers weekday per day for each month of the past 2 years (actual values)

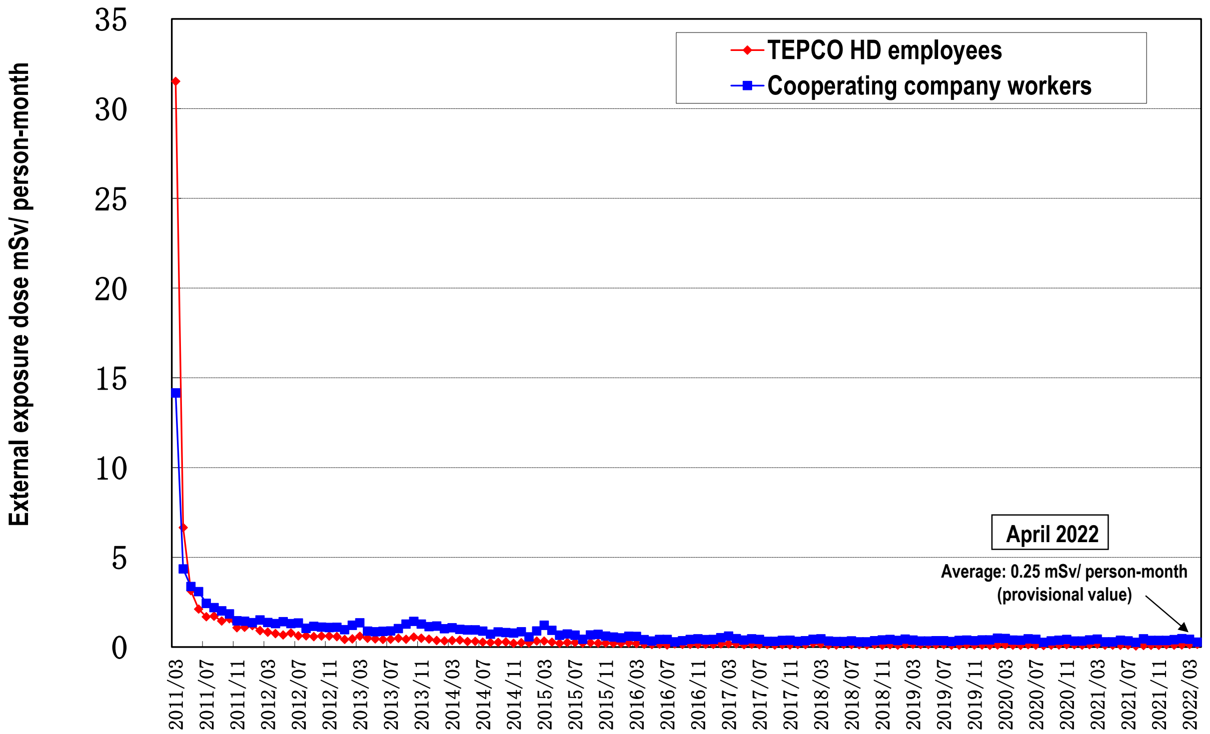


Figure 7: Changes in monthly average exposure dose of individual worker
(monthly exposure dose since March 2011)

➢ Countermeasures to suppress the spread of COVID-19 infections

- Although infections in Japan have been gradually decreasing, many are still reported daily. For TEPCO HD employees and company workers at the Fukushima Daiichi Nuclear Power Station (NPS), 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, continue to be properly implemented. In addition, they must appropriately observe the rules, including reporting to their supervisors and managers if their own physical condition or that of their family members is poor before coming to the company at the beginning of the week to proceed with decommissioning work, prioritizing safety above all.

- As of June 29, 2022, 330 workers (including 56 TEPCO HD employees, one temporary worker, 271 cooperating company workers and two business partner company employees) of the Fukushima Daiichi NPS had contracted COVID-19, an increase of 11 workers (including two TEPCO HD employees and nine cooperating company workers) from those in the previous published material (as of May 25).
- No significant influence on decommissioning work, such as a corresponding delay to work processes due to this infection, had been identified.

➢ Status of heat stroke cases

- In FY2022, measures to further prevent heat stroke commenced from April to cope with the hottest season.
- FY2022, one worker suffered heat stroke due to work up until June 27 (in FY2021, two workers up until the end of June). Continued measures will be taken to prevent heat stroke.

Status of seawater monitoring within the port (comparison between the highest values in 2013 and the latest values)

"The highest value" → "the latest value (sampled during June 13-27)"; unit (Bq/L); ND represents a value below the detection limit

Summary of TEPCO data as of June 27, 2022

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

Cesium-134 :	ND(0.36)
Cesium-137 :	0.81
Total β :	ND(14)
Toritium :	ND(1.7)

※1

Cesium-134 :	3.3	(H25/12/24)	→	ND(0.27)	1/10以下
Cesium-137 :	7.3	(H25/10/11)	→	ND(0.27)	1/20以下
Total β :	69	(H25/8/19)	→	17	1/4以下
Toritium :	68	(H25/8/19)	→	0.62	1/100以下

Cesium-134 :	3.3	(H25/10/17)	→	ND(0.27)	Below 1/10
Cesium-137 :	9	(H25/10/17)	→	0.56	Below 1/10
Total β :	74	(H25/8/19)	→	ND(14)	Below 1/5
Toritium :	67	(H25/8/19)	→	ND(1.9)	Below 1/30

