Status of Progress of the installation of ALPS treated water dilution/discharge facility and related facilities

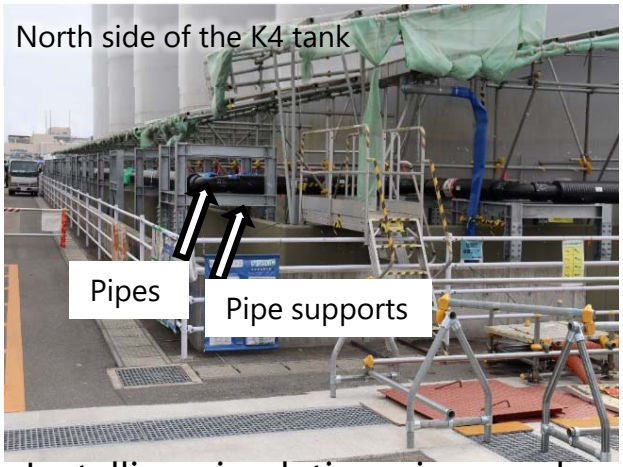
February 22, 2023

Tokyo Electric Power Company Holdings, Inc.

1. Status of construction

■ Measurement/confirmation facility and transfer facility

The installation of pipe supports and pipes for the measurement/confirmation facility and the transfer facility began on August 4 from the area around K4 tank area.
Pre-service inspection was started on January 16.

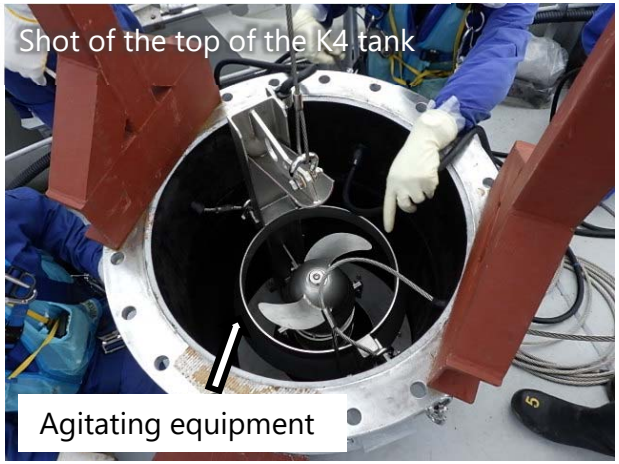


Installing circulation pipes and pipe supports

Installing the piping supports/pipes

【 Measurement/confirmation facility 】
・Supports
Approx. 540 out of approx. 540m
・Pipes
Approx. 1,000 out of approx. 1,000m

【Transfer facility】
・Supports
Approx. 1,328 out of approx. 1,500m ※1
・Pipes
Approx. 1,268 out of approx. 1,500m ※1
※1 Descriptions have been revised
<As of February 20>



Installing agitating equipment

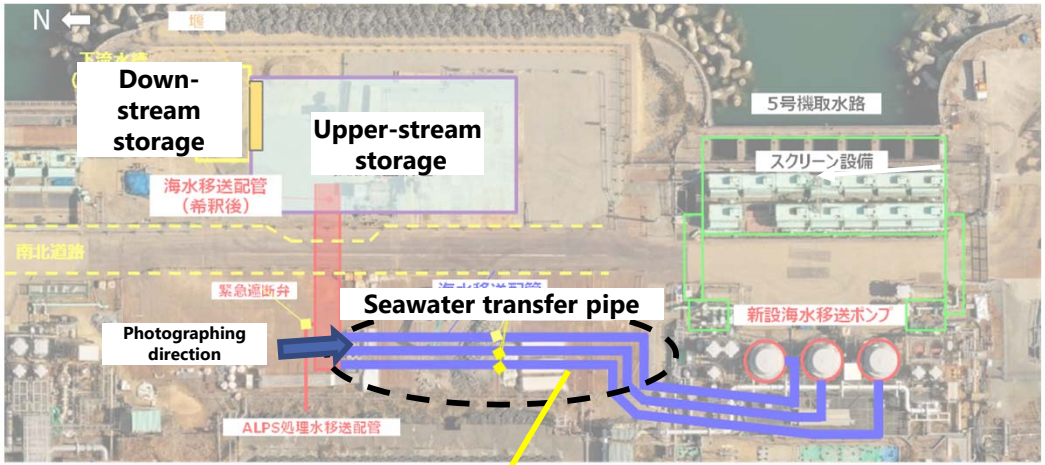
Installing agitating equipment

27 out of 30 units
(Pre-service inspection completed)
<As of February 20 >

*3 units are planned to undergo pre-service inspection

■ Dilution facilities

The foundation shafts for the seawater transfer pipes have been installed. The frame of the foundation is currently being built.

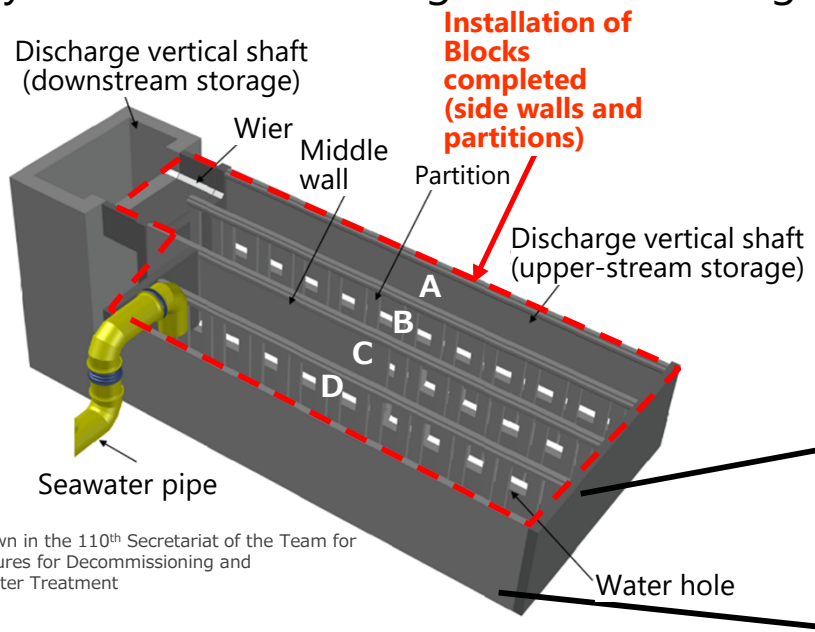


Building the seawater transfer pipe foundation

【Dilution facilities】
・Constructing the foundation of pipe foundation
1 out of 11 complete
・Support facility
0 out of 320 m complete
・Pipe facility
0 out of 320 m complete
<as of February 20>

1. Progress in construction (cont.)

- Dilution facility: Discharge vertical shaft (upper-stream storage)
  The installation and assembly of the block (manufactured outside of the premises) was started on January 12. Concrete casting for the base began on February 9.



