ALPS Treated Water Dilution and Discharge Facilities Status and Measures to Ensure Safety

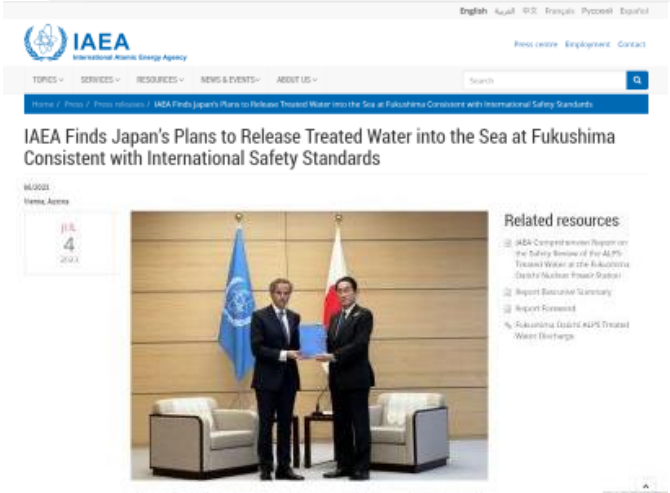
July 27, 2023

Tokyo Electric Power Company Holdings, Inc.

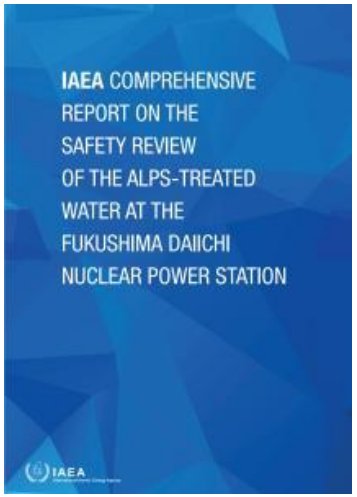
1. Progress with facility construction

- **The construction of all ALPS treated water dilution/discharge facilities, which is a requirement for the pre-use inspection, was completed on June 26**.
- On July 7, **we received a certificate of completion from the Nuclear Regulation Agency pertaining to the pre-use inspection, which serves as a technical verification of the facilities.**

  Furthermore, on July 4, the **International Atomic Energy Agency (IAEA) presented its Comprehensive Report** that focuses on three main aspects of discharge into the sea (safety assessment, regulatory activities and processes, independent sampling, data corroboration and analysis) to the Japanese government, which was subsequently **disclosed to the public**.
- On July 18, **TEPCO presented a report to the Fukushima Prefecture Decommissioning Safety Monitoring Council on the eight requirements that had been made to TEPCO and received the Council's approval**. **We will continue to steadily address the eight requirements after the commencement of discharge**, such as the implementation of multilayered countermeasures for the measurement/confirmation facility, etc., **as we thoroughly ensure safety during the implementation of long-term initiatives of handling ALPS treated water**.



IAEA Press release （HP）



IAEA Comprehensive Report (cover)

Eight requirements made to TEPCO	
(1)	Identify radioactive substances present in ALPS treated water
(2)	Suitably manage the circulation/agitation of ALPS treated water
(3)	Control radioactive substances present in diluted seawater
(4)	Utilize effective maintenance plans to prevent troubles
(5)	Implement measures to mitigate environment impact of abnormalities
(6)	Prioritize safety when shortening construction schedules
(7)	Convey information pertaining to treated water measurement results, etc. in an easy-to-understand manner
(8)	Convey information pertaining to the radiological impact assessments, etc. in an easy-to-understand manner

