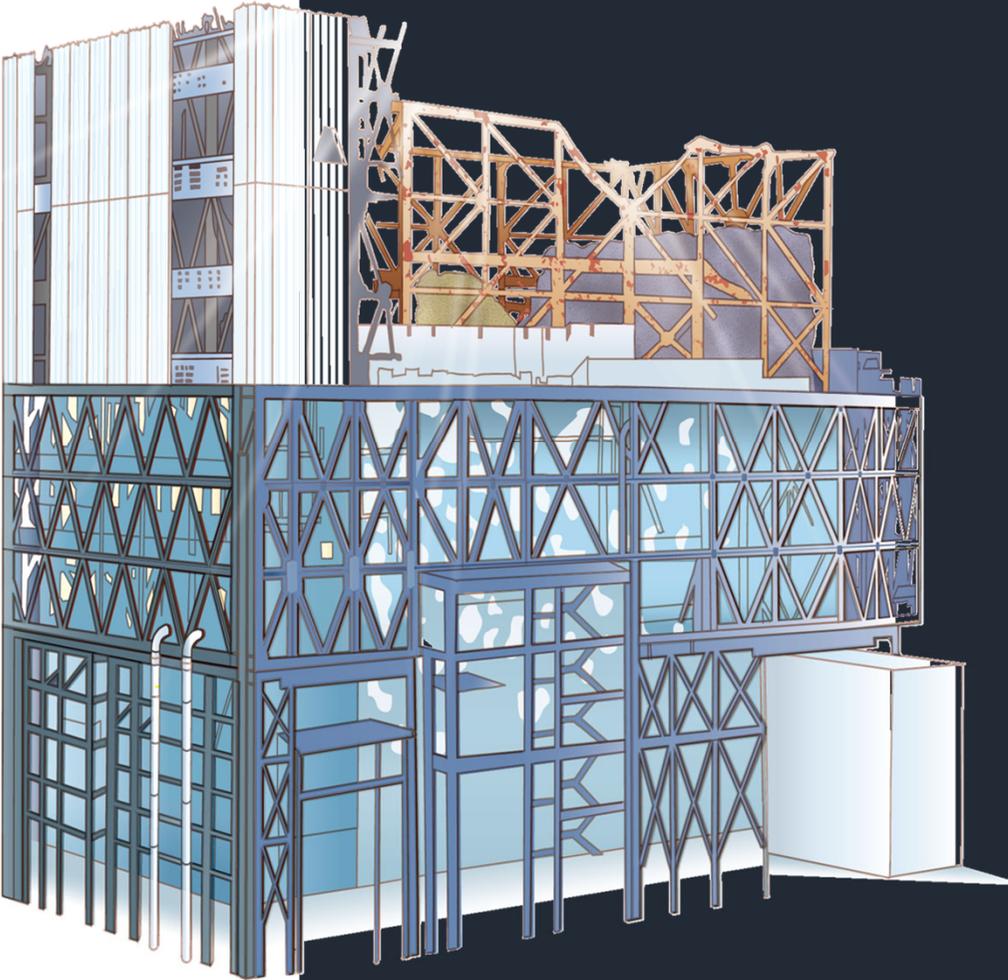


TEPCO



Decommissioning Initiatives Going Forward 2025

—Mid-and-Long-Term Decommissioning Action Plan Appendix—



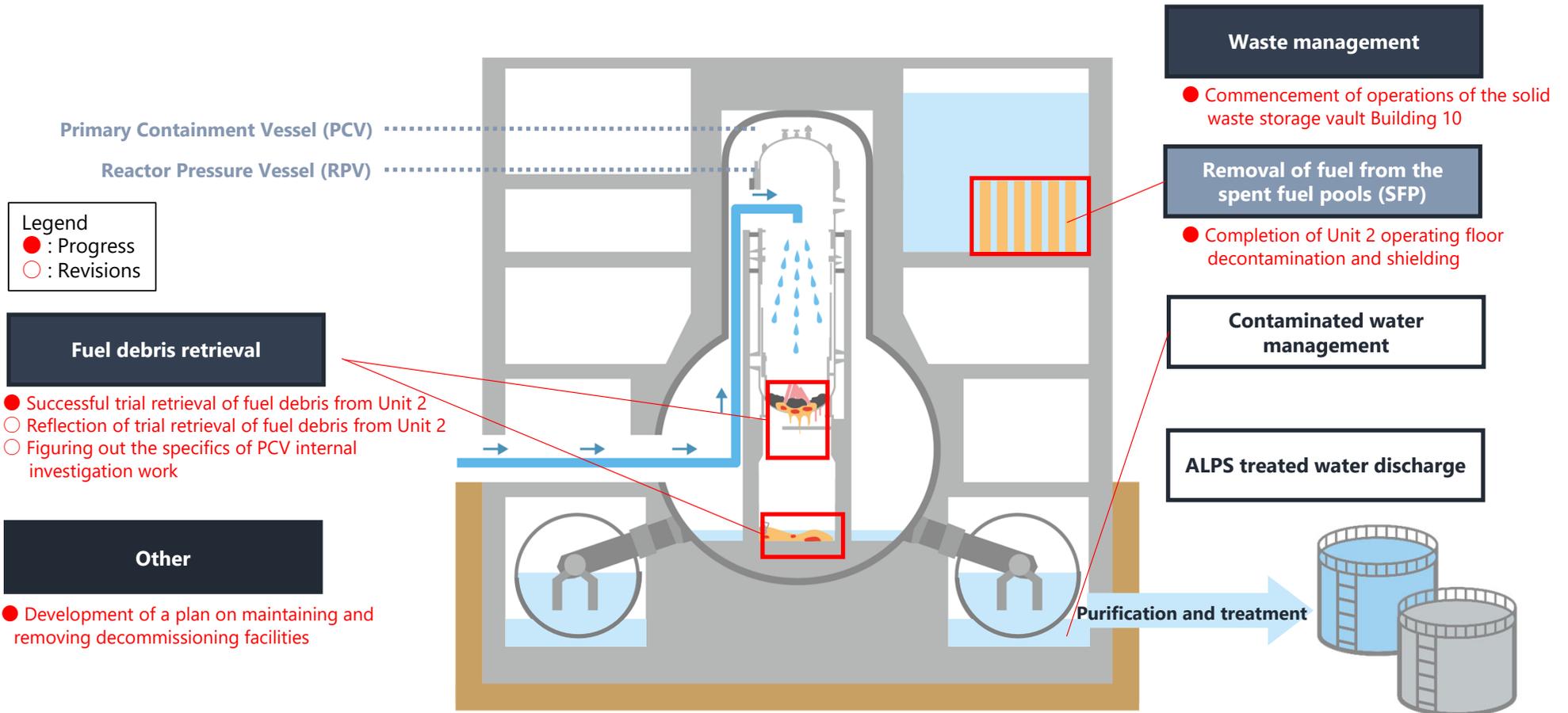
This document breaks down the Mid-and-Long-Term Decommissioning Action Plan 2025 using illustrations and photos based on feedback from the public who are seeking explanations of the decommissioning of Fukushima Daiichi Nuclear Power Station in easy to understand, layman's terms. Please see the Action Plan for specifics and details.

The Mid-and-Long-Term Decommissioning Action Plan lays out the major work processes of decommissioning in general to achieve the targets set in the Mid-and-Long-Term Roadmap and Nuclear Regulation Authority (NRA) Risk Map. Under the principle of "coexistence of reconstruction and decommissioning", we aim to carefully explain our projections for decommissioning work in an easy to understand manner to ensure we decommission the plant with the understanding of the region and the Japanese public. Furthermore, an outsourcing plan will be formulated based on the Mid-and-Long-Term Decommissioning Action Plan 2025 as we strive to expand outsourcing and get more local companies involved in decommissioning. The initiatives undertaken during the work of decommissioning the Fukushima Daiichi Nuclear Power Station are unprecedented in the world, and hence, we will revise this plan regularly in accordance with the progress made and the challenges faced, as we systematically proceed with safe and stable decommissioning.

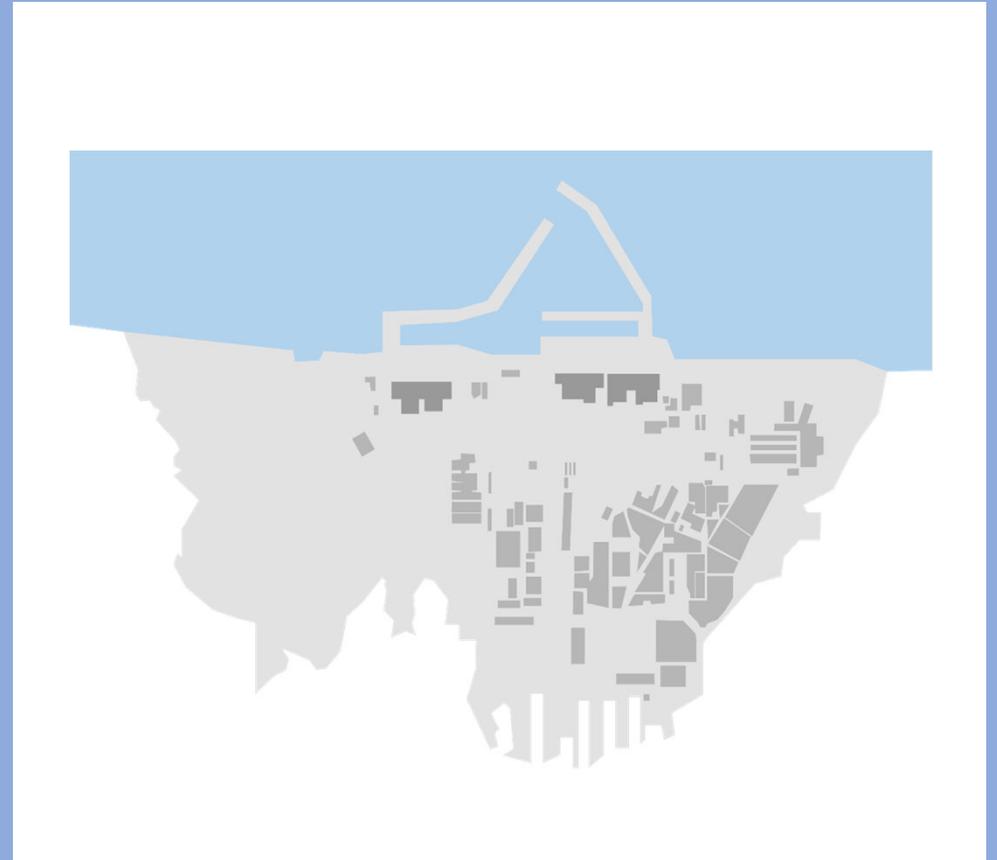
Progress and revisions in 2025

Decommissioning is work to reduce the risk radioactive materials pose to community residents and the local environment. It can be broken down into five categories.

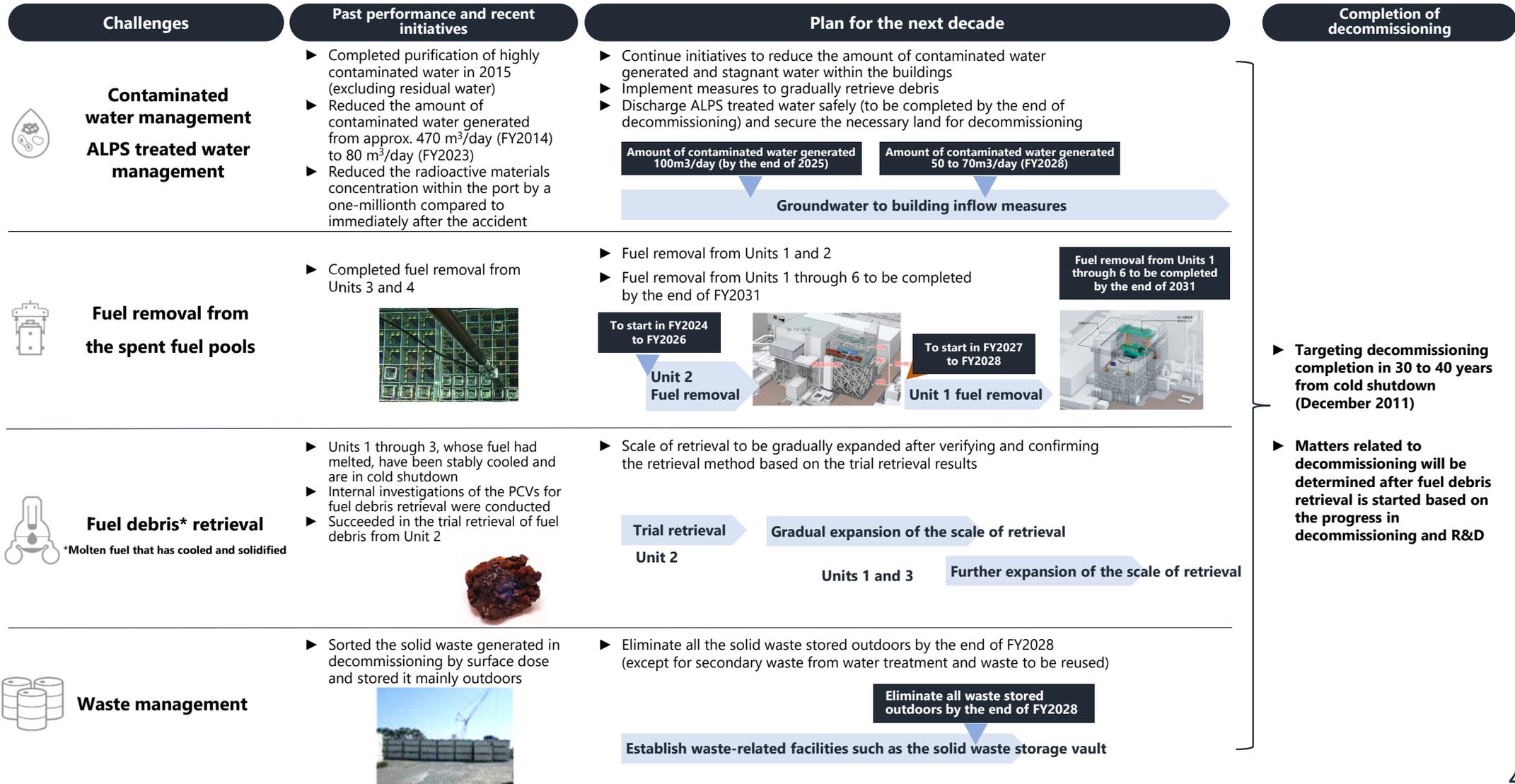
Progress and revisions made in the Mid-and-Long-Term Decommissioning Action Plan 2025 are as follows.



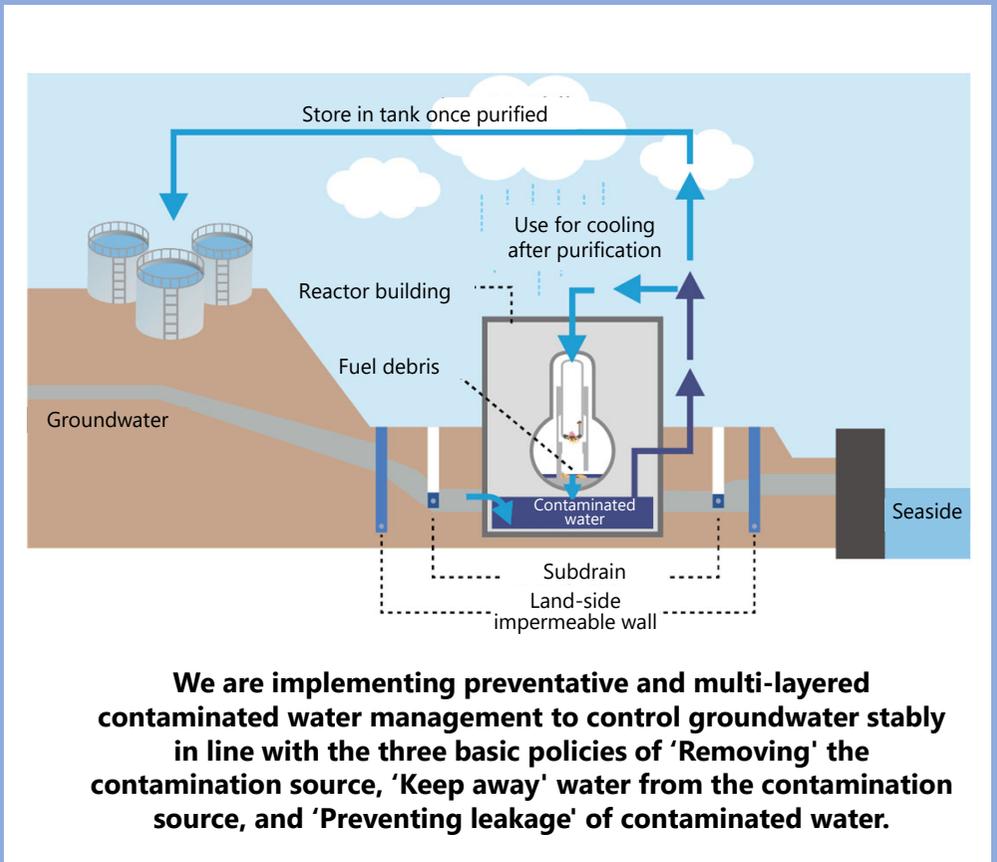
- **General decommissioning schedule**



Progress toward the decommissioning of Fukushima Daiichi Nuclear Power Station



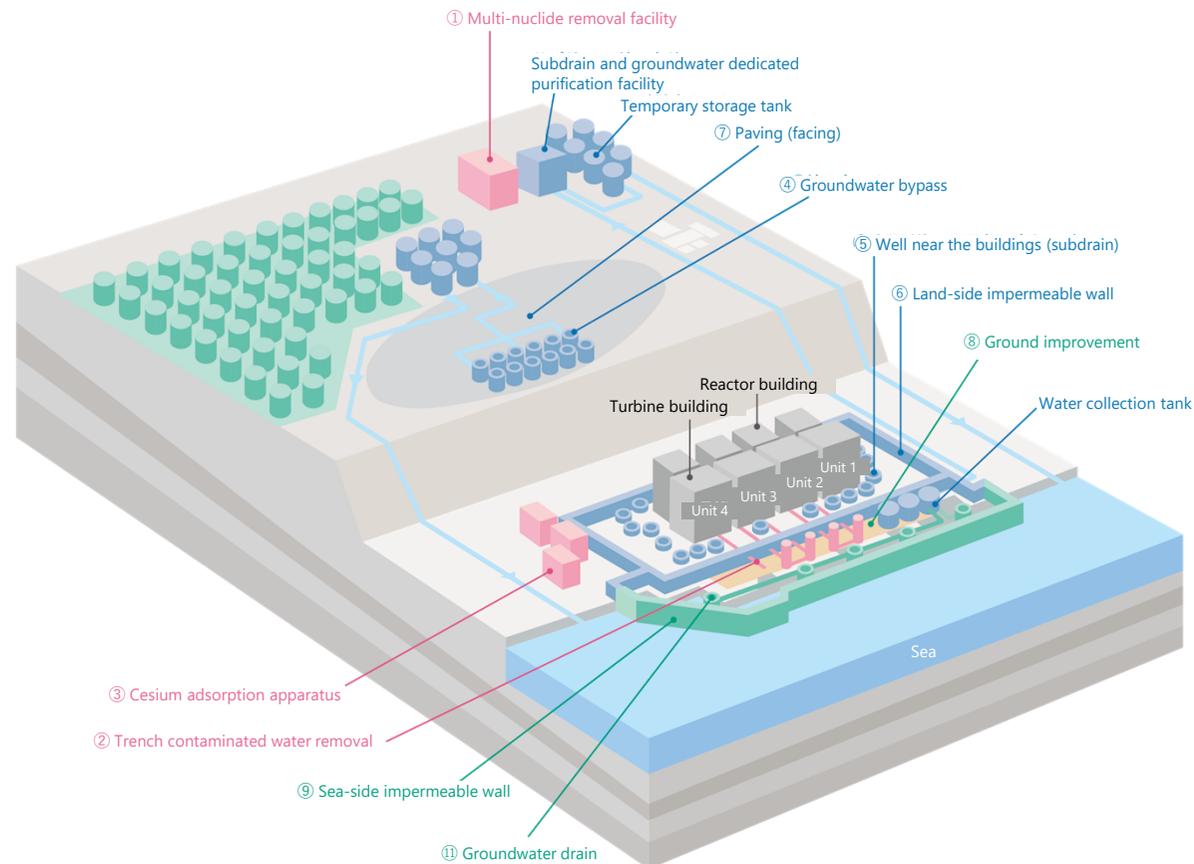
- Contaminated water management



Three basic policies of contaminated water management

Contaminated water is generated when the **groundwater** that flows from the mountain-side to the sea-side and the **rainwater** that flows in from the damaged buildings flows into the reactor buildings and **mixes with the water containing radioactive materials pooled in the buildings.**

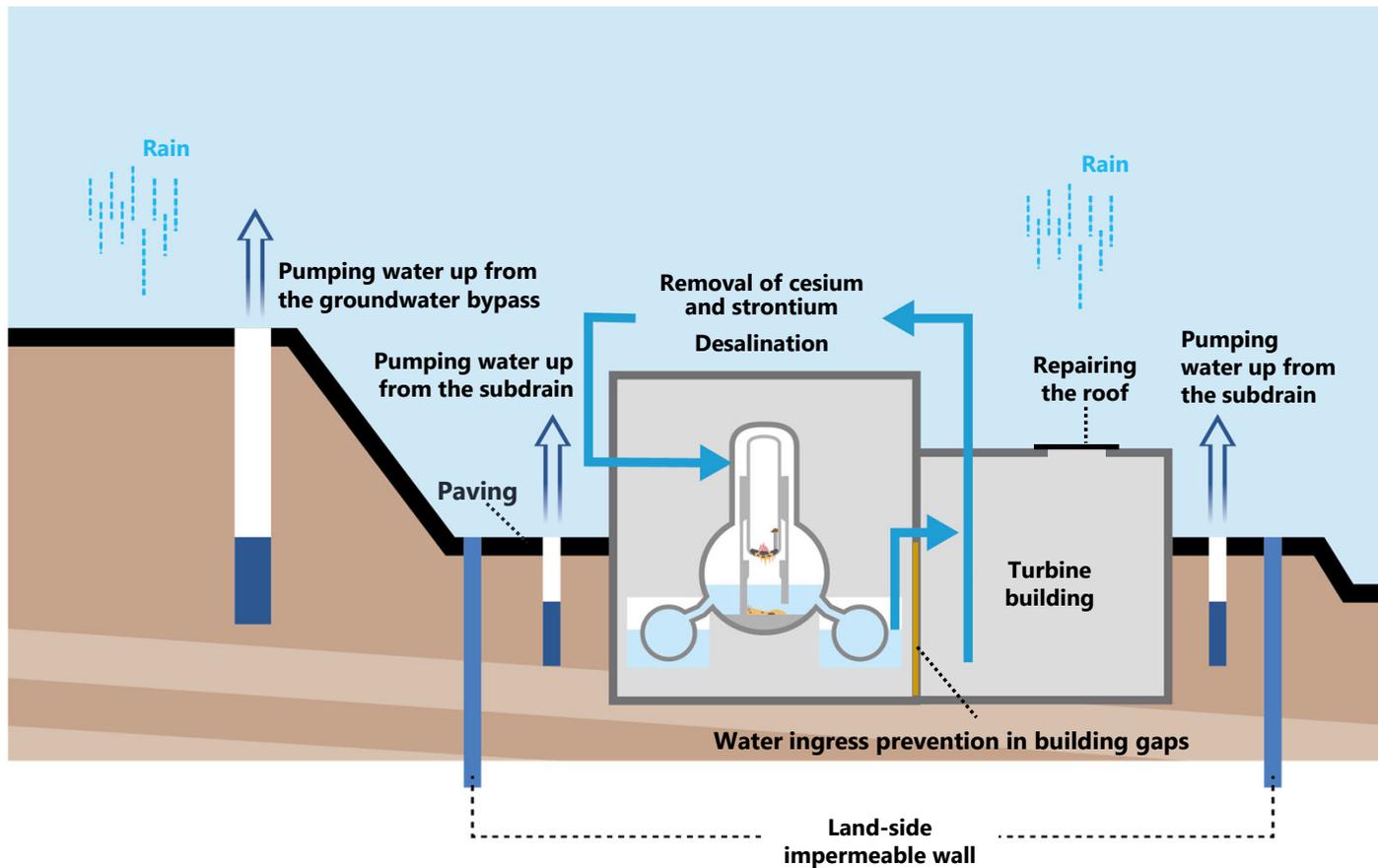
We are implementing multi-layered contaminated water management to control groundwater stably in line with the three basic policies of **'removing'** the contamination source, **'keep away'** water from the contamination source, and **'preventing leakage'** of contaminated water.