Cesium-134 :	3.5	(H25/10/17)	→	ND(0.31)	1/10以下
Cesium-137 :	7.8	(H25/10/17)	→	ND(0.32)	1/20以下
Total β :	79	(H25/8/19)	→	ND(14)	1/5以下
Toritium :	60	(H25/8/19)	→	ND(1.9)	1/30以下

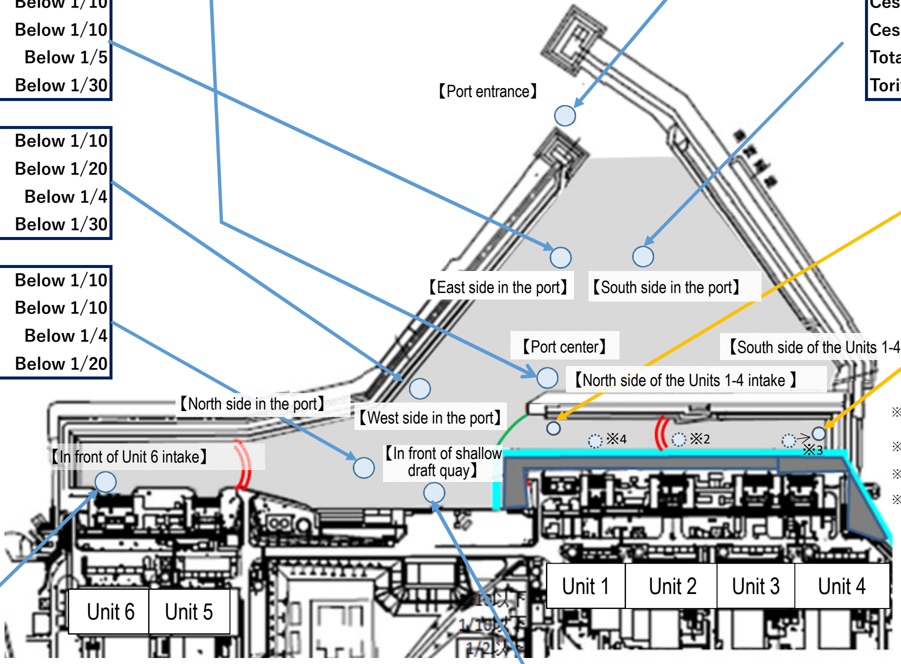
Cesium-134 :	4.4	(H25/12/24)	→	ND(0.25)	Below 1/10
Cesium-137 :	10	(H25/12/24)	→	ND(0.35)	Below 1/20
Total β :	60	(H25/7/4)	→	ND(14)	Below 1/4
Toritium :	59	(H25/8/19)	→	ND(1.9)	Below 1/30

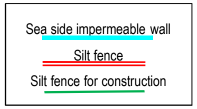
Cesium-134 :	32	(H25/10/11)	→	ND(0.25)	1/100以下
Cesium-137 :	73	(H25/10/11)	→	3.0	1/20以下
Total β :	320	(H25/8/12)	→	ND(12)	1/20以下
Toritium :	510	(H25/9/2)	→	5.4	1/90以下

Cesium-134 :	5	(H25/12/2)	→	ND(0.32)	Below 1/10
Cesium-137 :	8.4	(H25/12/2)	→	0.68	Below 1/10
Total β :	69	(H25/8/19)	→	ND(14)	Below 1/4
Toritium :	52	(H25/8/19)	→	ND(1.9)	Below 1/20

Cesium-134 :	ND(0.30)
Cesium-137 :	6.4
Total β :	13
Toritium :	52

※1





Cesium-134 :	2.8	(H25/12/2)	→	ND(0.34)	Below 1/8
Cesium-137 :	5.8	(H25/12/2)	→	ND(0.47)	Below 1/10
Total β :	46	(H25/8/19)	→	ND(12)	Below 1/3
Toritium :	24	(H25/8/19)	→	ND(2.2)	Below 1/10

Cesium-134 :	5.3	(H25/8/5)	→	ND(0.24)	Below 1/20
Cesium-137 :	8.6	(H25/8/5)	→	0.45	Below 1/10
Total β :	40	(H25/7/3)	→	ND(12)	Below 1/3
Toritium :	340	(H25/6/26)	→	ND(1.8)	Below 1/100

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

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

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

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

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

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

Status of seawater monitoring around outside of the port
(comparison between the highest values in 2013 and the latest values)

Unit (Bq/L); ND represents a value below the detection limit; values in ( ) represent the detection limit; ND (2013) represents ND throughout 2013

(The latest values sampled during June 13-27)

Summary of TEPCO data as of June 27, 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(0.22)
Cesium-137 : ND (H25) → ND(0.31)
Total β : ND (H25) → ND(13)
Toritium : ND (H25) → –

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

Cesium-134 : ND (H25) → ND(0.31)
Cesium-137 : 1.6 (H25/10/18) → ND(0.33) Below 1/2
Total β : ND (H25) → ND(13)
Toritium : 6.4 (H25/10/18) → –

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

Cesium-134 : ND (H25) → ND(0.36)
Cesium-137 : ND (H25) → ND(0.36)
Total β : ND (H25) → ND(13)
Toritium : ND (H25) → –

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

Cesium-134 : ND (H25) → ND(0.30)
Cesium-137 : ND (H25) → ND(0.29)
Total β : ND (H25) → 18
Toritium : 4.7 (H25/8/18) → –

【Port entrance】

Cesium-134 : 3.3 (H25/12/24) → ND(0.27) Below 1/10
Cesium-137 : 7.3 (H25/10/11) → ND(0.27) Below 1/20
Total β : 69 (H25/8/19) → 17 Below 1/4
Toritium : 68 (H25/8/19) → 0.62 Below 1/100

