Summary and review of one year of initiatives in the discharge of ALPS treated water into the sea

August 23, 2024

Tokyo Electric Power Company Holdings, Inc.

TEPCO

INITIATIVES AT THE FUKUSHIMA DAIICHI NUCLEAR POWER STATION

＜One year of initiatives and future plans＞

- Discharge into the sea is being conducted safely as planned
- We are gradually dismantling tanks in order to move forward with decommissioning

Seven discharges were completed in the first year since commencement. We will remain vigilant during the eighth and following discharges

FY2023 ALPS treated water discharge record

- In FY2023 we conducted a total of four sea discharges. All discharges fulfilled requirements and were conducted safely as planned.

▼FY2023 Discharge record

	Tank Group	Tritium concentration prior to dilution	Concentration of radioactive substances other than tritium			Start of discharge	End of discharge	Tritium concentration after dilution	Amount of treated water discharged	Total amount of tritium
			Sum of ratios of legally required concentrations		Regulatory requirement					
1st	Group B	140,000Bq/L	0.28	<	1	Aug. 24 2023	Sep. 11 2023	Max: 220Bq/L	7,788m^3	Approx. 1.1 trillion Bq
2nd	Group C	140,000Bq/L	0.25	<	1	Oct. 5 2023	Oct. 23 2023	Max: 189Bq/L	7,810m^3	Approx. 1.1 trillion Bq
3rd	Group A	130,000Bq/L	0.25	<	1	Nov. 2 2023	Nov. 20 2023	Max: 200Bq/L	7,753m^3	Approx. 1.0 trillion Bq
4th	Group B	170,000Bq/L	0.34	<	1	Feb. 28 2024	Mar. 17 2024	Max: 254Bq/L	7,794m^3	Approx. 1.3 trillion Bq
								Total	31,145m^3	Approx. 4.5 trillion Bq

Annual total tritium discharge limit: 22 trillion Bq

※ Tritium concentrations in specimens sampled from seawater pipes (Values consider uncertainty (analysis data accuracy))

FY2024 ALPS treated water discharge record and future plans

- **A total of seven discharges are planned for FY2024. The total annual amount of treated water to be discharged is approximately 54,600m³ and the total annual amount of tritium to be discharged is approximately 14 trillion Bq.**
- The first three discharges for FY2024 have already been completed. All discharges met discharge requirements and were carried out safely as planned. **We will continue to remain vigilant when conducting discharges**.

▼FY2024 Discharge record

	Tank group	Tritium concentration prior to dilution	Concentration of radioactive substances excluding tritium		Start of discharge	End of discharge	Tritium concentration after dilution	Amount of discharged treated water	Total amount of tritium
			Sum of ratios of legally required concentrations	Regulatory requirement					
First	Group C	190,000Bq/L	0.31	< 1	Apr. 19 2024	May 7 2024	Max: 266Bq/L	7,851m³	Approx. 1.5 trillion Bq
Second	Group A	170,000Bq/L	0.17	< 1	May 17 2024	Jun. 4 2024	Max: 234Bq/L	7,892m³	Approx. 1.3 trillion Bq
Third	Group B	170,000Bq/L	0.18	< 1	Jun. 28 2024	Jul. 16 2024	Max: 276Bq/L	7,846m³	Approx. 1.3 trillion Bq
Fourth	Group C	200,000Bq/L	0.12※2	< 1	Aug. 7 2024				

※1 Tritium concentrations in specimens sampled from seawater pipes (Values consider uncertainty (analysis data accuracy))
※2 Starting with this discharge, cadmium 113m was added to the nuclides targeted for measurement/assessment based on the selection process noted in the implementation plan approved by the NRA in accordance with FY2023 analysis results.

▼FY2024 Discharge plan

	Tank group	Tank from which water was transferred	Amount transferred	Secondary treatment	Tritium concentration	Total amount of tritium	Discharge period
Fifth	Group A	G4 South area Group C G4 South area Group A	Approx. 6,700m3 Approx. 1,100m3	No	30～350,000Bq/L	Approx. 2.4 trillion Bq	Aug~Sep
Sixth	Group B	G4 South area Group A	Approx. 7,800m3	No	34～350,000Bq/L	Approx. 2.7 trillion Bq	Sep~Oct
Inspection shutdown (Including meacurement/confirmation facility Group B tank full inspection)							
Seventh	Group C	G4 South area Group A G4 South are Group B	Approx. 800m3 Approx. 7,000m3	No	34～400,000Bq/L	Approx. 3.0 trillion Bq	Feb~Mar 2025

[Reference] Safety reviews by the IAEA (Complying with international safety standards)

- The ALPS treated water sea discharge process was subject to review by the International Atomic Energy Agency (IAEA), an agency with expertise in the field of nuclear power, prior to the commencement of discharge, and on July 4, 2023, a comprehensive report covering the entire review was released to the public.
- The comprehensive report stated that, "the approach to discharge ALPS treated water into the sea, and associated activities by TEPCO, Nuclear Regulation Authority and the government of Japan, are consistent with relevant international safety standards."
- Furthermore, a report from the second review mission conducted after the commencement of sea discharge that was released to the public on July 18, 2024 stated that, “the Task Force did not identify anything that is inconsistent with the requirements in the relevant international safety standards. Therefore, the IAEA can reaffirm the fundamental conclusions of its safety review as outlined in the 4 July 2023 Comprehensive Report."