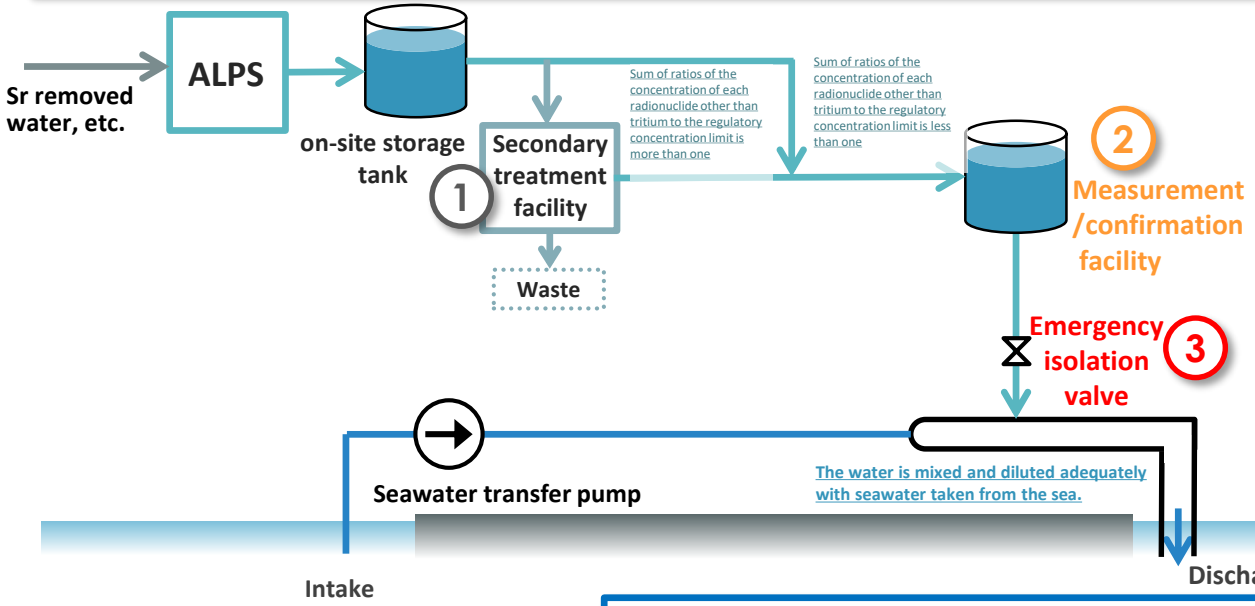
Requests from the Fukushima Prefecture Safety Assurance Technical Review Committee

2. Measures for ensuring safety during the discharge of ALPS treated water into the sea

■ During the series of tasks performed to discharge ALPS treated water, **TEPCO employees continuously monitor and check data and weather information in the control room (seismic isolation building), and are ready to respond to any abnormality that may occur.**

① Secondary treatment facilities

- **Water stored in tanks is repeatedly purified** as many times as necessary to reduce the concentrations of radioactive substances, with the exception of tritium, to **well below safety standards prior to discharge. (Treated water with concentrations of radioactive substances that exceed regulatory standards will not be discharged into the sea).**
- **The water will then be kept in tanks to allow the tritium to naturally decay until tritium concentrations prior to dilution are less than 1 million Bq/liter.**



② Measurement/confirmation facility

At the measurement/confirmation facility, **TEPCO and other external agencies measure/assess the concentrations of radioactive substances in the ALPS treated water that has been made homogeneous through circulation/agitation. Only water for which it has been confirmed that regulatory standards have been met will then move to the next step in the discharge process**

③ Emergency isolation valve

If an abnormality is detected during the dilution/discharge of ALPS treated water, emergency isolation valve will be closed.

④ ALPS treated water discharge amount

- By using three pumps that can **pump approximately 170,000m³ a day (two to be in operation), we ensure that tritium concentration after dilution with seawater is less than 1,500Bq/liter**.
- When discharging ALPS treated water **we will be sure that the tritium concentration after dilution is less than 1,500Bq/liter ※1, and that the annual amount of tritium discharged is less than 22 trillion Bq ※2**

※1: Management target for tritium concentrations in wastewater, such as from subdrains, etc.
※2: Target discharge control value of the FDNPS before the accident

3-1. Measurement/confirmation facility status and measures for ensuring safety

- Analysis of ALPS treated water in tank group B was completed on June 22. **Samples were taken from tank group C and tank group A on June 26 and July 10, respectively, and are being analyzed.**
- **Interlock checks (systems that prevent water from moving to the next step if certain conditions have not been fulfilled) have been installed to prevent human error,** such as transferring water from the wrong tanks, etc.
- The concentrations of radioactive substances in ALPS treated water are **measured and assessed by not only TEPCO, but also by an external agency consigned by TEPCO, to ensure that the concentrations of radioactive substances, excluding tritium, fall below regulatory requirements.**
- In addition, **measurement/analysis is also performed by the Japan Atomic Energy Agency (JAEA)** , an organization consigned by the Japanese Government (Agency for Natural Resources and Energy) has outsourced such tasks.