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

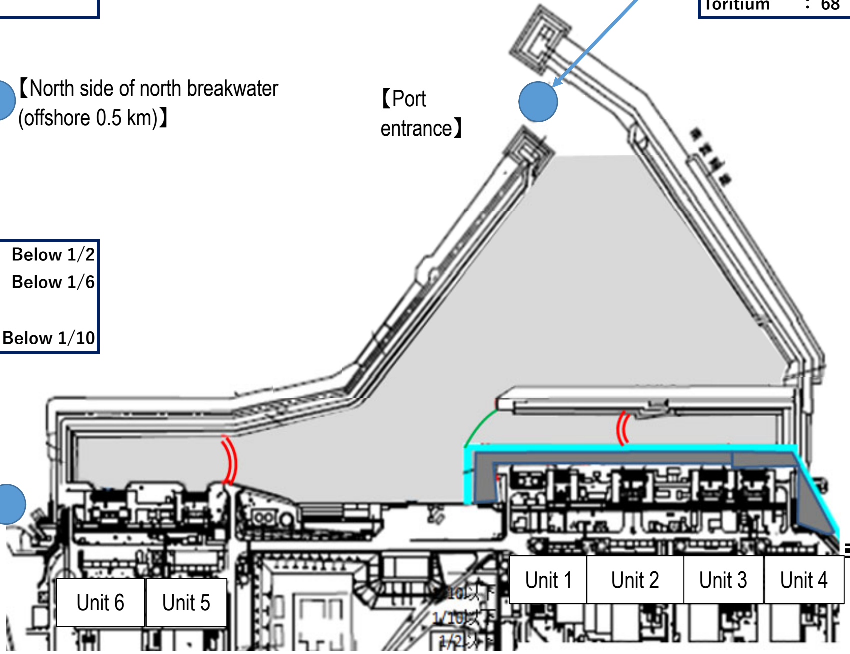
Cesium-134 : ND (H25) → ND(0.27)
Cesium-137 : ND (H25) → ND(0.28)
Total β : ND (H25) → ND(13)
Toritium : ND (H25) → –

【North side of Unit 5 and 6 release outlet】

Cesium-134 : 1.8 (H25/6/21) → ND(0.66) Below 1/2
Cesium-137 : 4.5 (H25/3/17) → ND(0.75) Below 1/6
Total β : 12 (H25/12/23) → 9.8
Toritium : 8.6 (H25/6/26) → 0.67 Below 1/10

【Near south release outlet】

Cesium-134 : ND (H25) → ND(0.76)
Cesium-137 : 3 (H25/7/15) → 0.71 Below 1/4
Total β : 15 (H25/12/23) → 5.3 Below 1/2
Toritium : 1.9 (H25/11/25) → 0.36 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.

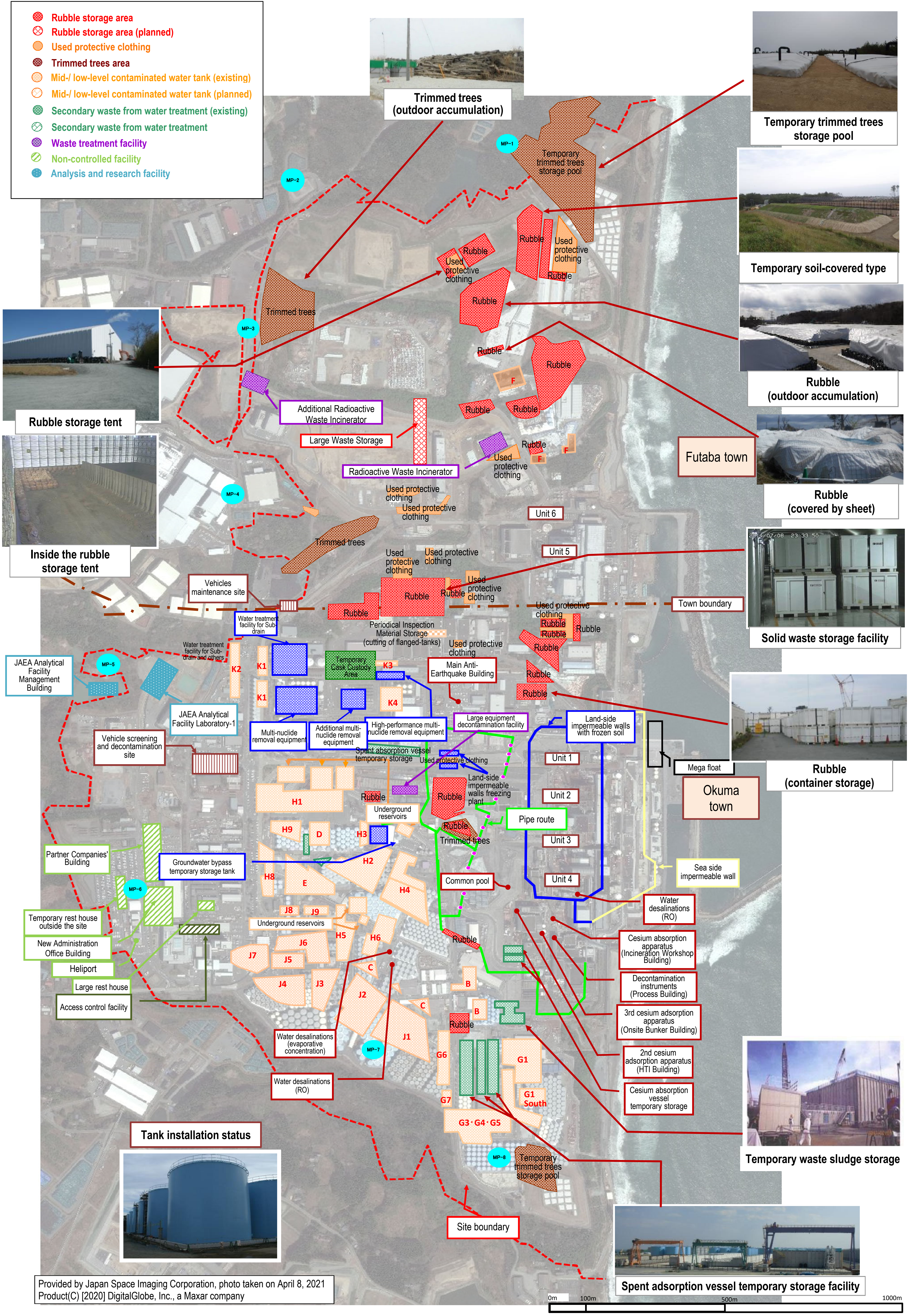
Note: Because safety of the sampling points was unassured due to the influence of Typhoon No. 10 in 2016, samples were taken from approx. 330 m south of the Unit 1-4 release outlet.
Samples were also taken from a point approx. 280m south from the same release outlet from January 27, 2017 and approx.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