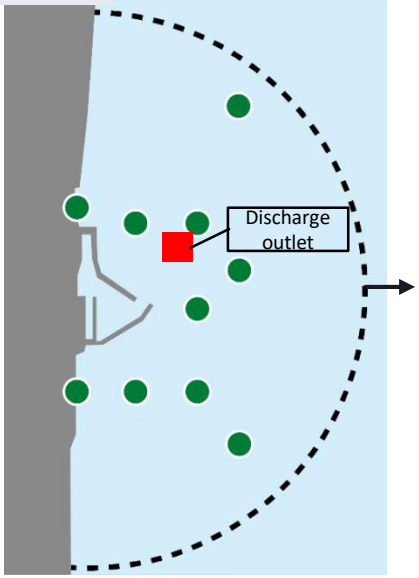
Director and ALPS Coordinator Gustavo Caruso At Opening Session （April 23 in 2024, Ministry of Foreign Affairs)

The IAEA Task Force at the dilution facility （April 25 in 2024, Fukushima Daiichi Nuclear Power Station)

Sea area monitoring [Seawater tritium]

- TEPCO has been engaged in sea monitoring since prior to the commencement of ALPS treated water sea discharge, and since the commencement of discharge in particular, we have raised the detection limit by approximately 10Bq/liter at 10 points within a 3km radius from the power station, and four points within a 10km² area in front of the power station so as to quickly obtain analysis results.
- All measurements take to date have fallen below the WHO drinking water guidelines (10,000Bq/L), the Japanese Government's upper limit for tritium concentration during sea discharge (1,5000Bq/L), and TEPCO's discharge suspension determination levels (operational indicator) <700Bq/L for points within a 3km radius of the power station> <30Bq/L for points within a 10km² area in front of the power station>

10 points within a 3km radius from the power station



■ **Quick measurement "Tritium concentration (Units: Bq/L)"**

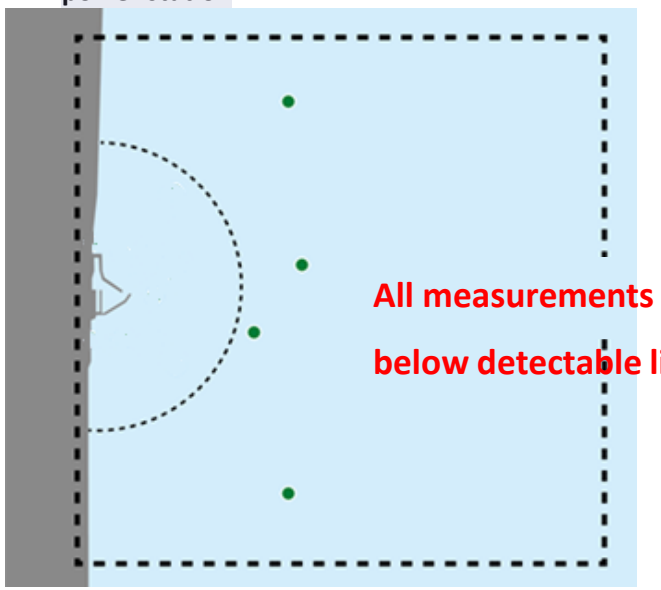
■ **FY2023**

1st: Below detectable limit~Max:	10	<	700
2nd: Below detectable limit~Max:	22	<	700
3rd: Below detectable limit~Max:	11	<	700
4th : Below detectable limit~Max:		<	700

■ **FY2024**

1st : Below detectable limit~Max:	29	<	700
2nd: Below detectable limit~Max:	7.7	<	700
3rd : Below detectable limit~Max:	18	<	700