Mitigating the amount of contaminated water generated

The groundwater bypass, subdrain, and land-side impermeable wall are maintained, managed, and operated, to stably maintain the groundwater around the buildings at a low level.

'Paving on the inside of the land-side impermeable wall', 'repair of damaged roofs of the buildings', and 'water ingress prevention in building gaps' are implemented to prevent rainwater seepage.



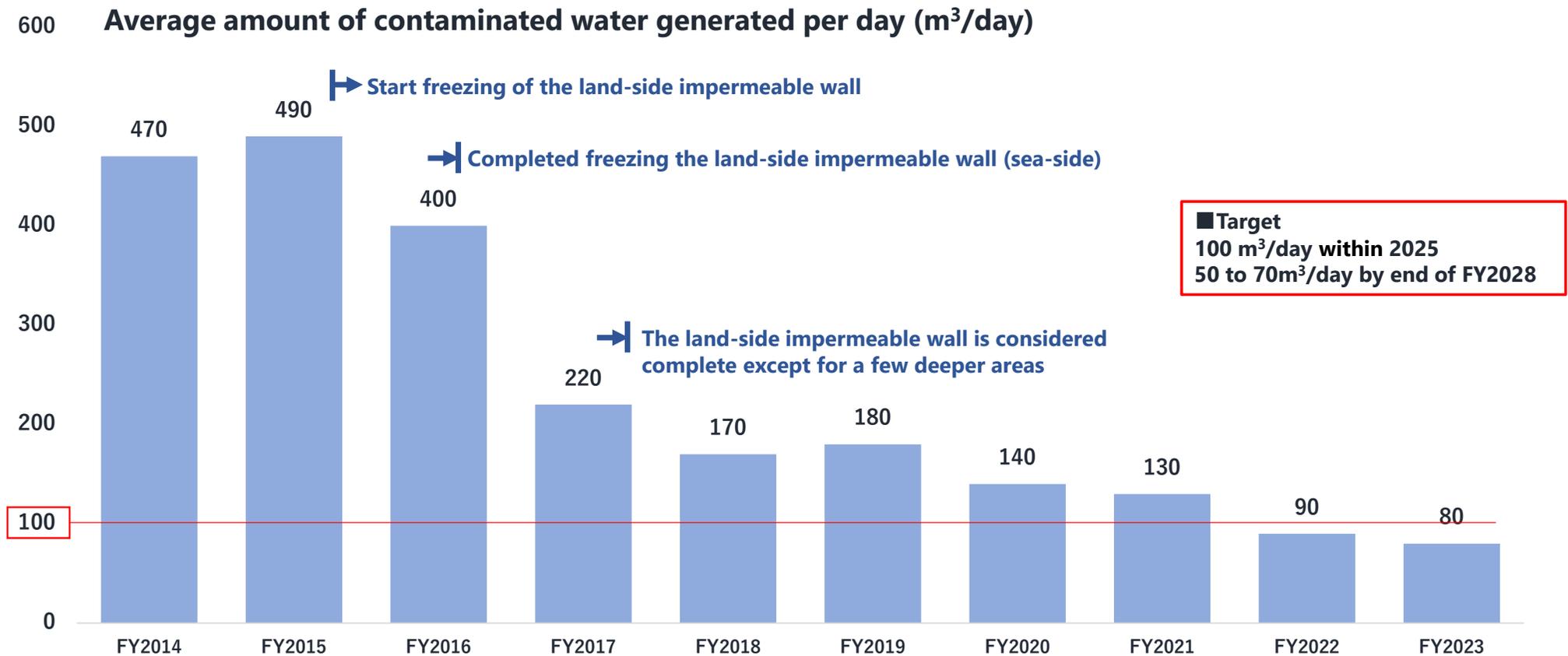
Paving over the mountain-side of the Unit 4 reactor building



Repairing the damaged parts of the Unit 3 turbine building

Reducing the amount of contaminated water generated

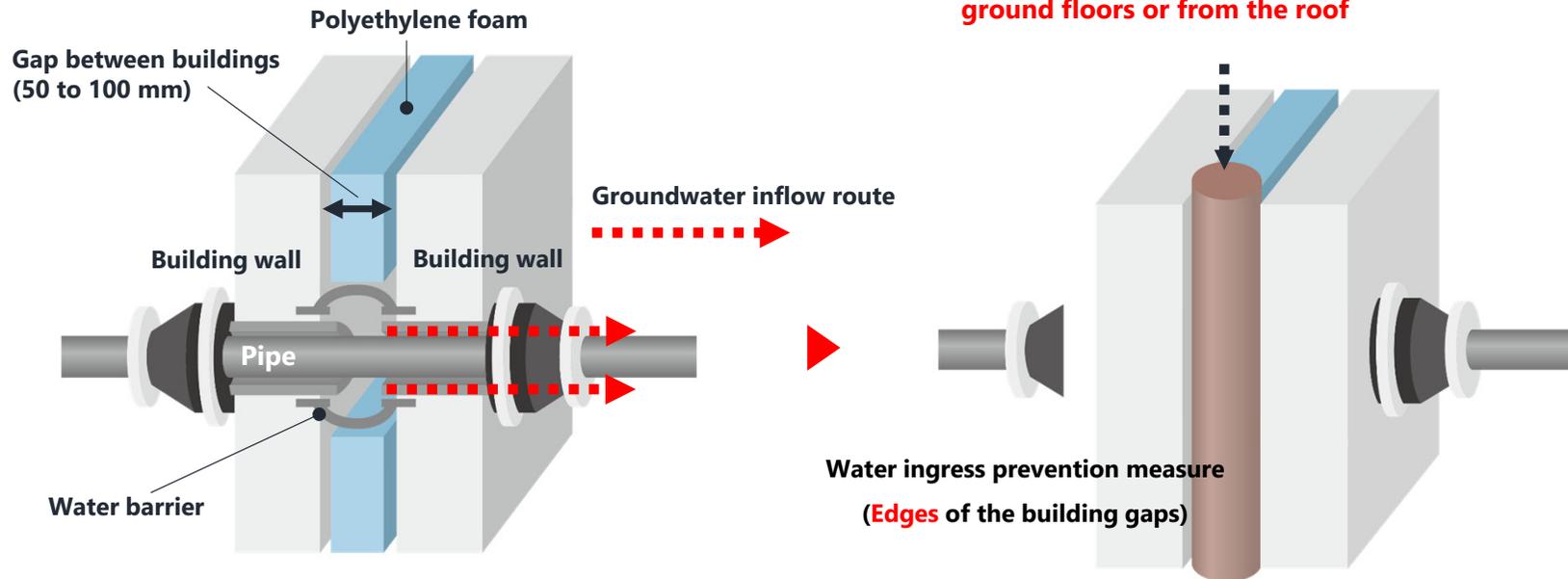
We were able to achieve the target of **reducing the amount of contaminated water generated** for an average level of rainfall to **100m³/day by the end of 2025**, ahead of schedule in FY2023.



Contaminated water generation mitigation measures [Water ingress prevention in building gaps]

There are 50 to 100 mm **gaps between buildings** filled with polyethylene foam. There are many penetration piping along these gaps. Because **groundwater could flow into the buildings** through the penetration pipes in these gaps, **water ingress prevention measures** will be implemented **in this area**.

■ Illustration of water ingress prevention measures in the gaps between buildings



Considering boring from the ground floors or from the roof

FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

▼ Reduce the amount of contaminated water generated to around 50 to 70 m³/day (end of FY2028)

Units 5
and 6
(Unit 4)

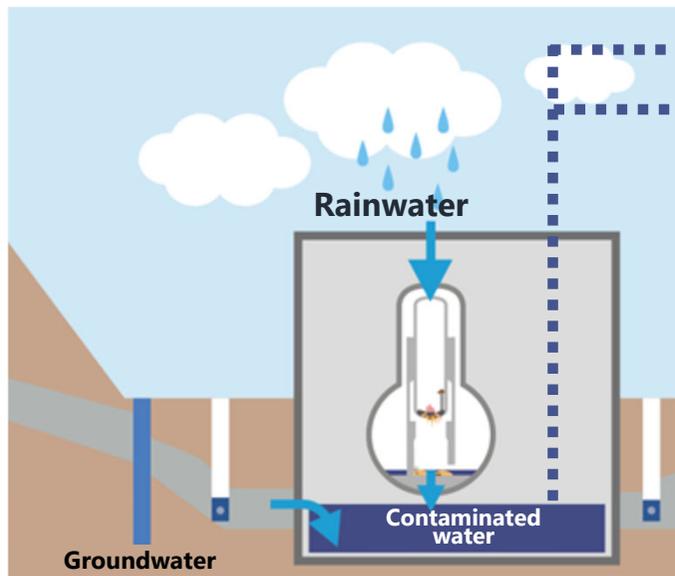
Unit 3

Units 1, 2, 4

Treatment of stagnant water in buildings (Process main building/High temperature incinerator building)

The following measures will be implemented to treat the contaminated water that remain in the process main building and the high temperature incinerator building. We are aiming to treat the contaminated water so that **the floor will be exposed** in the end.

- ① **Collect the high radiation dose zeolite sandbags on the lowermost basement floor** of each building (p.11)
- ② Install '**alternative tanks**' as the two buildings are used to temporarily store contaminated water before they are treated with the cesium adsorption apparatus. (p.12)
- ③ Install ' **α nuclide removal equipment**' near the exit of the 'cesium adsorption apparatus' that reduces the transfer of α nuclides contained in the sludge within the contaminated water. (p.13)



At the time of the accident, high radiation dose water in the reactor buildings of Units 1 through 4 was transferred to different buildings as it was increasing and threatening to overflow.

Process main building



High temperature incinerator building



'Zeolite sandbags', which absorb radioactive substance, have been installed in the buildings to reduce the dose of transferred water as much as possible.

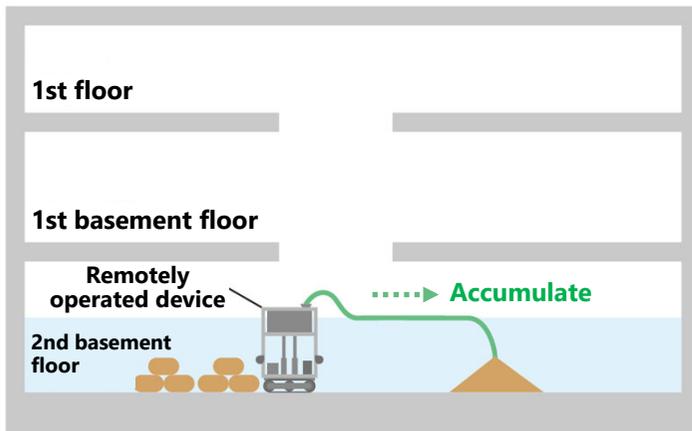


Treatment of stagnant water in buildings (Process main building/High temperature incinerator building)

[① Collecting zeolite sandbags]

The **high radiation dose zeolite sandbags in the lowest basement floor** of each building are **accumulated** by a remotely controlled device and **collected into metal storage containers**.

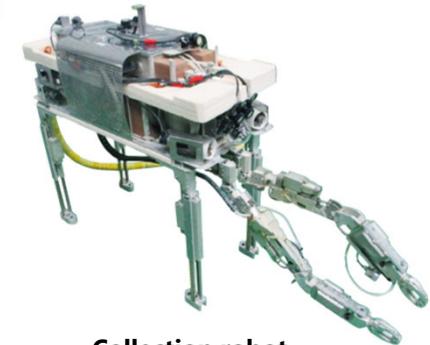
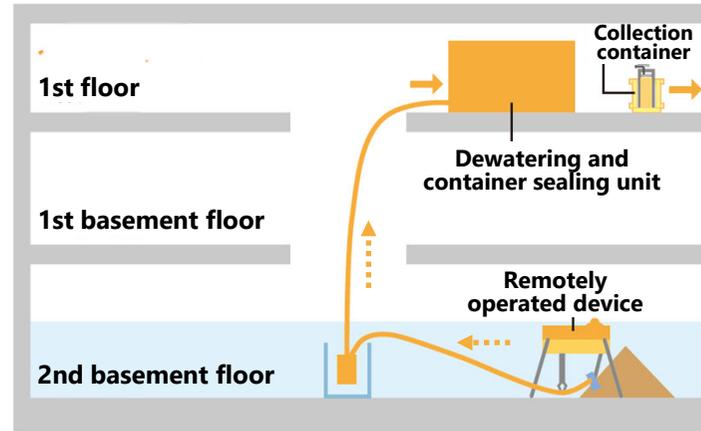
Step ①: Accumulation



Accumulation robot

The remotely operated device for accumulation is installed into the basement floor. It sucks up the zeolite and transfers it to the collection area.

Step ②: Sealing in containers



Collection robot

The collected zeolite is transferred to the ground floor via a remotely operated device for sealing into containers, and sealed into metal containers.

FY2024

Short-term (next 3 years)

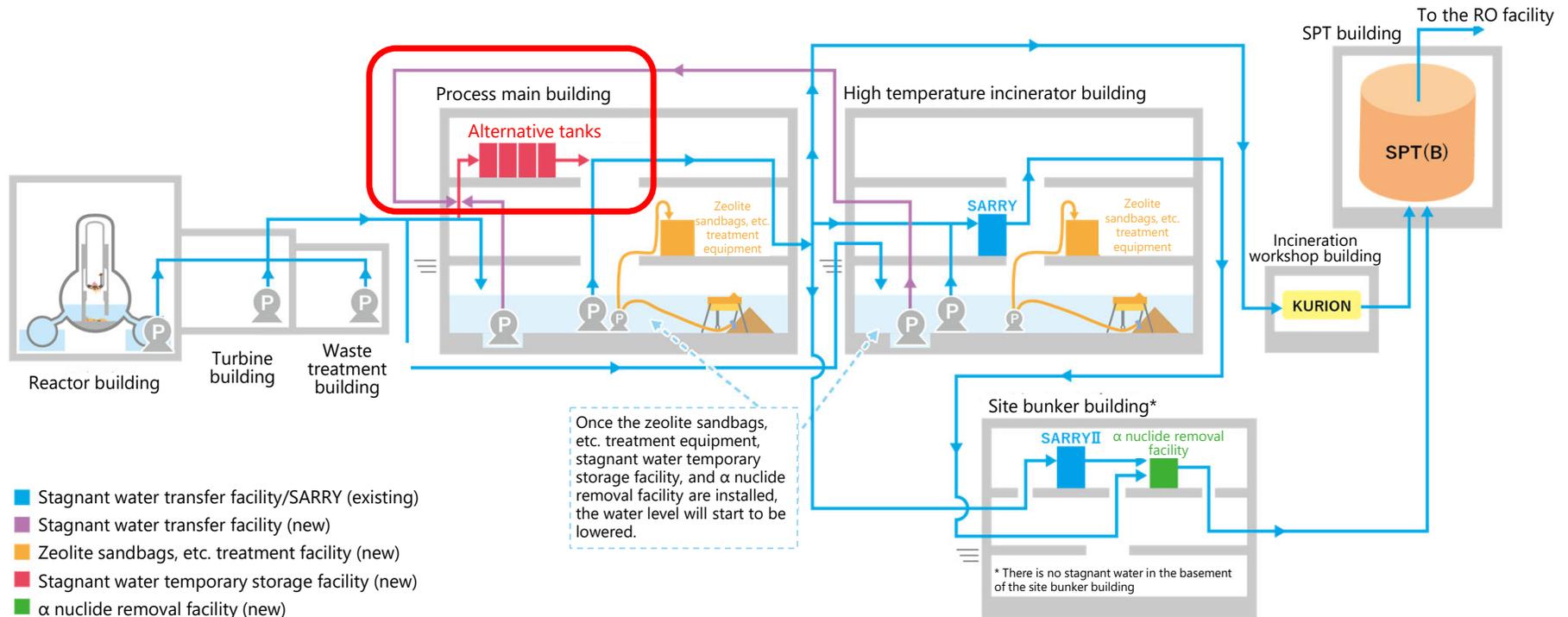
Mid-to-long term (FY2028 to FY2036)

Accumulation and collection of zeolite Sandbags (including the design and manufacture of devices)



Treatment of stagnant water in buildings (Process main building/High temperature incinerator building) [② Installation of alternative tanks]

The two buildings of the 'Process main building' and the 'High temperature incinerator building', are used to temporarily store contaminated water before it is treated with the 'cesium adsorption apparatus'. The 'alternative tanks' will be installed in the process main building to expose the floors in these two buildings.



FY2024

Short-term (next 3 years)

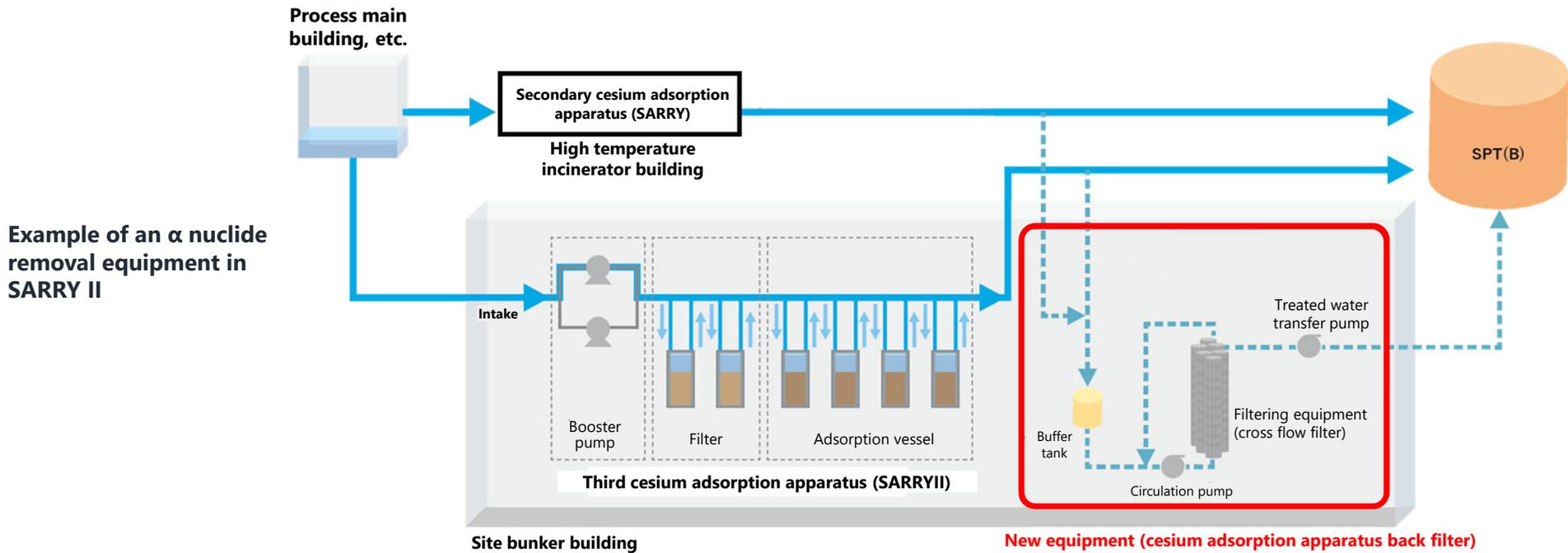
Mid-to-long term (FY2028 to FY2036)

Design, manufacture, and installation of alternative tanks



Treatment of stagnant water in buildings (Process main building/High temperature incinerator building) [③ Installation of α nuclide removal facility]

A new filter will be installed for the **stagnant water** in reactor buildings with a relatively high concentration of ' α nuclides' **to minimize the risk of the spread of ' α nuclide' contamination**. The challenge is to develop concrete methods for separating and removing α nuclides.



FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

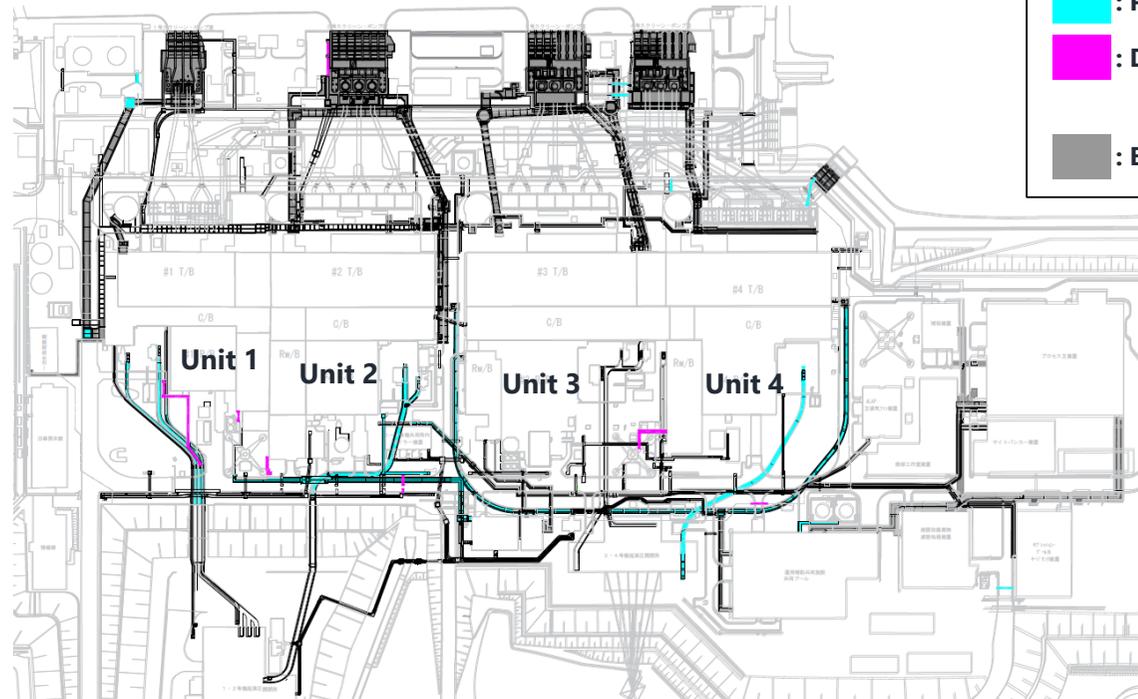
Design

Manufacture and
installation

Countermeasures for puddle (1/3)

'Investigations of trenches around buildings' and 'removal of puddles' are being conducted as part of efforts to remove puddles on the premises of Fukushima Daiichi Nuclear Power Station.