June 30, 2022

TEPCO Holdings Fukushima Daiichi Nuclear Power Station Site Layout



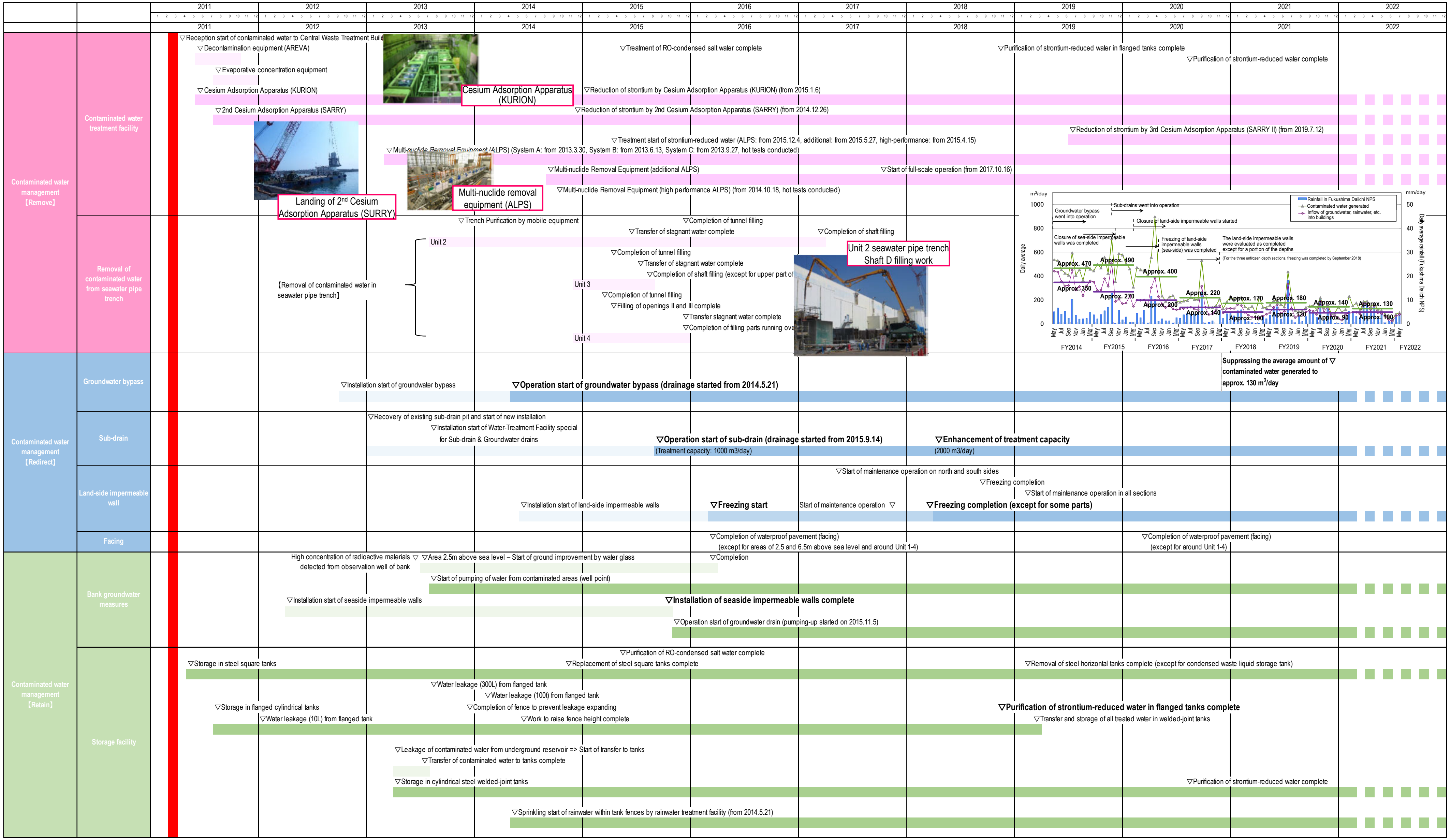
Provided by Japan Space Imaging Corporation, photo taken on April 8, 2021
Product(C) [2020] DigitalGlobe, Inc., a Maxar company