The image is shown in the 110th Secretariat of the Team for the Countermeasures for Decommissioning and Contaminated Water Treatment

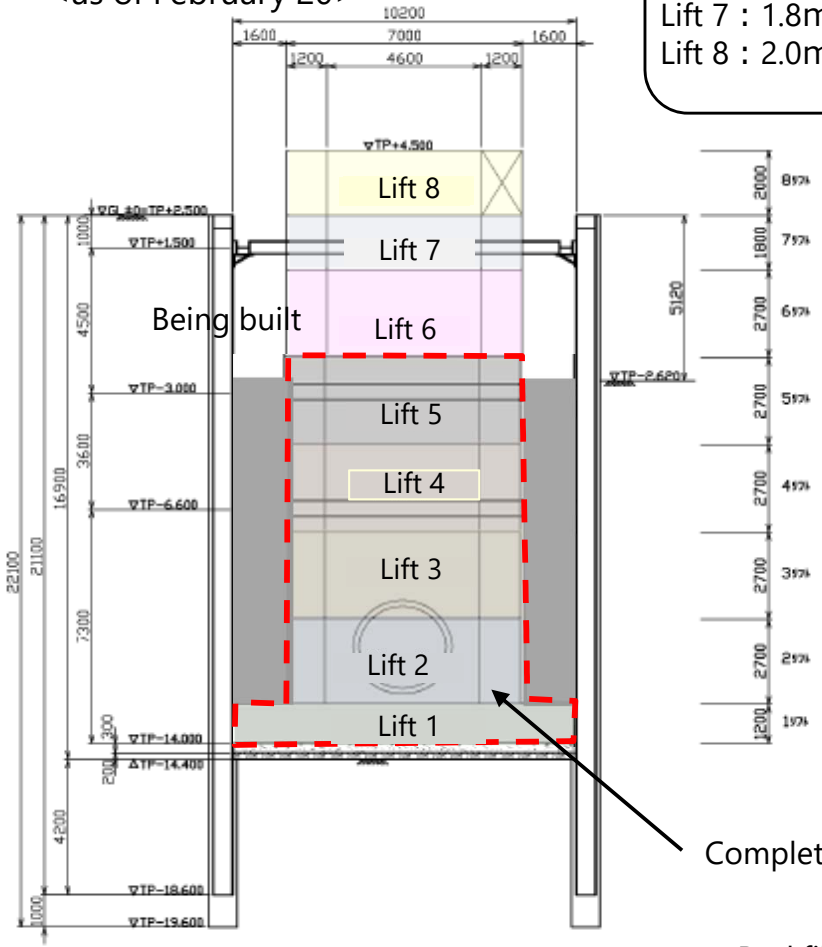
1. Progress in construction (cont.)

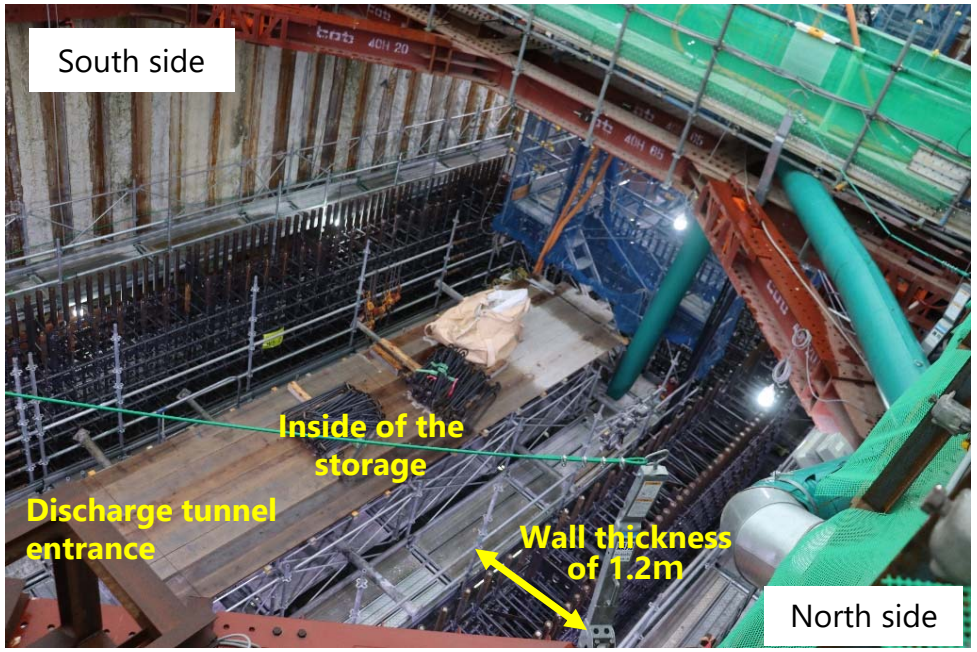
■ Discharge facility: Discharge vertical shaft (down-stream storage)
Construction of the frame was started on December 18.

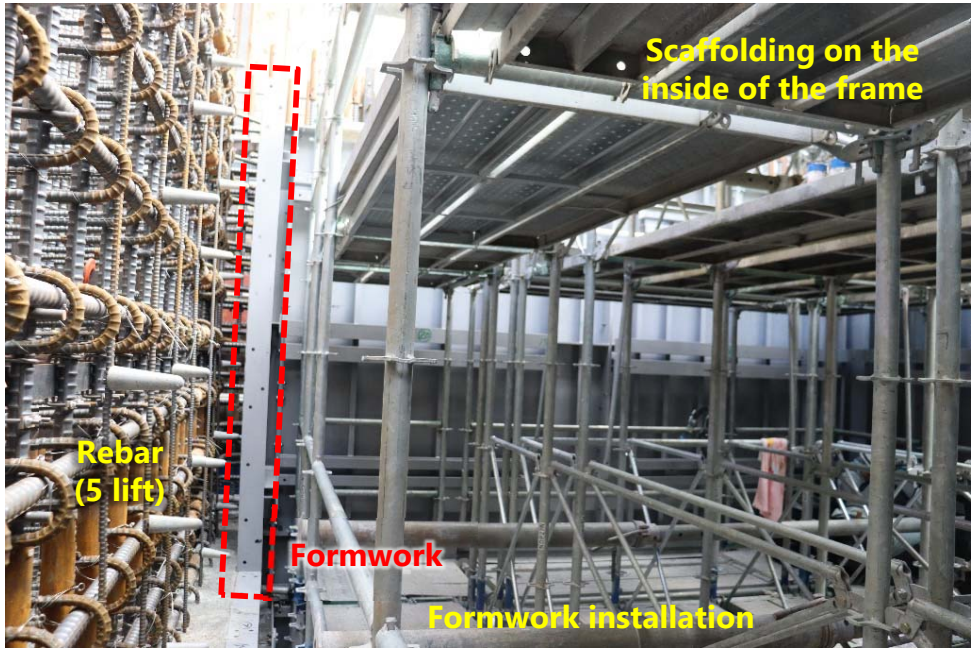
【Discharge facility】

・Down-stream storage: Frame building
5 out of 8 lifts complete
<as of February 20>

Height
Lift 1：1.2m
Lifts 2 through 6：2.7m
Lift 7：1.8m
Lift 8：2.0m







Backfilled with slurry (lean-mixed concrete)

