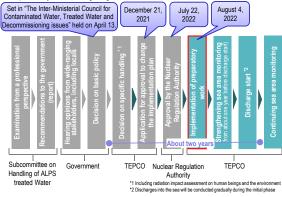
#### Main decommissioning work and steps Fuel removal from the spent fuel pool was completed in December 2014 at Unit 4 and on February 28, 2021 at Unit 3. Work continues sequentially toward the start of fuel removal from Units 1 and 2 and debris (Note 1) retrieval from Units 1-3. (Note 1) Fuel assemblies having melted through in the accident. <Milestones in the Mid-and-Long-Term Roadmap> Completion of fuel removal Within 2031 Unit 1 Start of fuel removal FY2027 - FY2028 Units 3 and 4 Unit 2 Start of fuel removal FY2024 - FY2026 Units 1 and 2 Storage **Fuel Removal** stallation of fuel-remova First unit Start of fuel debris retrieval Fuel removal from SFP /Transportation Within 2021 \* Due to the spread of COVID-19, w Unit 2 Units 1 and 3 the second half of fiscal 2023 to improve safety and reliability. **Fuel Debris** Fuel debris Understanding the situation inside the **Storage** Retrieval PCV /Consideration of retrieval methods, etc /Transportation Dismantling Design and manufacturing Scenario development & Dismantling technology consideration of devices /equipment **Facilities**

### Measures for treated water

## Handling of ALPS treated water

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



### Contaminated water management - triple-pronged efforts -

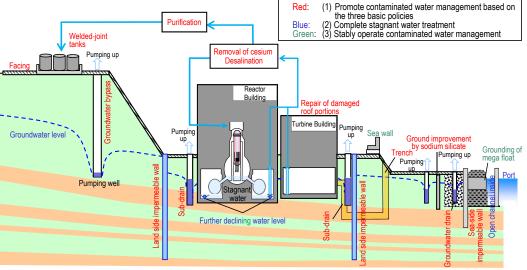
- (1) Efforts to promote contaminated water management based on the three basic policies (1) "Remove" the source of water contamination (2) "Redirect" fresh water from contaminated areas
- 3 "Retain" contaminated water from leakage
- Strontium-reduced water from other equipment is being re-treated in the Advanced Liquid Processing System (ALPS: multi-nuclide removal equipment) and stored in welded-joint tanks.
- Multi-layered contaminated water management measures, including land-side impermeable walls and sub-drains, have stabilized the groundwater at a low level and the increased contaminated water generated during rainfall is being suppressed by repairing damaged portions of building roofs facing onsite, etc. Through these measures, the generation of contaminated water was reduced from approx. 540 m<sup>3</sup>/day (in May 2014) to approx. 130 m<sup>3</sup>/day (in FY2021).
- Measures continue to further suppress the generation of contaminated water to 100 m<sup>3</sup>/day or less within 2025.

### (2) Efforts to complete stagnant water treatment

- To reduce the stagnant water levels in buildings as planned, work to install additional stagnant water transfer equipment is underway.
- In 2020, treatment of stagnant water in buildings was completed, except for the Unit 1-3 Reactor Buildings, Process Main Building and High-Temperature Incinerator Building.
- While conducting the dust impact assessment, measures to reduce the stagnant water level were implemented. In March 2023, the target water level in each building was achieved. For the Units 1-3 Reactor Buildings, "reducing stagnant water in the Reactor Buildings to about half the amount at the end of 2020 during the period FY2022-2024" was achieved.
- For zeolite sandbags on the basement floors of the Process Main Building and High-Temperature Incinerator Building, measures to reduce the radiation dose are being examined with stabilization in mind.

## (3) Efforts to stably operate contaminated water management

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



## **Progress status**

◆ The temperatures of the Reactor and the Primary Containment Vessel of Units 1-3 have been maintained stable. There was no significant change in the concentration of radioactive materials newly released from Reactor Buildings into the air. It was concluded that the comprehensive cold shutdown condition had been maintained.

**Evaluation of contaminated water generated** in FY2022 and future measures to suppress groundwater inflow to buildings

Multiple measures have been implemented to manage contaminated water, including installing a roof on the building to prevent rainwater infiltration and constructing barriers around buildings. Additionally, the rainfall in 2022 was lower (1,192 mm) compared to previous normal years (approximately 1,470 mm), and there were no instances of heavy rain exceeding 100 mm/day. As a result, the amount of contaminated water generated in 2022 was approximately 90 m<sup>3</sup>/day, indicating that the inflow of water into buildings was effectively reduced.

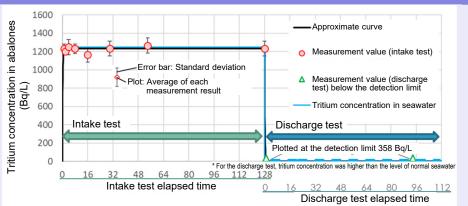
Measures such as facing in the west-side area of Unit 3 will continue, and efforts to reduce the generation of contaminated water will be consistently carried out.

## Progress status of the rearing test of marine organisms

In the abalone testing, it was confirmed that when abalones were raised in seawater containing ALPS treated water (with a tritium concentration of less than 1,500 Bg/L), the tritium levels in their bodies did not exceed the concentration in their growing environment. Moreover, when the abalones were transferred to regular seawater, the tritium concentration in their bodies was decreased. TEPCO will continue to provide easy-to-understand information on this matter.

> Live video of marine organisms rearing test https://www.youtube.com/channel/UC LEn8NHHX2WrMvn6ZYfAjJA





< Tritium concentration in abalones >

**Unit 1 Status of the Primary Containment** Removed fuel (assemblies) Dome roof Removed fuel (assemblies) Fuel-handling Front chamber **566/566** Reactor Spent Fuel machine Crane Operating floor **1535**/1535\*1 Pressure Pool (SFP) (Fuel removal completed on February 28, 2021) Vesse (RPV) (Fuel removal completed FHM girder Shield on December 22, 2014) Shield Primary nbly of the guaranty rame is underway Containment Vessel Cover for fuel 615 (PCV) removal Water Pedesta Water injection iniection Suppression chamber (SC) 1568/1568 \*1 Including two new fuel Unit 2 Unit 3 Unit 4 Reactor Building (R/B) | Init

**Vessel (PCV) internal investigation** (the latter half)

Between March 28 and 31, an investigation inside the pedestal by the ROV-A2 was conducted.

The investigation confirmed a deposit of less than 1 meter in height across the floor and a fallen portion of the pedestal's upper structure. Additionally, no reflection from the structure expected in the upper part of the pedestal was observed, and a part appeared to be a black space. Consequently, it was assumed that a hole existed at the bottom of the Reactor Pressure Vessel.

This investigation also confirmed that some of the lower concrete inside the pedestal was missing, exposing the bar arrangement. Based on these findings, a seismic assessment will be conducted for the pedestal. If the potential safety implications of losing the support function are identified, measures to mitigate any influence will be explored.

# Assumed to be the upper structure of the pedestal Deposit 2023/03/ 10 37:56

<Status of the pedestal bottom >

## IAEA published the Review Report (2nd) concerning the safety of ALPS treated water

The IAEA Review Report (2nd) concerning the safety of ALPS treated water and based on the November 2022 review was published on April 5.

The report contains points of discussions between the IAEA Taskforce, the Ministry of Economy, Trade and Industry and TEPCO as well as findings for each technical subject.

Overall, no major problems were pointed and the report indicated the following: instructions in the 1st review in February 2022 were appropriately reflected, understanding on the IAEA side was deepened and no additional mission would be necessary.

## Unit 2 Status of preliminary work for the PCV internal investigation and trial retrieval

In preparation for the investigation inside Unit 2's Primary Containment Vessel (PCV) and the trial retrieval, an isolation room was installed on-site and completed on April 14.

The new isolation room will serve as a boundary to contain gas inside the PCV when opening the hatch for the X-6 penetration, which will be the entry point for the robot arm.

While the hatch is open, measures will be taken to prevent the spread of contamination, such as increasing the pressure inside the isolation room to prevent gas leakage from the PCV and installing filtered local exhaust fans. Moreover, dust concentration will be monitored during the work to ensure that safety remains a top priority.