Four points within a 10km² area in front of the power station

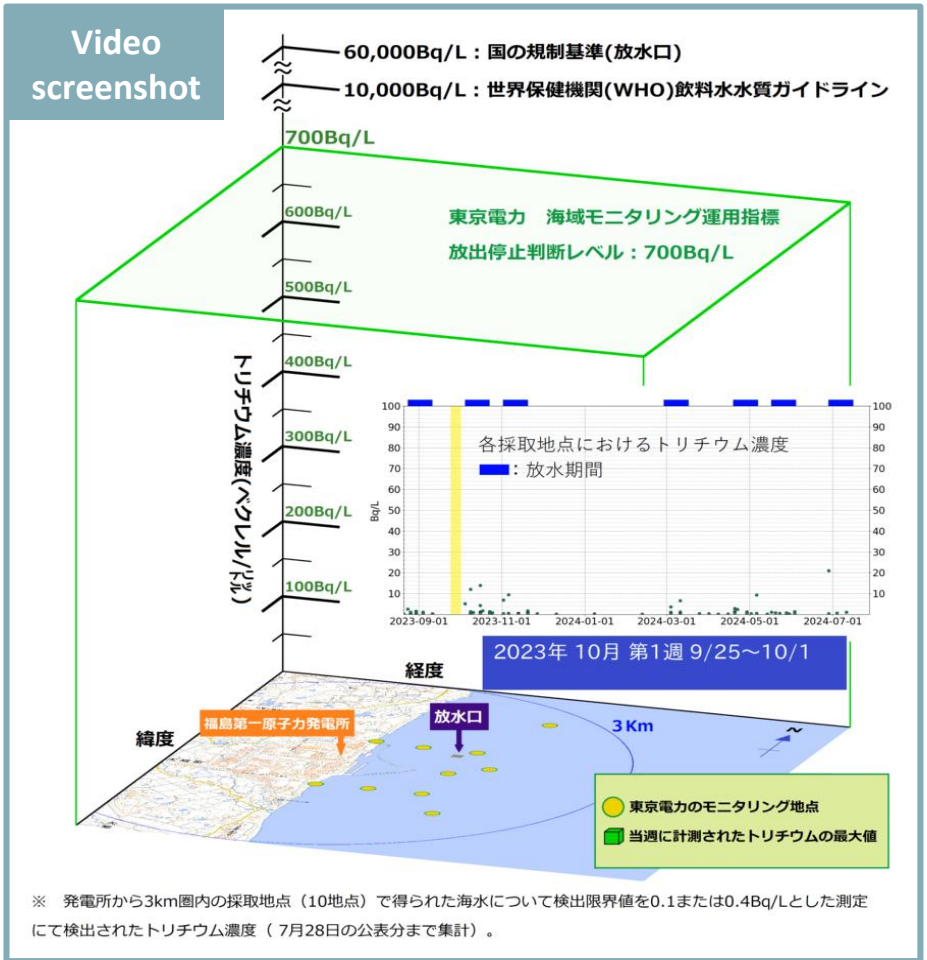


All measurements were below detectable limits

[Reference] Newly released video showing the changes over time in sea monitoring results since August 2023

- We have created a video showing the changes over time in the seawater tritium concentration monitoring results (ordinary analysis) for one year since August 2023.
- **It is a visual representation of how tritium concentrations have remained much lower than the Japanese government's regulatory requirements (60,000Bq/liter) and the WHO's drinking water quality guidelines (10,000Bq/liter)**

Video screenshot



※　発電所から3km圏内の採取地点（10地点）で得られた海水について検出限界値を0.1または0.4Bq/Lとした測定にて検出されたトリチウム濃度（ 7月28日の公表分まで集計）。

Disclosure steps

August 8

- ✓ The video shows the weekly maximum tritium concentrations detected through ordinary analysis of seawater obtained from sampling points (10 locations) within a 3km radius of the power station
- ✓ The video can be viewed or downloaded from TEPCO's website through the video archives. There is also a link to the video on the Treated Water Portal Site

【 TEPCO website video archives (In Japanese Only for now) 】
https://www.tepco.co.jp/library/movie/detail-j.html?catid=61709&video_uuid=15308