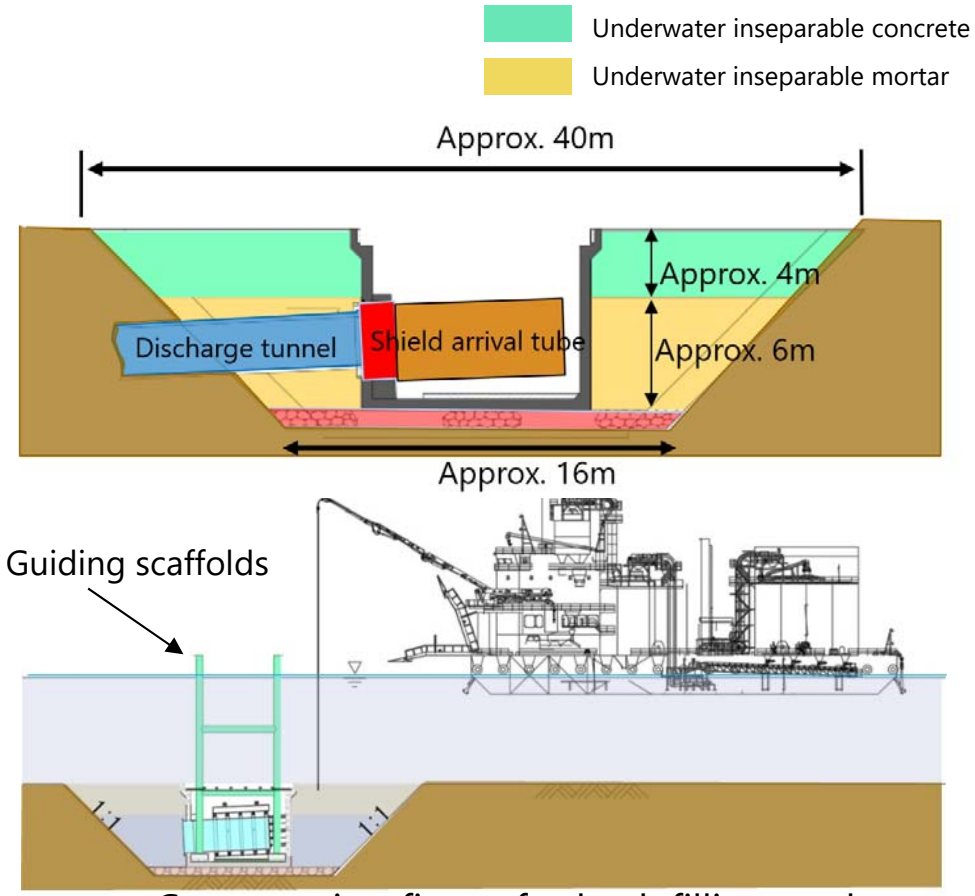
The image is shown in the 110th Secretariat of the Team for the Countermeasures for Decommissioning, Contaminated Water and Treated Water

1. Status of construction (cont.)

■ Discharge facility: Discharge outlet caisson

Underwater inseparable mortar (area where the shield machine passes) and underwater inseparable concrete will be cast in the area around the discharge outlet caisson. Work was started on December 8, and casting of underwater inseparable mortar was completed on January 7, underwater inseparable concrete on February 7. Based on sounding and underwater investigations, it was decided on February 14 that backfilling was completed.

After preparations are completed, arrival tube once the shield machine arrives (see diagram on the upper left), and the temporary guiding scaffolds on the caisson (see diagram on the lower left) will be removed.



Cross section figure for back filling work

Backfilling (final)

【Discharge facility】
- Discharge outlet caisson: Backfilling approx. 5,400m^3 out of approx. 5,400m^3 complete

Concrete plant ship

Underwater investigation after backfilling

The image is shown in Document 1-1, the 12th Review Meeting on the Implementation Plan Regarding the Handling of ALPS Treated Water

[Reference] Removal of the guiding scaffolds and shield machine (arrival tube)

TEPCO

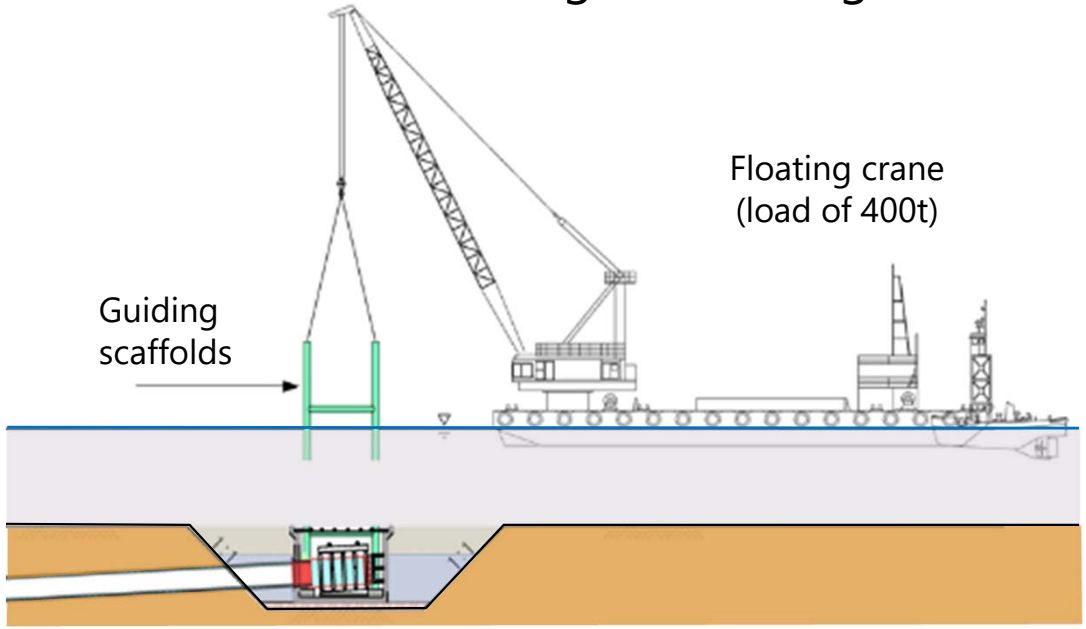
■ Removal of the guiding scaffolds

➢ The guiding scaffolds will be removed using the floating crane once the caisson installation location is fixed.

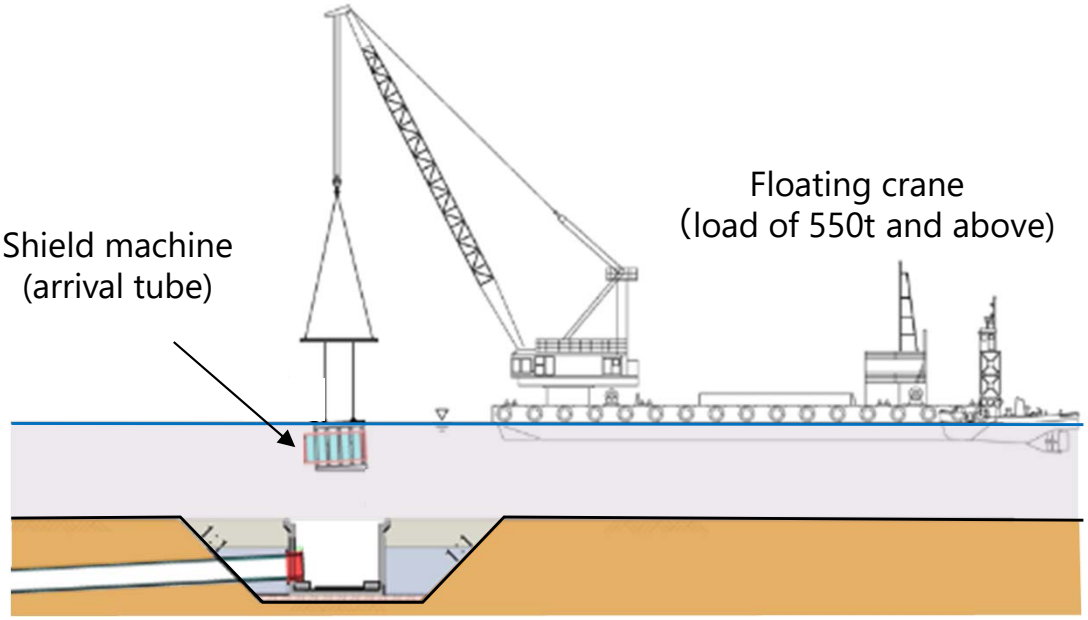
■ Removal of the shield machine (arrival tube)

➢ Once the shield machine arrives at the arrival tube, the injection valve in the arrival tube is operated to inject seawater into the tunnel.

➢ Once it has been confirmed that the tunnel is filled with seawater and the arrival tube and the discharge port caisson connecting part is separated, the shield machine (arrival tube) will be removed using the floating crane.