Trenches around Units 1 through 4 that have stagnant water within or is connected to buildings that used to have stagnant water within them
(Plane view)



Legend

-  : Puddles
-  : Difficult to discern the existence of puddles (due to high radiation dose or obstacles)
-  : Blocked area

FY2024

Short-term (next 3 years)

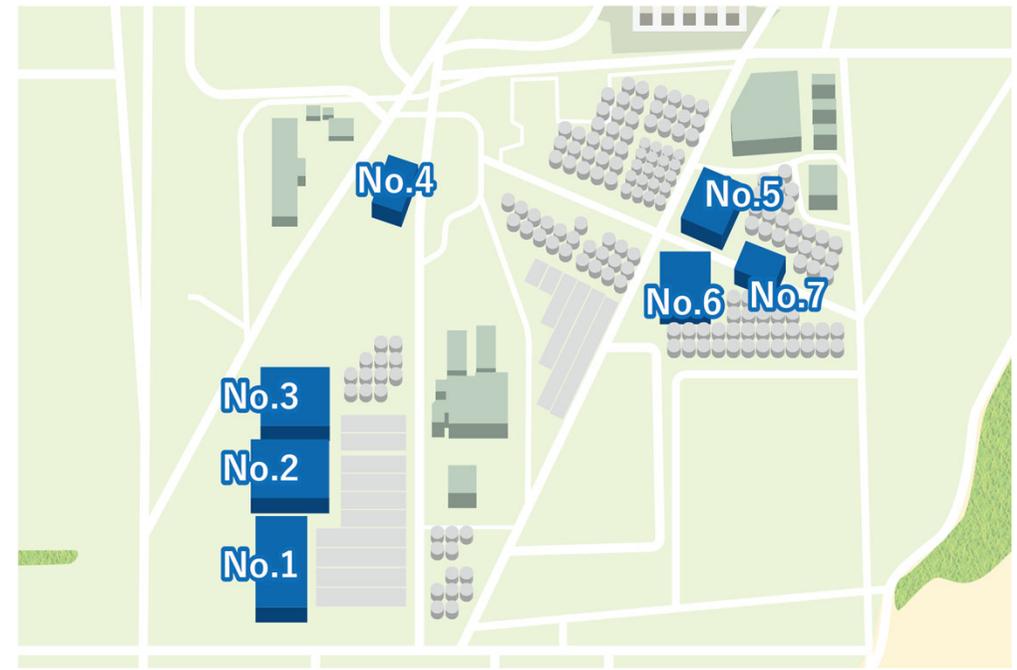
Mid-to-long term (FY2028 to FY2036)

Removal of puddles (already confirmed)

Investigation and removal of puddles in uninvestigated areas

Countermeasures for puddle (2/3)

The '**underground reservoirs that stored the contaminated water**' will be removed once a **dismantling method that ensures dust will not scatter** is developed. There are challenges regarding the storage and reduction in volume of contaminated waste generated when the underground reservoirs are dismantled.



Layout for underground reservoirs (No. 1 through 7)

FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

Conceptual study

Design and removal

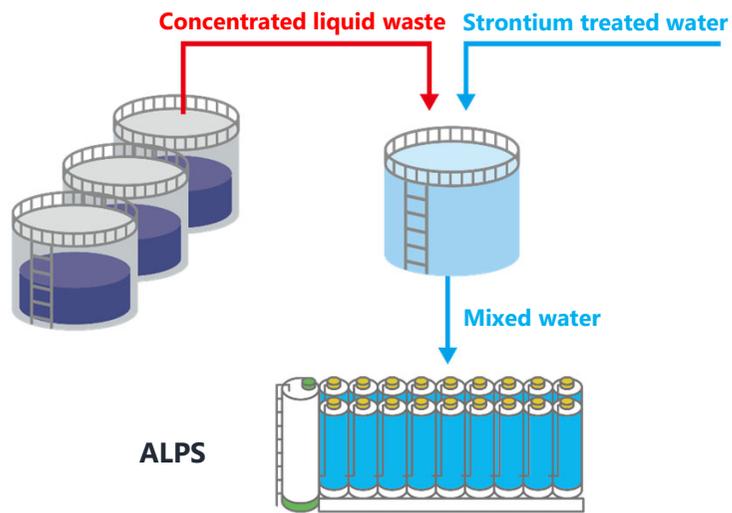
Countermeasures for puddle (3/3)

Immediately after the accident, 'desalination apparatus' and 'evaporative concentration apparatus' was used to reuse the stagnant water in the buildings as cooling water to be injected into the reactor.

The water distilled in the 'evaporative concentration apparatus' is injected into the reactor as cooling water, and the concentrated water is stored in tanks as concentrated liquid waste.

We are currently in the process of confirming if adjusting the concentration of the concentrated liquid waste within the tanks with the strontium treated water generated daily and then treating the end product with ALPS will be sufficient.

■ Adjusting the concentration



Storage of concentrated liquid waste

FY2024

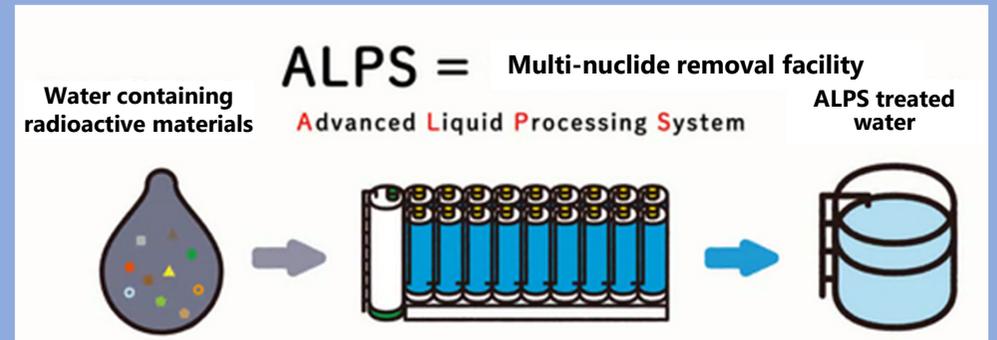
Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

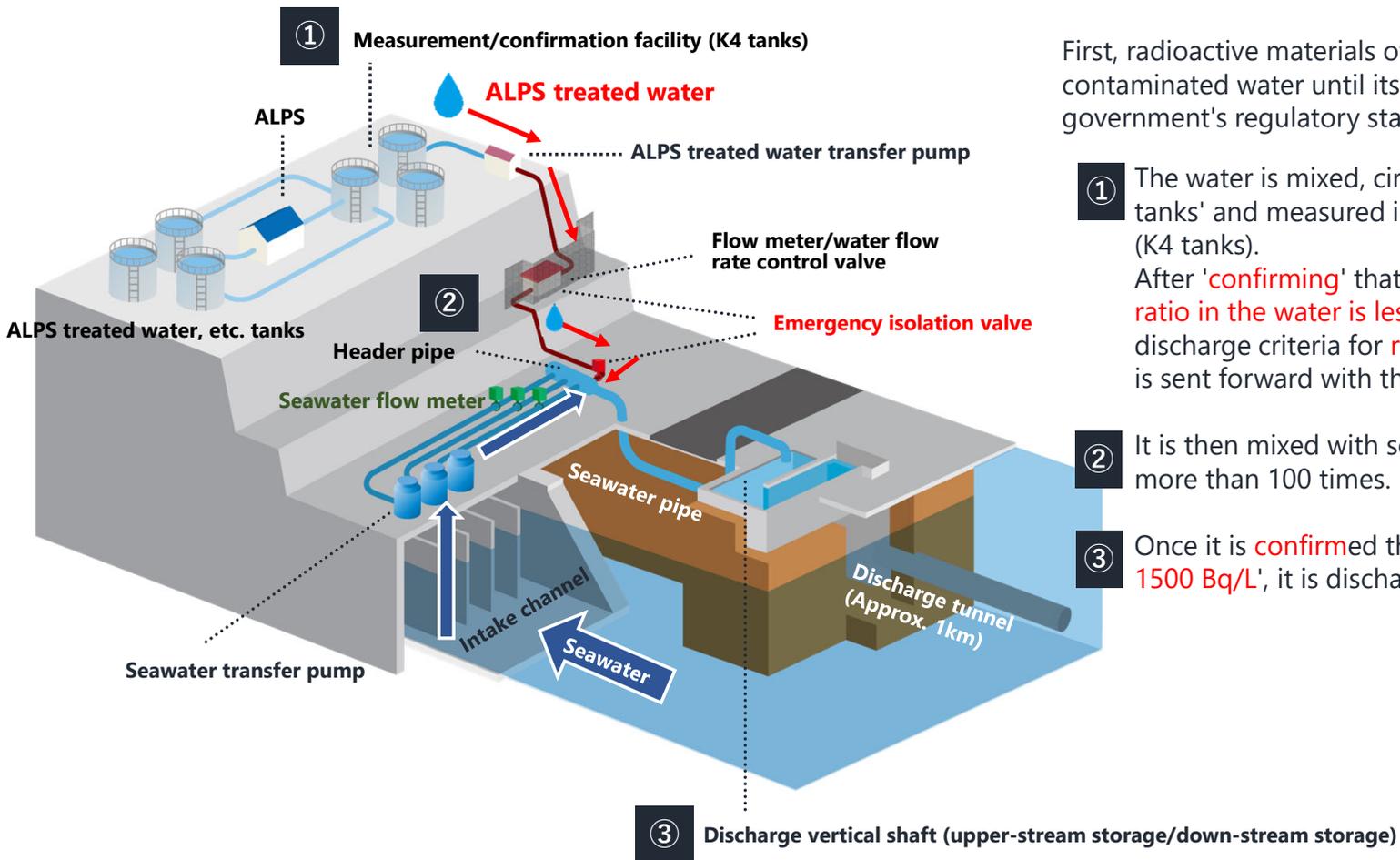
Development of
treatment methods
Pre-processing
on a trial basis

Treatment of the concentrated liquid
waste (supernatant liquid)

- Treated water management



Discharging ALPS treated water into the sea



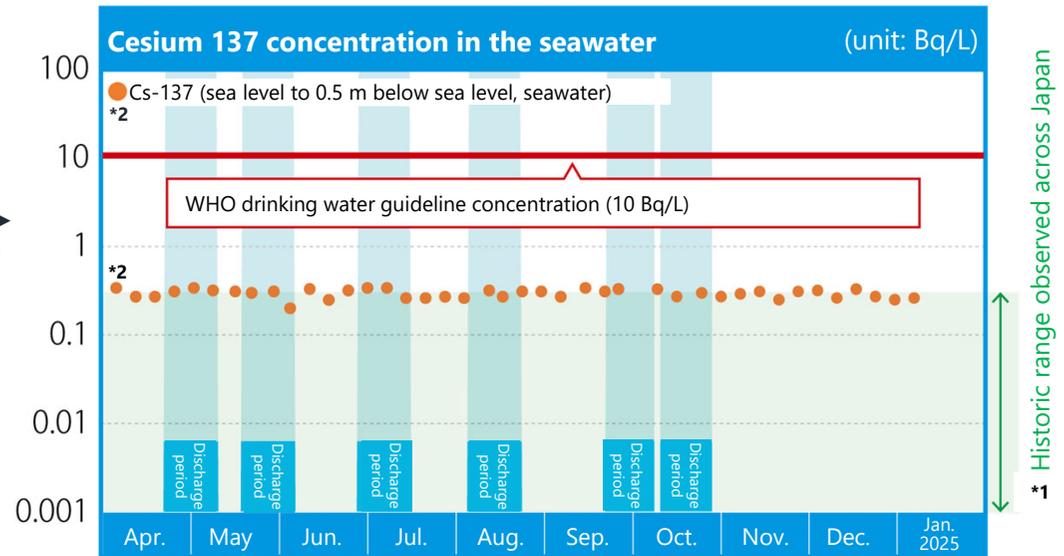
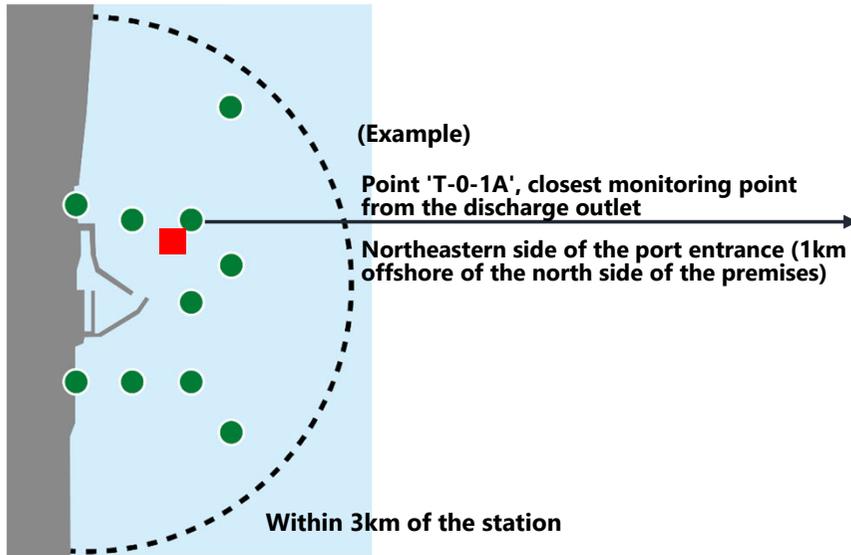
First, radioactive materials other than tritium are removed from the contaminated water until its concentration falls below the Japanese government's regulatory standard.

- ① The water is mixed, circulated, and homogenized in the 'receiving tanks' and measured in the measurement and confirmation facility (K4 tanks). After 'confirming' that the sum of the radionuclide concentration ratio in the water is less than 1, excluding tritium, which is the discharge criteria for radioactive materials, the ALPS treated water is sent forward with the transfer pump.
- ② It is then mixed with seawater in the header pipe, and diluted by more than 100 times.
- ③ Once it is confirmed that the tritium concentration is 'less than 1500 Bq/L', it is discharged into the sea 1 km out from the station.

Sea area monitoring [Major nuclide (Cesium 137)]

Seawater monitoring has been conducted from before ALPS treated water was discharged into the sea. **The concentration of cesium 137, a major nuclide for measuring the change in environment, has been trending at a similar concentration historically observed in seawater monitoring across Japan**^{*1}.

■ Cesium 137 concentration (unit: Bq/L)



*1 Observed range is defined as the range between the minimum and maximum values in the data observed from September 2019 to March 2022 in the database on the right (Source: Environmental Radioactivity Radiation Database in Japan)

*2 ● mark data point at which the measured value was below the detection limit. The detection limit differs according to the characteristics of the measuring environment and measuring equipment.

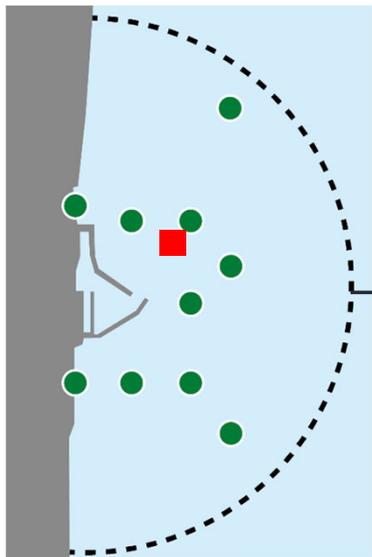


Sea area monitoring [Tritium]

Since the commencement of discharge, we have been monitoring '10 locations within 3km of the power station' and '4 locations within a 10 km square in front of the power station' to promptly determine how the tritium is dispersing. **Tritium measurements have been below 'Discharge suspension level (TEPCO's operational indices): <700 Bq/L within 3km of the power station> and <30 Bq/L in a 10km square in front of the power station>' in all instances.**

Reference: 'Upper limit of the tritium concentration for discharge into the sea indicated in government policy: 1500 Bq/' (1/40th of Japan's regulatory standard, 1/7th of World Health Organization's (WHO's) drinking water quality guidelines)

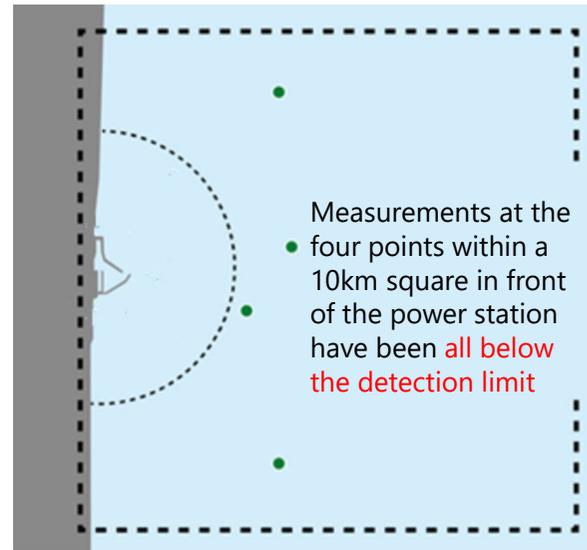
Measurements to obtain results quickly 'tritium concentration (unit: Bq/L)'



10 locations within 3km of the power station

FY2024

- 1st: Below the detection limit to **29 (max.)** ^{*1} < 700
- 2nd: Below the detection limit to **7.7 (max.)** < 700
- 3rd: Below the detection limit to **18 (max.)** < 700
- 4th: Below the detection limit to **9.0 (max.)** < 700
- 5th: Below the detection limit to **33 (max.)** < 700
- 6th: Below the detection limit to **48 (max.)** < 700



Measurements at the four points within a 10km square in front of the power station have been **all below the detection limit**

*1 The maximum observed in regular measurements is 50 Bq/L (October 28, 2024).

TEPCO Treated Water Portal Site

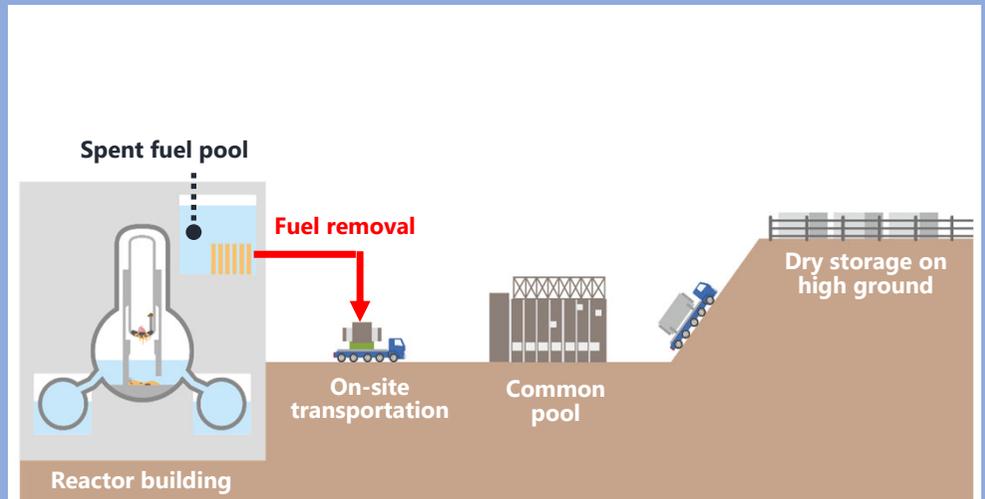


60,000	Japan's regulatory standard (discharge outlet)*2
Unit: Bq/L	
10,000	WHO's drinking water quality guidelines
1,500	Upper limit of tritium concentration to be discharged into the sea indicated in the government policy
700	Discharge suspension level (10 locations within 3km of the power station)
350	Investigation level (10 locations within 3km of the power station)
30	Discharge suspension level (4 locations within a 10km square in front of the power station)
20	Investigation level (4 locations within a 10km square in front of the power station)
Approx. 10	Detection limit of quick measurement
Approx. 0.1-0.4	Detection limit of regular measurement
	20~0.043Bq/L Historic range for seawater across Japan ³

*2 This standard has been stipulated based on the calculation that if a person were to drink approximately 2L of the water coming out of the discharge outlet of a nuclear facility every day for one year, his/her exposure would be 1mSv.

*3 Source "Environmental Radioactivity and Radiation in Japan" (Period: April 2019 to March 2022)

● Fuel removal from the spent fuel pools



Fuel remains in the reactor buildings. Removal involves a series of tasks, from 'collecting the fuel from the spent fuel pool that houses the fuel using a handling apparatus, transporting it to the common pool on-site, carrying it out from the common pool and dry storing it on high ground.'