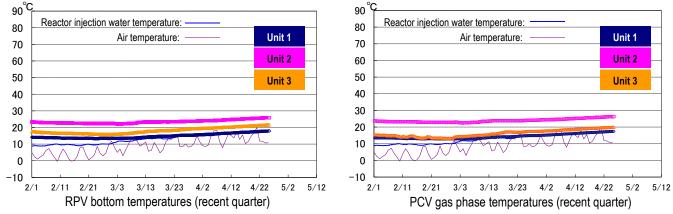
< Status of the isolation room installation >

## Major initiatives – Locations on site FY2022 evaluation of contaminated water generated and future measures to suppress groundwater inflow to buildings Unit 2 Status of preliminary work for Unit 1 Status of the Primary Containment Vessel (PCV) internal investigation (the latter half) the PCV internal investigation and trial retrieval Sea-side impermeable walls Land-side impermeable walls Process Main Building Unit 6 Unit 5 Sub-drain MP-1 High Temperature Incinerator Building Radioactive Waste Incinerator MP-8 Area for installation of waste storage facilities Area for installation of waste treatment and storage facilities MP-7 Area for installation of tank MP-2 **Additional Radioactive Waste** Incinerator Site boundary MP-4 Progress status of the rearing test of marine organisms IAEA published the Review Report (2nd) concerning the safety of ALPS treated water Provided by Japan Space Imaging Corp., photo taken on April 8, 2021 Product (C) [2020] DigitalGlobe, Inc., a Maxar company

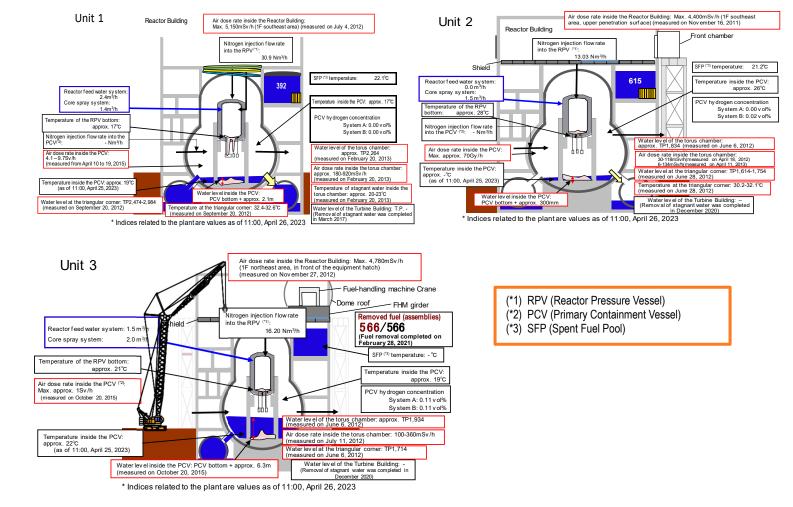
### I. Confirmation of the reactor conditions

### Temperatures inside the reactors

Through continuous reactor cooling by water injection, the temperatures of the Reactor Pressure Vessel (RPV) bottom and the Primary Containment Vessel (PCV) gas phase were maintained within the range of approx. 15 to 25°C for the past month, though it varied depending on the unit and location of the thermometer.



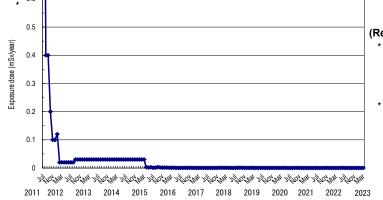
- \*1 The trend graphs show part of the temperature data measured at multiple points.
- \*2 A part of data could not be measured due to maintenance and inspection of the facility and other work.



## Release of radioactive materials from the Reactor Buildings

As of March 2023, the concentration of radioactive materials newly released from Reactor Building Units 1-4 into the air and measured at the site boundary was evaluated at approx.  $2.2 \times 10^{-12}$  Bg/cm<sup>3</sup> and  $1.5 \times 10^{-12}$  Bg/cm<sup>3</sup> for Cs-134 and -137 respectively, while the radiation exposure dose due to the release of radioactive materials there was less than 0.00004 mSv/year.

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



- \* The concentration limit of radioactive materials in the air outside the surrounding monitoring
- [Cs-134]: 2 x 10<sup>-5</sup> Bq/cm<sup>3Marc</sup>
- [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 0.315- 1.066 µSv/h (March 29 - April 25, 2023).

To measure the variation in the air dose rate of MP2-MP8 more accurately, work to improve the environment (trimming trees, removing surface soil and shielding around the MPs) was

- 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.

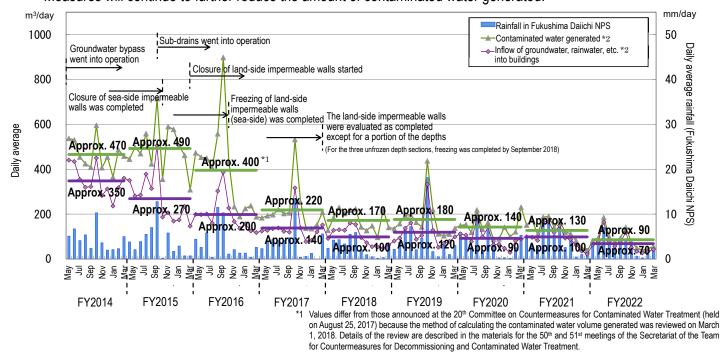
Based on the above, it was confirmed that the comprehensive cold shutdown condition had been maintained and the reactors remained in a stabilized condition.

### . 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
- After implementing "redirecting" measures (groundwater bypass, sub-drains, land-side impermeable walls and others) and rainwater prevention measures, including repairing damaged portions of building roofs and due to less rainfall than in previous normal years without concentrated heavy rain of 100 mm/day or more, the amount of contaminated water generated within FY2022 declined to approx. 90 m<sup>3</sup>/day.
- Measures will continue to further reduce the amount of contaminated water generated.



calculated based on the data measured at 7:00 on every Thursday.

\*2: The monthly daily average is derived from the daily average from the previous Thursday to the last Wednesday, which is

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 April 18, 2023, 2,133 release operations had been conducted.

The water quality of all temporary storage tanks satisfied the operational target.

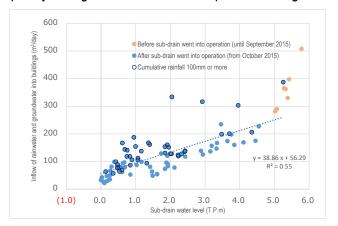


Figure 2: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Units 1-4 sub-drains

## Implementation status of facing

Facing is a measure that involves asphalting the on-site surface to reduce the radiation dose, prevent rainwater infiltrating the ground and reduce the amount of underground water flowing into buildings. As of the end of March 2023, 95% of the planned area (1,450,000 m<sup>2</sup> 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 March 2023, 40% of the planned area (60,000 m<sup>2</sup>) had been completed.

## Status of the groundwater level around buildings

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

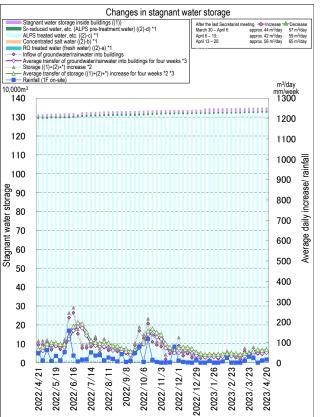
## Operation of the multi-nuclide removal equipment and other water-treatment facilities

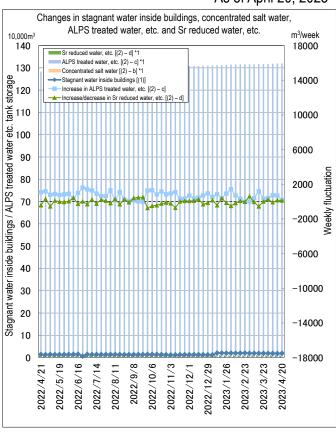
- Regarding the multi-nuclide removal equipment (existing), hot tests using radioactive water had been conducted (System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013). On March 23, 2022, a pre-service inspection certificate was granted by the Nuclear Regulation Authority (NRA) and the entire pre-service inspection was completed. The multi-nuclide removal equipment (additional) went into full-scale operation from October 16, 2017. Regarding the multi-nuclide removal equipment (high-performance), hot tests using radioactive water had been conducted from October 18, 2014. On March 2, 2023, a pre-service inspection certificate was granted by the NRA and the entire pre-service inspection was completed.
- As of April 20, 2023, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 495,000, 755,000 and 104,000 m<sup>3</sup>, respectively (including approx. 9,500 m<sup>3</sup> 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 April 20, 2023, approx. 712,000 m<sup>3</sup> had been treated.