<Sample specimens are checked to ensure that they meet the following criteria>

※ Analysis results are disclosed to the public via Treated Water Portal Site

Criteria	Tank group B analysis results
①29 nuclides to be measured and assessed **⇒Sum of the ratios of the concentration of each radionuclide to the regulatory concentration limit**	**0.28**
②Tritium concentration **⇒Less than 1 million Bq/L**	**140,000Bq/L**
③39 nuclides not subject to measurement/assessment **⇒Should not be significantly present**	**Concentrations of all nuclides were below detectable levels**
④General water quality (44 criteria) **⇒No abnormalities with water quality**	**All criteria were satisfied**

Treated Water Portal Site Measurement/Confirmation Facility Conditions
https://www.tepco.co.jp/en/decommission/progress/watertreatment/measurementfacility/index-e.html

3-2. Transfer facilities status and measures for ensuring safety

- Transfer facilities **have been equipped with two emergency isolation valves that will automatically stop discharge into the sea when an abnormality is detected.**
- Furthermore, discharge can be suspended through remote operations performed in the control room in the event of natural phenomena, such as an earthquake with a seismic density of 5 or greater, or a tsunami alert, etc., or if ocean monitoring indicators (discharge suspension level, etc.) are exceeded.

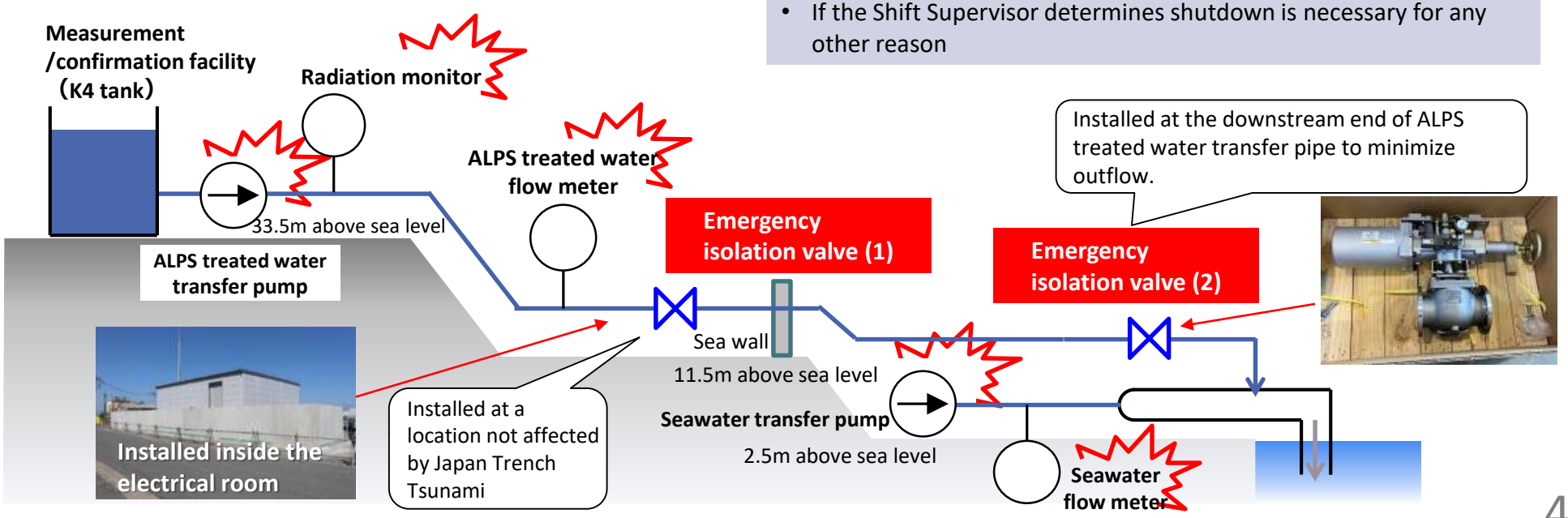
Events that would result in automatic closing of the emergency isolation valves

- Flowmeter malfunction, pump trip, low seawater flow, high ALPS treated water flow level, high radiation monitor, etc.