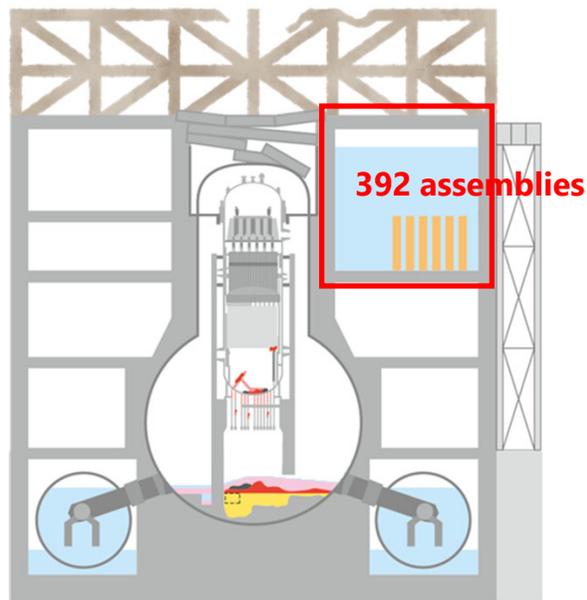
Status of Units 1 through 4

Fuel needs to be carefully removed from the spent fuel pools so as not to let radioactive materials scatter in the process. We are currently working and preparing having optimized the process for each Unit, and are aiming to **complete removing all the fuel from all units (Units 1 through 6) by the end of 2031.**

Unit 1



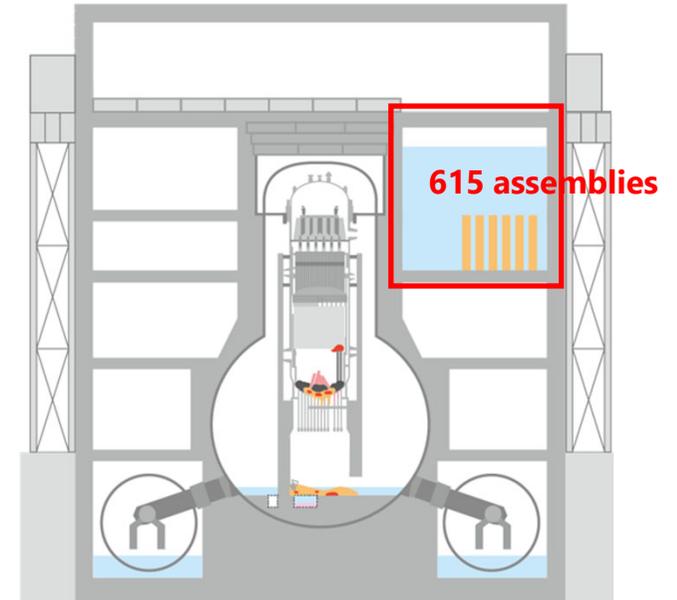
Commencement of
fuel removal
FY2027 to FY2028



Unit 2



Commencement of
fuel removal
FY2024 to FY2026



Unit 3

February 2021
Completed removing
562 assemblies



Unit 4

December 2014
Completed removing
1535 assemblies



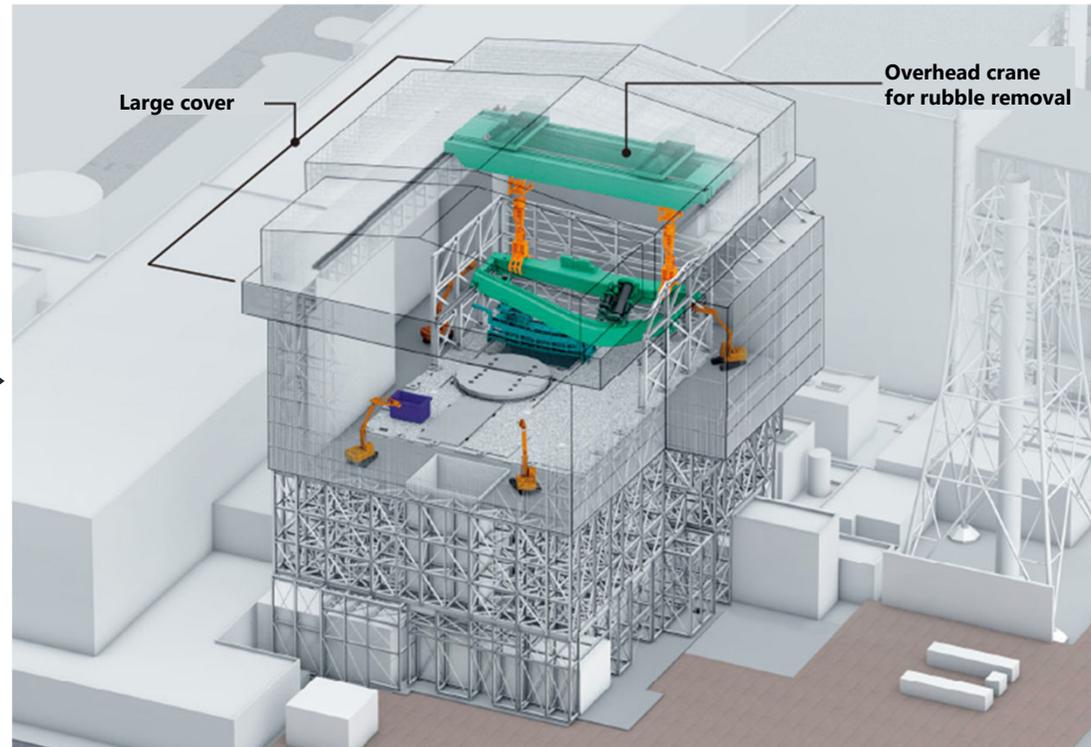
Preparing for fuel removal [Unit 1]

A large cover is currently being installed to prevent dust from scattering when removing the rubble that exist on the operating floor.

■ Unit 1 (photo taken in 2022)



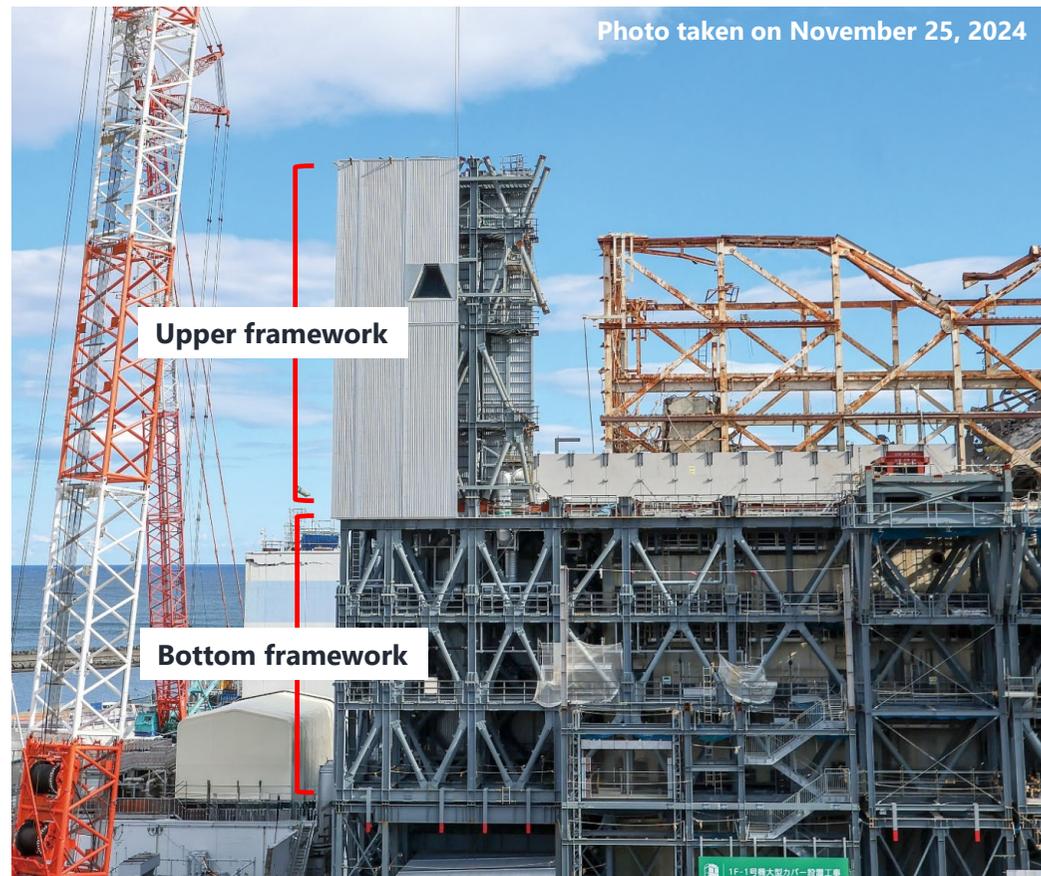
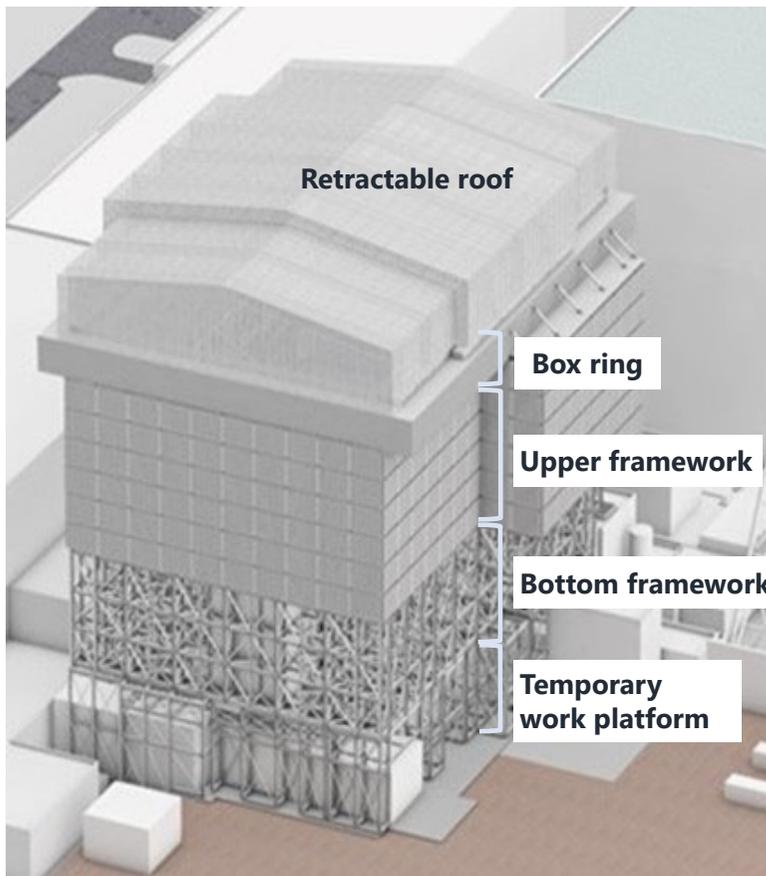
■ Large cover (illustration)



Progress in installing a large cover [Unit 1]

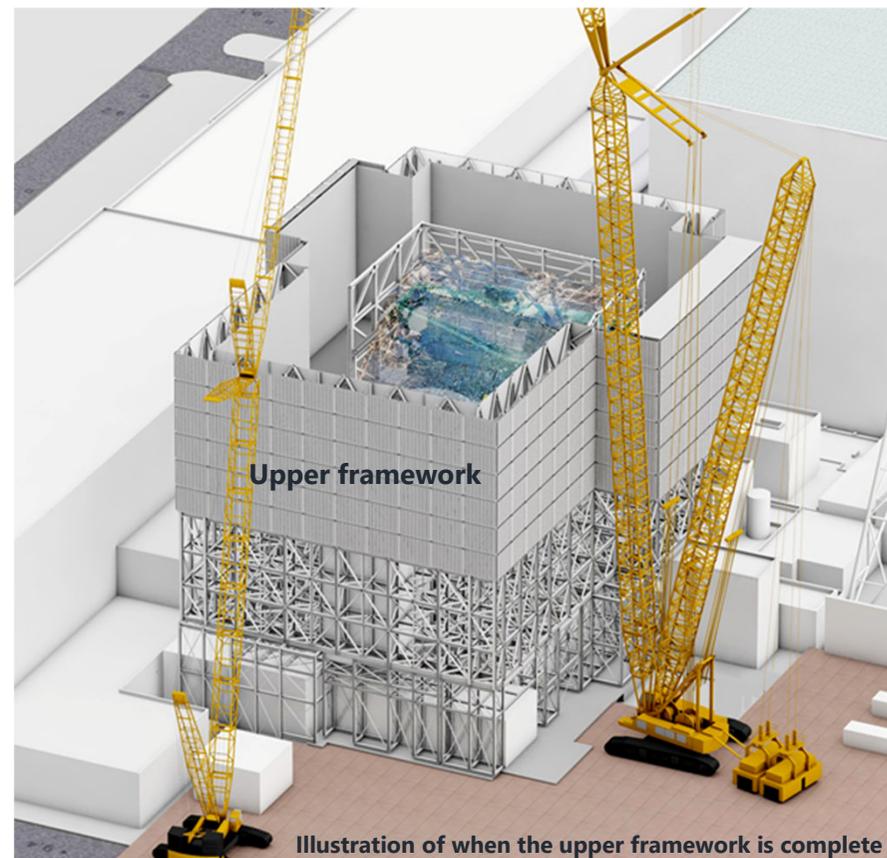
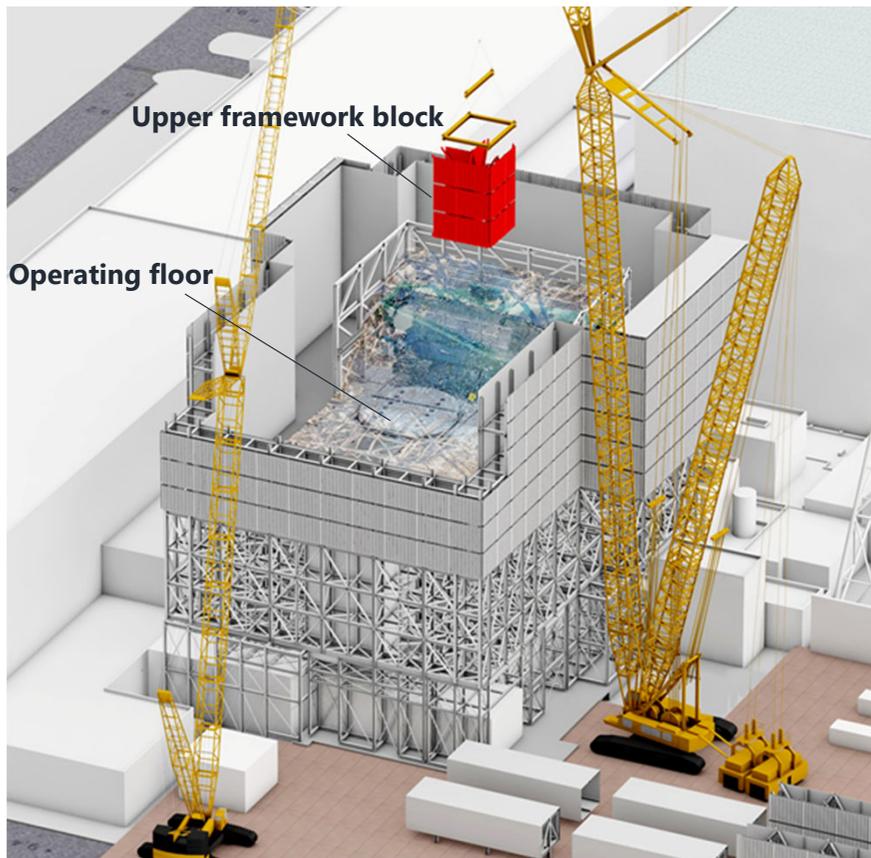
The large cover consists of the 'temporary work platform' at the bottom, the 'bottom framework*', 'upper framework' and 'box ring' above it, and the 'retractable roof' at the very top. Having just **completed** building the 'bottom framework' (November 2024), we are currently **working on building the 'upper framework'**.

* Framework: Architectural structure comprised of pillars and beams



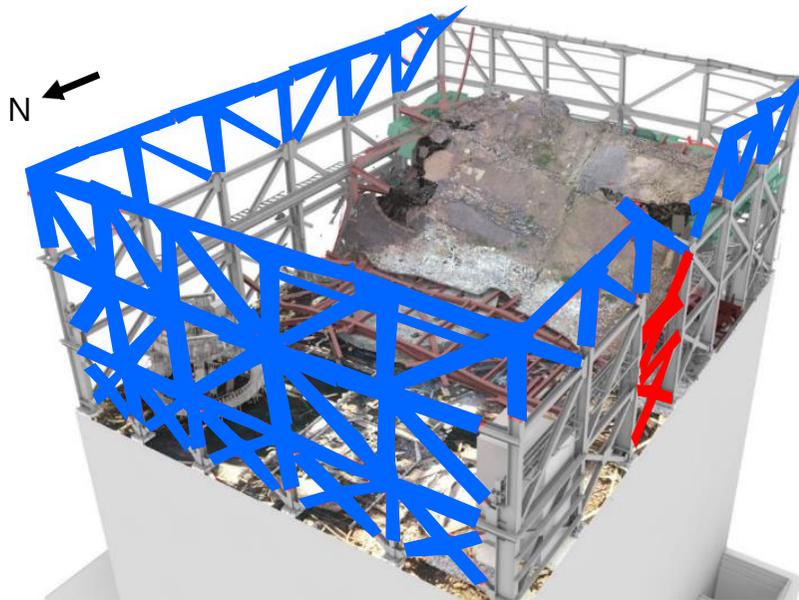
Large cover—Method for installing the upper framework [Unit 1]

The 'upper framework' is a framework above the operating floor with a height of approximately 21m. The upper framework, broken down into 12 steel blocks in an off-site yard, is transported into station premises, lifted up and installed using a large crane.



Removal of the surrounding steel frame [Unit 1]

The surrounding steel frame is being removed to reduce the risk of it coming into contact with the 'upper framework' in the large cover and to increase seismic resistance.

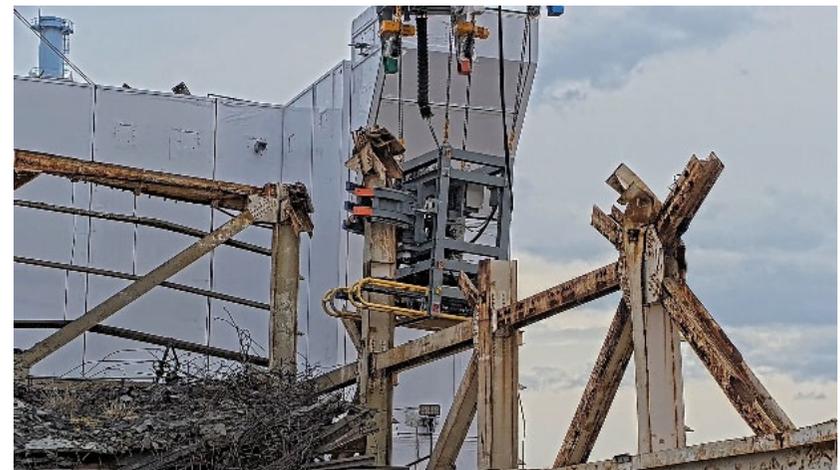


Blue Parts that have already been removed (as of March 17, 2025)

Red Area to be removed

*The area to be removed is subject to change depending on the work plan and status on the field

Working to remove the surrounding steel frame →
(March 11, 2025)

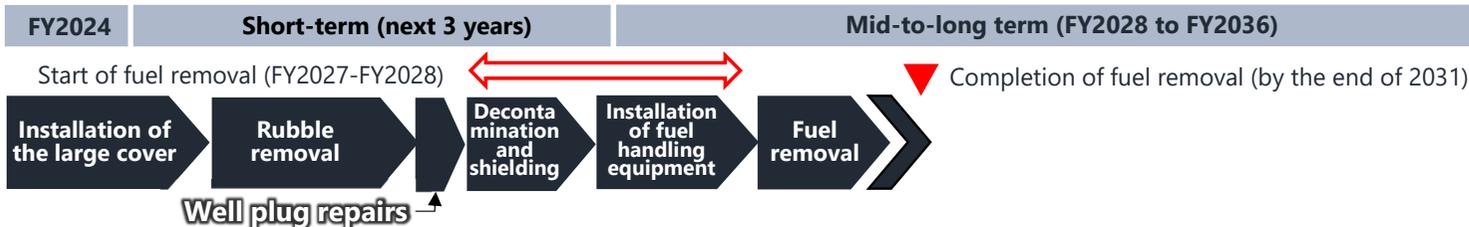
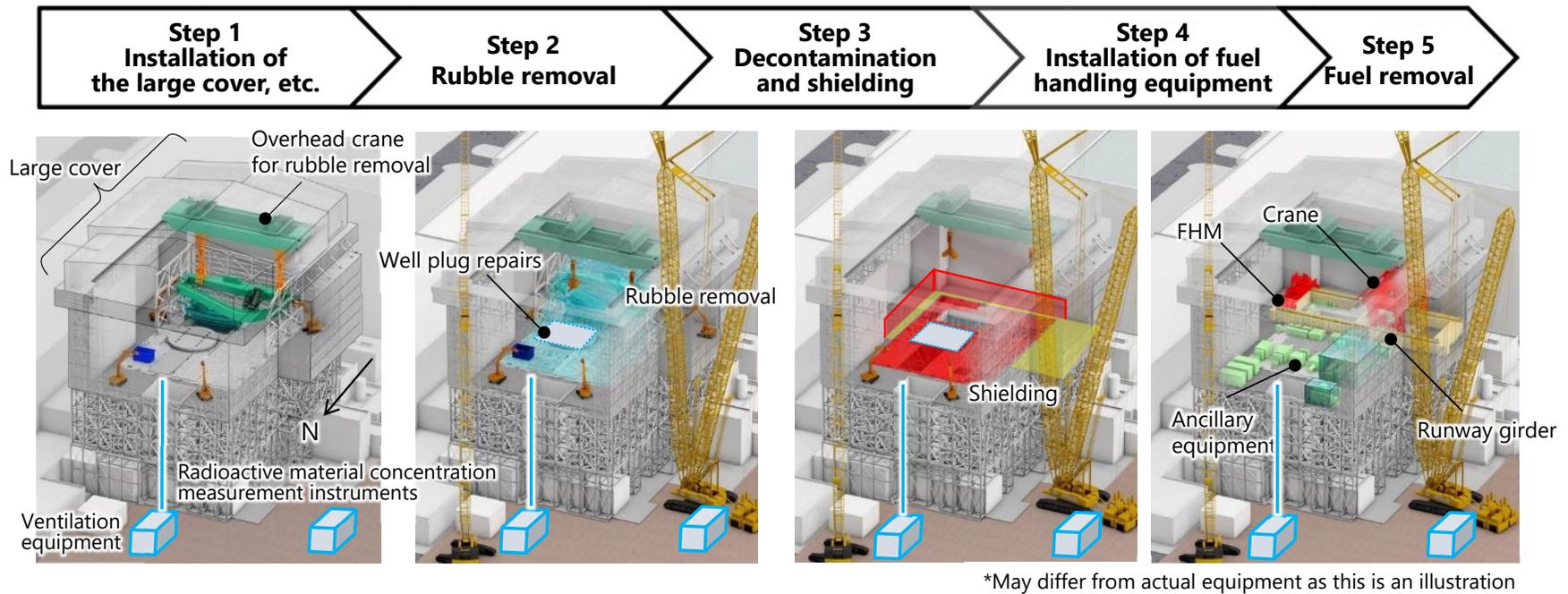


Fuel removal from spent fuel pool [Unit 1]

Fuel removal is scheduled to start once the large cover is installed and preparation for fuel removal such as 'rubble removal' and 'installation of the fuel handling equipment' are complete. We are currently facing challenges in developing and implementing a plan for reliably 'removing rubble', 'implementing effective decontamination and shielding', 'handling damaged fuel stored from before the accident'.