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)



Contaminated water management【Remove】

Contaminated water treatment facility

▽Reception start of contaminated water to Central Waste Treatment Build
▽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)
▽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)
▽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)

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】

Unit 2
▽Trench Purification by mobile equipment
▽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. 130 m^3/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

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

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

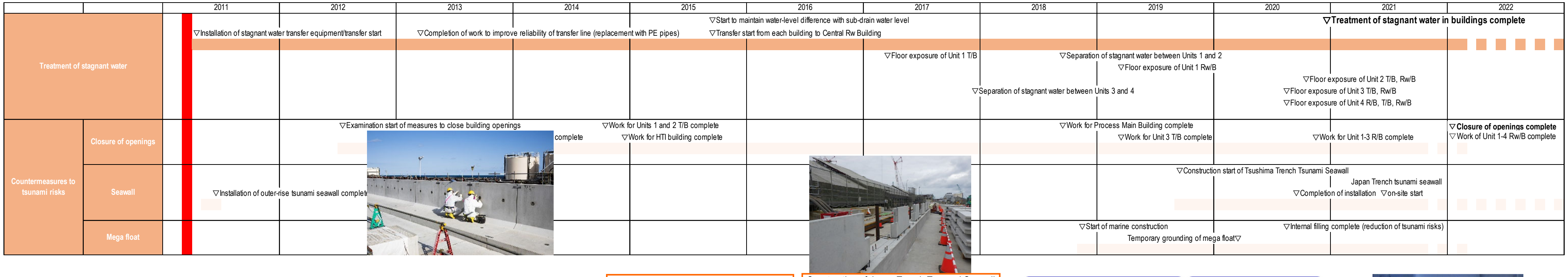
Placement of seaside impermeable walls complete

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)



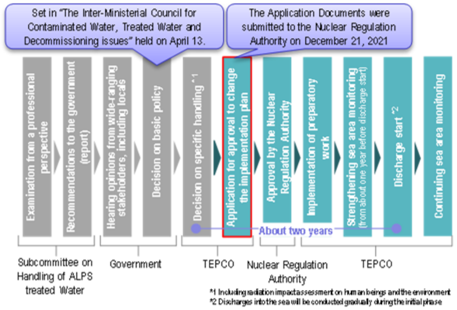
Chishima Trench Tsunami Seawall complete

Construction of Japan Trench Tsunami Seawall

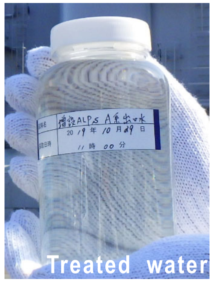
2 Handling of ALPS treated water

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.



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



Examination concerning handling of ALPS treated water

Tritiated Water Taskforce (2013.12 – 2016.5, 15 meetings)

2016.6 Report of Tritiated Water Taskforce

Tank area viewed from the Large Rest House (2015.10.29)

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

2018.8 Explanatory and hearing meeting, receiving opinions

2020.2 Report of Subcommittee on Handling of ALPS treated water

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

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

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

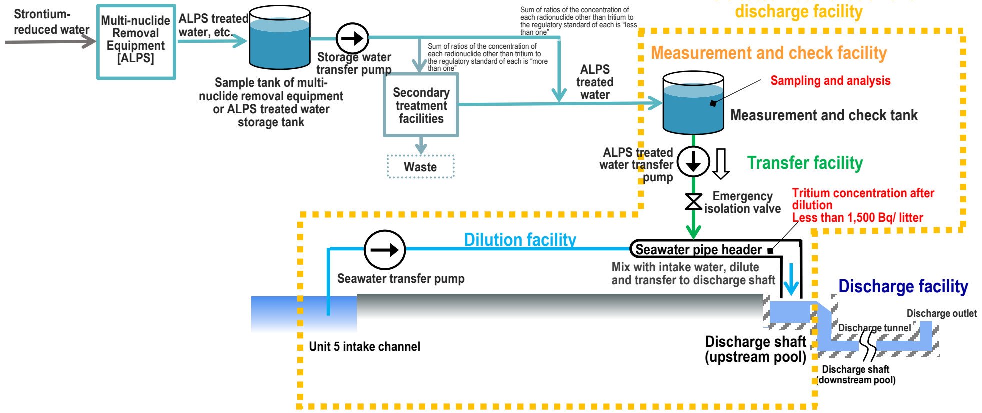
2021.12.21 The "Application Documents for Approval to Amend the Implementation Plan for Fukushima Daiichi Nuclear Power Station Specified Nuclear Facility" regarding ALPS treated water were submitted to the Nuclear Regulation Authority

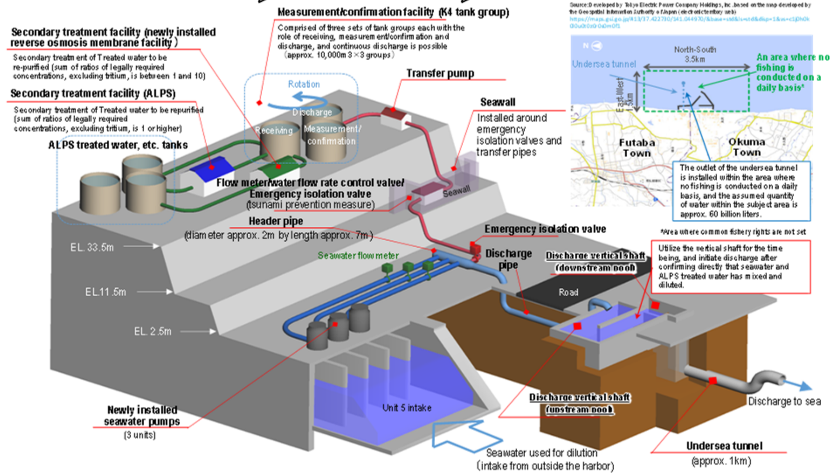
2021.12.28 "The Action Plan concerning the Continuous Implementation of the Basic Policy on Handling of ALPS Treated Water" was formulated