※ If power is lost due to a power outage, etc., emergency isolation valves 1 and 2 will automatically close thereby stopping the discharge of ALPS treated water into the sea

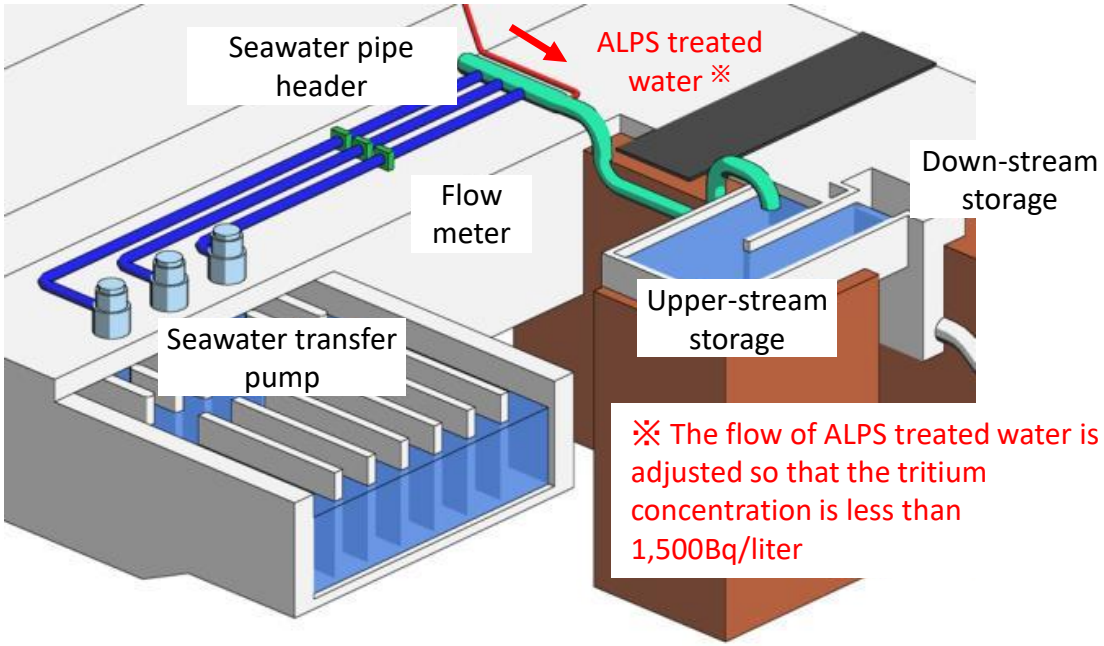
Events that would result in the remote shutdown of the discharge from the seismic isolation building

- A natural phenomenon that may impact ALPS treated water dilution and discharge facilities and/or related facilities (an earthquake with a seismic density of 5 or greater, or a tsunami alert, tornado warning, high tide warning, etc.)
- If sea area monitoring results exceed the indicator (discharge suspension level)
- If the Shift Supervisor determines shutdown is necessary for any other reason



3-3. Dilution facility status and measures for ensuring safety

- A seawater transfer pump for taking in seawater used for dilution has been installed. **A flow meter has also been installed on the seawater transfer pump outlet and used to regularly monitor flow when the facility is in operation.**
- When ALPS treated water is diluted with seawater, **the upper limit for calculated tritium concentration is operated at 700Bq/liter to ensure that the tritium concentration during discharge is less than 1,500Bq/liter in consideration of the margin of error of flow instruments.**
- During discharge, **water is sampled from the seawater pipe header outlet once a day in order to measure tritium concentrations**. These tritium measurements are disclosed to the public the day after sampling as soon as they have been verified.
- For the time being, **water will be sampled from the upper-stream storage prior to discharge and measured to confirm that the concentration of tritium is less than 1,500Bq/liter, after which the water will be discharged.**