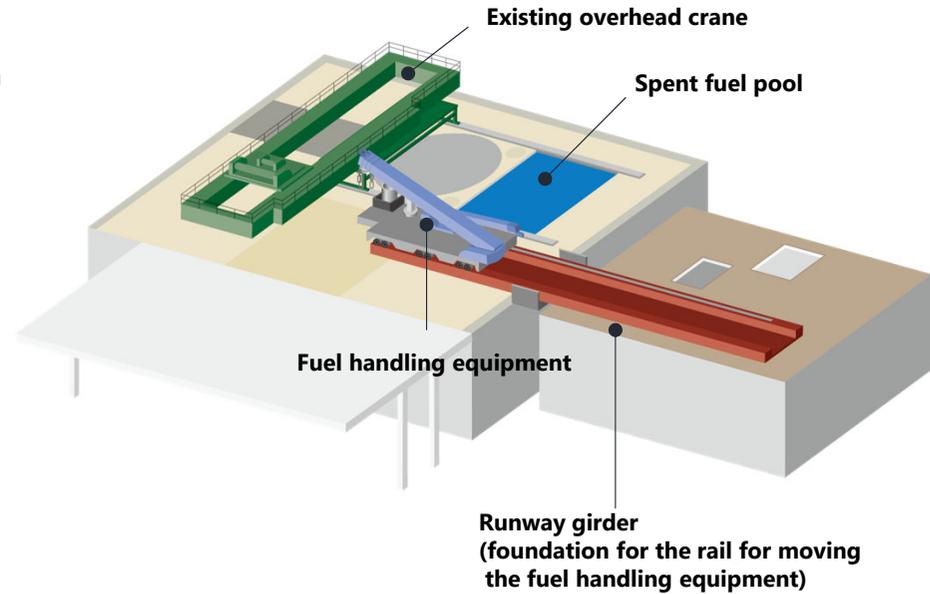
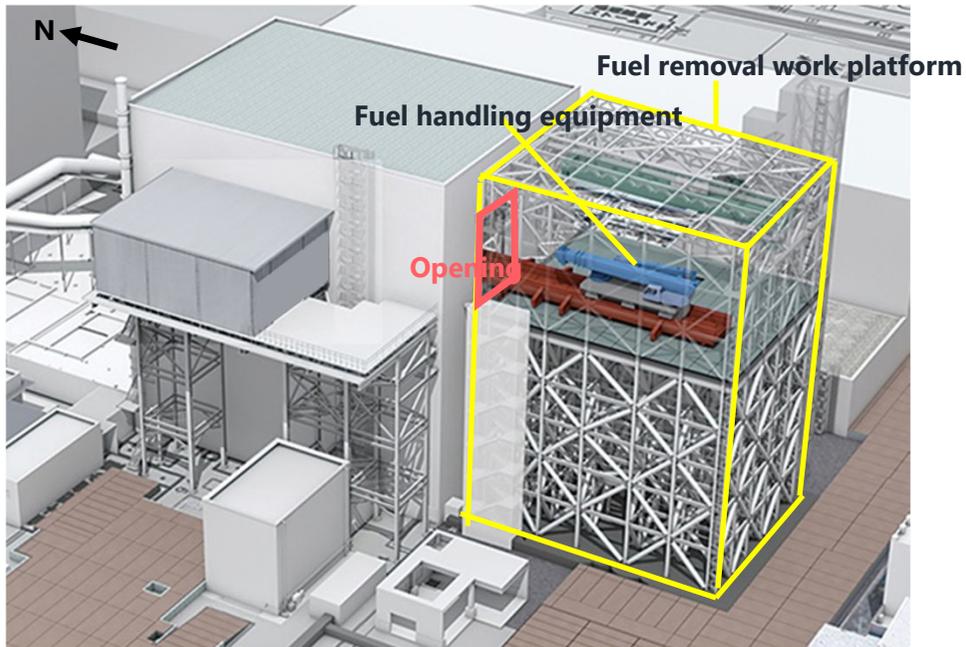
Commencement of fuel removal
FY2027 to FY2028



Fuel removal from spent fuel pool [Unit 2]

Fuel removal is scheduled to start at Unit 2 once preparations such as 'installing a work platform for removing fuel from the reactor building' and 'installing fuel handling equipment' are complete.

Fuel removal work platform



FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

Start of fuel removal (FY2024-FY2026)

Installation of the fuel removal work platform and opening

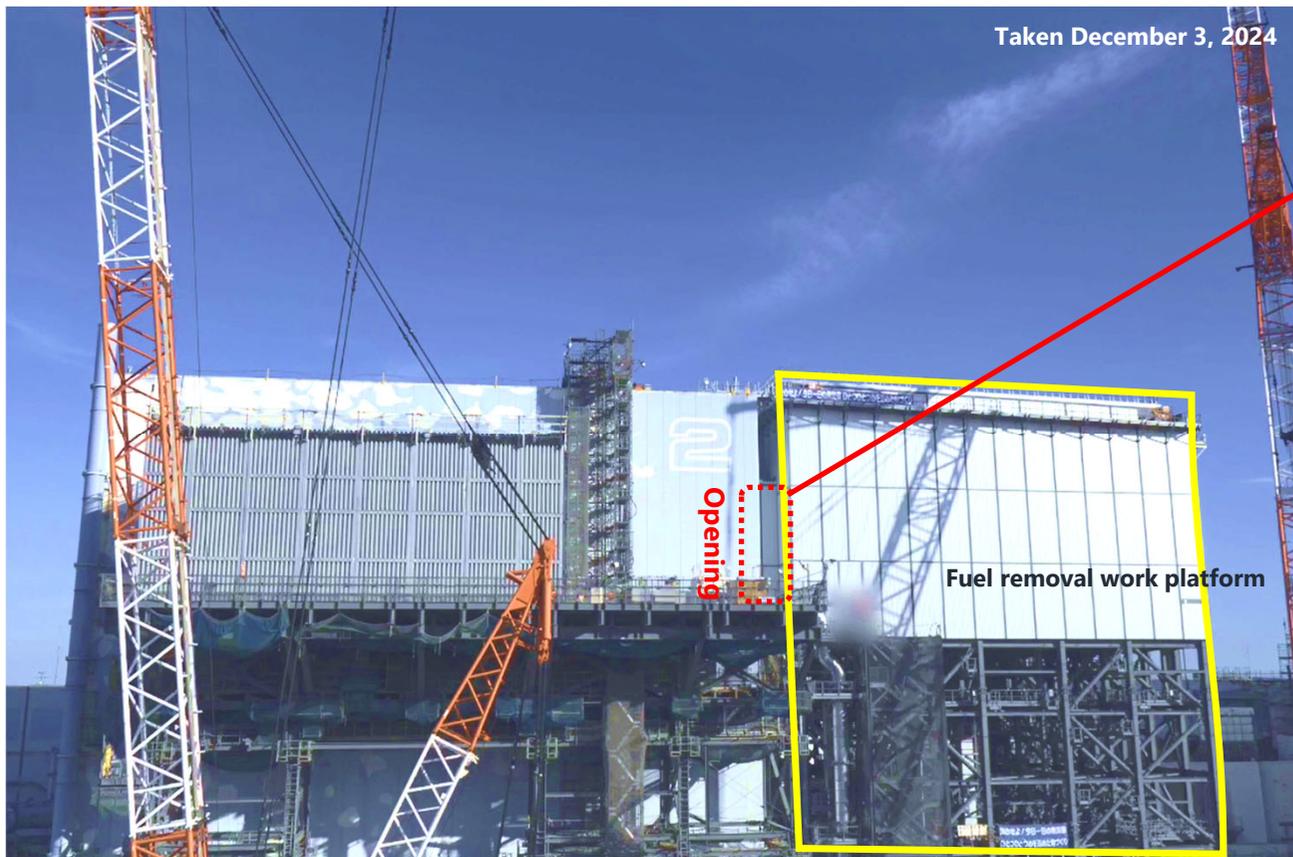
Installation of fuel handling equipment

Fuel removal

Completion of fuel removal (by the end of 2031)

Progress in work to install the fuel removal work platform [Unit 2]

In June 2024, all the steel beams for fuel removal work platform was **assembled**. In December 2024, **an opening** was built to move the fuel handling equipment between the reactor building and the fuel removal work platform. And in March 2025, the '**runway girder**' that supports the rails upon which the fuel handling equipment will travel **was installed**. We are currently preparing to install the fuel handling equipment.

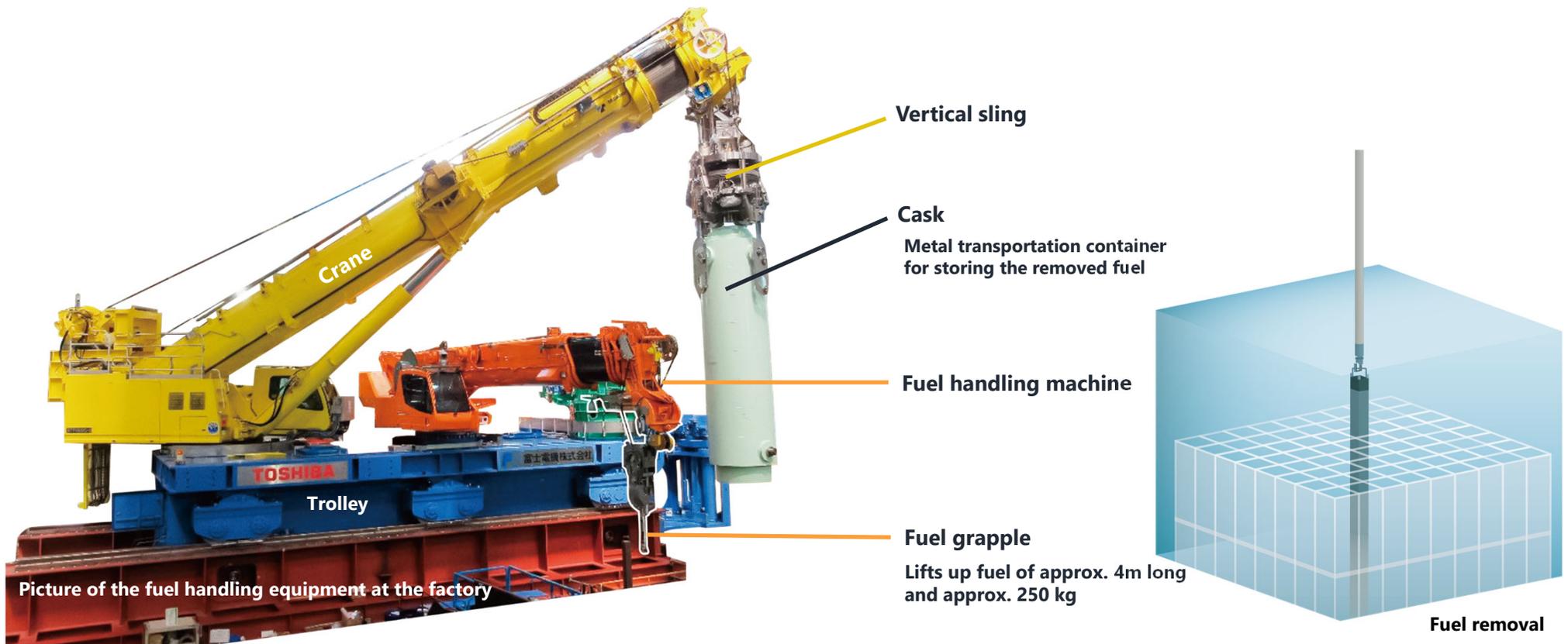


Building an opening



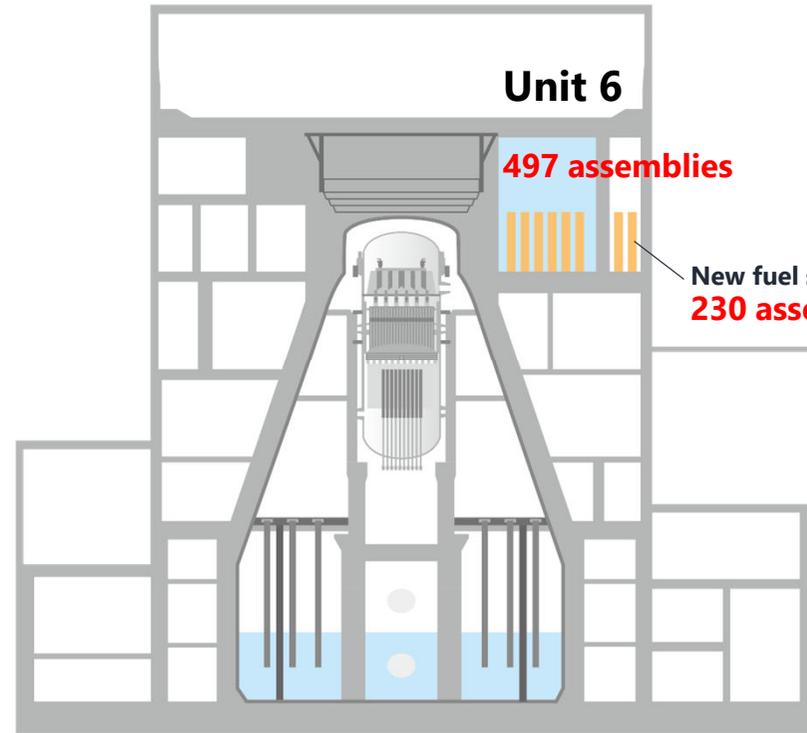
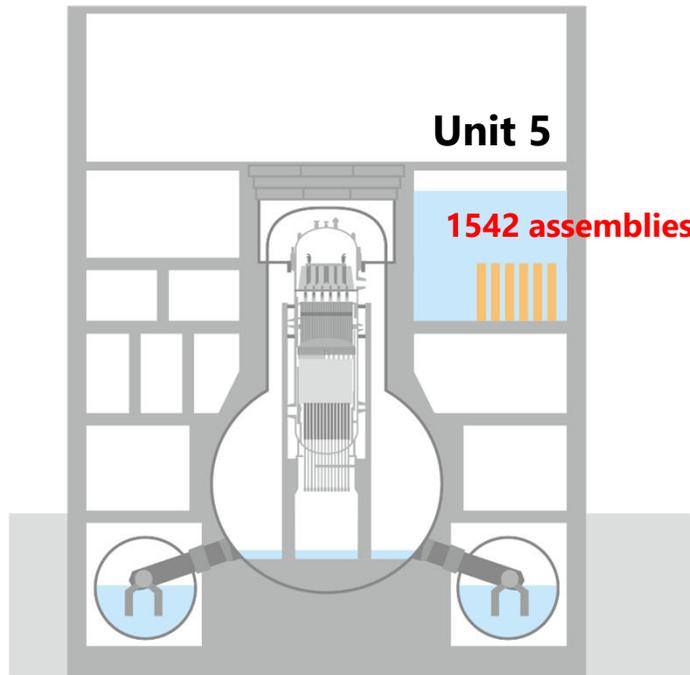
Fuel handling equipment [Unit 2]

The 'fuel handling equipment' is comprised of the 'fuel handling machine' which grabs the fuel within the spent fuel pool and puts it away in the transportation container, and the 'crane' which grabs the transportation container, hoists it up vertically and moves it. This equipment **is operated remotely**. Assembly at the factory is complete, and we are currently conducting trial operations for each of the components of the equipment. Once trial operations are complete, they will be shipped by sea.



Fuel removal from spent fuel pools [Units 5 and 6]

Fuel will be removed from Units 5 and 6 to the extent that they don't disturb the fuel removal work at Units 1 and 2.



Commencement of fuel removal around FY2025



Fuel removal in progress

Fuel removed
1157 out of
1884 assemblies

(as of February 25, 2025)

FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

Unit 6

Unit 5

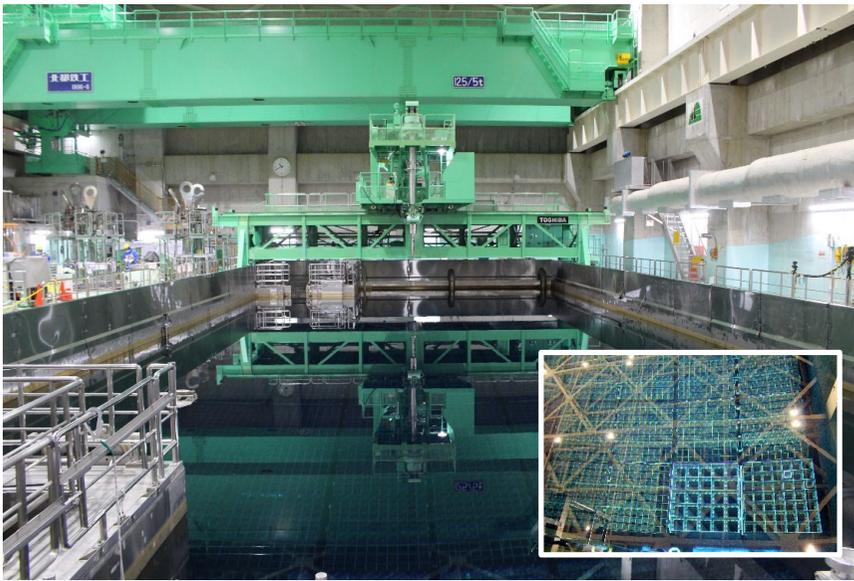
▼ Completion of fuel removal (by the end of 2031)

Transferring fuel removed from each Unit

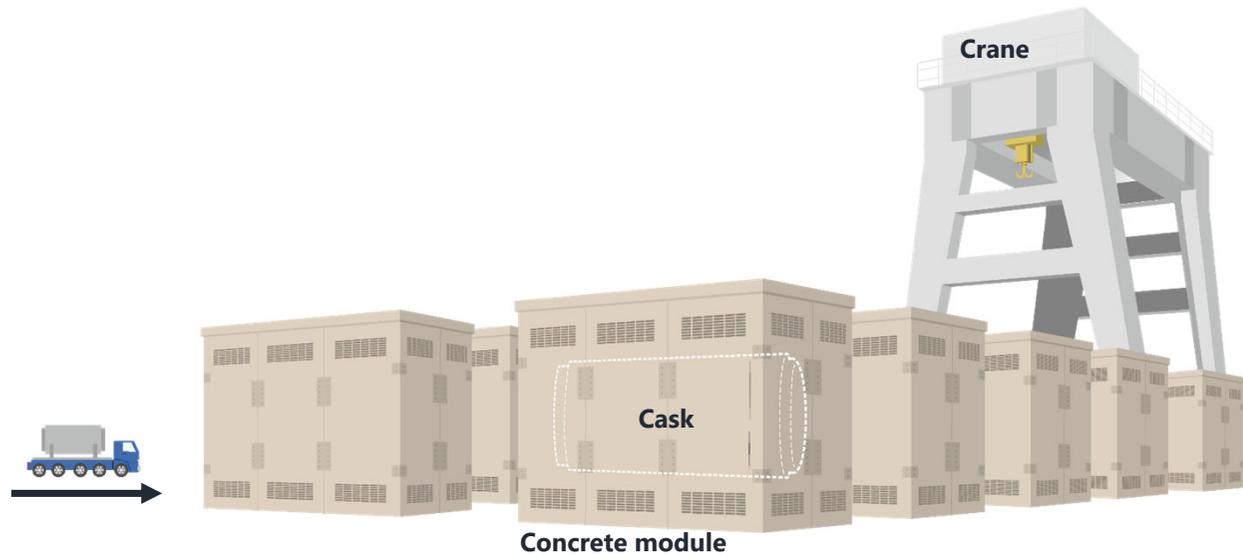
The spent fuel taken out from each Unit is transferred to the 'common pool'. The spent fuel sufficiently cooled in the 'common pool' is moved to dry storage containers (casks) to secure space in the common pool, and transferred to temporary storage facility on high ground. There, the spent fuel is housed in 'concrete modules' and cooled via natural air convection.

The current challenge is expanding our dry cask temporary storage facilities in line with the fuel removal plan for all Units including Units 5 and 6.

Common pool



Temporary storage facility for dry storage containers (casks) [Illustration]



FY2024

Short-term (next 3 years)

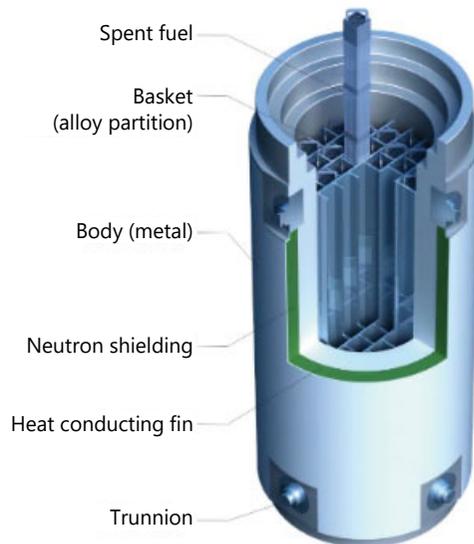
Mid-to-long term (FY2028 to FY2036)

Securing empty space
in the common pool

Fuel removal from spent fuel pools [Fuel removed from each Unit]

We are testing the applicability of 'concrete casks' for **dry storing** fuel taken out from the common pool on high ground, **as a storage option** in addition to the existing storage containers, the 'metal casks'. A challenge we are also facing is developing a dry storage method for damaged fuel that has been stored on site premises from before the accident.

■ Metal cask (example)



■ Concrete cask (example)



Source: Federation of Electric Power Companies, "Spent Fuel Storage Measures"
https://www.fepc.or.jp/library/pamphlet/pdf/18_chozo_taisaku_torikumi.pdf

FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

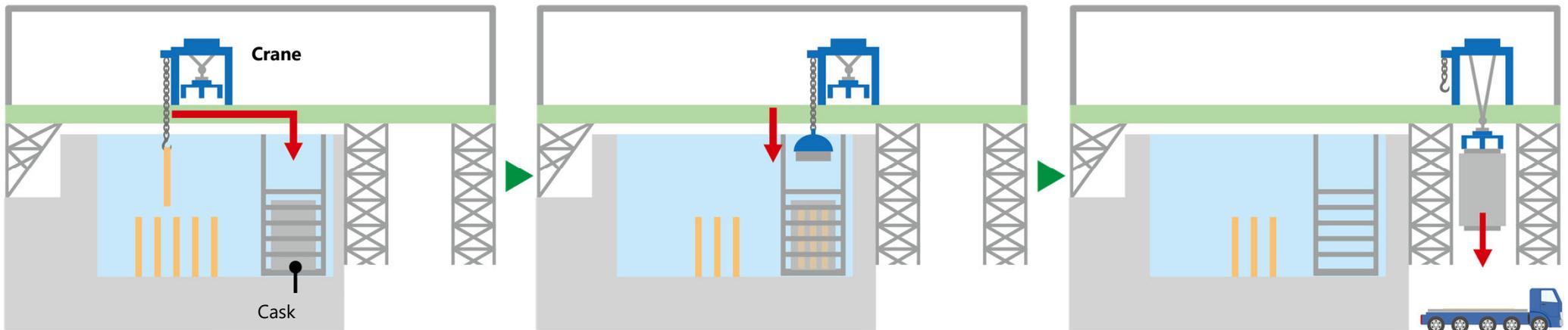
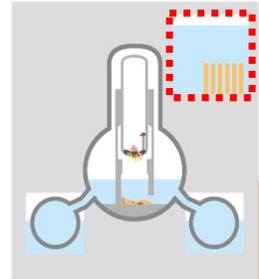
Development, design, installation of metal or concrete casks

Dry storage on high ground

Fuel removal from spent fuel pools [High radiation dose equipment removal]

Once the fuel is removed from the spent fuel pools of each Unit, the 'high radiation dose equipment such as spent control rods' stored in the spent fuel pools will be removed. A new facility will be built to store the high radiation dose equipment from Units 1 and 2.

Because large high radiation dose equipment is also stored in Unit 4, that equipment will be taken out together. The challenge is developing specific removal measures (remote operations, transfer, storage) of various equipment of differing sizes and shapes.