Guiding scaffolds removal

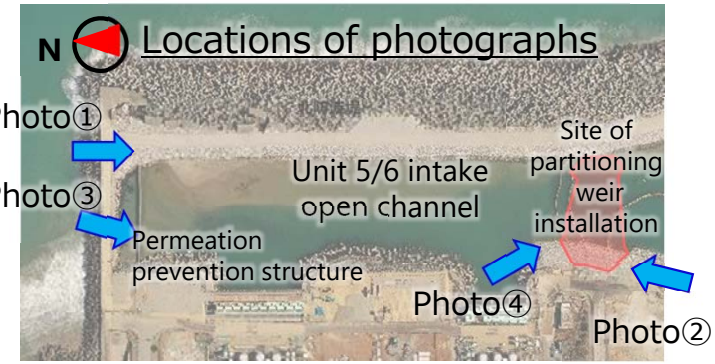


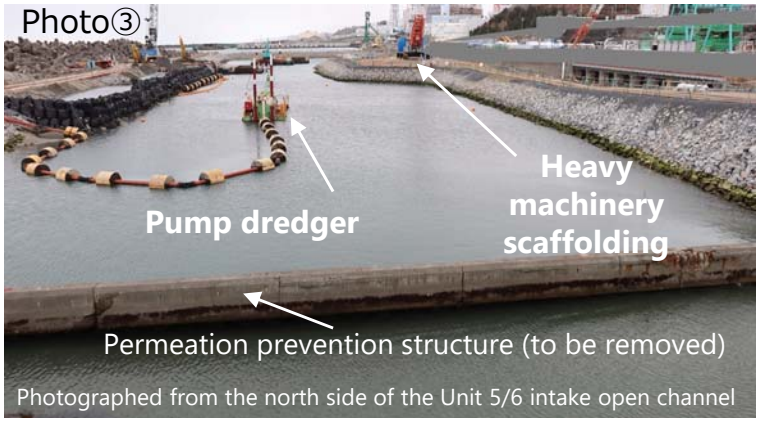
Shield machine (arrival tube) removal

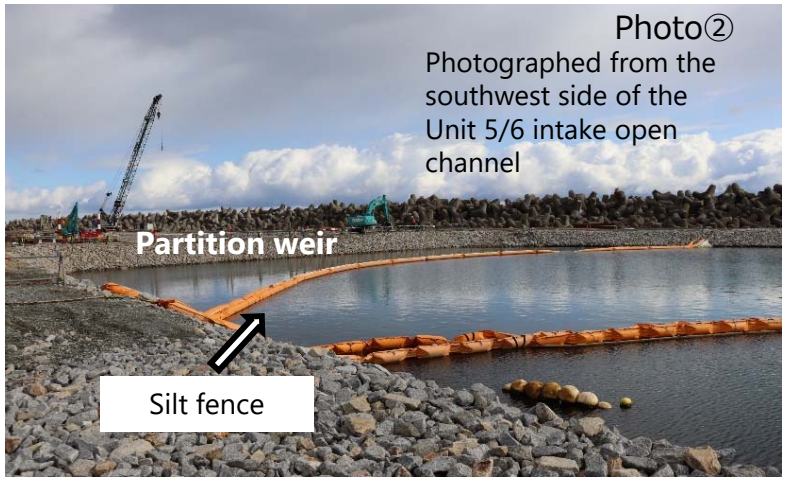
The image is shown in Document 1-1, the 12th Review Meeting on the Implementation Plan Regarding the Handling of ALPS Treated Water

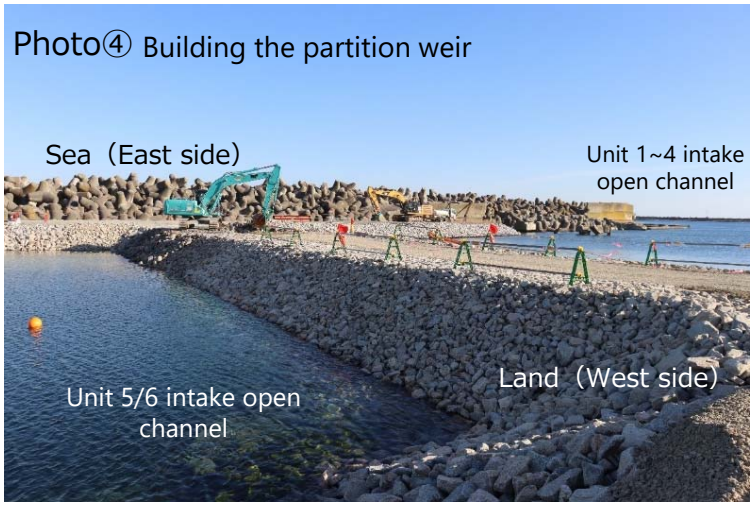
1. Status of construction (cont.)

- Other (building a partition weir, etc.)
  In the Units 5 and 6 sea-side construction area, the heavy machinery scaffolding was completed on December 29. The scaffolding has been in use for building the upper-stream storage since January 5. The removal of silt from the open intake channel (dredging) and the building of the partition weir are being done simultaneously. Once the partition weir is complete, the permeation prevention wall will be removed.









Work area on the sea side of Units 5/6

(Reference) Results of seawater monitoring during the discharge outlet caisson installation