Dilution facility concept diagram

Installment of seawater transfer pipes and seawater pipe header

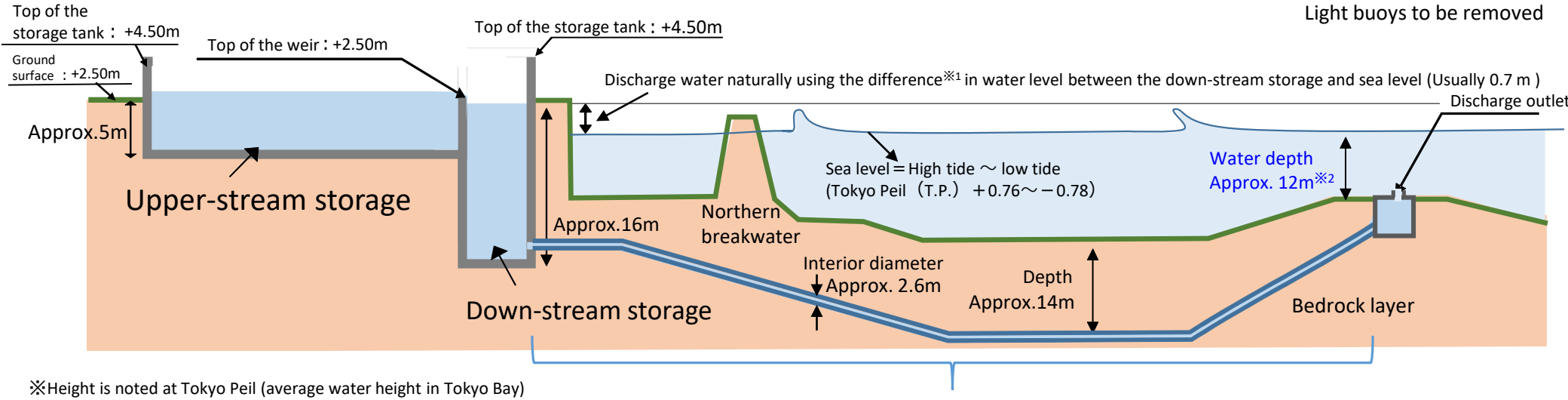
3-4. Discharge facility operation/status

- On June 26, removal of the shield machine and installment of the top lid on the discharge outlet caisson were completed.
- **As future offshore work, sinker blocks and light buoys (including steel sinker blocks) used during the construction will be removed by crane ship as soon as preparations are completed** (within the year)**.**
- The discharge facility is designed so that water (that flows over the barrier wall (weir) inside the upper-stream storage) will flow out of the discharge outlet approximately 1km offshore due to the difference in elevation between the down-stream storage and the sea surface (0.7m difference) and the operation of two seawater transfer pumps.
- The water then disperses and dilutes in the vicinity of the discharge outlet after it **naturally flows downstream due to the difference in elevation between the down-stream storage and the sea surface.**
- **The discharge of ALPS treated water will be suspended from the control room in the event of a tsunami alert or a high tide warning.**