- Carrying in a transfer container (cask) into the spent fuel pool
- Housing the high radiation dose equipment in the transfer container

- Attaching the primary lid to the transfer container

- Carrying out the transfer container

FY2024

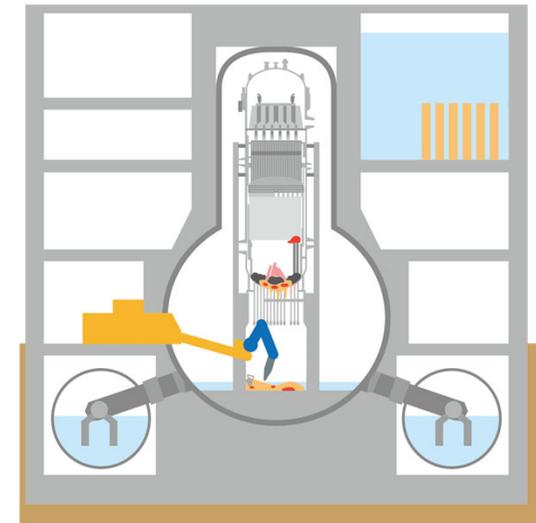
Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

Unit 3 (High radiation dose equipment removal and pool water drainage)

Unit 4 (High radiation dose equipment removal and preparation to remove large equipment)

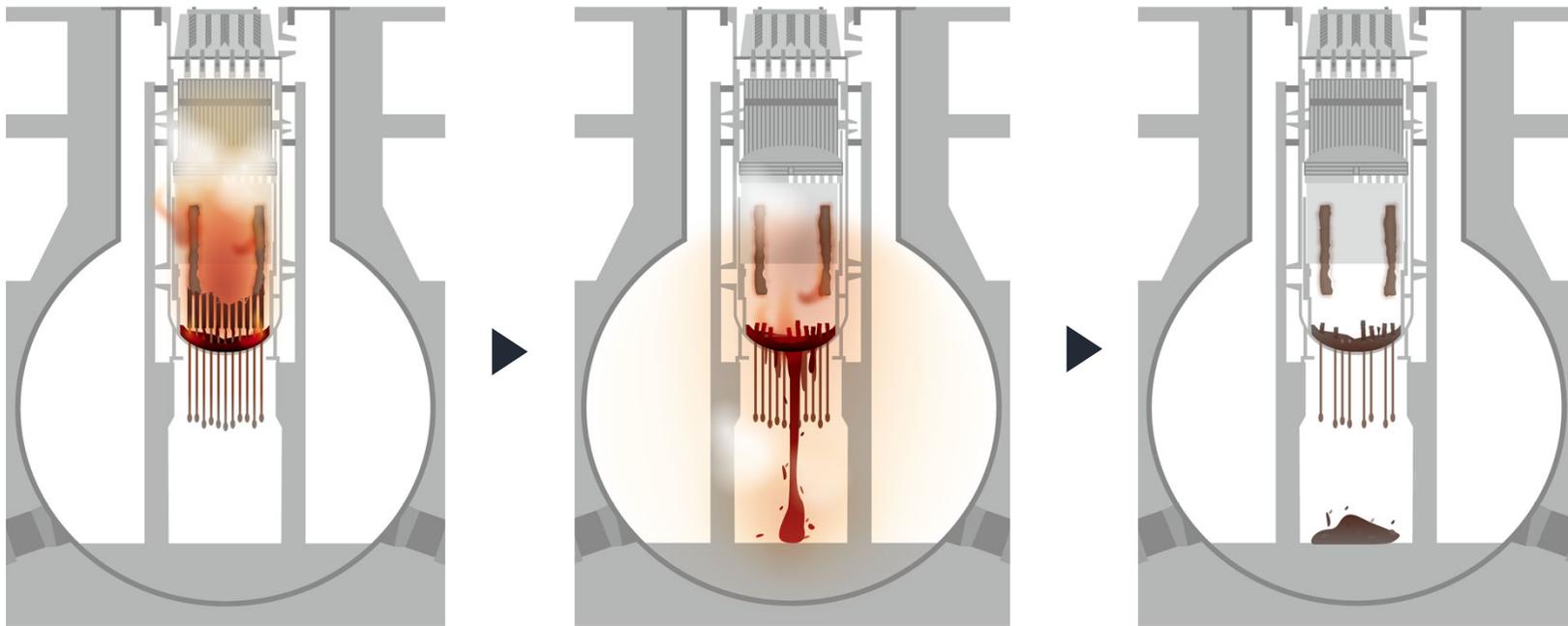
- Fuel debris retrieval



Because the radiation dose inside the primary containment vessel is high, we are currently conducting a detailed internal investigation using remotely operated robots. We have also succeeded in the fuel debris trial retrieval.

What is fuel debris?

After the accident occurred, it became impossible to cool the reactor cores due to a loss of emergency power thereby allowing the fuel to overheat and **melt along with fuel rods and in-vessel structures**. These melted structures then **cooled and solidified to become what we call fuel debris**.



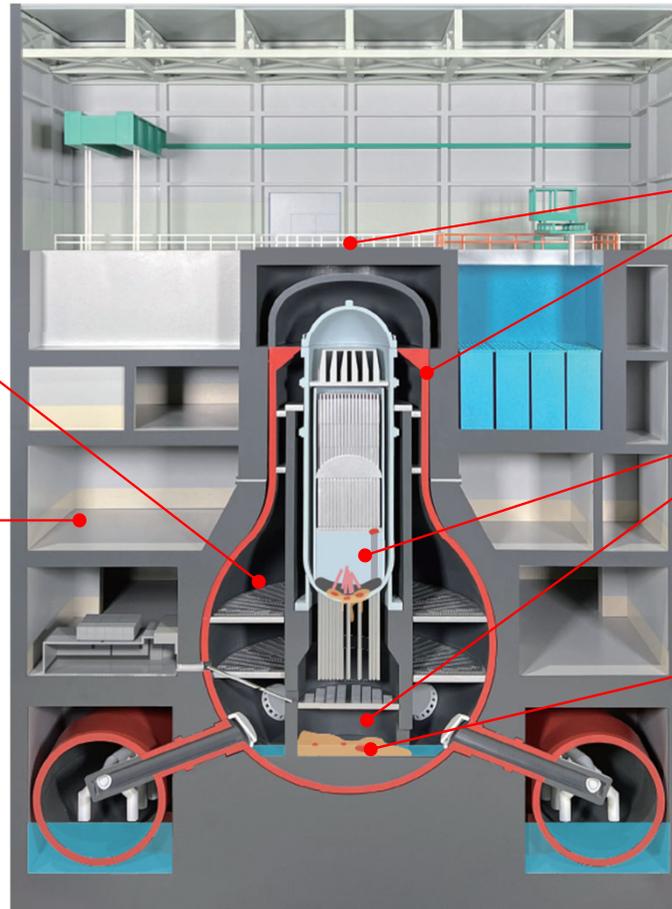
Cooling water continues to be injected into Units 1~3 to cool the fuel debris to this day. The heat given off by the fuel debris has greatly decreased since the accident and is now being kept in a stable state. Temperatures inside the primary containment vessels are being maintained at approximately 15~35°C.

Toward fuel debris retrieval

There are **various challenges** pertaining to the 'fuel debris retrieval'

The radiation dose inside the primary containment vessel is **extremely high** and **requires remotely operated equipment** to access.

The inside of the reactor building is a **relatively high-dose environment** in which **long periods of time cannot be spent working**.



Measures must be implemented at the opening of the primary containment vessel **to mitigate the dispersion** of radioactive materials.

Though internal investigations are being conducted, **there are some areas in which the status of the field condition is unknown**.

Fuel debris needs to be retrieved carefully so that criticality is not achieved again.

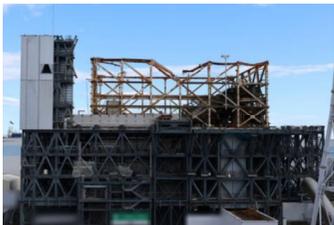
Overall fuel debris retrieval process

The work schedule will be broken up into three phases. "Since site radiation doses are relatively low, and the primary containment vessel can be accessed earlier than others", "Unit 2" has been selected as the first unit from which fuel debris shall be retrieved. Unit 2 entered into Phase 2 following the success of trial retrieval.

Phase ①

Ascertaining primary containment vessel conditions
/retrieval method deliberation, etc.

Unit 1 Unit 3



Phase ②

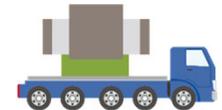
Fuel debris retrieval

Unit 2



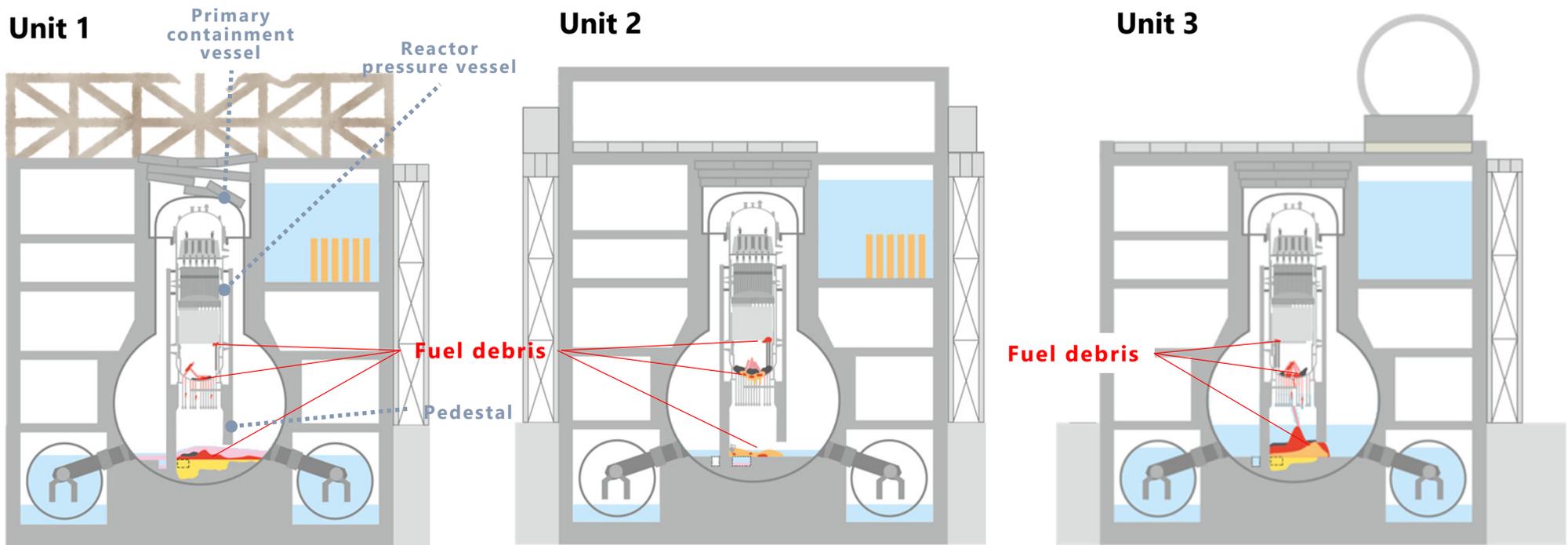
Phase ③

Transportation



Estimating fuel debris distribution in Units 1~3

Various investigations and accident analysis have been conducted, and the '**distribution of fuel debris in each Unit**' is estimated based on the result.



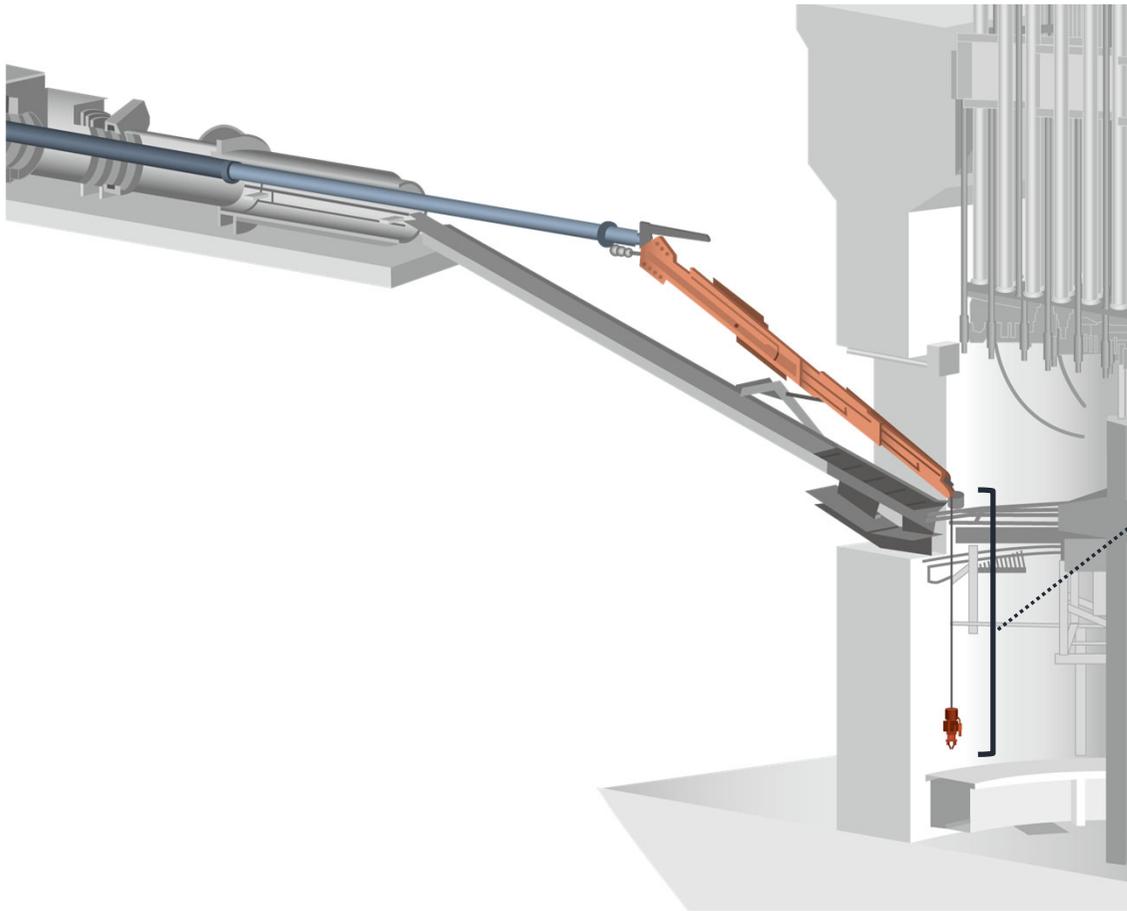
Almost no fuel debris exists in the reactor pressure vessel.
Most of it has fallen inside the primary containment vessel.

There is a lot of fuel debris still at the bottom of the reactor pressure vessel.
There is very little inside the primary containment vessel.

There is little fuel debris in the reactor pressure vessel.
There is some fuel debris in the primary containment vessel.

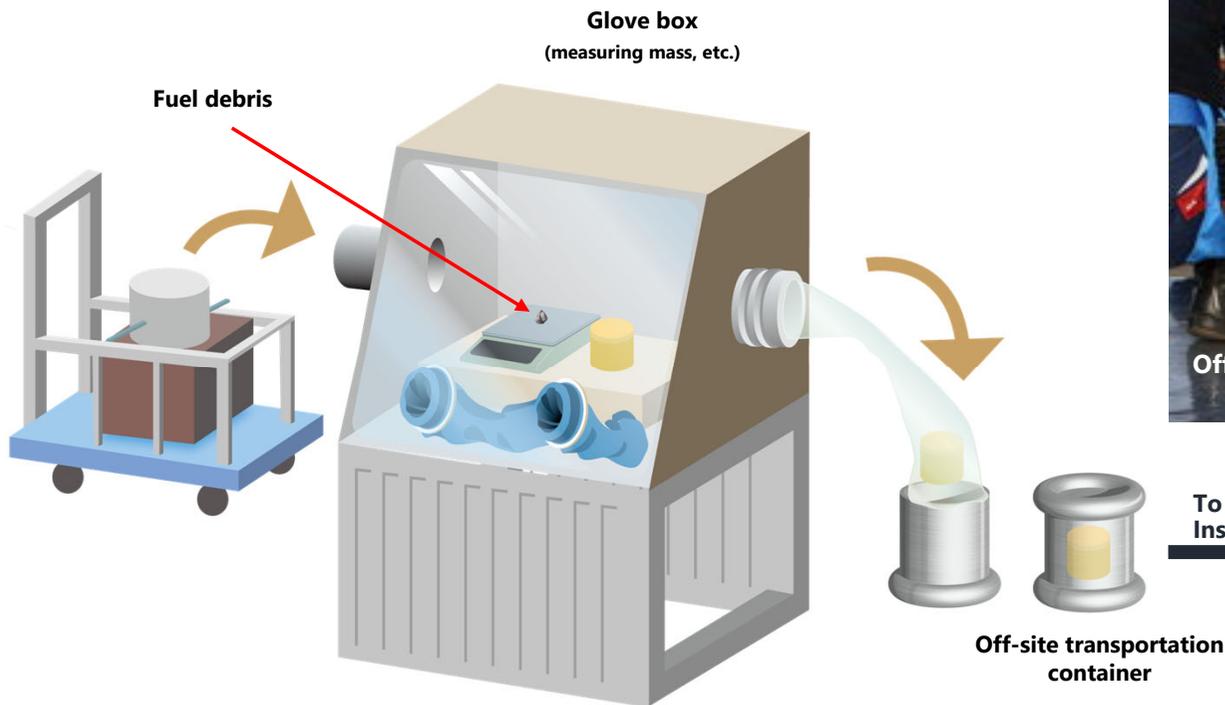
Successful retrieval of fuel debris on a trial basis using the [telescopic retrieval device]

On October 30, 2024, the end jig of the telescopic device inserted into the pedestal was lowered down to **grip the 'fuel debris'**. The sampled 'fuel debris' was loaded into the 'DPTE container (indoor transportation container)', and this round of **'trial retrieval' was completed** (November 7).



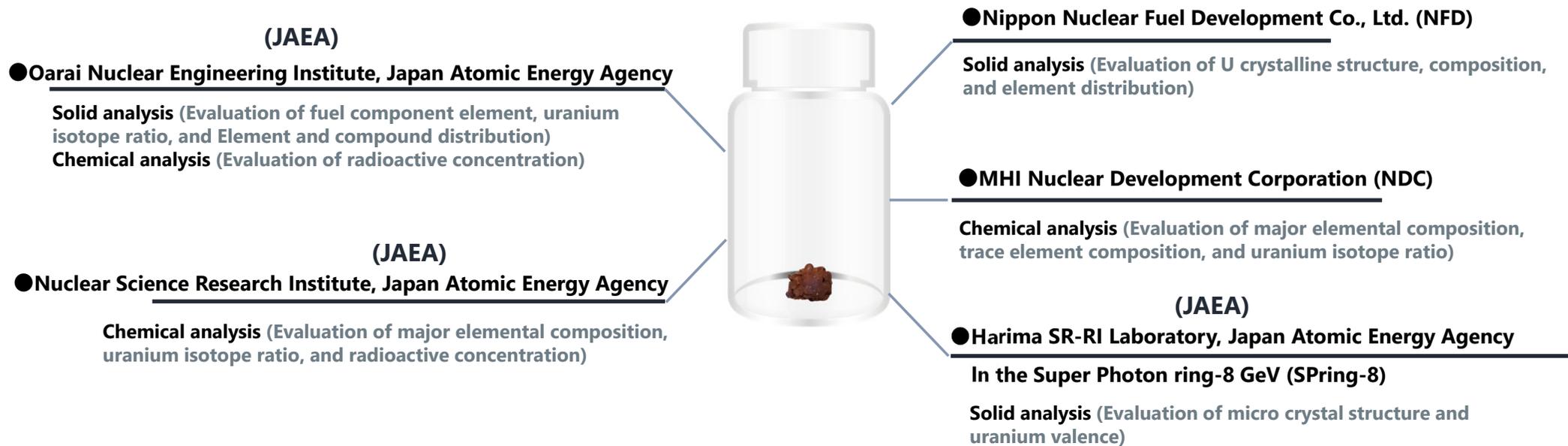
Transportation of fuel debris

The mass of the fuel debris taken out on a trial basis was measured in the glove box. The debris is then stored in an off-site transportation container, and transported to the Japan Atomic Energy Agency (JAEA) Oarai Nuclear Engineering Institute in Ibaraki Prefecture. The properties of the fuel debris will be analyzed, and the results will be used to develop 'fuel debris retrieval methods', 'safety measures', and 'storage methods.'



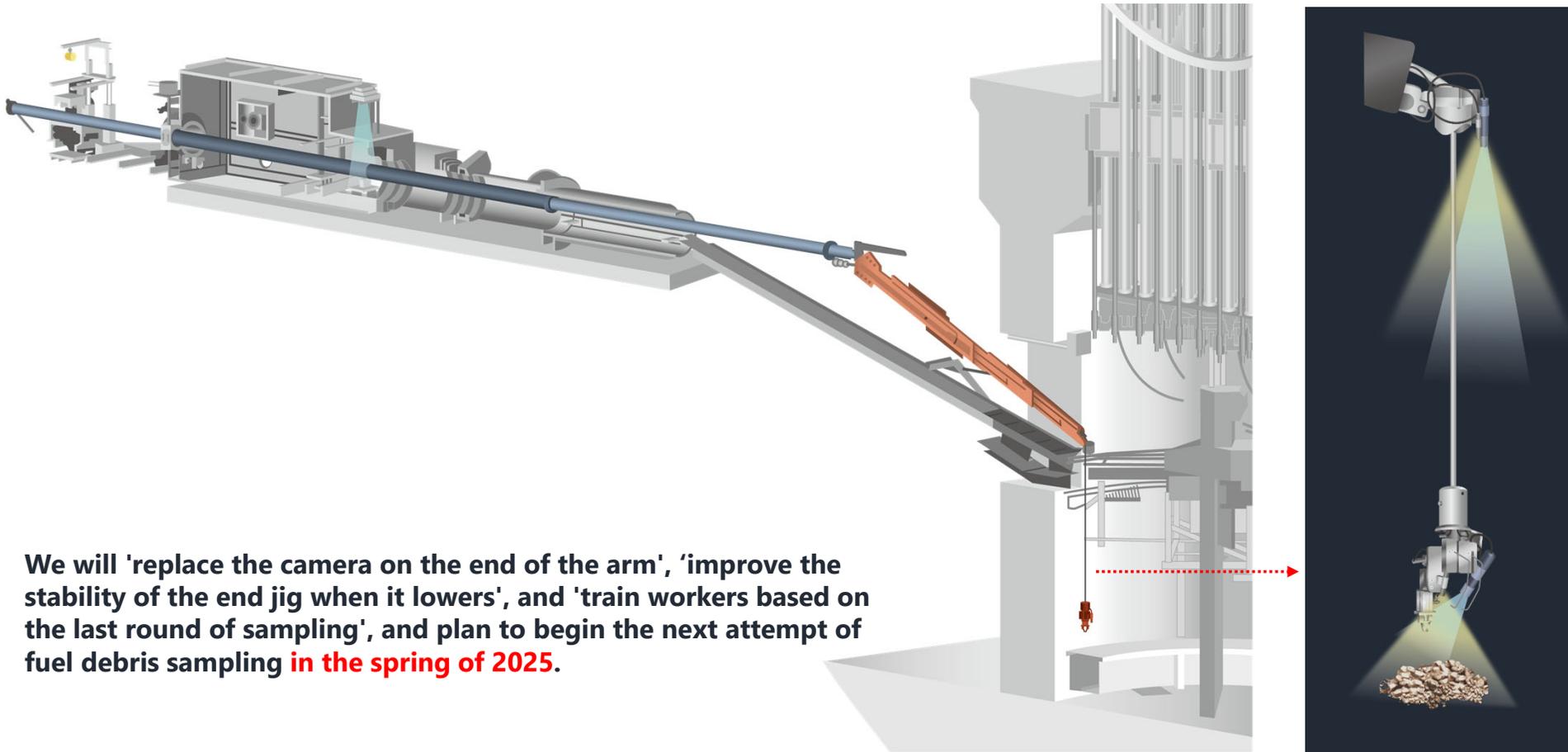
Future analysis

Because the fuel debris sample was able to be **crushed and fractionated**, samples were able to be transported to **each analysis laboratory** as planned. **Analysis will be conducted and the results summarized** going forward.