TEPCO

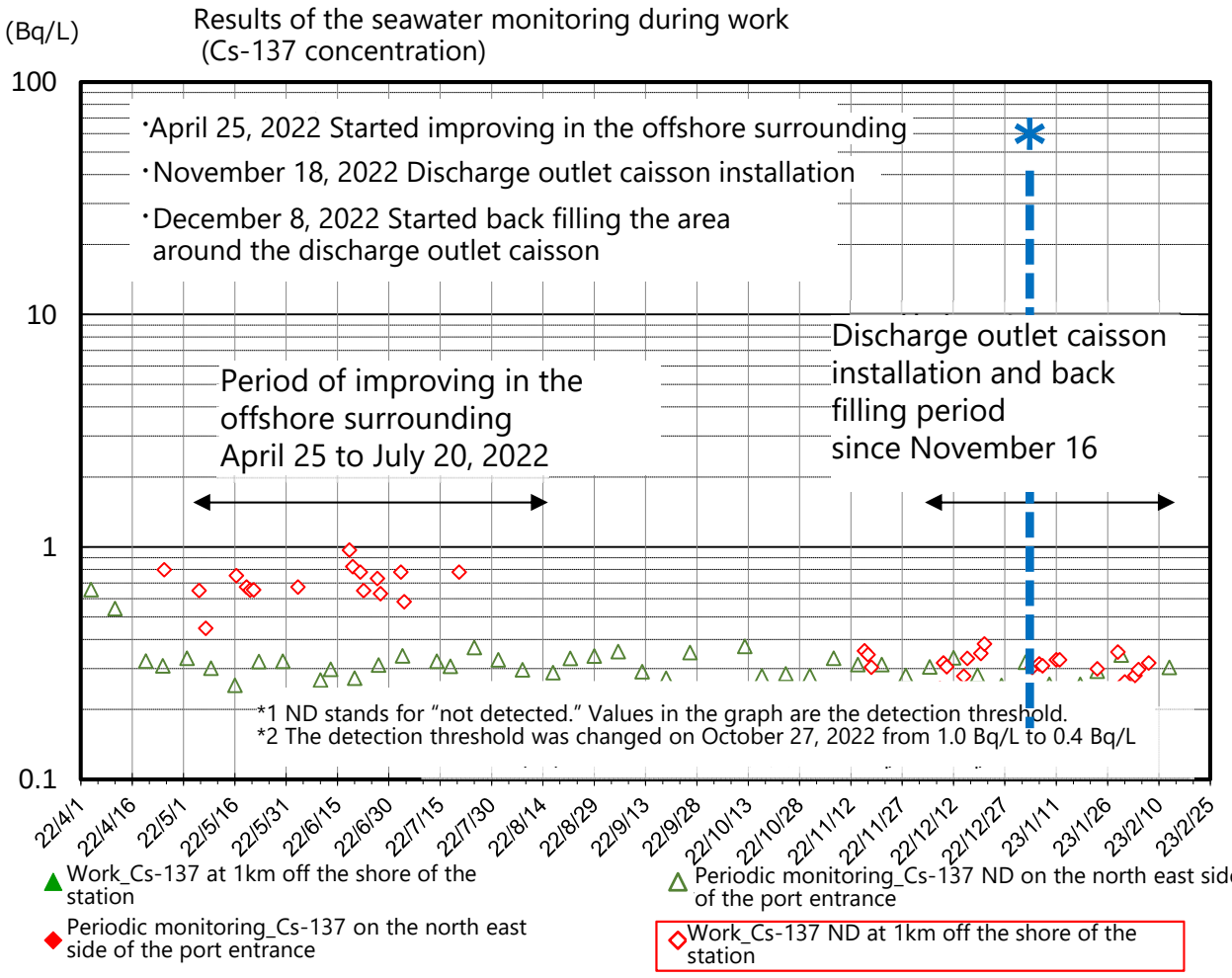
- Overview

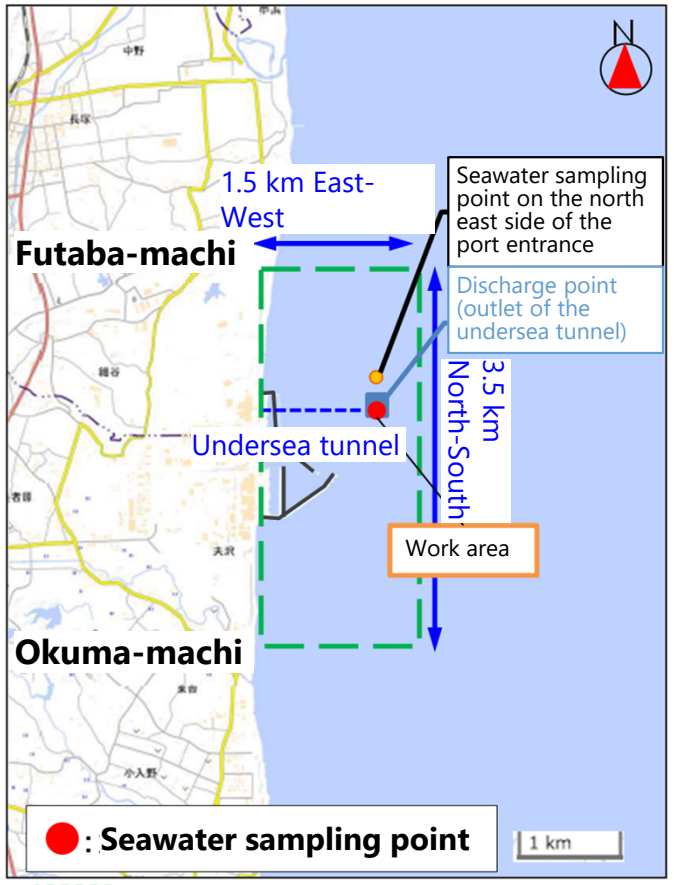
  Seawater was sampled during the discharge outlet caisson installation, etc. *1 conducted offshore, and results confirmed that cesium concentration had not risen due to the work.

*1 Discharge outlet caisson installation, work to remove the seabed sediment before installation

- Results

  Cesium up to the most recent samples taken February 16, 2023 have not been detected (ND) and there have been no significant fluctuations in seawater cesium concentrations. We will continue to appropriately monitor the seawater during the plant offshore work.





(Reference) Results of turbidity measurement during discharge outlet caisson installation

TEPCO

➢ Overview

Turbidity measurements were taken using a turbidity meter at four locations at the work area boundary during the discharge outlet caisson installation, etc. *1 conducted offshore, and results confirmed that turbidity had not increased due to the work outside of the work area.

*1 Discharge outlet caisson installation, work to remove the seabed sediment before installation

➢ Results

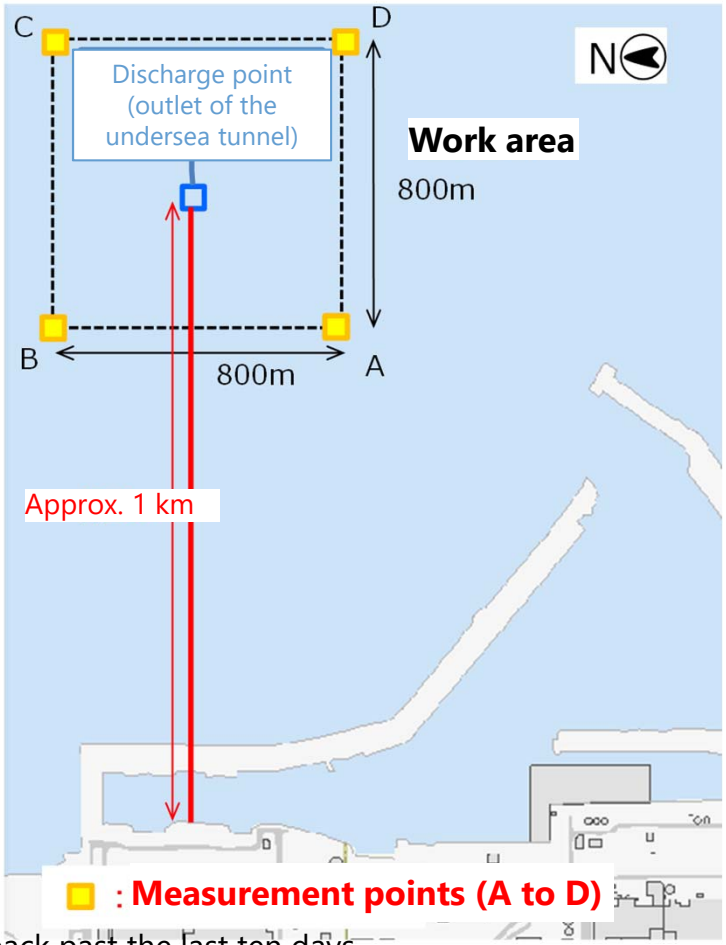
The turbidity measurements taken until February 16, 2023 were all below the control value*2. Visual inspection of turbidity has found that turbidity had not increased due to the work outside of the work area. We will continue to measure turbidity during the plant offshore work appropriately.

*2 Control value

Turbidity is converted to SS (suspended solids; mg/L). It is confirmed that SS does not exceed the threshold of BG value (measurement before work started) + 10mg/L.

Work date (measurement date)	Turbidity measurement results							
	A		B		C		D	
Jan 6, 2023	○	(2.1)	○	(2.2)	○	(2.4)	○	(2.0)
Jan 7, 2023	○	(1.8)	○	(1.7)	○	(1.8)	○	(1.5)
Jan 11, 2023	○	(2.2)	○	(1.6)	○	(1.6)	○	(1.5)
Jan 12, 2023	○	(2.3)	○	(4.4)	○	(2.8)	○	(2.7)
Jan 23, 2023	○	(2.9)	○	(4.1)	○	(1.8)	○	(2.4)
Jan 29, 2023	○	(2.5)	○	(1.5)	○	(1.5)	○	(1.6)
Jan 31, 2023	○	(2.3)	○	(2.1)	○	(1.5)	○	(1.5)
Feb 3, 2023	○	(1.7)	○	(1.5)	○	(1.8)	○	(1.6)
Feb 4, 2023	○	(1.8)	○	(1.6)	○	(1.5)	○	(1.5)
Feb 7, 2023	○	(2.2)	○	(2.1)	○	(1.5)	○	(1.5)

Criteria: Less than control value ○; More than control value ×



※Results for the last ten days. The measurement results were less than the control values going back past the last ten days.