### Risk reduction of strontium-reduced water

To reduce the risks of strontium-reduced water, treatment using existing, additional and high-performance multinuclide removal equipment is underway. Up until April 20, 2023, approx. 879,000 m³ had been treated.

As of April 20, 2023





- (1): Stagnant water storage inside buildings (Units 1-4, Process Main Building, High Temperature Incinerator Building, Waste Liquid Supply Tank, SPT (A), SPT (B), Units 1-3 CST, buffer tank)
- (2): Units 1-4 tank storage ([(2)-a RO treated water (fresh water)] + [(2)-b Concentrated salt water] + [(2)-c ALPS treated water, etc.] + [(2)-d Sr-reduced water, etc. (ALPS pre-treatment water)]
- Water amount from tank bottom to water-level gauge 0% (DS) \*1: Water amount for which the water-level gauge indicates 0% or more
- \*2: Calculated in the method of contaminated water generated [(Inflow of groundwater/rainwater into buildings) + (other transfer) + (chemical injection into ALPS)]
  \*3: Average transfer of storage increase and groundwater/rainwater into buildings for four weeks was added (November 24, 2022)

Figure 3: Status of stagnant water storage

## Progress status of tsunami countermeasures

- To prepare for an imminent emergency of the Japan Trench tsunami, construction to install the "Japan Trench Tsunami Seawall" started from June 2021. As of April 2023, construction of the seawall and road on the Units 1-4 side and the south side of Unit 4 is underway.
- The Japan Trench Tsunami Seawall will be completed in the 2nd half of FY2023.
- Ongoing work to install the sub-drain and the water collection facilities, which are currently installed in the area of 2.5 m above sea level, also in the area of 33.5 m above sea level continues. After dismantling the heavy oil tanks on-site within FY2023, relay tanks will be installed.
- · For the high ground area (33.5 m above sea level) to which water collection facilities will be transferred, after completing the area preparation, work to improve the ground started from October 2022. At present, construction of the concrete base prior to installing the water collection facilities is underway.
- Subsequently, according to the installation of the sub-drain and the water-collection facilities, work to install pipes to transfer from the sub-drain relay tanks to the water-collection facilities, pumps to transfer to the purification equipment, power supply and other facilities will be implemented sequentially.
- Measures to improve the reliability of the ALPS outlet sample tanks (including flanged tanks)
- There is a system to treat water in each of the existing, additional and high-performance ALPS and then temporarily store it in sample tanks dedicated for each ALPS. To prioritize water treatment, the existing ALPS needs to be operated with flanged sample tanks.

- To improve the reliability of the existing ALPS operation (to ensure operation in the case of trouble in the sample tank due to the effects of sample earthquakes or other factors) and for other purposes, "connecting pipes" to transfer water treated in the existing ALPS to sample tanks (welded-joint tanks) for additional and high-performance ALPS.
- The pre-service inspection was completed and went into operation from April 18, 2023. Meanwhile, considering the operation of each ALPS, flanged sample tanks remain in use after the connecting pipes go into operation. The storage capacity of ALPS treated water tanks (1.373 million m³) remained unchanged after operation got underway.
- > Status of sea-area monitoring related to the handling of ALPS treated water
- The concentration of tritium in seawater within 2km of the port has remained constant over the past two years and was also low at new measurement points within the fluctuation range of seawater in Japan\*. The concentration of Cesium-137 increased temporarily, which was considered due to rainfall, as applied to the past fluctuation in seawater around the Fukushima Daiichi Nuclear Power Station. However, it remained constant relative to measurement benchmarks over the past two years and at new measurement points also low within the fluctuation range of seawater in Japan\*. For tritium, monitoring with a lower detection limit has been conducted since April 18, 2022.
- Both concentrations of tritium and Cesium-137 in seawater within 20km of the coast had remained constant over the past two years and low within the fluctuation range of seawater in Japan\*.
- The concentration of tritium in seawater further than 20km from the coast remained low, including at new measurement
  points, within the fluctuation range of seawater in Japan\*. The concentration of Cesium-137 remained constant over
  the past two years within the fluctuation range of seawater in Japan\*.
- \* : The range of the minimum maximum values detected during April 2019 March 2022 was as follows in the database below:

In Japan (including off the coast of Fukushima Prefecture):

Tritium concentration: 0.043 - 20 Bq/L
Cesium-137 concentration: 0.0010 - 0.45 Bg/L

Off the coast of Fukushima Prefecture

Tritium concentration: 0.043 – 2.2 Bq/L Cesium-137 concentration: 0.0010 - 0.45 Bq/L

Source: Environmental Radioactivity and Radiation in Japan, Environmental Radiation Database

https://www.kankyo-hoshano.go.jp/data/database/

- The concentration of tritium in fish sampled at the sampling point T-S8 had remained constant over the past two years. The concentration of tritium in fish sampled at new sampling points, including those for which the analytical value was verified, remained low within a similar fluctuation range for seawater in Japan\*. Other measurement data of fish is being verified.
- \* : The range of the minimum maximum values detected during April 2019 March 2022 was as follows in the database above:

In Japan (including off the coast of Fukushima Prefecture)

Tritium concentration (tissue free water type): 0.064 – 0.13 Bg/L

The concentration of iodine 129 in seaweed sampled since July 2022 had been below the lower detection limit (< 0.1 Bq/kg (raw)). The concentration of tritium had not been analyzed due to a lack of sufficient sample population for reanalysis via the improved method following a review of the analytical procedures and based on the verification results of fish tritium analysis data. The fluctuation range of iodine 129 in seaweed in Japan had been within the range of minimum – maximum values detected during April 2019 – March 2022 in the database below.</li>

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

- Progress status of work to install the ALPS treated Water Dilution/Discharge Facility and related facilities
- For the measurement and confirmation/transfer facilities, work to install a pipe support, piping and others for these facilities started from August 4, 2022 from around the K4 area tanks. The pre-service test started from January 16,

2023.

- For the discharge facility, drilling of the discharge tunnel was completed on April 26, 2023 (tunnel length: approx. 1,031 m).
- For the discharge shaft (upstream pool) of the dilution facility, installation and assembly of blocks (manufactured outside the site) started from January 12 and concrete placement of the bottom plate (bottom) and others, from February 9. The installation and assembly and concrete placement were completed. Subsequently, waterproof coating is underway.
- In the seaside area for Units 5 and 6, scaffolding for heavy-duty machines was completed on December 29, 2022, and the scaffold has been utilized, mainly to construct the upper stream pool from January 5, 2023. Sedimentation inside the intake open channels was removed (dredging) and the partition weir was built (completed on April 13) simultaneously. From April 18, a portion of the anti-permeation work started.
- At sea, the temporary surveying tower, which is equipped with the outlet caisson, was removed. The surveying tower
  was split into upper and lower parts. Removal of the upper part was completed on April 9 and the lower part, on April
  13.

## Fuel removal from the spent fuel pools

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

## Main work to help spent fuel removal at Unit 1

- From April 2021, work to assemble a temporary gantry and others has been underway in a yard outside the site as part of efforts to install a large cover. The ground assembly was completed for the temporary gantry and lower structure and approx. 83%, for the upper structure.
- A work yard was prepared around the Reactor Building and preliminary work to install a large cover started from August 2021.
- A temporary gantry is being installed from the portion where anchors and base plates near the top of the temporary gantry are installed.
- Before the forthcoming drilling of anchors near the operating floor level, removal of rubble which would interfere with the drilling started in advance from March 2023.
- Main work to help spent fuel removal at Unit 2
- Work to remove the control room of the fuel-handling machine (hereinafter FHM control room), which started from August 2022, was completed in November 2022. (Work to transport dismantled rubble was completed on January 31)
- From February 6, 2023, work to dismantle the existing facility on the south side commenced and was completed in March 20. Work to collect and transfer the dismantled rubble continues.
- Outside the building, the erection of a steel structure commenced from January 23, 2023.
- Outside the site, before erecting the steel structure on-site, ground assembly continues.