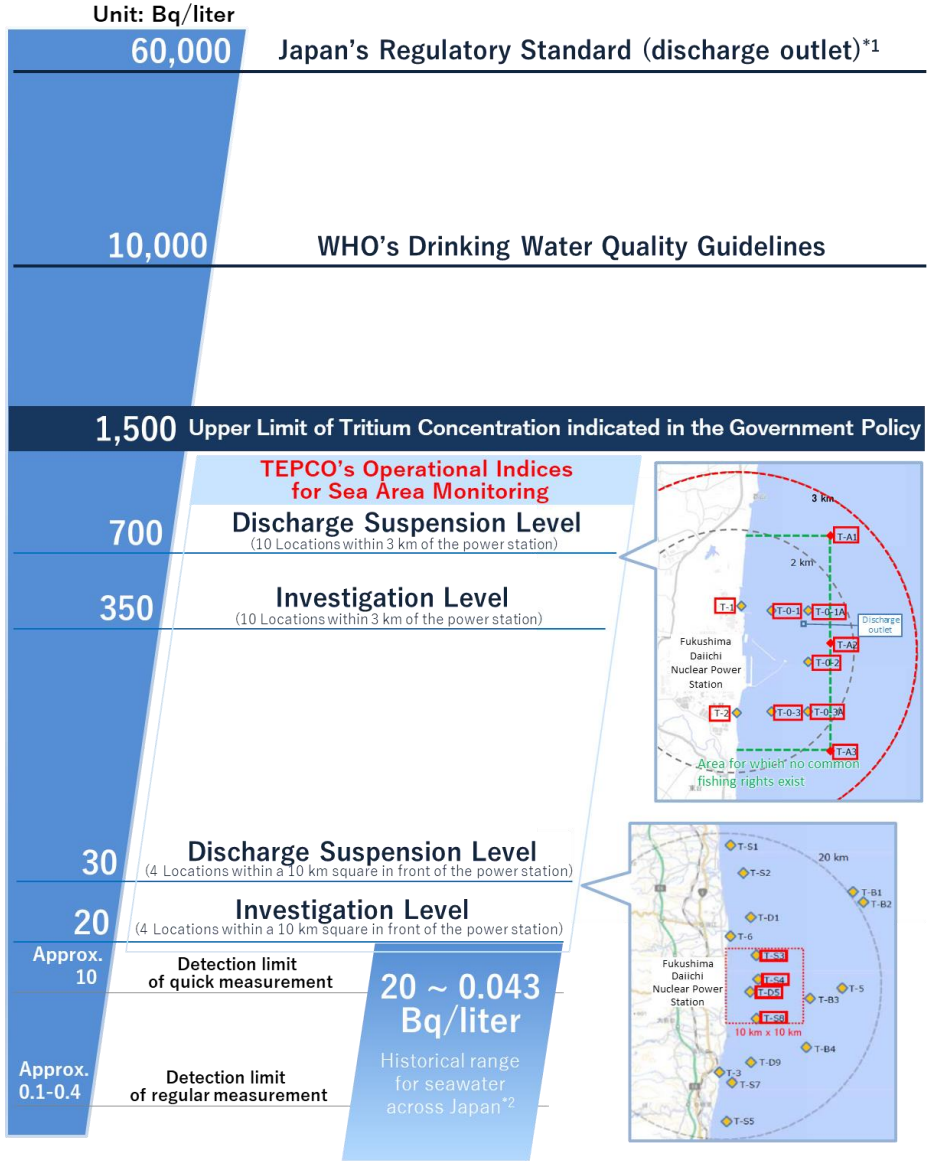
【 Treated Water Portal Site 】
https://www.tepco.co.jp/en/decommission/progress/watertreatment/index-e.html

Scan the code to see the video (In Japanese only for now)

- ✓ Video showing changes over time for measurements taken outside of the 3km radius (all sea areas off the coast of Fukushima Prefecture) released
- ✓ Measurements from locations within the 3km radius and outside of the 3km radius released in different languages (English, simplified Chinese, traditional Chinese/Hong Kong, traditional Chinese/Taiwan, Korean)

[Reference] Comparison of tritium concentration in seawater

- Tritium concentrations measured during sea area monitoring after the commencement of discharge are within the range of fluctuation identified through past seawater monitoring performed throughout the entirety of Japan.
- In the future, it is possible that concentrations of tritium in the seawater may be affected by the concentrations of tritium in the ALPS treated water that is discharged, and exceed those observed in the past.
- However, even if this occurs, sea dispersion simulation results for discharged water performed during the radiological impact assessment have shown that these fluctuations will be within predicted levels and below the investigation level.