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

2014 2015 2016 2017 2018 2019 2020 2021 2022

【Overview of ALPS treated water dilution and discharge facility】





Source: Developed by Tokyo Electric Power Company Holdings, Inc. based on the map developed by the Geospatial Information Authority of Japan (electronic territory web)
https://maps.gsi.go.jp/#13/37.422730/141.044970/&base=std&ls=std&disp=1&vs=c1j0h0k0l0u0t0z0r0s0m0f1

The outlet of the undersea tunnel is installed within the area where no fishing is conducted on a daily basis, and the assumed quantity of water within the subject area is approx. 60 billion liters.

*Area where common fishery rights are not set

Utilize the vertical shaft for the time being, and initiate discharge after confirming directly that seawater and ALPS treated water has mixed and diluted.

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)

Reference
June 30, 2022
Secretariat of the Team for Countermeasures for
Decommissioning, Contaminated Water and Treated Water

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

2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

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

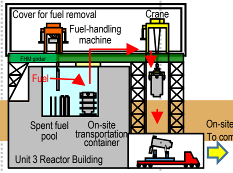
All fuel assemblies from Unit 3 had been removed by February 2021.

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



On-site transportation
To common pool

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

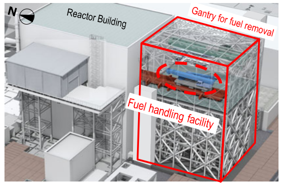
Unit 2

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
▼ 2021.10-2022.4 Ground improvement work


<Unit 2 Construction of gantry for fuel removal>

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



As part of efforts to remove fuel from the Unit 2 spent fuel pool and based on findings from internal operating floor investigations from November 2018 to February 2019, instead of fully dismantling the upper part of the building, the decision was made to install a small opening on the south side and use a boom crane. Examination continues to initiate fuel removal from FY2024 to FY2026.

<Reference> Progress to date
Previously, scope to recover the existing overhead crane and the fuel-handling machine was examined. However, the high radiation dose inside the operating floor meant the decision was taken to dismantle the upper part of the building in November 2015. Findings from internal investigations of the operating floor from November 2018 to February 2019 underlined the potential to conduct limited work there and the means of accessing from the south side was examined.

Unit 1

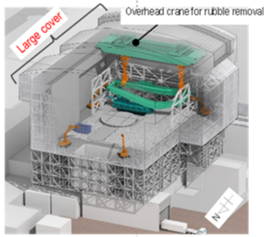
For Unit 1, a large cover will be installed over the whole building, within which rubble will be removed.

▼ 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

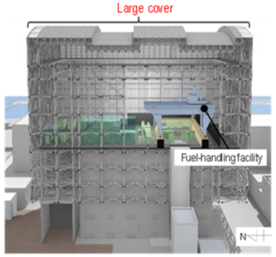
As part of efforts to remove fuel from the Unit 1 spent fuel pool, investigations are underway to ascertain the conditions of the fallen roof on the south side and the contamination of the well plug. Based on the results, "the method initially installing a large cover over the Reactor Building, then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

Reference
June 30, 2022
Secretariat of the Team for Countermeasures for
Decommissioning, Contaminated Water and Treated Water

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

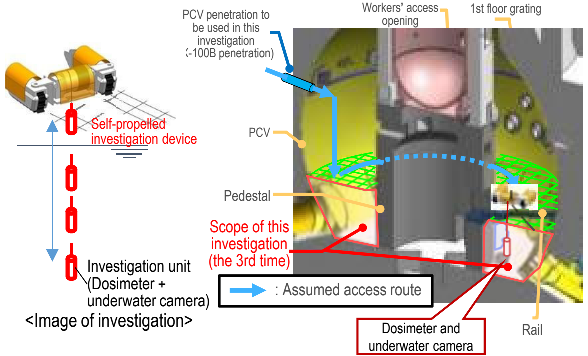
Start of fuel debris retrieval from the first unit (Unit 2). Expanding the scale in stages (within 2021 * The schedule will be extended for about 1 year due to the spread of COVID-19 infections)

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

Unit 1 Investigation overview

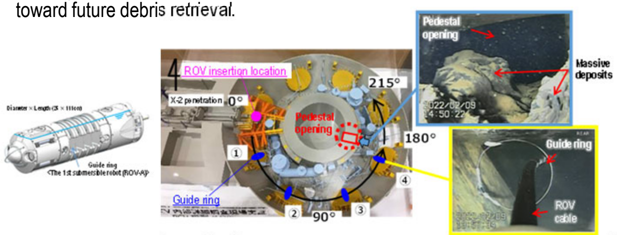
・In April 2015, a device having entered the inside of the PCV via a narrow opening (bore:φ100 mm) collected information such as images and airborne dose inside the PCV 1st floor.