(Reference) Overview of the ALPS treated water dilution/discharge facility and related facilities

Secondary treatment facility（newly installed reverse osmosis membrane facility）

Secondary treatment of treated water to be re-purified (sum of the ratios of nuclides, excluding tritium, is between 1 and 10)

Secondary treatment facility（ALPS）

Secondary treatment of Treated water to be re-purified (sum of the ratios of nuclides, excluding tritium, is 1 or higher)

Measurement/confirmation facility (K4 tank group)

Comprised of three sets of tank groups each with the role of receiving, measurement/confirmation, and discharge. In the measurement/confirmation stage, water that has been made homogenized through circulation and agitating is sampled and analyzed (approx. 10,000m³ × 3 groups)

Transfer facility

Seawall

Installed around emergency isolation valves and transfer pipes

ALPS treated water, etc. tanks

Rotation

Discharge

Receiving

Measurement/ confirmation

ALPS treated water transfer pump

Flow meter/water flow rate control valve/ Emergency isolation valve (tsunami prevention measure)

Seawall

Header pipe (diameter approx. 2m by length approx. 7m)

Emergency isolation valve

EL 33.5m

Seawater flow meter

Seawater pipe

Discharge vertical shaft (Down-stream storage)

EL 11.5m

Road

EL 2.5m

Seawater transfer pump (3 units)

Discharge to sea

Unit 5 intake

Dilution facility

Discharge vertical shaft (upper-stream storage)

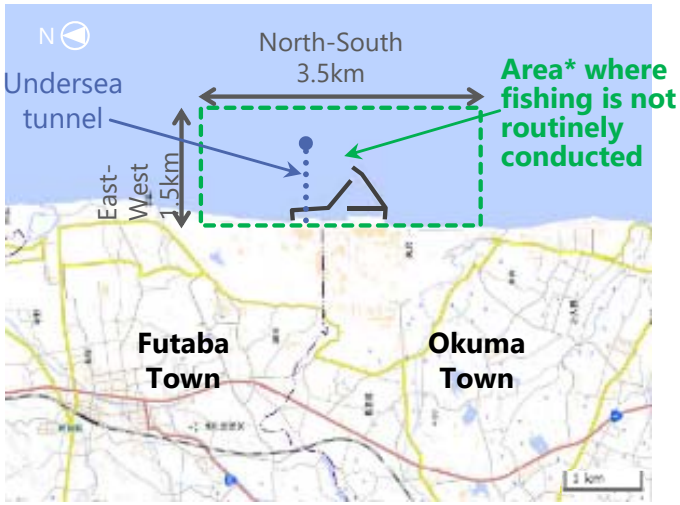
Discharge facility

Discharge tunnel (approx. 1km)

Use the differential head equivalent to the loss in the discharge tunnel (difference between the water surface in the down-stream storage and the sea surface) to discharge water naturally.

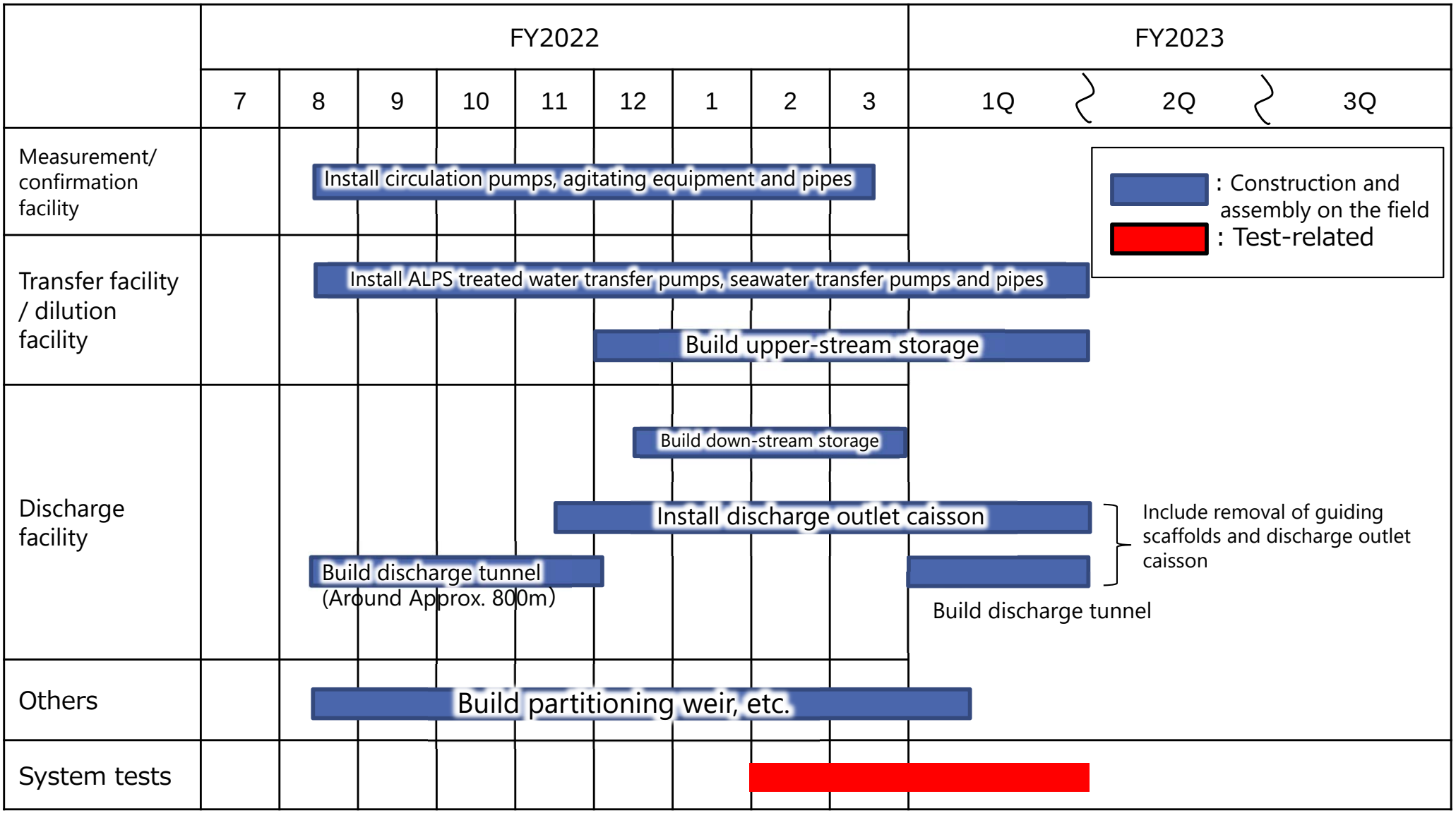
Seawater used for dilution (intake from outside the harbor)