## Retrieval of fuel debris

- Unit 1 PCV internal investigation (the latter half)
- From March 28, 2023, the investigation inside the pedestal by ROV-A2 started and was completed on March 31.
- In this investigation, it was confirmed that a portion of lower concrete inside the pedestal was lost, and the bar arrangement was exposed. Based on the investigative results, a seismic assessment of the pedestal will be conducted.
   After confirming the potential influence on safety in the case where the support function is lost, measures to alleviate the influence will be examined.
- Progress status toward Unit 2 PCV internal investigation and trial retrieval
  - Regarding the robot arm, by correcting the difference between the information acquired through the ongoing Naraha mockup test simulating the site, which had been conducted since February 2022 and the pre-simulation results, to

reduce the risk of contact while retrieving the fuel debris, correction of the control program and other improvements are currently underway. (Improvements: correcting and improving the accuracy of the control program, increasing the arm operation speed, improving the cable-mounting tool, increasing visibility, improving the gripper, etc.)

• As preliminary work of the Unit 2 site, work to install the isolation room toward opening the X-6 penetration hatch commenced from November 2021. In response to the damage to the rubber box in the isolation room, bending of the guide roller (earthquake response), misalignment of the shield door, damage to the pressing mechanism part and others having occurred during the work, countermeasures were implemented, and the installation of the isolation room was completed in April 2023. Subsequently, removal of deposits inside X-6 penetration and other work are scheduled. Work will proceed safely and carefully.

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

- Work to remove the pipes of the Standby Gas Treatment System (SGTS) was resumed from April 19, but suspended due to trouble involving the pipe support cutter.
- After conducting the cause analysis of the trouble, recurrence prevention measures and inspection of the facility, work will resume. Work will proceed safely and carefully prioritizing safety.
- > Status of the on-site investigation toward dismantling the Units 3/4 exhaust stack
- To secure the site for the fuel debris retrieval equipment, the Units 3/4 exhaust stack will be dismantled and removed.
- The sections to be dismantled are the SGTS pipes on the ground and inside the Units 3/4 exhaust stack, the main exhaust duct and SGTS pipes from the Units 3/4 exhaust stack until the Unit 4 T/B Building.
- As part of the on-site investigation before removing the Units 3/4 exhaust stack, the dose rate inside the exhaust stack and SGTS pipes will be measured. After testing using the mockup, assembly of the house, boring for the Units 3/4 exhaust stack and SGTS pipes and investigation will be conducted in May and June.
- In the Units 3/4 exhaust stack, the air dose rate is lower compared with the Units 1/2 exhaust stack, which also means a lower contamination risk. However, to thoroughly ensure work safety, a dust prevention house and local exhaust fans will be installed before the investigation, as was done for the Units 1/2 exhaust stack.

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

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

## Management status of rubble and trimmed trees

• As of the end of March 2023, the total storage volume for rubble of concrete and metal etc. was approx. 388,200 m³ (+60,900 m³ compared to the end of February with an area-occupation rate of 76%). The total storage volume of trimmed trees was approx. 118,700 m³ (-200 m³ with an area-occupation rate of 68%). The total storage volume of used protective clothing was approx. 15,800 m³ (+1,100 m³, with an area-occupation rate of 62%). The total storage volume of radioactive solid waste (incinerated ash and others) was approx. 38,100 m³ (a slight increase, with an area-occupation rate of 60%). The increase in rubble was attributable to the setting sift of the temporary deposits awaiting temporary storage to the temporary storage area. On March 30, 2023, the temporary deposits awaiting temporary storage were eliminated by setting them as the temporary storage area or eliminating them.

## Management status of secondary waste from water treatment

• As of April 6, 2023, the total storage volume of waste sludge was 474 m³ (area-occupation rate: 68%), while that of concentrated waste fluid was 9,407 m³ (area-occupation rate: 91%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment and other vessels, was 5,550 (area-occupation rate: 88%).

## > Progress status concerning the optimization of waste storage management

- On March 30, 2023, the temporary storage awaiting temporary accumulation were eliminated by setting a new temporary storage area.
- This helped achieve a state where only temporary accumulation for separating waste or putting the waste in containers

was handled.

• Patrols, drone surveys, container inspections, monitoring in case of emergency and other measures will continue to maintain optimal management state.

## Status of trouble shooting of the Radioactive Waste Incinerator

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

## Reduction in radiation dose and mitigation of contamination

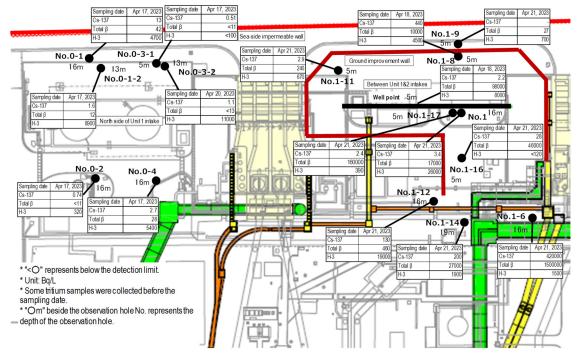
Effective dose-reduction at site boundaries and purification of port water to mitigate the impact of radiation on the external environment

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

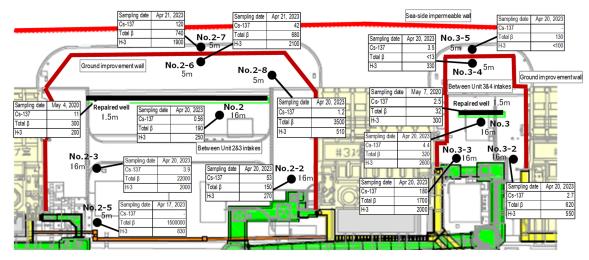
- In the Unit 1 intake north side area, the H-3 concentration was below the legal discharge limit of 60,000 Bq/L at all observation holes and remained constant or has been declining overall. The concentration of total β radioactive materials has remained constant overall but increased temporarily from April 2020 and is even increasing or declining at many observation holes at present, including Nos. 0-1-2, 0-3-1, 0-3-2 and 0-4. The trend continues to be carefully monitored.
- In the area between the Unit 1 and 2 intakes, the H-3 concentration has remained below the legal discharge limit of 60,000 Bq/L at all observation holes. It has been increasing or declining at Nos. 1-14, 1-16 and 1-17 but has otherwise remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall but been increasing or declining at many observation holes, including Nos. 1-6, 1-9, 1-11, 1-12, 1-14, 1-16 and 1-17. The trend continues to be carefully monitored.
- In the area between the Unit 2 and 3 intakes, the H-3 concentration has been below the legal discharge limit of 60,000 Bq/L at all observation holes. It has been increasing and declining at Nos. 2-3, 2-5, 2-6 and 2-7 but has remained constant overall. The concentration of total β radioactive materials has remained constant overall but been increasing or declining at No. 2-5. The trend continues to be carefully monitored.
- In the area between the Unit 3 and 4 intakes, the H-3 concentration has been below the legal discharge limit of 60,000 Bq/L at all observation holes and remained constant or been declining overall. The concentration of total β radioactive materials has remained constant overall but has been increasing or declining at many observation holes, including Nos. 3-4 and 3-5. The trend continues to be carefully monitored.
- In the groundwater on the east side of the Turbine Buildings, as with the total β radioactive materials, the concentration of cesium has also remained constant as the overall area but been increasing or declining and exceeded the previous highest record at some observation holes. Investigations into the fluctuation are underway for Nos. 0-3-2, 1, 1-6, 2-5, 2-6 and 3-3.
- The concentration of radioactive materials in drainage channels has remained constant overall, despite increasing during rainfall. In Drainage Channel D, drainage of the low-dose area on the west side of the site started to pass from August 30, 2022 and the concentration has remained low. From November 29, 2022, continuous monitors were installed and drainage around the Units 1 and 2 switch yard started to pass.
- In the open channel area of seawater intake for Units 1 to 4, the concentration of radioactive materials in seawater
  has remained below the legal discharge limit and been declining long term, despite temporary increases in Cs-137
  and Sr-90 noted during rainfall. They have also been declining following the completed installation and the connection
  of steel pipe sheet piles for the sea-side impermeable walls. The concentration of Cs-137 has remained slightly higher

in front of the south-side impermeable walls and slightly lower on the north side of the east breakwater since March 20, 2019, when the silt fence was transferred to the center of the open channel due to mega float-related construction.