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



<Image of investigation>

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



<Status inside the PCV (February 9)>

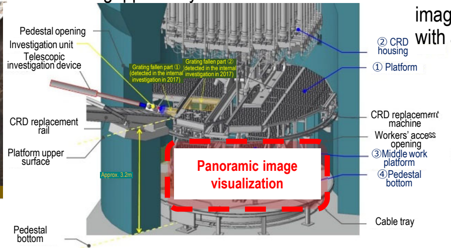
Unit 2 Investigation overview

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

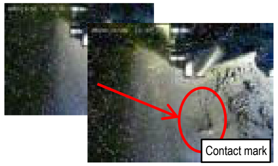
・In January 2018, the conditions below the platform inside the pedestal were investigated. Based on the analytical results of images obtained in the investigation, deposits, probably including fuel debris, were found at the bottom of the pedestal. Moreover, multiple parts exceeding the surrounding deposits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

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

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

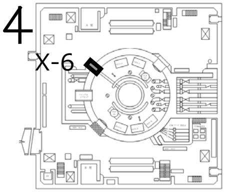


・In October 2020, as part of work to prepare for the PCV internal investigation and trial retrieval, a contact investigation to study deposits inside the penetration (X-6 penetration) was conducted, which involved inserting a guide pipe incorporating an investigative unit into the penetration. This confirmed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



<Conditions of deposits before and after contact>

<Work in front of the penetration>



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

Unit 3 Investigation overview

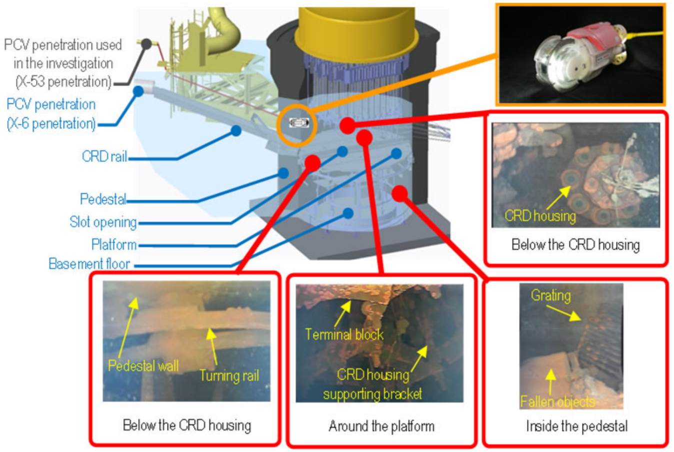
・In October 2014, the conditions of X-53 penetration, which may be under water and which is scheduled for use to investigate the inside of the PCV, was investigated via remote-controlled ultrasonic test equipment. The results showed that the penetration was not under water.

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

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

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

<Conditions inside the pedestal>



Unit 1 PCV internal investigation

Investigations inside the PCV	1st (2012.10)	- Acquiring images - Measuring the air temperature and dose rate - Measuring the water level and temperature - Sampling stagnant water - Installing permanent monitoring instrumentation
	2nd (2015.4)	Confirming the status of the PCV 1st floor - Acquiring images - Measuring the air temperature and dose rate - Replacing permanent monitoring instrumentation
	3rd (2017.3)	Confirming the status of the PCV 1st basement floor - Acquiring images - Measuring the dose rate - Sampling deposit - Replacing permanent monitoring instrumentation
Leakage points from PCV	- PCV vent pipe vacuum break line bellows (identified in 2014.5) - Sand cushion drain line (identified in 2013.11)	

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

Unit 2 PCV internal investigation

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

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

Unit 3 PCV internal investigation

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

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

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

5 Management of solid radioactive waste

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

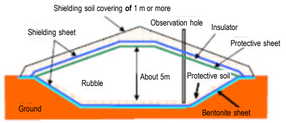
★ 2017.6 Revision ★ 2018.6 Revision ★ 2019.6 Revision ★ 2020.7 Revision ★ 2021.7 Revision

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

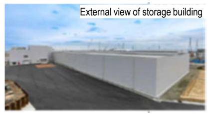
▼ 2012.9 Transfer start of rubble to the soil-covered temporary storage facility

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

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



<Outline of soil-covered temporary storage facility>



External view of the 9th Solid Waste Storage

▼ 2014.7 Start of pre-work

9th Solid Waste Storage

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

▼ 2018.2 Operation start

▼ 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

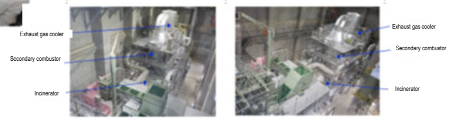
▼ 2016.3 Operation start

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

Whole view of Solid Waste Incinerator

Electrical room

Control room



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

▼ 2017.4 Start of pre-work

Additional Solid Waste Incinerator

▼2022.5 Start of operation

2017.10 Installation work gets

▼ 2018.5 Operation start

Large Equipment Decontamination Facility

▼ 2020.9 Start of pre-work

Compaction Facility

Site of Volume Reduction Facility

Present status Note

Storage of rubble and others

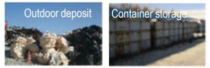
Present storage
Approx.480,000 m³
(as of 2021.3)

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

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

Approx. 290,000 m³

Contaminated soil (0.005 - 1 mSv/h)



Approx. 60,000 m³

Rubble (metal, concrete, others)

Approx. 60,000 m³

More than 1 mSv/h

0.005-1 mSv/h

Approx. 170,000 m³

Less than 0.005mSv

Approx. 220,000 m³

Storage of water treatment secondary waste

Approx. 6,500 tanks

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

Status after a decade

Legend 🟨: Newly installed equipment and facility

To (A)
(*1)

Incineration

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

Crusher example

Radioactive Waste Incinerator

Additional Radioactive Waste Incinerator (scheduled for completion in FY2021)