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



*Area where common fishery rights are not set

（Reference）The whole process



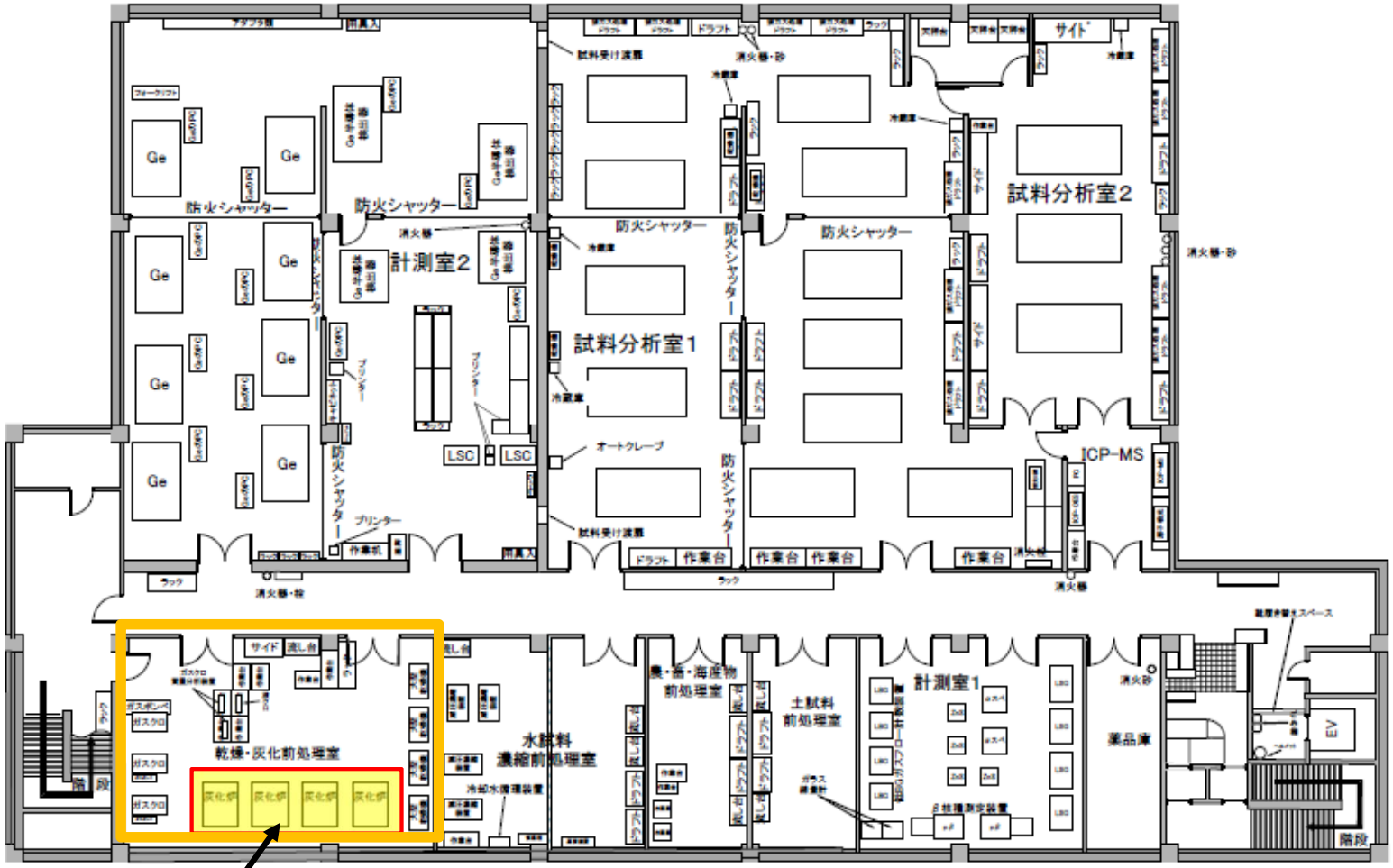
※The schedule may be revised based on progress made and other factors.

2. Installation of electrolytic accumulation devices

The 110th Secretariat of the Team for the Countermeasures for Decommissioning, Contaminated Water and Treated Water
January 26, 2023

TEPCO

- The four incinerators in the drying and incineration pre-processing room in the chemical analysis building were removed to install the electrolytic accumulation devices*.
- 8 electrolytic accumulation devices have been delivered to the site as of December 2022. Their operation will start by March 2023 after accumulation tests.



Electrolytic accumulation devices to be installed here

Chemical analysis building B1F

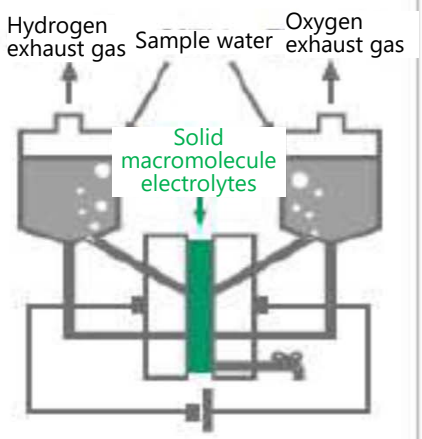
*Pre-processing device to analyze tritium in extremely low concentrations

2. Installation of electrolytic accumulation devices （cont.）

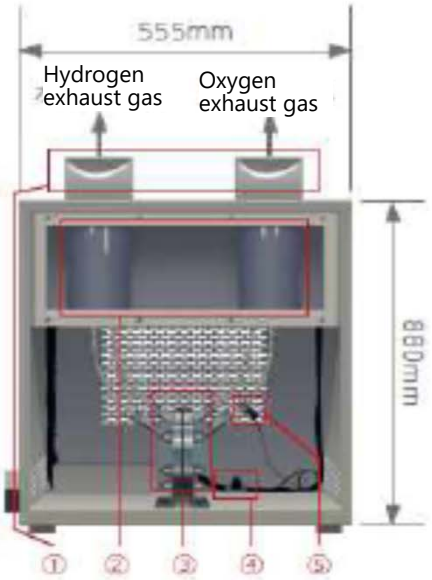
TEPCO

- To detect tritium that may exist in background levels in surface seawater, the tritium needs to be concentrated through electrolysis of the water*.
- The number of days required for analysis takes a month to 45 days more because of the electrolysis but this allows measurement with a lower detection limit.
- This method will be introduced in tritium analysis conducted at Fukushima Daiichi NPS (analysis of free water tritium in marine organisms).

Device schematic



Electrolysis concentration unit



1) Electronic cooler
2) Sample water tank
3) Electrolysis tank
4) Sample water outlet
5) Liquid level sensor

(*) Concentration through electrolysis

Water releases hydrogen and oxygen gas through electrolysis. The reaction rate of becoming hydrogen gas is as follows:

$^{1}H > {}^{2}H > {}^{3}H$ (tritium)

This means that tritium water is less easily electrolyzed. Tritium is concentrated through electrolysis using this characteristic.

【Specifications】

- It can concentrate 1,000 mL of distilled sample water to 50 mL with around 60 hours.
- Hydrogen and oxygen are released as the electrolysis products.