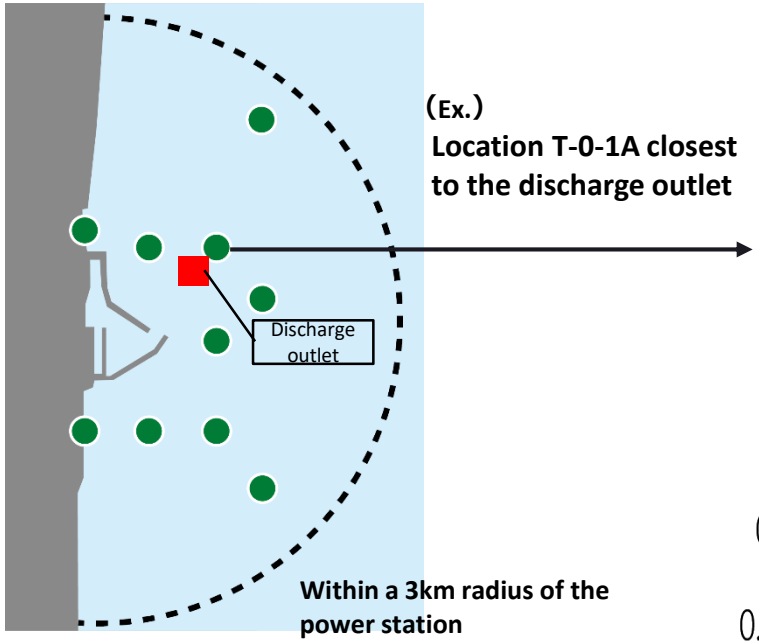


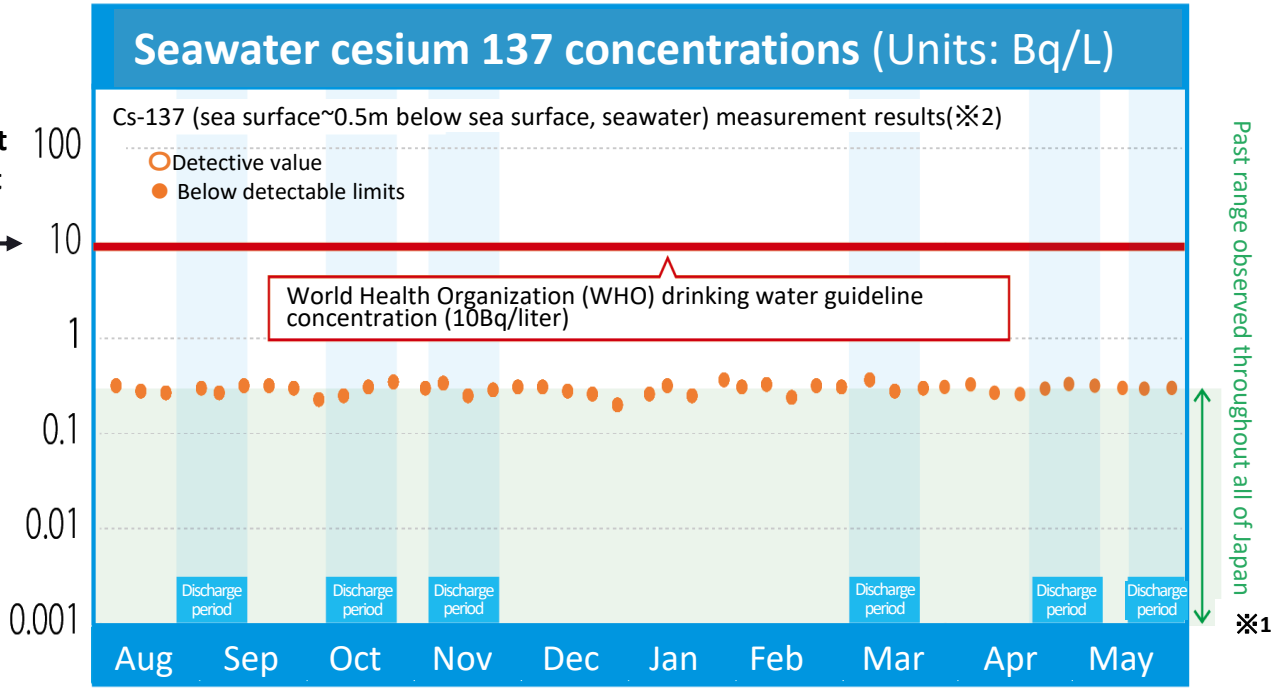
*1: This standard has been stipulated based on the calculation that if a person were to drink approximately 2L of the water coming out of the discharge outlet of a nuclear facility every day for one year, his/her exposure would be 1mSv.
*2: Source: Environmental Radioactivity and Radiation in Japan (Period: April 2019 to March 2022)

Sea area monitoring [Seawater radioactive substances (cesium 137)]

- TEPCO has engaged in seawater monitoring since prior to the commencement of ALPS treated water sea discharge and **we have found that the concentration of the radioactive substance cesium 137, which is a primary nuclide targeted for measurement in order to determine changes in the environment, remains approximately within the range of fluctuation ※1 observed during seawater monitoring throughout all of Japan (0.0010~0.45Bq/liter).** Furthermore, the concentration of cesium 137 in diluted ALPS treated water that has been discharged into the sea has been between 0.0001-0.001Bq/liter.