Removal of the shield machine

Installing the discharge outlet lid

Light buoys to be removed

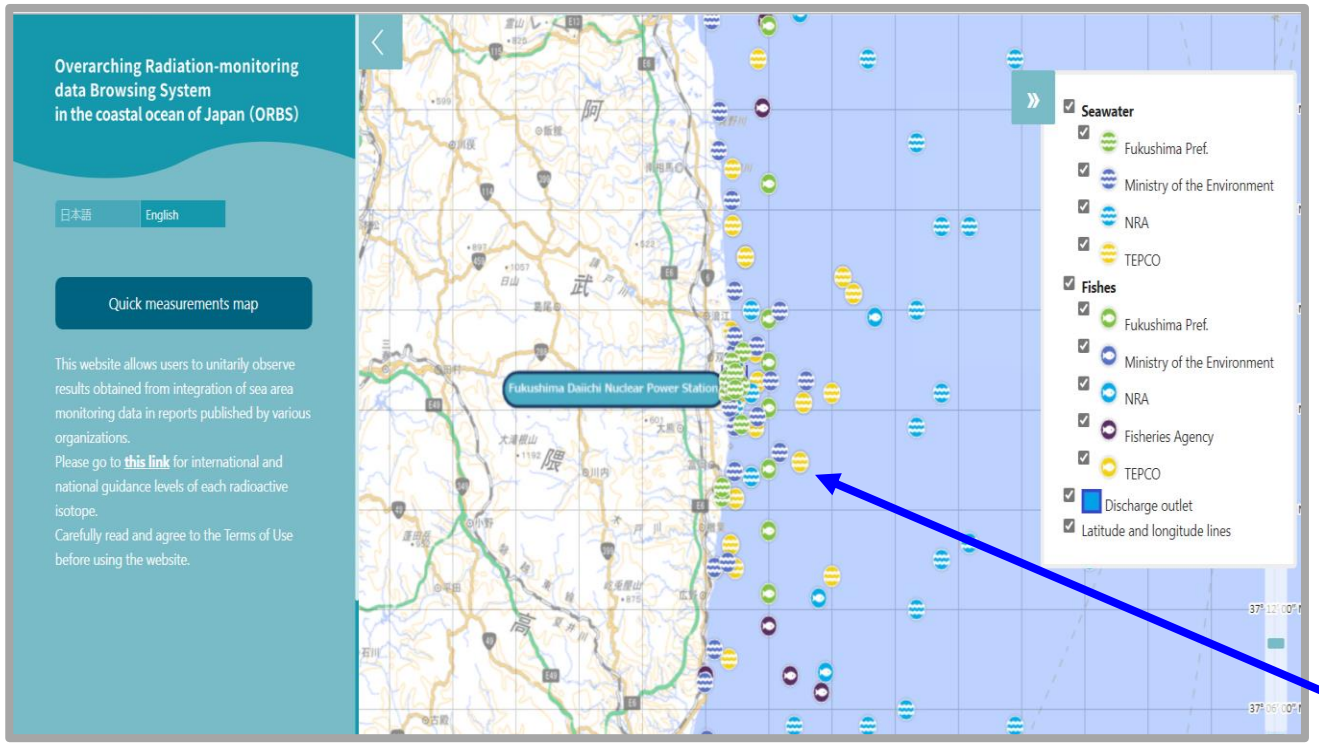


※Height is noted at Tokyo Peil (average water height in Tokyo Bay)
※1 In the case of three seawater transfer pumps are used: 1.6m; If two are used: 0.7m
※2 If standard tide height for Tokyo Peil (T.P.) is used

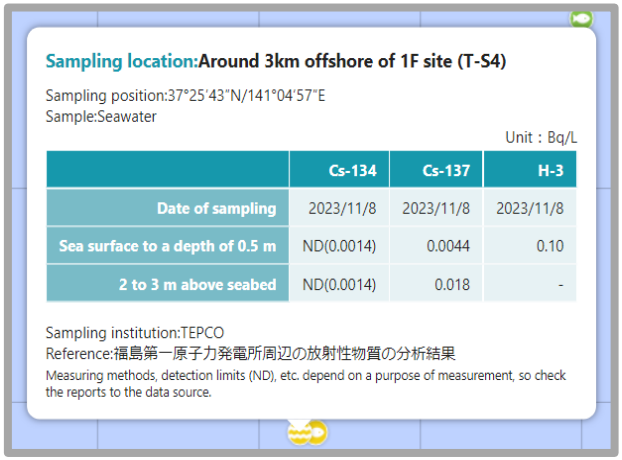
Discharge facility conceptual diagram

4. Strengthening sea area monitoring

- Since April 2022, **we have strengthened sea area monitoring by increasing the number of locations and frequency of tritium measurement for seawater and fish in the vicinity of the power station.** (Please refer to page 8)
- Sea area monitoring results are being conveyed in an easy-to-understand manner on our website.
- Furthermore, in addition to TEPCO's measurement results, the sea area monitoring results from various locations disclosed by related ministries and agencies and local governments **have also been collected and are shown together on the same map in an easy-to-understand manner.** (Refer to the screenshot below)