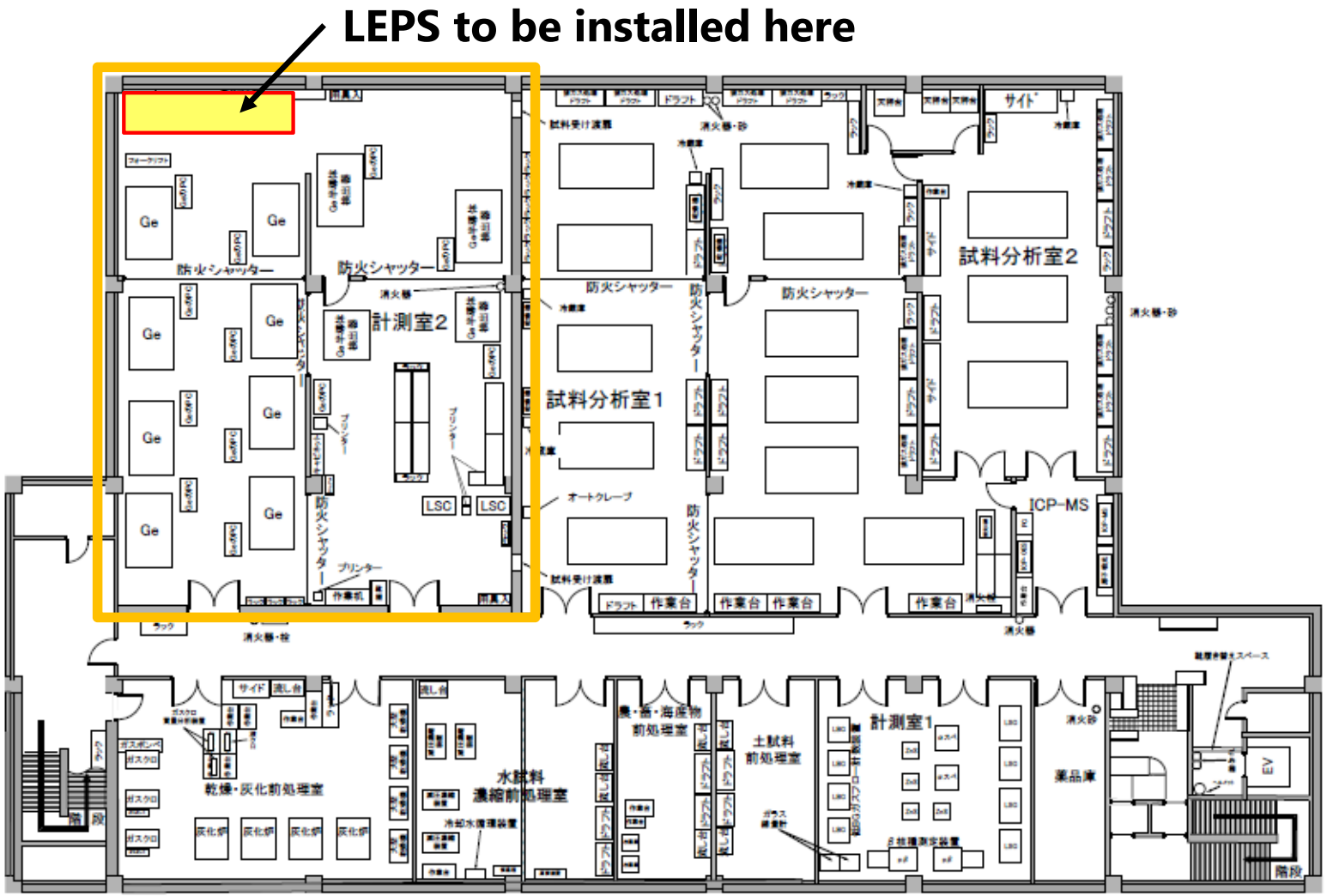
*Descriptions taken from the De Nora Permelec, Ltd. website

3. Low-energy photon germanium semiconductor detector (LEPS)

The 110th Secretariat of the Team for the Countermeasures for Decommissioning, Contaminated Water and Treated Water
January 26, 2023

TEPCO

- A low-energy photon germanium semiconductor detector (LEPS) will be installed in the measurement room in the chemical analysis building. Set up of two LEPS was completed in December 2022, and the operation will start by March 2023 after verification tests.

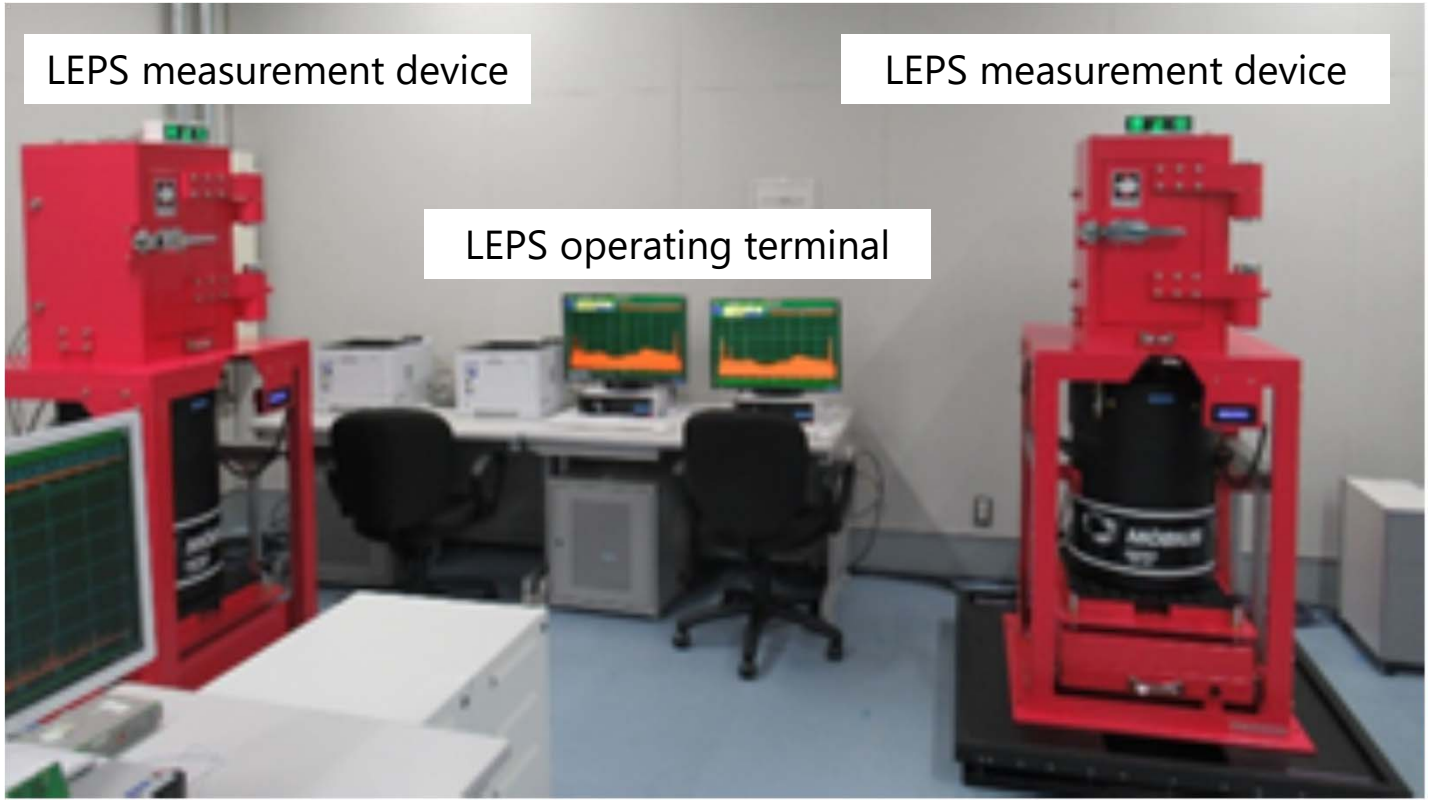


Chemical analysis building B1F

3. Low-energy photon germanium semiconductor detector (LEPS) (cont.)

TEPCO

- A new type of analysis for analyzing the nuclides that emit low-energy radiation such as Fe-55 (nuclides other than the 62 nuclides subject to removal by ALPS) is required in analyzing ALPS treated water analysis.
- To conduct this nuclide analysis on Fukushima Daiichi premises, LEPSs will be installed.



LEPS
(device in the chemical analysis building measurement room)

Reference: existing germanium semiconductor detector
(Photo of the device in the chemical analysis building measurement room)