■ Seawater monitoring: Cesium 137 concentration [Units: Bq/L]





TEPCO Treated Water Portal Site

https://www.tepco.co.jp/en/decommission/progress/watertreatment/index-e.html

※1： The past range of fluctuation has been determined using the minimum and maximum data values detected between April 2019 and March 2022 in the database. (Source: Environmental Radioactivity and Radiation in Japan Environmental Radiation Database)

※2： Detection limits fluctuate based on the attributes of the measurement environment and measurement equipment

Sea area monitoring [Fish/Seaweed]

- The concentrations of free tritium found in fish sampled between the commencement of ALPS treated water discharge and December 2023 were approximately the same as the concentrations found in seawater at the fish sampling points, and within the same range of concentrations observed between FY2022 and the commencement of discharge.
- The concentrations of free water tritium found and seaweed sampled up until March 2024 have been approximately the same as the concentrations found in seawater. Concentrations of iodine 129 were below detectable levels.

■ **Fish monitoring "tritium concentration (units: Bq/L)"**

Observed range		Tritium concentrations (Bq/L)	
		Fish (free water tritium)	Seawater (fish sampling point)
Before the commencement of discharge	Minimum~maximum of data obtained between May 2022~August 2023	0.053 ～ 0.18	0.037 ～ 0.39
After the commencement of discharge	Minimum~maximum of data obtained in August 2023~December 2023	0.054 ～ 0.24	0.057 ～ 0.25

■ **Seaweed monitoring "tritium concentration (Units: Bq/L)"**

Observed range		Tritium concentrations (Bq/L)	
		Seaweed (free water tritium)	Seawater (in the vicinity of the seaweed sampling point)
Before the commencement of discharge	Minimum~maximum of data obtained between April 2023~July 2023	0.055 ～ 0.10	0.084 ～ 0.11
After the commencement of discharge	Minimum~maximum of data obtained between August 2023~March 24	0.20 ～ 0.22	0.099 ～ 1.4

Confirming the integrity of discharge facilities after the completion of discharges 1~3

Detailed facility inspections (first round of inspections for equipment that was used) performed after the completion of first three discharges in FY2023

- Patrol inspections of equipment were performed every day after the commencement of first three discharges and no abnormalities were found.
- Furthermore, detailed facility inspections are performed after the completion of each discharge and no abnormalities were found

Facility name	Patrol inspection details	Inspection after the 3rd discharge	Results
Measurement/ confirmation facility	**External inspection (measurement/confirmation tanks)** - Visual check for abnormalities	**Inspection implemented in accordance with the long-term inspection plan (agitators/MO valves)** - Insulation resistance measurement, Check for leakage thorough the valve seat **(ongoing)**	No abnormalities
Transfer facility	**External inspection (ALPS treated water transfer pumps/transfer pipes)** - Visual check for abnormalities, Check for abnormal sounds using tool	**External inspection (ALPS treated water transfer pumps/transfer pipes)** - Visual check for abnormalities **(ongoing)** **Others** - Strainer cleaning, Check for leakage through MO valve seat **(ongoing)**	No abnormalities
Dilution facility	**External inspection (seawater transfer pipes/seawater pipe header)** - Visual check for abnormalities, Check for abnormal sounds using tool **External inspection (discharge vertical shaft (upper-stream storage))** - Visual check for abnormalities	**External inspection (seawater transfer pipes/seawater pipe header)** - Visual check for abnormalities **(ongoing)** **External inspection (discharge vertical shaft (upper-stream storage))** - Draining of the storage, follow-up observation and repair※ **Others** - Replacement of seawater transfer pumps gland packings, Flow meter inspection	No abnormalities
Discharge facility	**External inspection (discharge vertical shaft (down-stream storage))** - Visual check for abnormalities (Submerged areas, such as the discharge tunnel, etc., will be inspected at a different time)		No abnormalities
Seawater intake facility	**External inspection (partitioning weirs)** - Visual check for abnormalities		No abnormalities

Site usage (Facilities and equipment for fuel debris retrieval)

- In addition to Area E (flange tank dismantling underway), which will be where Unit 2 fuel debris retrieval-related facilities will most likely be built, the J8※1 and J9 areas near Area E will be where Unit 3 fuel debris retrieval–related facilities will most likely be built.
- Tank dismantling in areas J9 and J8 ※1 will start in J9 where the tanks have already been drained by discharge of ALPS treated water into the sea. （Dismantling period: Second half of FY2024 - around end of FY2025 ※2 ）
- Prior to dismantling, preparations in the surrounding area will gradually be made, such as treating the residual water in the J9 tanks and removing obstructions from the vicinity that are unrelated to tank storage functions.