- In the port area, the concentration of radioactive materials in seawater has remained below the legal discharge limit and been declining long term, despite temporary increases in Cs-137 and Sr-90 observed during rainfall. They have remained below the level of those in the Units 1-4 intake open channel area and been declining following the completed installation and connection of steel pipe sheet piles for the sea-side impermeable walls.
- In the area outside the port, regarding the concentration of radioactive materials in seawater, those of Cs-137 and Sr-90 declined and remained low after steel pipe sheet piles for the sea-side impermeable walls were installed and connected. Regarding the concentration of Cs-137, a temporary increase was sometimes observed on the north side of the Unit 5 and 6 outlets and near the south outlet due to the influence of weather, marine meteorology and other factors. Regarding the concentration of Sr-90, variation was observed in FY2021 in the area outside the port (north and south outlets). Monitoring of the tendency continues, including the potential influence of the weather, marine meteorology and others.



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



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

Figure 4: Groundwater concentration on the Turbine Building east side

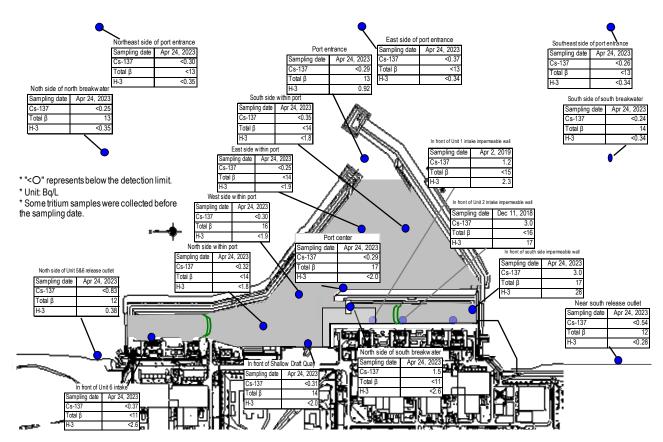


Figure 5: Seawater concentration around the port

## Status of the dose rate inside the Fukushima Daiichi Nuclear Power Station

- To improve the work environment inside the Fukushima Daiichi Nuclear Power Station, removal of surface soil, shielding and other measures have been implemented sequentially from areas with many workers to reduce the dose rate.
- The average dose rate of 1m above the surface around Units 1-4 was similar to that in FY2022 in the area 2.5m above sea level and declined from 99 to 53 μSv/h in the area 8.5m above sea level. The main works considered to contribute to the dose rate reduction include the removal of buried rubble on the north side of Unit 4 and rubble removal in the shed of the Unit 3 Turbine Building.
- Periodical dose rate measurement and efforts to determine the status will continue to improve the on-site work environment.

## 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 December 2022 to February 2023 was approx. 9,600 (cooperating company workers and TEPCO HD employees), which exceeded the monthly average workforce (approx. 7,700). Accordingly, sufficient personnel were registered to work on site.
- It was confirmed with the prime contractors that the estimated manpower necessary for the work in May 2023 (approx. 4,000 workers per day: cooperating company workers and TEPCO HD employees) would be secured at present. The average numbers of workers per day for each month (actual values) for the most recent 2 years were maintained, with approx. 3,000 to 4,600.
- The number of workers from both within and outside Fukushima Prefecture increased slightly. The local employment ratio (cooperating company workers and TEPCO HD employees) as of March 2023 remained constant at around 70%.
- The average exposure doses of workers were approx. 2.54 and 2.60 and 2.51 mSv/person-year during FY2019, 2020

and 2021, respectively (The legal exposure dose limits are 100 mSv/person and 50 mSv/person-year over five years, the TEPCO HD management target is 20 mSv/person-year).

• For most workers, the exposure dose was sufficiently within the limit and allowed them to continue engaging in radiation work.

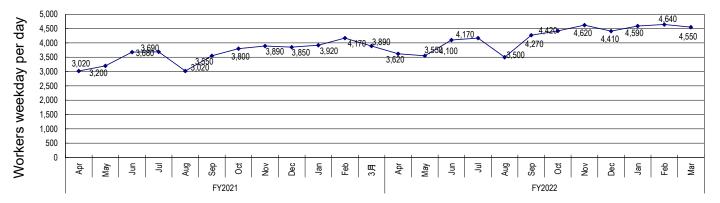


Figure 6: Changes in the average number of workers weekday per day for each month of the most recent 2 years (actual values)

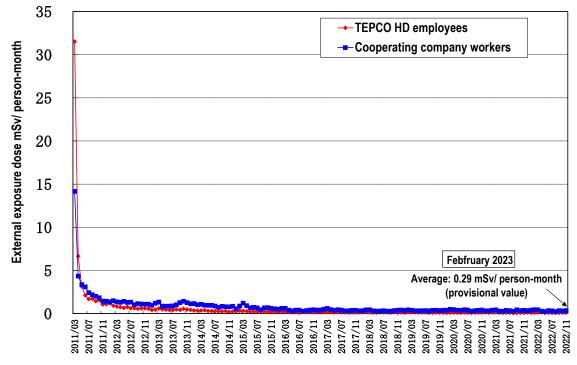


Figure 7: Changes in monthly average exposure dose of individual worker (monthly exposure dose since March 2011)

## Review of countermeasures to suppress the spread of COVID-19 infections

- At the Fukushima Daiichi Nuclear Power Station, in accordance with the TEPCO HD policy, each of the
  countermeasures to suppress the spread of infections will be abolished in principle from May 8, 2023. However, from
  the perspective of BCP (business continuity plan), part of the countermeasures to suppress the spread of infections
  within the workplace will continue for the time being, including mask wearing in crowded and closed places, a gradual
  review of operations for commuting and on-site buses and avoidance of contact with duty staff.
- Based on the social trend as well as the infection status within the workplace and other conditions, after May 8 and by around the end of June, the entire abolishment of the countermeasures including for duty staff was considered.
- Basic countermeasures (visiting medical institutions when feeling unwell, ventilation, avoidance of the "Three Cs," frequent handwashing, etc.) will continue to be implemented appropriately by each worker and TEPCO will proceed with decommissioning while prioritizing safety.

## FY2022 accident occurrence status and FY2023 safety activity plan

- The number of work accidents in FY2022 increased slightly to 23 from 22 the previous fiscal year. The number of
  accidents remained high. Issues need to be analyzed and ongoing accident prevention measures must continue to
  be reviewed and improved. There were three serious injuries (incapacitating workers for 14 days or more).
- The number of heat stroke cases in FY2022 increased to ten (degree-I: six cases; dehydration: four cases) from eight (degree-I: eight cases) in FY2021. In FY2022, as in the previous year, there were no serious heat stroke cases of degree-II or more. As a characteristic in FY2022, there were cases during work with multiple conditions among "work wearing full-face masks," "outdoor work" and "workers with disease affecting heat stroke occurrence" (such as high blood pressure). Strengthened management of work with multiple conditions will be reflected in the heat-stroke prevention plan.
- In FY2023, as in FY2022, "efforts to thoroughly ensure safety actions" and "efforts to conduct safety activities together
  with partners (prime contractors) and TEPCO" continue to be set as the focused activities. In particular, for the first
  focused activity, by thoroughly eliminating on-site risks through a series of safety management measures, including
  "on-site KY" and "after KY," any accidental injuries or fatalities will be prevented.

## Health management of workers in the Fukushima Daiichi Nuclear Power Station

- As health management measures in line with the guidelines of the Ministry of Health, Labour and Welfare (issued in August 2015), a scheme was established and operated, whereby prime contractors confirmed reexamination at medical institutions and the subsequent status of workers who were diagnosed as requiring "detailed examination and treatment" in the health checkup, with TEPCO confirming the operation status by the prime contractors.
- The recent report on the management status of the health checkup during the third quarter (October December) in FY2022 confirmed that the prime contractors had provided appropriate guidance and managed operations properly under the scheme. The report on the follow-up status during the second quarter in FY2022 and before confirmed that responses to workers, which had not been completed by the time of the previous report, were being provided on an ongoing basis and checking of operations will continue.

## Measures to prevent infection and expansion of influenza and norovirus

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

### Status of influenza and norovirus cases

• Until the 16th week of 2023 (April 17-23, 2023), 25 influenza and four norovirus infections were recorded. The totals for the same period for the previous season also showed no influenza and seven norovirus infections.

Note: The above data is based on reports from TEPCO HD and cooperating companies, which include diagnoses at medical clinics outside the site.

The subjects of this report were cooperating company workers and TEPCO HD employees in Fukushima Daiichi and Daini Nuclear Power Stations.