Overarching Radiation monitoring data Browsing System



Sampling location:Around 3km offshore of 1F site (T-S4)

Sampling position:37°25'43"N/141°04'57"E
Sample:Seawater

Unit：Bq/L

	Cs-134	Cs-137	H-3
Date of sampling	2023/11/8	2023/11/8	2023/11/8
Sea surface to a depth of 0.5 m	ND(0.0014)	0.0044	0.10
2 to 3 m above seabed	ND(0.0014)	0.018	-

Sampling institution:TEPCO
Reference:福島第一原子力発電所周辺の放射性物質の分析結果
Measuring methods, detection limits (ND), etc. depend on a purpose of measurement, so check the reports to the data source.

If you hover the mouse cursor over a measurement point on the map, a separate window with data will be displayed.

Displayed data: sampling location, radioactive substance concentration, sampling agency, etc.

Reference. Strengthening sea area monitoring

■ Since April 2022, we have been strengthening sea area monitoring to examine how tritium disperses in the sea and to study the migration of radioactive substances in fish and seaweed.

In blue: strengthened items

Subject	Location		Subject of the measurement	Before	After (as of today)	Note
Seawater	Inside the port	10 locations	Cesium 134/137 Tritium	Cesium：Every day Tritium：Once a week	Cesium：Every day Tritium：Once a week	**Conducted every day at the discharge vertical shaft (discharge end)**
	Within 2 km (and its vicinity)	7 locations		Cesium：Once a week Tritium：Once a week	Cesium：Once a week Tritium：Once a week	**Three sampling locations are added (10 locations in total)**
	Within 20 km	6 Locations		Cesium：Once a week Tritium：Once in every 2 weeks	Cesium：Once a week **Tritium：Once a week**	**The frequency of tritium analysis is doubled.**
	Out of 20km (off the coast of Fukushima Prefecture)	9 locations		Cesium：Once a month Tritium：None	**Cesium：Once a month** **Tritium：Once a month**	**Tritium is added.**
Fish	Within 20 km		Cesium 134 /137 Strontium Tritium	Cesium：Once a month (11 locations) Strontium：Every quarter (Top 5 samples of cesium concentration) Tritium：Once a month (1 location)	Cesium：Once a month (11 locations) Strontium：Every quarter (Top 5 samples of cesium concentration) **Tritium：Once a month (11 locations)**	Currently, fish are sampled and analyzed for cesium at 11 locations, and tritium is analyzed at one of these locations. After the change, **tritium analysis is additionally conducted at 10 other locations.**
Seaweed	Inside the port		Cesium 134 /137	Cesium：3 times a year (1 location)	Cesium：3 times a year (1 location)	Conducted three times a year, in March, May and July.
	Out of the port		Cesium 134/137 Iodine129 Tritium	Cesium：None Iodine：None Tritium：None	**Cesium：3 times a year (2 locations)** **Iodine：3 times a year (2 locations)** **Tritium：3 times a year (2 locations)**	**Two locations outside of the port are added.** Conduct three times a year, in March, May and July. (Considered through conducting habitat survey)

5. Determining when to suspend discharge based on sea area monitoring results

- When discharging ALPS treated water, **we have set a "discharge suspension level" for tritium concentration as a level where we to determine if discharge should be suspended when sea area monitoring shows that ALPS treated water discharged into the sea is not dispersing sufficiently.**
- Furthermore, we have also set **"investigation level" for tritium concentration as a level where we investigate facilities, operation status, and operation procedures, etc.,** when tritium concentrations that are approximately half of the discharge suspension level are detected.

Within 3km of the power station: 10 locations
Discharge suspension level: 700Bq/liter
※ Investigation level: 350Bq/liter