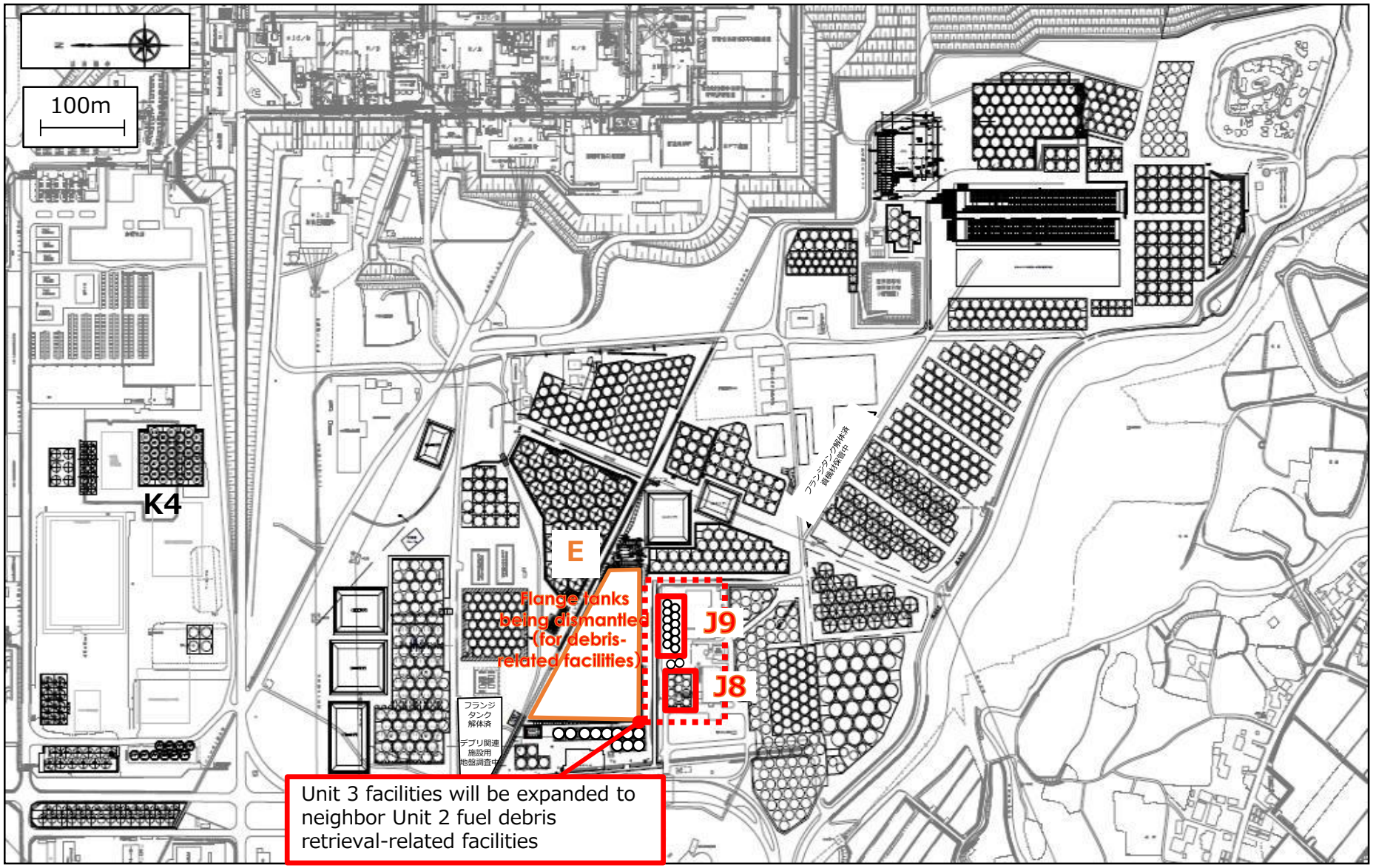
J9 area tanks

※1 Since the J8 tanks contain treated water to be re-purified dismantling will begin after the water in them has been transferred to other tanks that have been emptied.

※2 Since the tanks in the J8 and J9 areas will be the first welded tanks to be dismantled, we shall prioritize safety when engaging in this task while confirming procedures and accumulating knowledge.

J8 tanks
Capacity: 700m^3/tank
# of tanks: 9
J9 tanks
Capacity: 700m^3/tank
# of tanks: 12

[Reference] Location of dismantled tank groups



Marine life breeding tests

What we aim to show through breeding tests and what the tests have shown to date

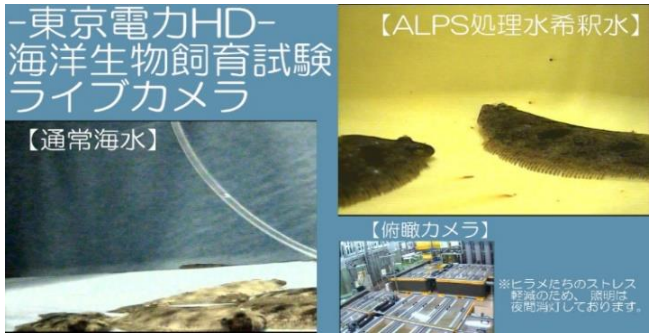
① We are breeding marine life in normal seawater and ALPS treated water that has been diluted with seawater in order to compare data on the conditions of creatures in both environments. We found no significant difference between the two and external experts have confirmed our results.