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

"The highest value" → "the latest value (sampled during April 10-24)"; unit (Bq/L); ND represents a value below the detection limit

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

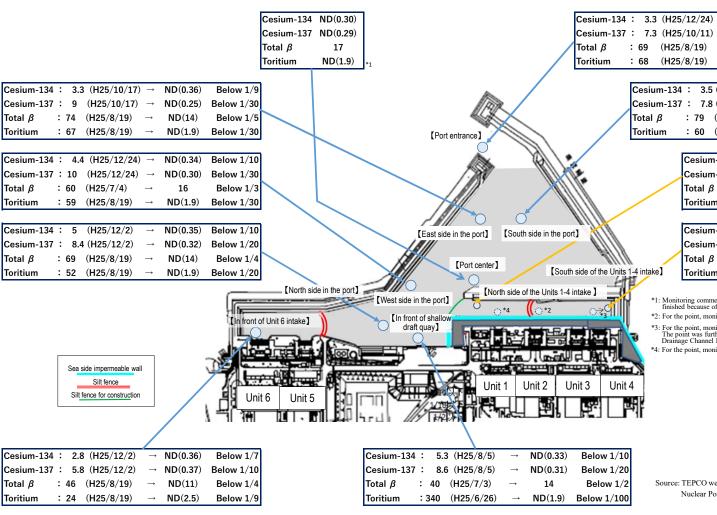
Below 1/9

**Below 1/20** 

Below 1/5

Below 1/100

#### Summary of TEPCO data as of April 25, 2023



Cesium-134	:	3.5	(H25/10/17)	$\rightarrow$	ND(0.30)	Below 1/10
Cesium-137	:	7.8	(H25/10/17)	$\rightarrow$	ND(0.35)	Below 1/20
Total $\beta$	:	79	(H25/10/17) (H25/8/19)	$\rightarrow$	ND(14)	Below 1/5
			(H25/8/19)			Below 1/30

ND(0.34)

ND(0.29)

13

0.67

	Cesium-134	:	32	(H25/10/11)	$\rightarrow$	ND(0.33)	Below 1/90
	Cesium-137	:	73	(H25/10/11)	$\rightarrow$	1.5	Below 1/40
	Total $\beta$	:	320	(H25/8/12)	$\rightarrow$	ND(11)	Below 1/20
	Toritium	:	510	(H25/10/11) (H25/10/11) (H25/8/12) (H25/9/2)	$\rightarrow$	3.8	Below 1/100

Cesium-134	ND(0.37)	ı
Cesium-137	3.0	ı
Total $oldsymbol{eta}$	17	ı
Toritium	29	

- \*1: Monitoring commenced in or after March 2014. Monitoring inside the sea-side impermeable walls was
- \*2: For the point, monitoring was finished from December 12, 2018 due to preparatory work for transfer of mega float.
- \*3. For the point, monitoring point was moved from February 6, 2019 due to preparatory work for transfer of mega float. The point was further moved to the outside of the slit fence from January 20, 2023, to install the slit fence to the Drainage Channel K outlet as a measure for fish in the port. (The sampling point was moved to approx.. 3m east side)
- \*4: For the point, monitoring was finished from April 3, 2019 due to preparatory work for transfer of mega float.

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

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

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

Note: The Total β measurement values include natural potassium 40 (approx. 12 Bg/L).

They also include the contribution of yttrium 90, which radioactively balance strontium 90.

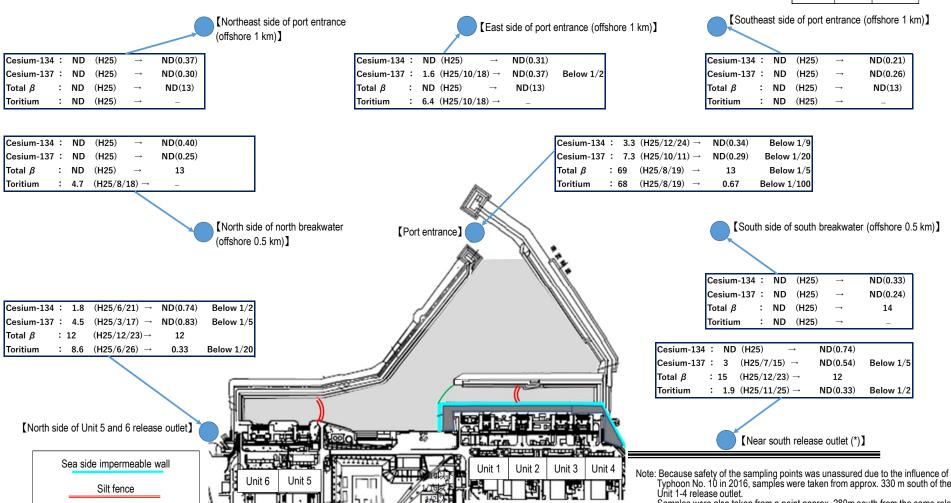
Unit (Bg/L); ND represents a value below the detection limit; values in ( ) represent the detection limit; ND (2013) represents ND throughout 2013

(The latest values sampled during April 10-24)

		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

Summary of TEPCO data as of April 25, 2023

Silt fence for construction



Typhoon No. 10 in 2016, samples were taken from approx. 330 m south of the

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/decommisjon/planaction/monitoring/index-j.html

Appendix 2

1000m

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

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

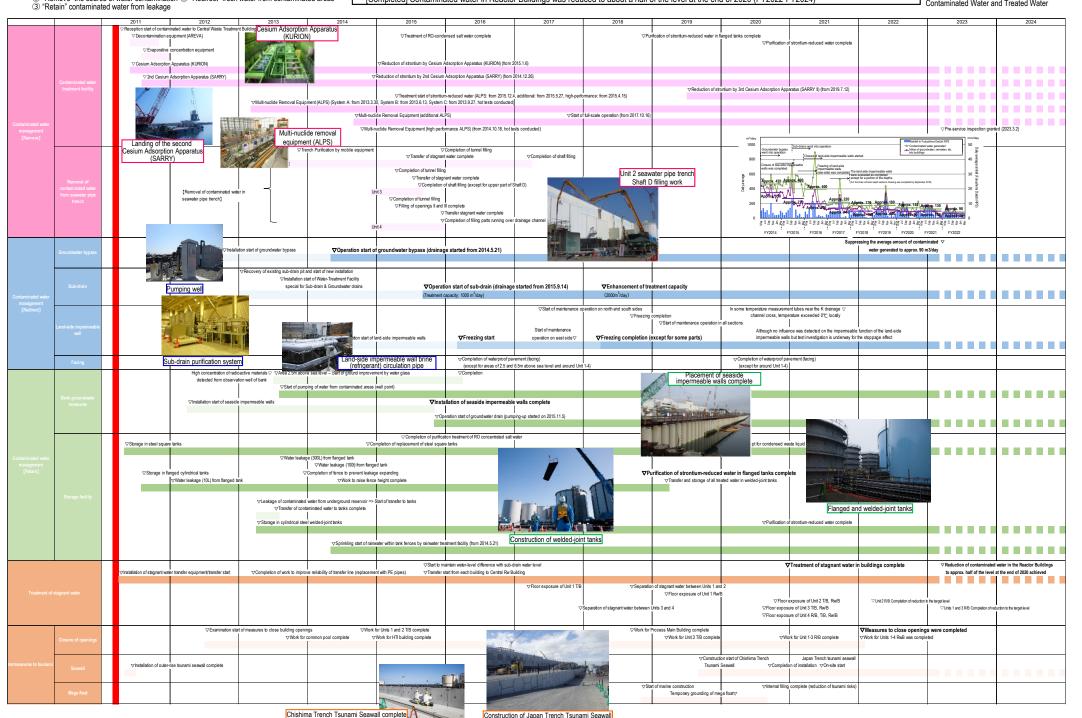
• [Completed] Suppressing the amount of contaminated water generated to 150 m³/day or less (within 2020)

• Suppressing the amount of contaminated water generated to 100 m<sup>3</sup>/day or less (within 2025)

• [Completed] Treatment of contaminated water in buildings was completed\* (Within 2020) "Except for Units 1-3 Reactor Buildings, Process Main Building and High Temperature Incinerator Buildings.