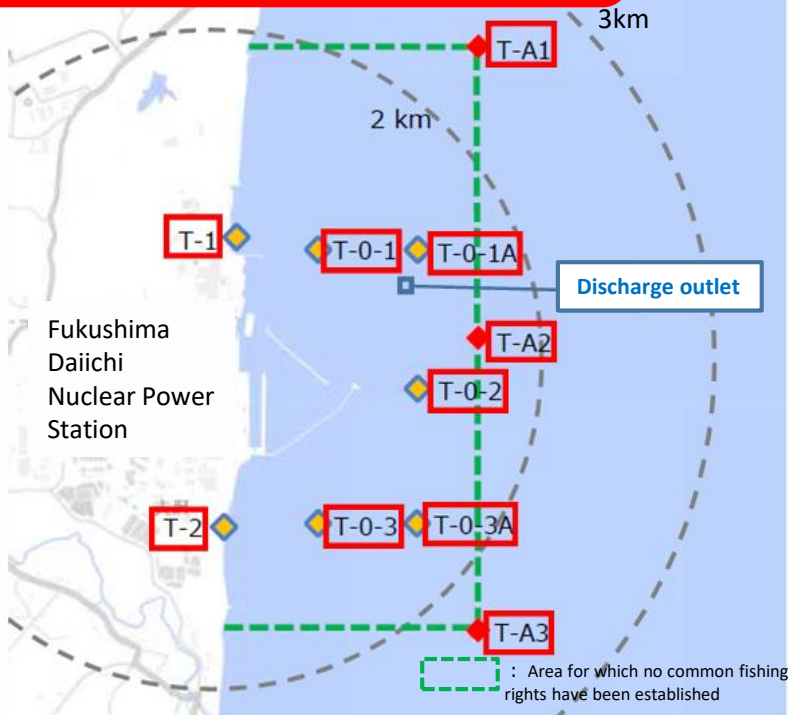


Figure 1. 10 locations in the vicinity of the discharge outlet (within 3km of the power station)

Within a 10km square in front of the power station: 4 locations
Discharge suspension level: 30Bq/liter
※ Investigation level: 20Bq/liter

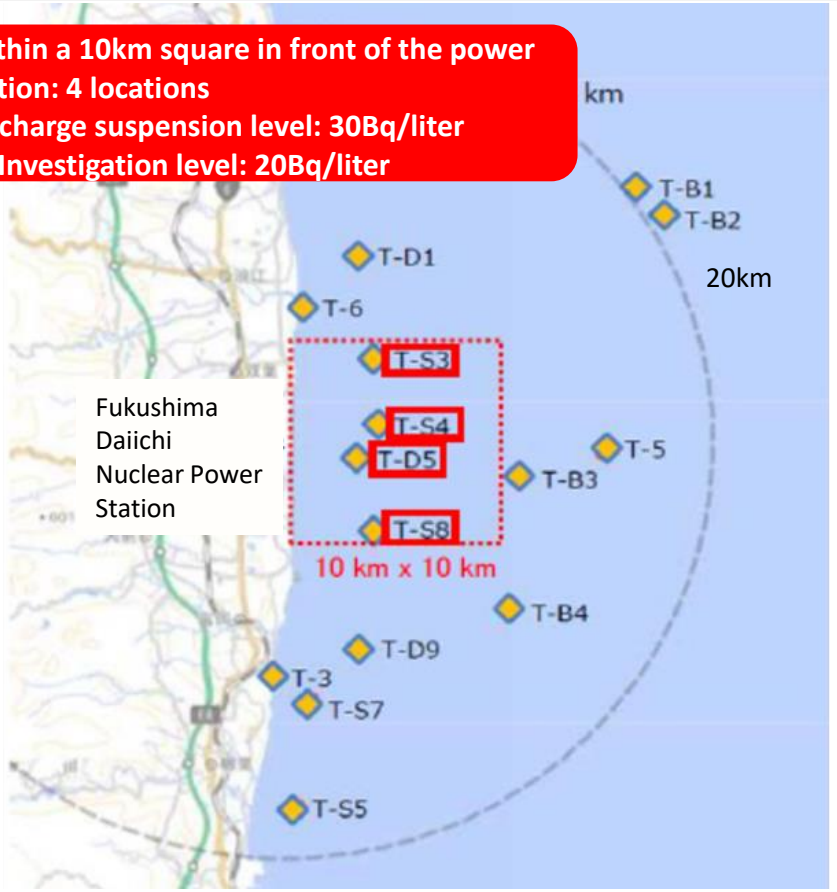


Figure 2. 4 locations in the vicinity of the power station (within 10km square in front of the power station