Work of main part

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

Stored and managed in Solid Waste Storage as done for rubble

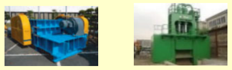
(A) (* 1)

(B)

To (A)
(*1)

Volume reduction

Compaction Facility
(scheduled for completion in FY2022)



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
Approx. 60,000 m³
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

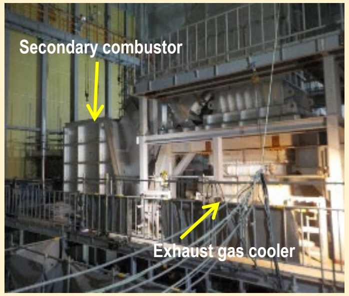
(*1) Items for which incineration, compaction, melting or reuse is difficult are stored directly in Solid Waste Storage without being treated
(*2) As values less than 10,000 m³ are rounded, they may not be consistent with the total of breakdown
(*3) In the estimate, approx. 250,000 m³ of waste will be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

Reference
June 30, 2022
Secretariat of the Team for Countermeasures for
Decommissioning, Contaminated Water and Treated Water

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

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


External view of Access Control Facility

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 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.

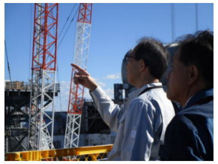
In March 2015, the Fukushima revitalization meal service center opened.

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

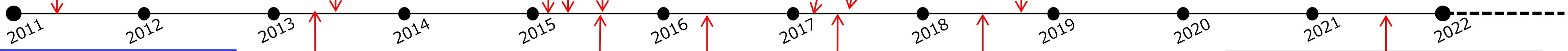
In February 2017, operation started at the Partner Companies' Building next to the New Administration Office Building.

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

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


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


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

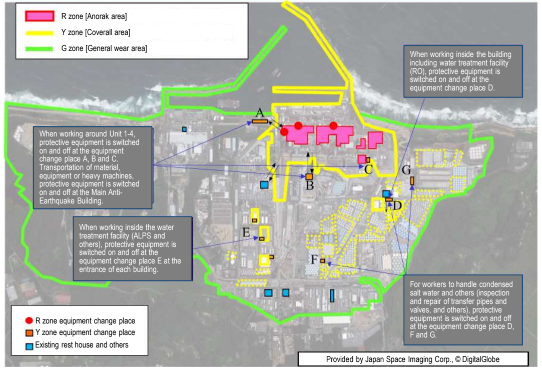


Changes in operation of controlled area

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

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

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



When working around Unit 1-4, protective equipment is switched on and off at the equipment change place A, B and C. Transportation of material, equipment or heavy machines, protective equipment is switched on and off at the Main Anti-Earthquake Building.

When working inside the building including water treatment facility (RO), protective equipment is switched on and off at the equipment change place D.

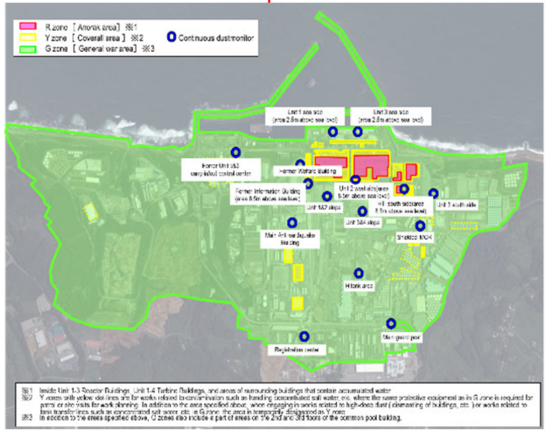
When working inside the water treatment facility (ALPS and others), protective equipment is switched on and off at the equipment change place E at the entrance of each building.

For workers to handle condensed salt water and others (inspection and repair of transfer pipes and valves, and others), protective equipment is switched on and off at the equipment change place D, F and G.

Provided by Japan Space Imaging Corp., © DigitalGlobe

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

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



※1 Inside Unit 1-3 Reactor Buildings, Unit 1-4 Turbine Buildings, and areas of surrounding buildings that contain accumulated water
※2 Y zones with yellow dot-lines are for works related to contamination such as handling concentrated salt water, etc. where the same protective equipment as in G zone is required for patrol or site visits for work planning. In addition to the area specified above, when engaging in works related to high-dose dust (dismantling of buildings, etc.) or works related to tank transfer lines such as concentrated salt water, etc. in G zone, the area is temporarily designated as Y zone.
※3 In addition to the areas specified above, G zones also include a part of areas on the 2nd and 3rd floors of the common pool building.

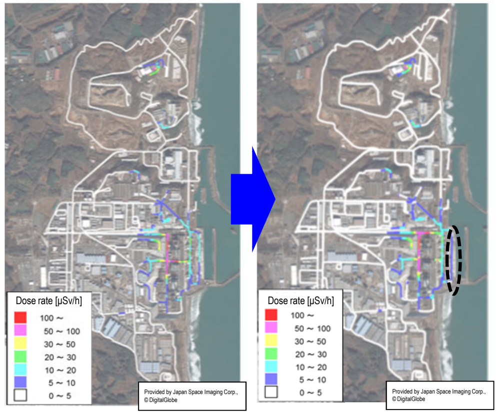
In May 2018, within about 96% of the site, workers are allowed to wear light equipment such as general workwear and disposable dust-protective masks.

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).

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

FY2020 4th Quarter (measured in 2021.3)

FY2021 4th Quarter (measured in 2022.2)



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