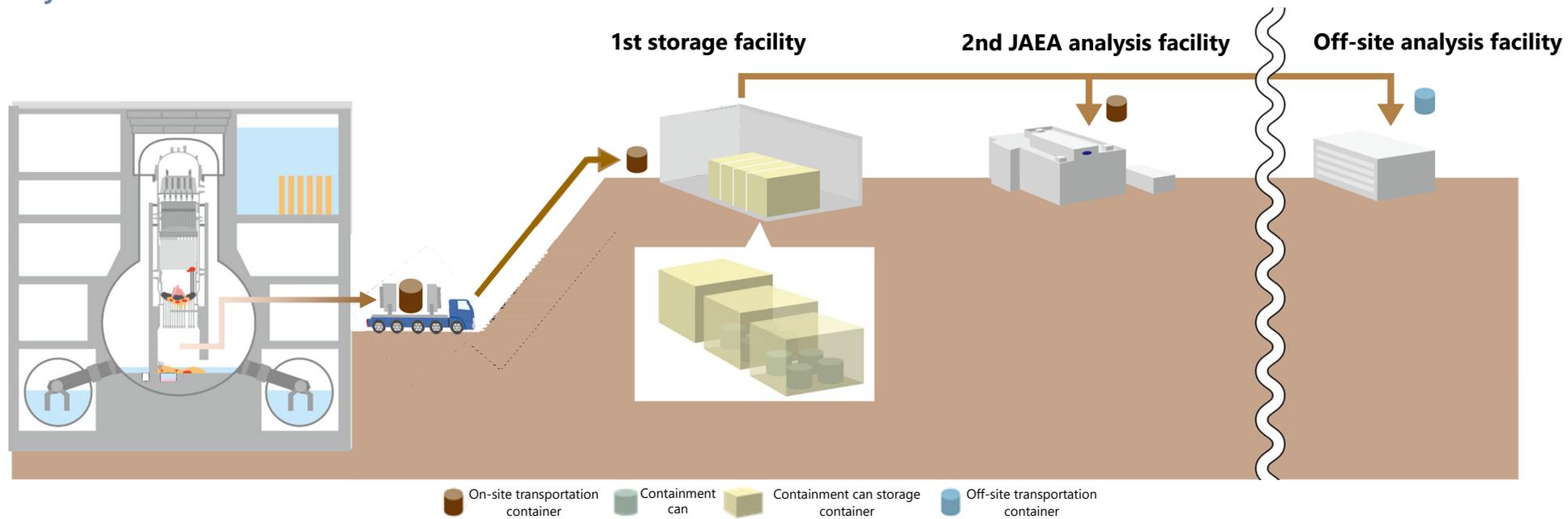
Future plans

Fuel debris is expected to have **a range of properties and distributions**. We plan to conduct **additional fuel debris sampling** to expand the knowledge about fuel debris. This sampling will be conducted using the '**telescopic device**' **currently installed in the reactor building**.



Gradual enlargement of the scale of retrieval [Unit 2]

To enlarge the scale of gradual retrieval of fuel debris, measures such as 'improving the environment inside the reactor buildings' to **reduce the radiation dose on the first floor of the reactor building**, are being implemented. We will **design deliberate, manufacture, and install 'fuel debris retrieval equipment', 'safety system (contain, cool and maintain, manage criticality)', 'fuel debris storage facility', 'maintenance equipment for retrieval equipment'**, based on the knowledge obtained through trial retrieval. The challenge is developing dust scattering prevention methods for when modifying fuel debris or removing components in the primary containment vessel.



FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

Design deliberation, manufacture, and installation of fuel debris retrieval equipment and storage facility

Fuel debris retrieval

[Reference] Deliberation to further enlarge the scale of fuel debris retrieval

Selecting the fuel debris retrieval method in order to **further enlarge the scale of fuel debris retrieval** will be very important decision that will affect the success of decommissioning in the mid-to-long term.

It requires **TEPCO**, with **the cooperation of the Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF)** and **the government**, as well as expert and focused deliberation.

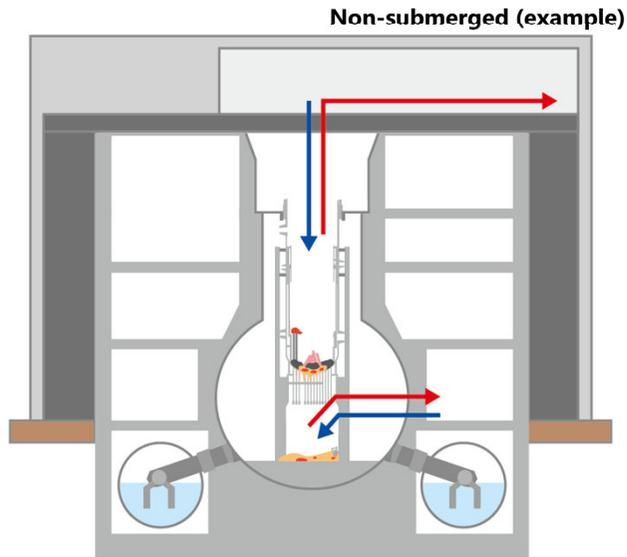
The '**Sub-committee for the Evaluation of Fuel Debris Retrieval Methods**' was established under the Decommissioning Technology Committee. This Subcommittee **deliberated methods and evaluated them** with safety as a premise, and summarized its findings in a report in March 2024. Based on this report, we plan to issue a technical forecast around mid-FY2025.

The following are some of the methods discussed.

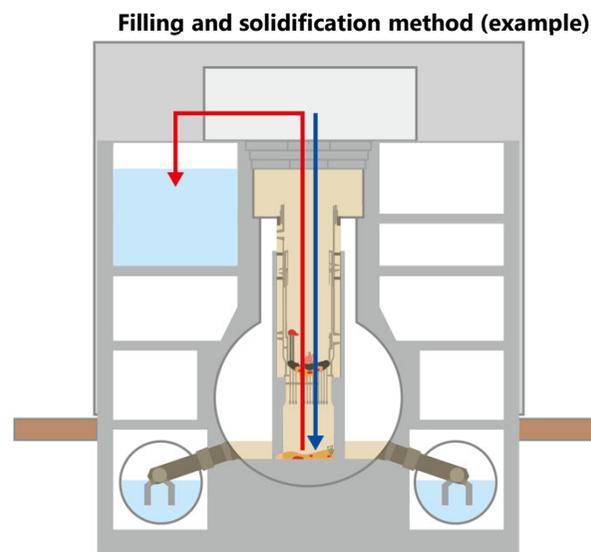
→ Direction of access for equipment

→ Direction of transport of fuel debris and waste

■ Filler material



Method in water is poured over fuel debris, which is kept exposed to the air, and then extracted



Method in which the fuel debris is stabilized using filler material and field dose is reduced, after which fuel debris along with components and the filler will be crushed using an excavator and fluidized to be circulated and collected

Sub-committee for the Evaluation of Fuel Debris Retrieval Method Report (March 7, 2024) excerpt

- Begin design deliberation/R&D that combine the non-submerged method with its method options.
- At the same time, conduct small-scale internal investigations utilizing top access points.

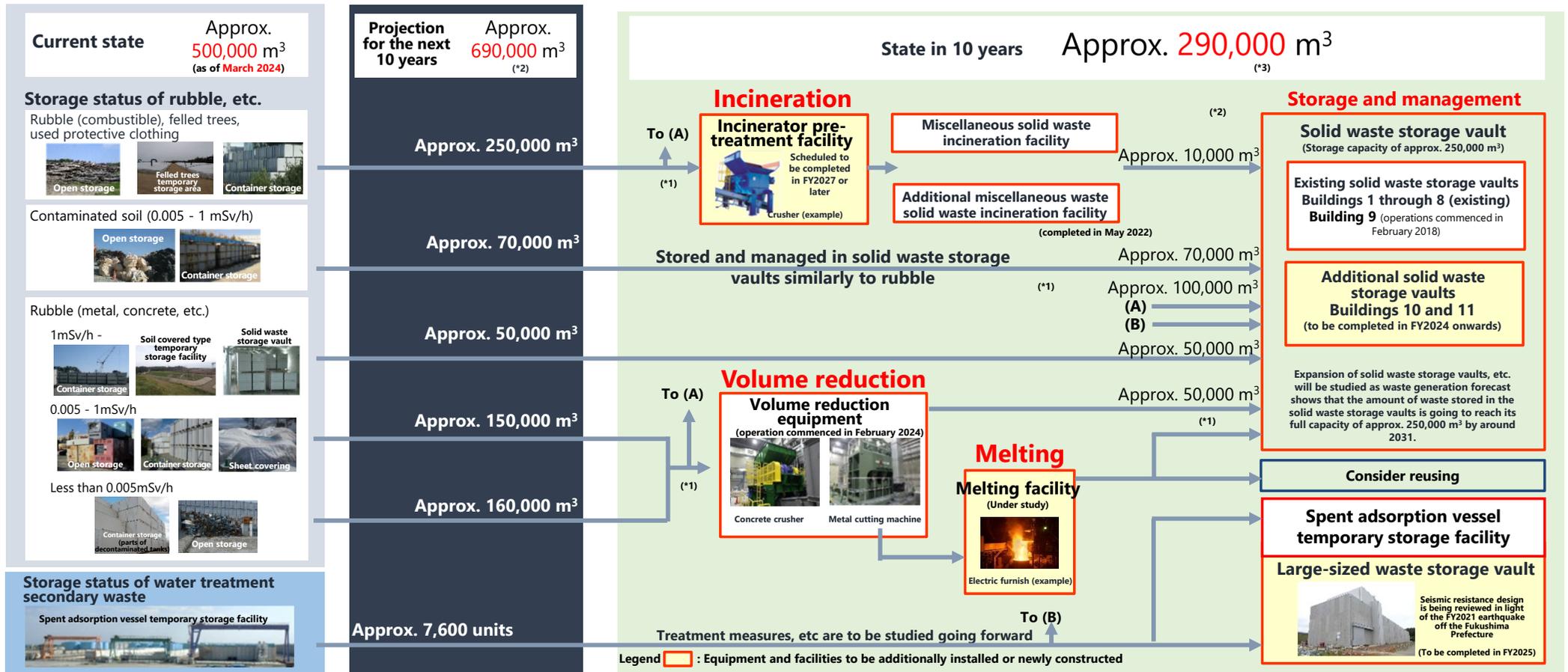
- Waste management



Waste generated in decommissioning will be separated according to the radiation dose, and stored on the premises of Fukushima Daiichi Nuclear Power Station.

Waste management [Solid waste]

Every fiscal year, we publish our 'Solid Waste Storage and Management Plan', which lays out the amount of waste generated and forecast for the amount of waste to be generated in the next 10 years. In December 2024, we issued the 8th revision to this plan. **The waste temporarily stored outdoors will be incinerated and its volume will be reduced to be stored in the 'solid waste storage vaults'.**



Note) Does not include used protective gear that is not incinerated and background-level concrete waste, which already have been decided should be processed or reused in a specific way

(*1) If incineration, volume reduction, melting and reuse are difficult, it will be directly stored in solid waste storage vaults.
 (*2) Totals may not add up as values are rounded at the 10,000 m³ place.
 (*3) Approx. 240,000 m³ of waste is estimated to be stored in the solid waste storage vaults as of the end of FY2028.

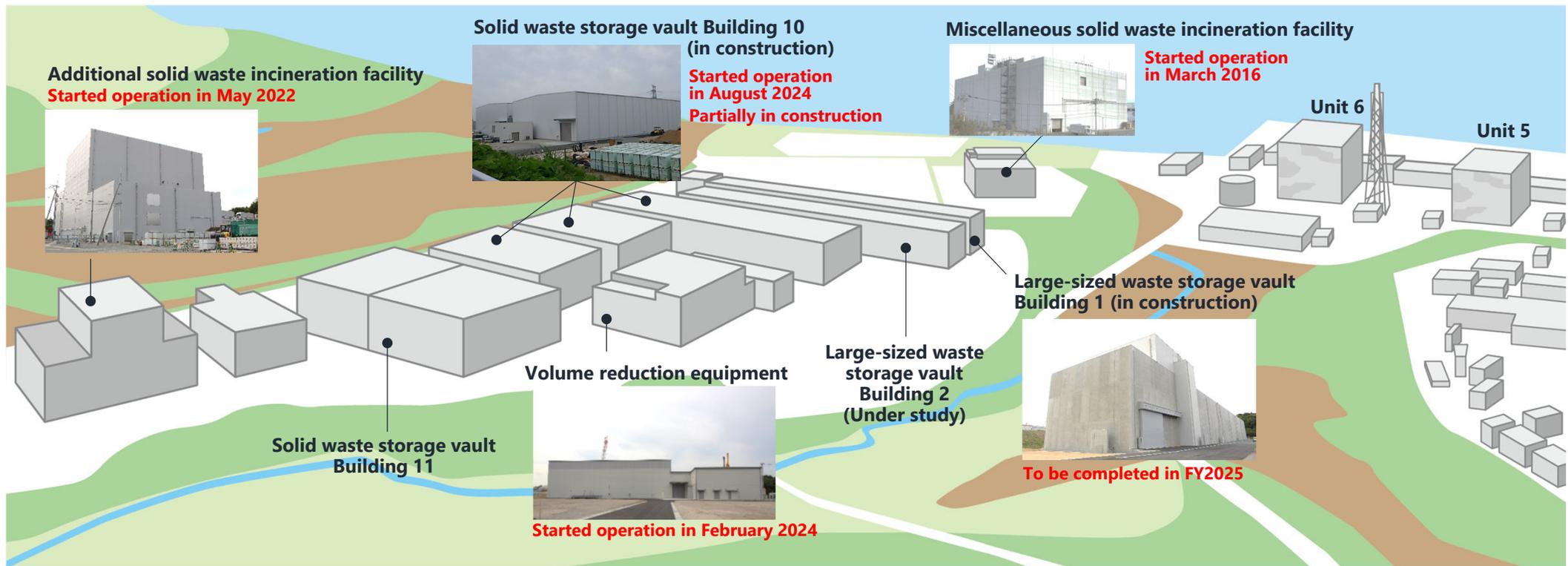
• The radiation dose at the site boundary is expected to decrease as the waste is moved to inside storage and outdoor storage is eliminated.
 • The dose of the exhaust gas from the incineration facility the dose on the site boundary are measured and published on our website, etc.

Overview of the Solid Waste Storage and Management Plan (revised in November 2023)

Waste management [Solid waste]

The plan is to incinerate and reduce the volume of waste temporarily stored outdoors to store in the 'solid waste storage vaults' in order to achieve the target in the Mid-and-Long-Term Roadmap of "eliminate temporary outdoor storage areas for rubble, etc. by end of FY2028 excluding the secondary waste from water treatment and waste to be reused".

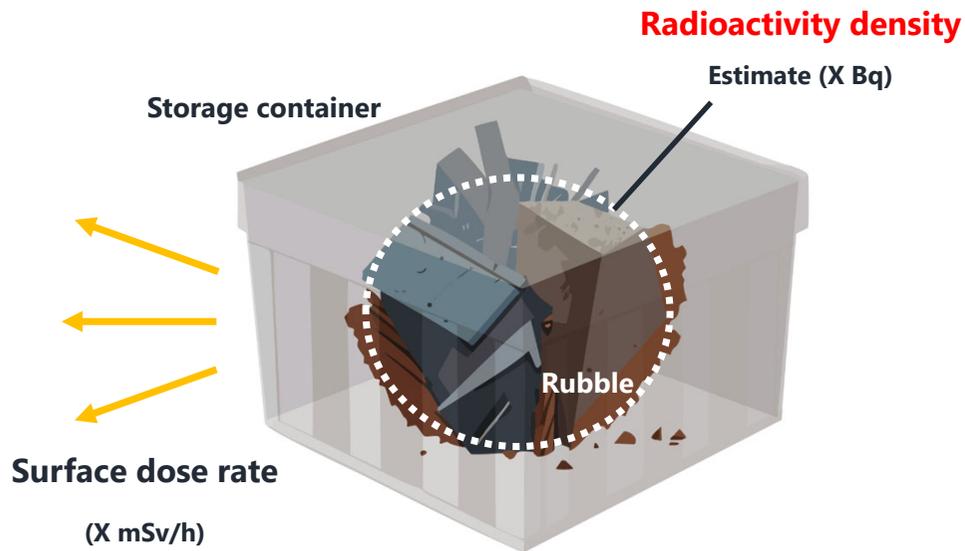
Storage capacity for waste up to the 'solid waste storage vault Building 11', currently being planned, is approximately 250,000 m³. This is larger than the estimated storage volume of "approximately 240,000 m³" at the end of FY2028 which is the target in the Mid-and-Long-Term Roadmap, and as such, we believe that we will be "able to achieve" this Mid-and-Long-Term Roadmap target.



Waste management [Solid waste]

We are currently developing a method to estimate the radioactivity density of and manage rubble, which is currently being sorted and managed based on surface radiation dose.

First, we will analyze the existing rubble and develop a management method based on the radioactivity density.



<Policy for evaluating and managing the radioactivity density>

- Going forward, the average radioactivity density of each nuclide (total radioactivity) of waste in the storage containers will be estimated using the measurable surface dose rate of containers.
- Considering the representativeness and uncertainty of data, a conservative estimate will be used if the value is difficult to explain.
- At the same time, to avoid excessive conservatism, grouping based on records when possible will be considered.

FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

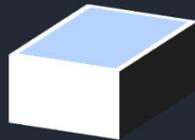
Develop and study a management method based on the radioactivity density of rubble

Waste management [Solid waste]

We will conduct document reviews, then conduct contamination investigations and study the methods for contamination evaluation, dismantling and decontamination, etc. using the '**Units 3 and 4 radioactive waste treatment building**' as a model case, when dismantling facilities and dealing with the buildings dismantled in the future.

Flow of studying buildings dismantled

Study as a dismantling model case

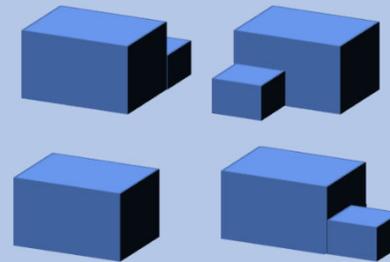


Units 3 and 4
radioactive waste
treatment building

Study the series of projects related to dismantling using a particular facility as a test case.

- Contamination investigations and evaluation method
- Dismantling method and decontamination method
- Waste classification and storage
- Radioactive concentration management method

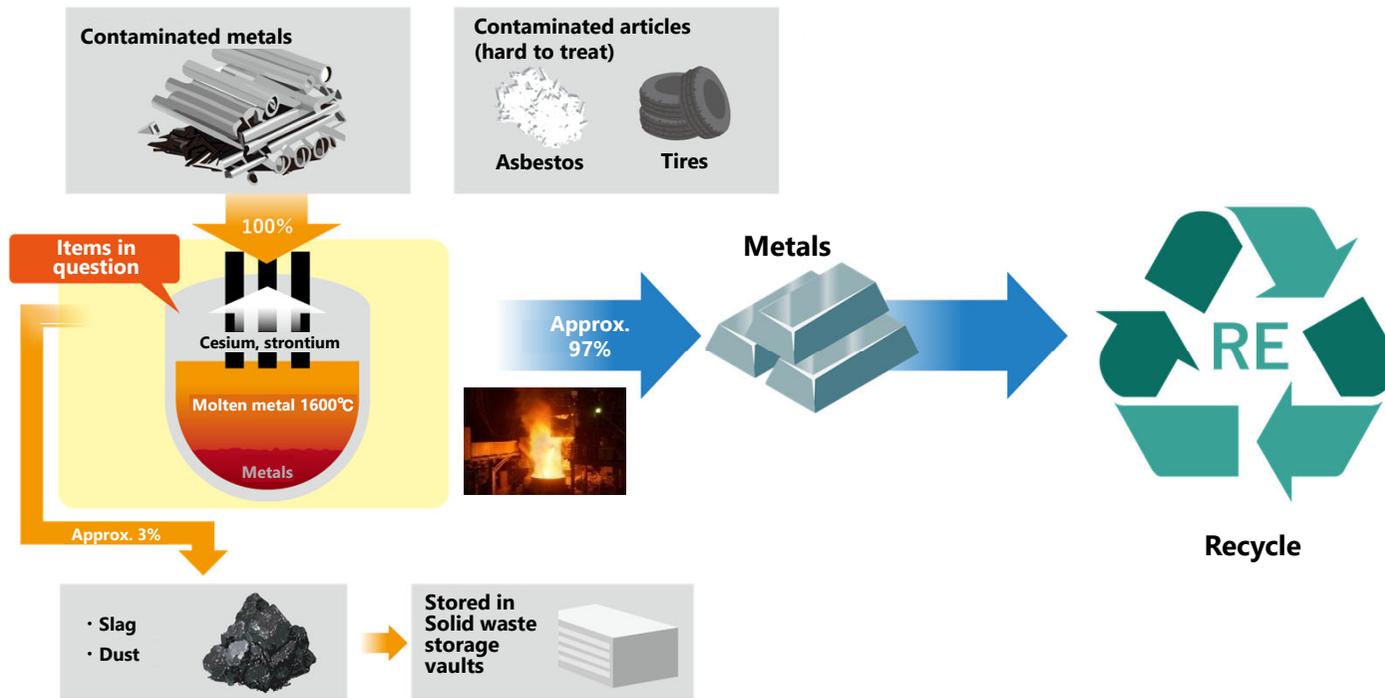
To be utilized in future facility dismantling



To be rolled out for facility dismantling and buildings dismantled in the future (target scope to be gradually expanded)

Waste management [Melting facility]

A **melting facility will be built to decontaminate and reduce the volume of waste** such as **metals that can be melted down** on Fukushima Daiichi premises. The types of waste to be melted will be reviewed based on progress made in design.



FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

Design, manufacture, installation

Waste management [Secondary waste from water treatment]

The **secondary waste from water treatment** (e.g., **adsorption vessels**) generated in decommissioning will be stored in **Large-sized waste storage vaults that will be built**.