• [Completed] Contaminated water in Reactor Buildings was reduced to about a half of the level at the end of 2020 (FY2022-FY2024)

Reference 1/6 April 27, 2023 Secretariat of the Team for Countermeasures for Decommissioning, Contaminated Water and Treated Water



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

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

#### Information provision and communication to foster understanding



#### Visits and Discussion Meetings of Fukushima Daijchi Nuclear Power Station

To solve people's questions, TEPCO invites their visits to the power station and answer their questions on site. From people who participated in the visit gave feedbacks such as "by directly seeing the decommission site and having dialogues, they could obtain deeper understanding about the present situation, issues and status of safety measures." TEPCO will continue these efforts to invite more people including online visits. <Visits in FY2022: 15 times, 142 participants in total>

Examination concerning handling of ALPS

treated water

2014

Measures for decommissioning, contaminated water and treated water of the Fukushima Daiichi Nuclear Power Station need efforts to reduce risks over a long term. Regarding handling of ALPS treated water as a part of decommissioning, to local residents, those who in the fishery industry and related parties, we will thoroughly explain about the policies and responses concerning the facility design, operation and management to ensure safety, monitoring of radioactive materials and others, and proceed with efforts to sincerely face their concerns and interests and respond to each of them.

Moreover, to further deepen the understanding of everyone in Japan and overseas, efforts to coherently disseminate measurement results of ALPS treated water and information concerning facility operation, radiation impact assessment and others will continue and be enhanced.

- For overseas, the was renewed. "Treated Water portal site in English, Chinese and Korean"
- "Sea Area Monitoring" page in English, Chinese and Korean was published Safety review of International Atomic Energy IAgency (IAEA)
- "The 1st IAEA Review" explanation booklet was published in English. Chinese and Korean
- When inaccurate or misleading overseas information was detected. for maximum suppression of reputation, return call or other actions will be taken.
- A condition to deliver science-based information to overseas media and embassies in Japan will be created.
- · Approach to major media and embassies is being enhanced.
- •For accurate media coverage, regular press conferences will continue to be



2018

In November 2022, IAEA review team visited Japan to conduct the second review concerning safety of ALPS treated water (the first review was conducted in February 2022 and the report was published in April)

- The article of the IAEA Review concerning handling of ALPS treated water and overview of the report are published timely on the TEPCO website.
- Instructions from IAEA were reflected in the revision of the implementation plan and the radiation assessment report.
- The report of the second review will be published around early 2023.



IAEA review team arrived at the Fukushima Daiichi Nuclear Power Station

Rearing test of marine organisms

- To alleviate concerns and lead to relief of local residents, related parties and the everyone in society, marine orgasms are being reared in tanks of seawater containing ALPS treated water and the status is compared with the original seawater controls. The progress will be shown coherently and clearly.

 Regarding behaviors of tritium and others, a lot of research has been conducted in Japan and overseas. Based on the experimental results, firstly experimental data for a half year will be collected and subsequently, the same as past experimental results, the theory "tritium in vivo is not concentrated and the concentration of tritium in vivo will not exceed the level in the growing environment" will also be reaffirmed.

Contaminated Water and Treated Water

Countermeasures for Decommissioning,

Reference 2/6 April 27, 2023 Secretariat of the Team for

Flounder in rearing preparation tank



Overall view of mockup tanks

 Measurement of tritium concentration of flounder (tritium) concentration less than 1.500 Bg/L) and analysis of results

Based on the measurement results of tritium concentration, the following was confirmed as in the past insight:

[Intake test]

The tritium concentration did not exceed the level in the growing vironment (in this test, the concentration exceeding the level in ALPS treated water diluted with

- The tritium concentration reached equilibrium in a certain period

#### [Discharge test]

 When flounder having reached equilibrium in the tritium concentration higher than the level of normal seawater is returned to normal seawater the concentration decreased

-Frror bar: Standard deviation Plot: Average of each measurement resul 1400 1200 Measurement value (intake test 1000 Measurement value (discharge test) -Tritium concentration in seawate 400 120 144 Discharge test elapsed tim

Daily rearing status is published in the TEPCO website and Twitter

— TEPC∩ website:

http://www.tepco.co.ip/decommission/information/newsrelease/breed ingtest/index-i.html

- TEPCO Twitter: https://twitter.com/TEPCOfishkeeper



Tritiated Water Taskforce (2013.12 - 2016.5, 15 meetings)



2015

2016.6 Report of Tritiated Water Taskforce

2016

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

2018.8 Explanatory and hearing meeting, receiving opinions Subcommittee on Handling

2020.2 Report of \_\_\_\_ of ALPS treated water

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

2021.12.21 The "Application Documents for Approval to Amend the Implementation Plan for Fukushima Daiichi Nuclear Power Station Specified Nuclear Facility" regarding ALPS treated water were submitted to the Nuclear Regulation Authority 2021.12.28 "The Action Plan concerning the Continuous Implementation of the Basic Policy on Handling of ALPS Treated Water" was formulated

Review meeting concerning the implementation plan on handling of ALPS treated water (from 2021.7 to 2022.4, 15 meetings) 2022.4.28, 5.13, 7.15

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

2022 7 22 Application for the Application Documents for Approval to Amend the Implementation Plan was approved

**2**023.2.14, 20 Application for the Application Documents for Approval to Amend the Implementation Plan was submitted 2022.8.4 Work has commenced (amendment of organizational structure, and nuclides be measured and assessed, and others)

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

2017

2019

2020

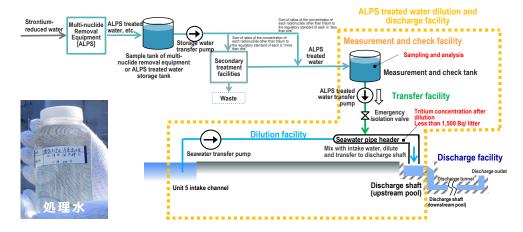
2021

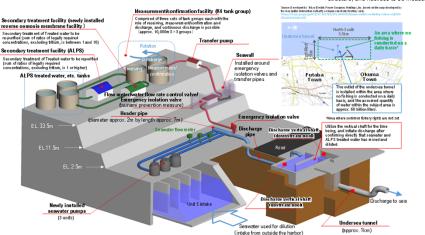
2022/8/30 The "Approach to Strengthening and Expansion of Measures in the Handling of ALPS Treated Water" was summarized

2023 **2022.11.14** 

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

## [Overview of ALPS treated water dilution and discharge facility]



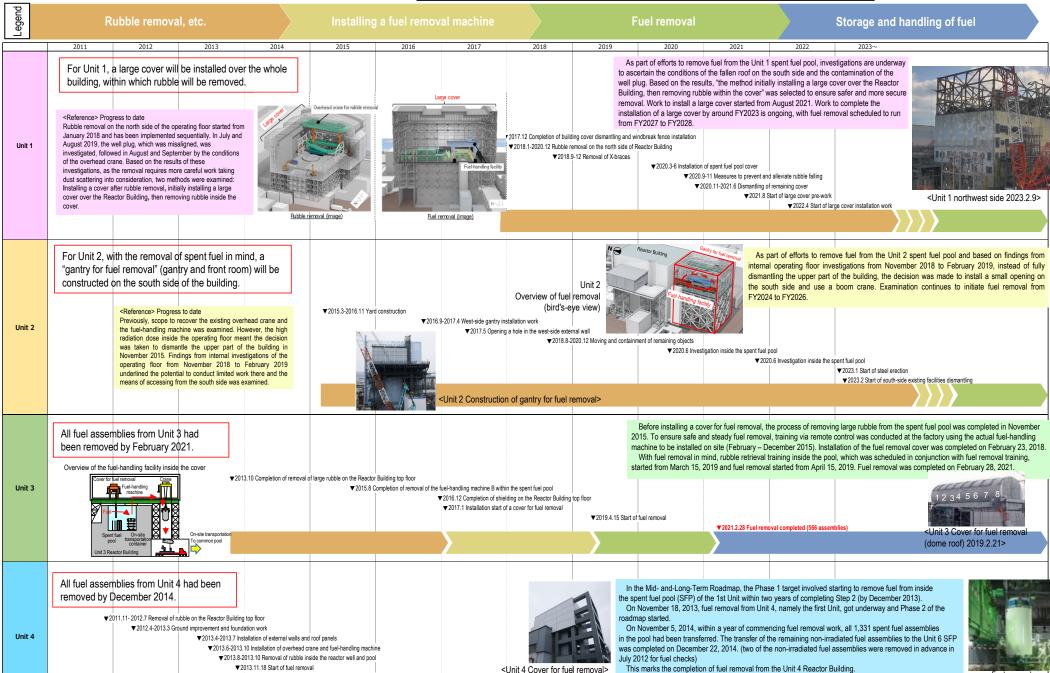


Milestones of the Mid- and-Long-Term Roadmap (major target processes)

- 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 3 / 6
April 27, 2023
Secretariat of the Team for
Countermeasures for Decommissioning,
Contaminated Water and Treated Water

Fuel remova



▼2014.12.22 Fuel removal was completed (1533 assemblies)

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

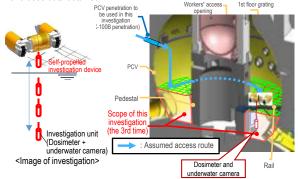
Milestones of the Mid- and-Long-Term Roadmap (major target processes)

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)

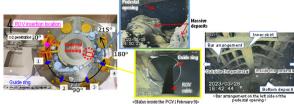
Before removing fuel debris, investigations inside the Primary Containment Vessel (PCV) are conducted to inspect the conditions there, including locations of fuel debris.