Cesium adsorption apparatus (SARRY)



Cesium adsorption apparatus (KURION)



Indoor storage
Large-sized waste storage vault

Current state of outdoor storage

FY2024

Short-term (next 3 years)

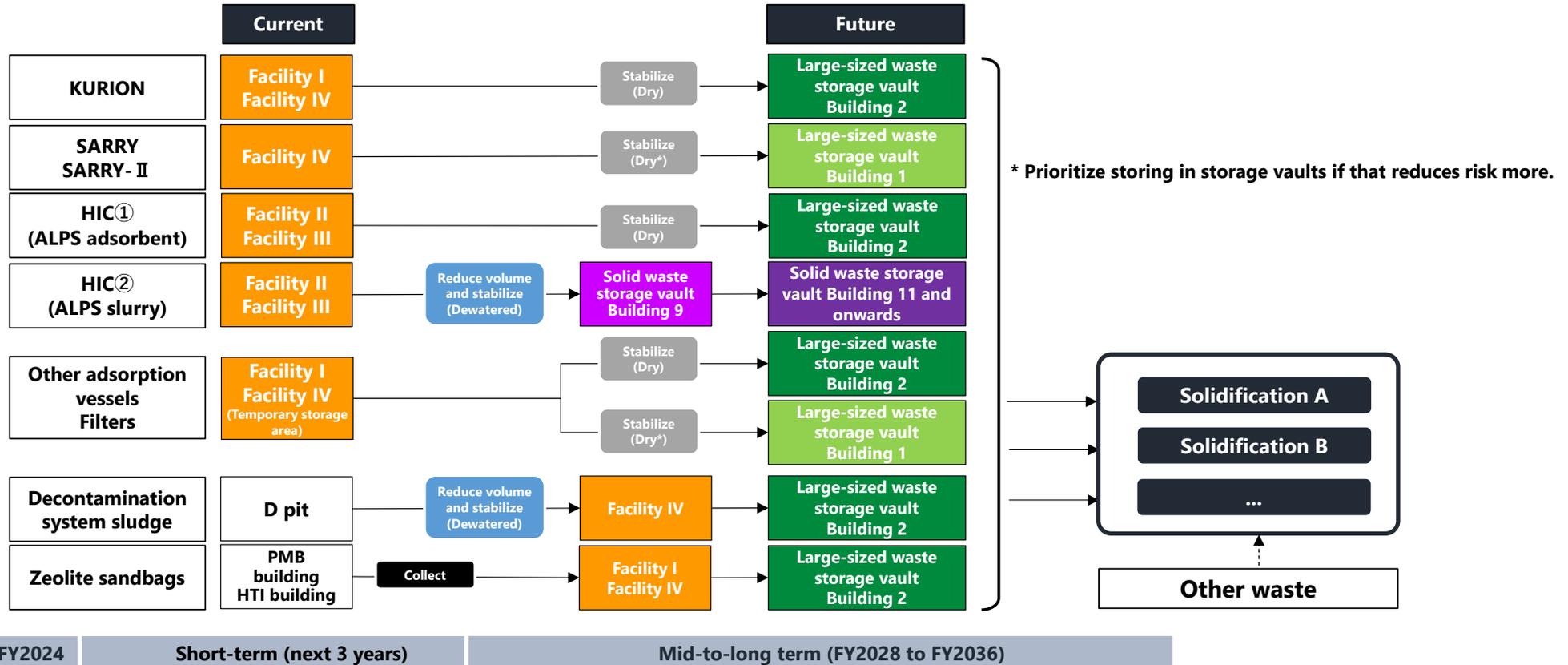
Mid-to-long term (FY2028 to FY2036)

Building and seismically reinforcing Large-sized waste storage vault Building 1

Study, design, installation of Large-sized waste storage vault Building 2

Waste management [Secondary waste from water treatment]

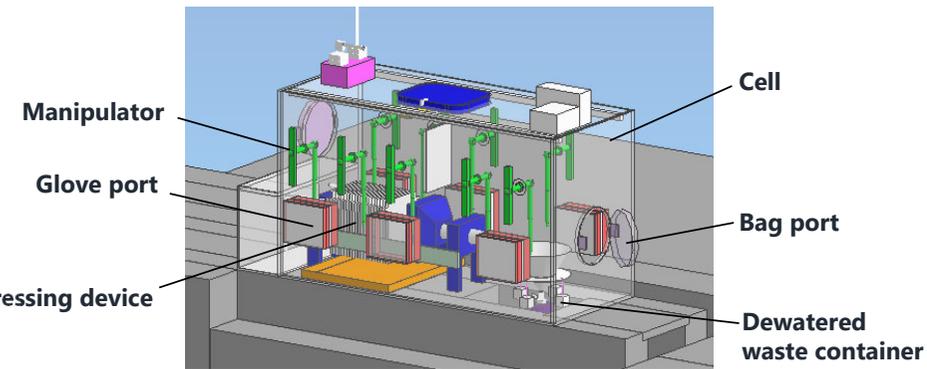
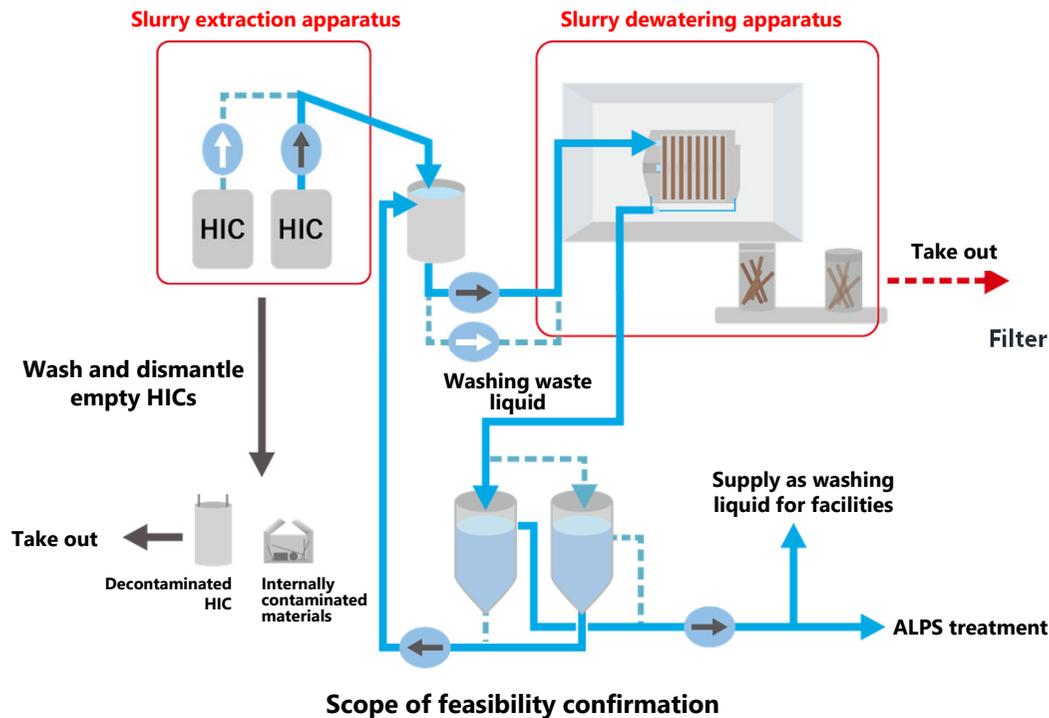
A **storage management policy** will be formulated for ALPS absorbents and other **secondary waste for water treatment** to eliminate the risk of corrosion and leakage in storage.



Study other treatment technology options for secondary waste for water treatment

Waste management [Secondary waste from water treatment]

Slurry, which is **secondary waste** generated when treating contaminated water with the multi-nuclide removal facility, is **dewatered (stabilization)** as it contains a lot of water.



Overview of the slurry dewatering system

- The dewaterability of the slurry was confirmed in the dewatering test using simulated slurry.
- In remote operations tests using manipulators, the feasibility of equipment layout within the cell as well as the feasibility of dewatering and maintenance were confirmed.
- The lack of significant dust scattering in dewatering and in filling dewatered waste has been confirmed.

FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

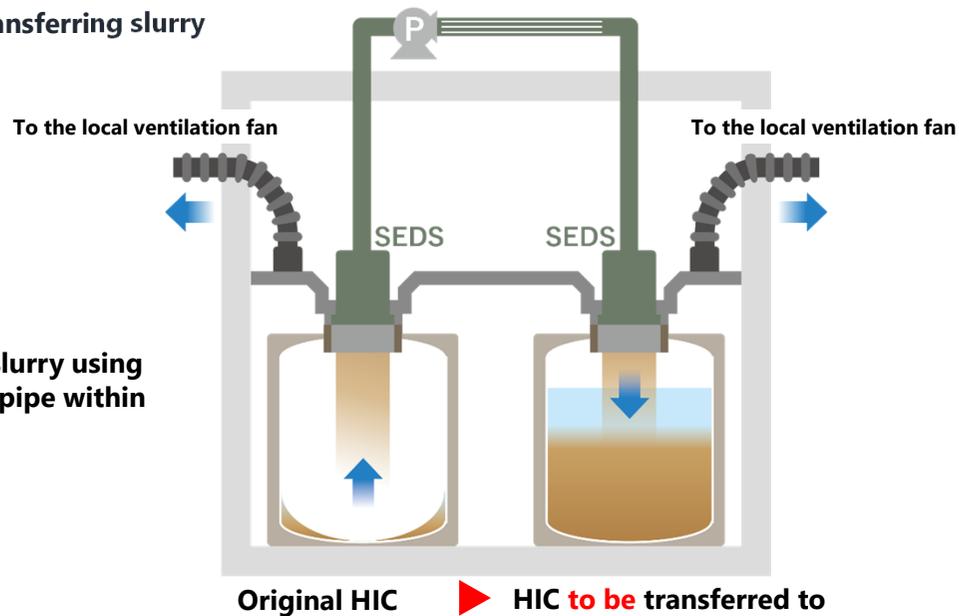
Design, manufacture, installation

Waste management [Secondary waste from water treatment]

Slurry, which is secondary waste generated when treating contaminated water with the multi-nuclide removal facility, is stored in 'High Integrity Containers (HICs)'.

Though there is no risk of leakage when kept stationary, the slurry contained in HICs whose integrity cannot be confirmed if it were to fall, will be transferred to another HIC by the commencement of slurry stabilization treatment equipment considering the impact of the radiation from the slurry.

Steps for transferring slurry



Transfer the slurry using the drainage pipe within the HIC



Transfer work

FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

Slurry transfer

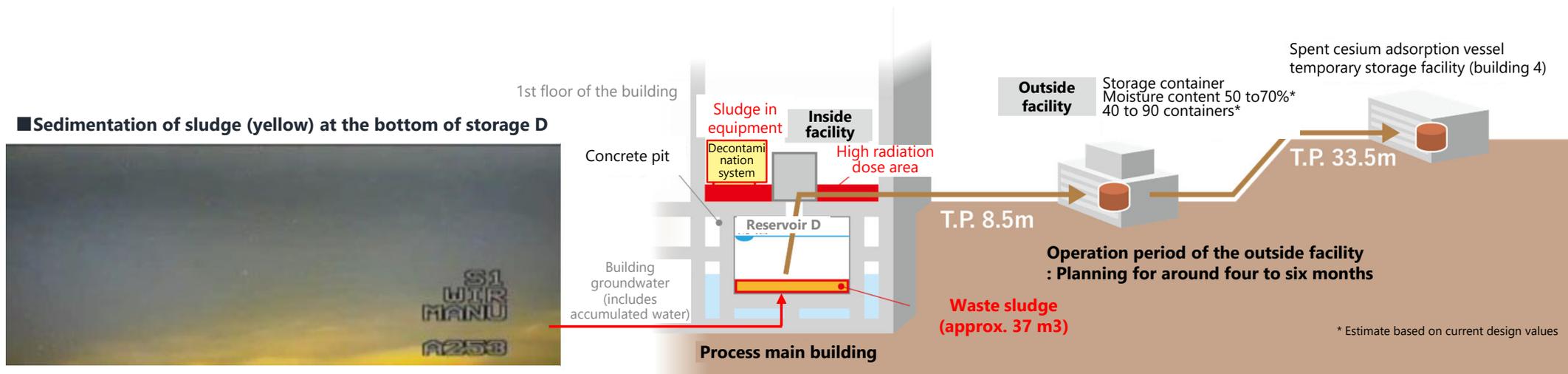
● Other

Natural disaster prevention measures

The **decontamination system** installed in the 'process main building' treated the contaminated water that was generated after the accident (June to September 2011).

The '**highly radioactive sludge**' generated during its operation is stored in the '**agglomeration pit/granulated solidification matter storage**' within the 'process main building'.

Because the process main building is **on ground 8.5m above sea level**, the plan is to **transfer the 'highly radioactive sludge' to high ground (33.5 m above sea level)** to ensure it is not affected by tsunamis.



FY2024

Short-term (next 3 years)

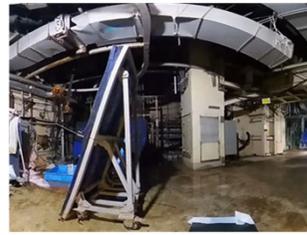
Mid-to-long term (FY2028 to FY2036)

Study, design, manufacture, installation, transfer of sludge using sludge transfer equipment

Natural disaster prevention measures

To confirm the long-term **soundness** of the reactor buildings of Units 1-3, an investigation of the building using a '**remotely operated robot**' which can be used to conduct investigations in high radiation environments, and '**trend analysis using seismometers**' are being conducted.

Remotely operated robot
(Mockup of a Unit 5 reactor building investigation)

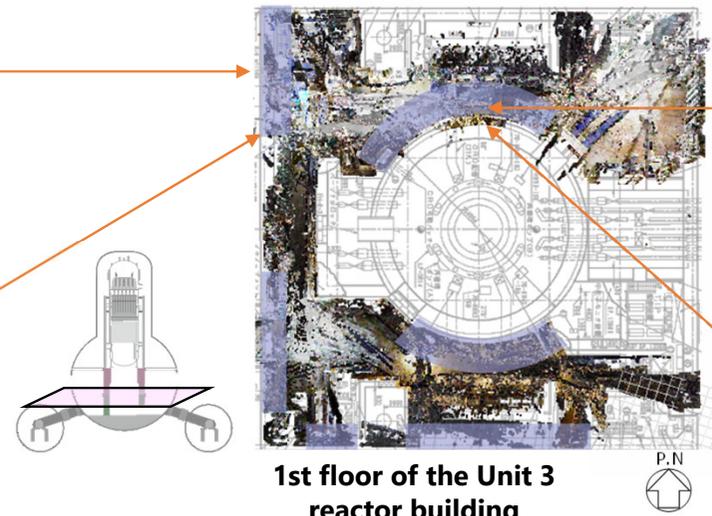


Northwestern outer wall



Points on the
northwestern outer wall

Investigation data from quadruped robots



1st floor of the Unit 3
reactor building



Northern shell wall



Points on the northern
shell wall

Area that can be investigated in the wall investigation

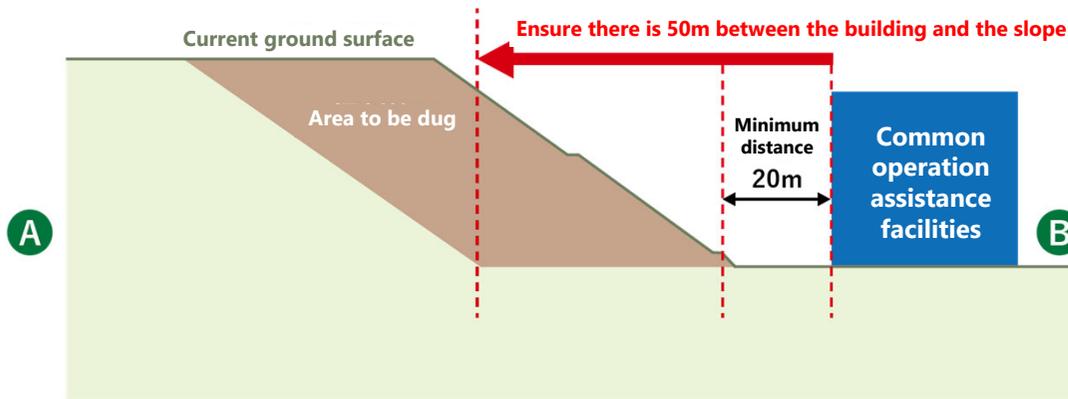
FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

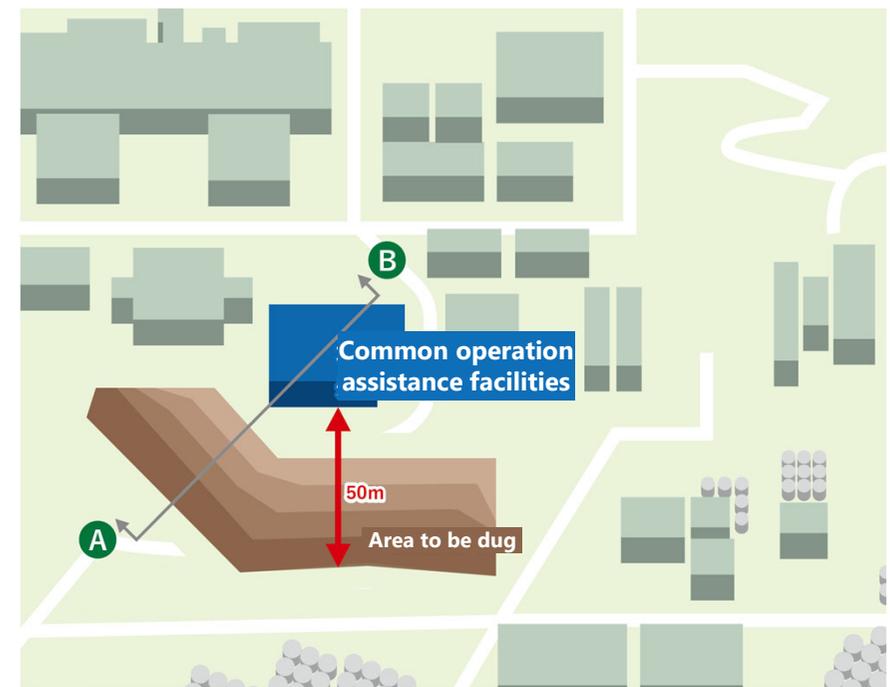
Natural disaster prevention measures

Deliberating **the risk of the slope failure** in a design-basis ground motion, **slope failure prevention work** will be conducted around the **'Common operation assistance facilities (common pool building)'** used to remove pool fuel.



A-B cross-section diagram

*The details of the work are being discussed and is subject to change.



FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

Deliberation, design and work on slope failure prevention measures for the common operation assistance facilities (common pool)

Analysis facility

A 'facility with an analysis function' that will become necessary in estimating the types of waste that will be generated as decommissioning progresses will be built. And an 'analysis structure' that flexibly accommodate changes in analysis demand will be developed.

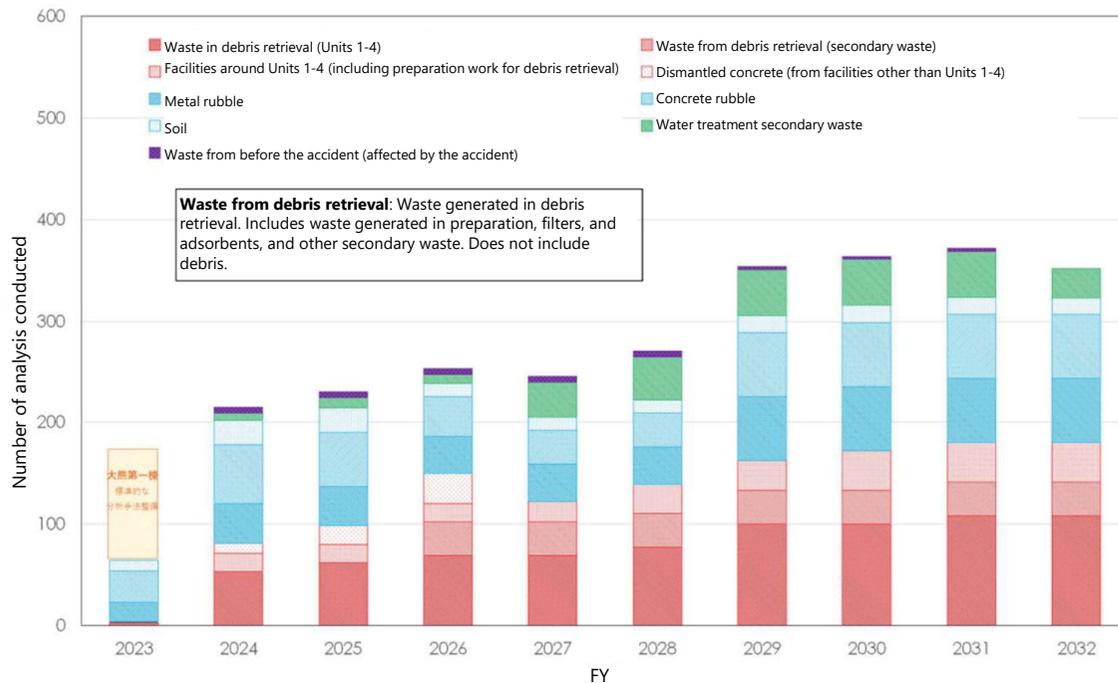
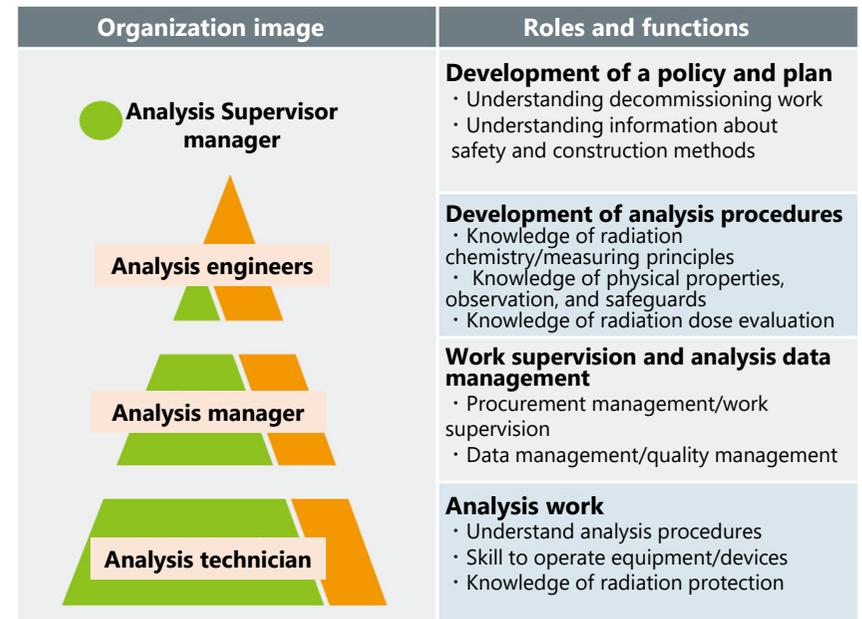


Diagram Overall Analysis Plan (trends in number of analysis per fiscal year)



Other

We **are working** on turning contractor buildings in the controlled area into rest areas **to increase work efficiency** on-site.

Contractor building



My Shoes: Expansion of areas where workers can move around in their own shoes



Maintaining/removing equipment facilities

To be able to **maintain decommissioning facilities stably in the long term, facilities will be updated to increase reliability.**



Examples of equipment/facilities being considered



Desalination apparatus (RO equipment)



Multi-nuclide removal equipment (ALPS)

FY2024

Short-term (next 3 years)

Mid-to-long term (FY2028 to FY2036)

Development of a plan to maintain/remove decommissioning equipment

Plan execution

Deliberation, design, and installation of new ALPS and new RO equipment

Operation