#### **Unit 1** Investigation overview

- In April 2015, a device having entered the inside of the PCV via a narrow opening (bore: \$\phi\$100 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



• In February 2022, the guide ring" was installed to facilitate the investigation. From March 28, 2023, the investigation inside the pedestal by ROV-A2 started and confirmed that a portion of the bar arrangement was exposed. Regarding the soundness of the pedestal, based on the past earthquake resistant evaluation by the International Research Institute for Nuclear Decommissioning (IRID), it was evaluated that even though a portion of the pedestal was lost, there would be no serious risk. However, as the present information is very limited, the investigation will continue to acquire as much information as possible for continued evaluation.



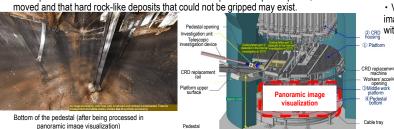
Unit 1 PCV internal investigation

	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	
Investigations	2nd (2015.4)	Confirming the status of the PCV 1st floor - Acquiring images - Measuring the air temperature and dose rate - Replacing permanent monitoring instrumentation	
inside the PCV	3rd (2017.3)	Confirming the status of the PCV 1st basement floor - Acquiring images - Measuring the dose rate - Sampling deposit - Replacing permanent monitoring instrumentation	
	4th (From 2022.2)	Acquiring information inside PCV (inside/outside of the pedestal) - Acquiring images - Measuring deposit thickness and sampling deposit - Detecting deposit debris, 3D mapping	
Leakage points from PCV	- PCV vent pipe vacuum break line bellows (identified in 2014.5) - Sand cushion drain line (identified in 2013.11)		

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

#### Unit 2 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



• 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>

Unit 2 PCV internal investigation 1st (2012.1

Investigations

inside the

Leakage

points from

2nd (2012.3)

4th (2017.1-2)

5th (2018.1)

6th (2019.2)

3rd (2013.2 - 2014.6)



<Work in front of the penetration>

Measuring the dose rate

- Acquiring images - Measuring the air temperature - Confirming water surface - Measuring the water temperature

Acquiring images - Sampling stagnant water

Determining characteristics of a portion of deposit

- Measuring water level - Installing permanent monitoring instrumentation

- Acquiring images - Measuring the dose rate - Measuring the air temperature

- Acquiring images - Measuring the dose rate - Measuring the air temperature Acquiring images - Measuring the dose rate - Measuring the air temperature

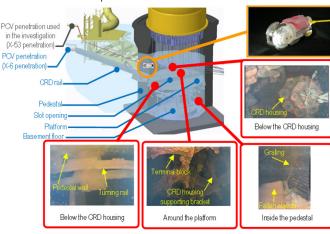
 Unit 2 Reactor Building 1st floor Location of the penetration>

4) Pedestal

#### 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
- · 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 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				

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)

- No leakage from the torus chamber rooftop - No leakage from any internal/external surfaces of S/C

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)

Reference 5/6 April 27, 2023

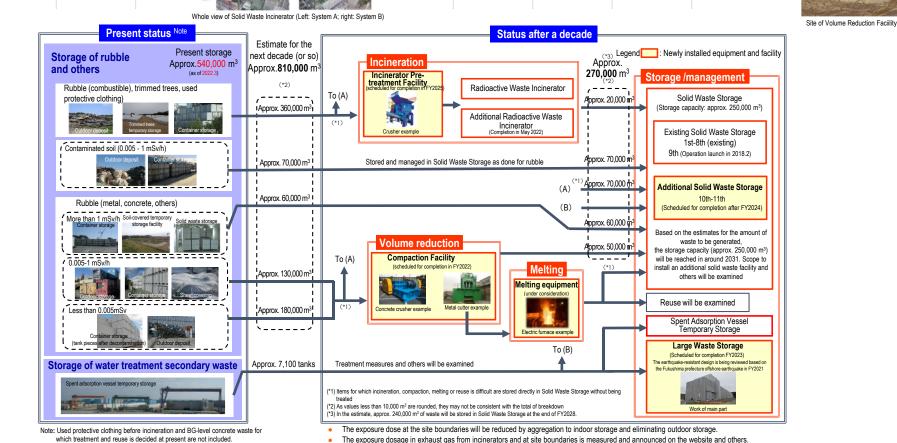
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Eliminating temporary outdoor storage of rubble and others \* Except for secondary waste of water treatment and materials for reuse or recycling (within FY2028) Decommissioning, Contaminated Water and Treated Water

★ 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 ry storage facility

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

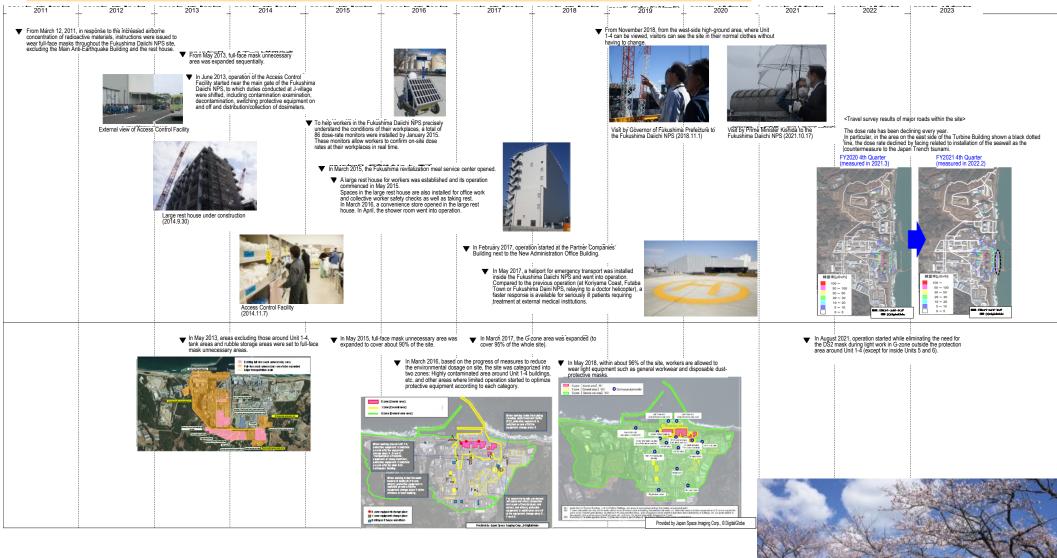
▼ 2019.6 Start of building construction 1st Large Waste Storage Roof construction (from the inside) ▼ 2013.1 Start of volume reduction of trimmed trees and storage in temporary storage tank A 1st Large Waste Storage ▼ 2014.7 Start of pre-work ▼ 2018.2 Operation start 9th Solid Waste Storage 2021.3 High alert issued from the Shallow Draft Quay <Outline of soil-covered temporary storage facility> ▼ 2021.7 Leakage of radioactive materials from drainage channel PS monitor ▼ a notch tank stored in temporary storage Area P External view of the 9th Solid Waste Storage (leakage from temporary storage Area W) Whole view of the soil-covered temporary storage facility Tank 3 2012 2013 2015 2016 2020 2011 2021 2022 ▼ 2016.3 Operation start ▼ 2013.5 Installation work gets underway Solid Waste Incinerato ▲ 2016.8-11 Manual stop (due to pin-hole incidence) ▼ 2017.4 Start of pre-work ▼2022.5 Start of operation Additional Solid Waste Incinerator 2017.10 Installation work gets ▼ 2018.5 Operation start Large Equipment Decontamination Facility Whole view of Solid Waste ▼ 2020.9 Start of pre-work Incinerator Compaction Facility



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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.









Facing (2017.4.13)