- The public can view the breeding tests through live streams on YouTube and read about them through daily breeding log posts on our website and X (formerly Twitter).
- Monthly summaries of the breeding environment (water quality, temperature, etc.), and breeding conditions (changes in the number of specimens, etc.) are also disclosed. Analysis results (comparisons between concentrations of tritium in the body and the concentration of tritium in the seawater) are also updated and disclosed as needed.

② Our tests have confirmed past experimental data that shows that, "tritium does not accumulate in the body, and the concentrations of tritium inside the bodies of living organisms do not exceed the concentrations in the breeding environment."

- We have confirmed that the concentration of free water tritium (FWT) in the bodies of living organisms equalizes after a certain period of time and does not exceed the concentration of tritium in the breeding environment after it has reached equilibrium within the body.
- We have also confirmed that when marine organisms in which the concentration of free water tritium (FWT) has reached equilibrium are returned to tanks containing normal seawater, the concentrations of tritium in their bodies decreases.
- We are currently conducting organically bound tritium (OBT) concentration tests and have confirmed that the results show similar trends and are in line with prior knowledge.

Online disclosure (In Japanese Only)



The tanks containing normal seawater are blue, and the tanks containing ALPS treated water that has been diluted with seawater are yellow

・ Free water tritium (FWT): Tritium that exists in water within the bodies of living organisms.
・ Organically bound tritium (OBT): Tritium that is organically bound to molecules of carbon, etc. inside the body of a living organism

[Reference] Achievements to date (1)

2022

Mar. 17

Breeding practice begins with normal seawater
Specimens: 140 flounder

Jun. 9

Parasites found in the gills of weakened flounder
→Parasite countermeasures, such as saltwater baths and UV disinfecting equipment, etc., added

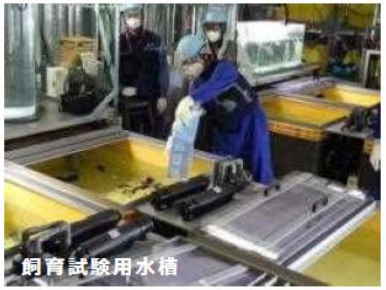
Jul. 21

Breeding practice begins using mockup water tanks

Specimens: 80 flounder, 30 abalone, 2kg of seaweed

Sep. 13

Breeding begins by putting the specimens in breeding tanks so that they can get used to the environment
→800 new flounder added



Sep. 30

Breeding tests begin
Specimens: Approximately 800 flounder

Oct. 3

ALPS treated water added (two tank series used to keep concentrations under 1,500Bq/liter)

[Reference] Achievements to date (2)

2022

Oct. 5

Start of tests to confirm the concentrations of tritium in the bodies of flounder (less than 1,500Bq/liter)

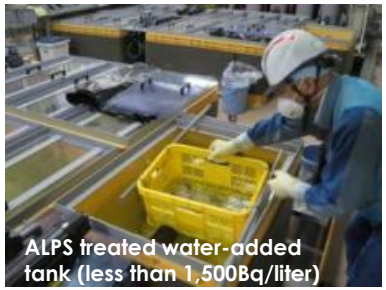
Oct. 25

Start of abalone breeding tests

Number of specimens: 800

Oct. 26

Start of tests to confirm the concentrations of tritium in the bodies of abalone (less than 1,500Bq/liter)



Nov. 17

ALPS treated water added

(Adjusted so that the concentration in one series of tanks is approximately 30 Becerra/leader

Nov. 30

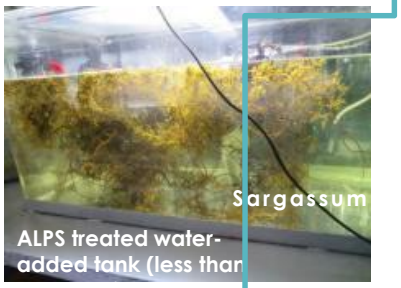
2023

Start of tests to confirm the concentrations of tritium in the bodies of flounder (less than 30Bq/liter)

May 9

Start of breeding tests and tests to confirm the concentrations of tritium in the sargassum (less than 1,500Bq/liter)

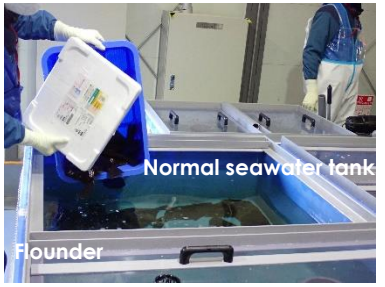
Amount: Approx. 3kg



2024

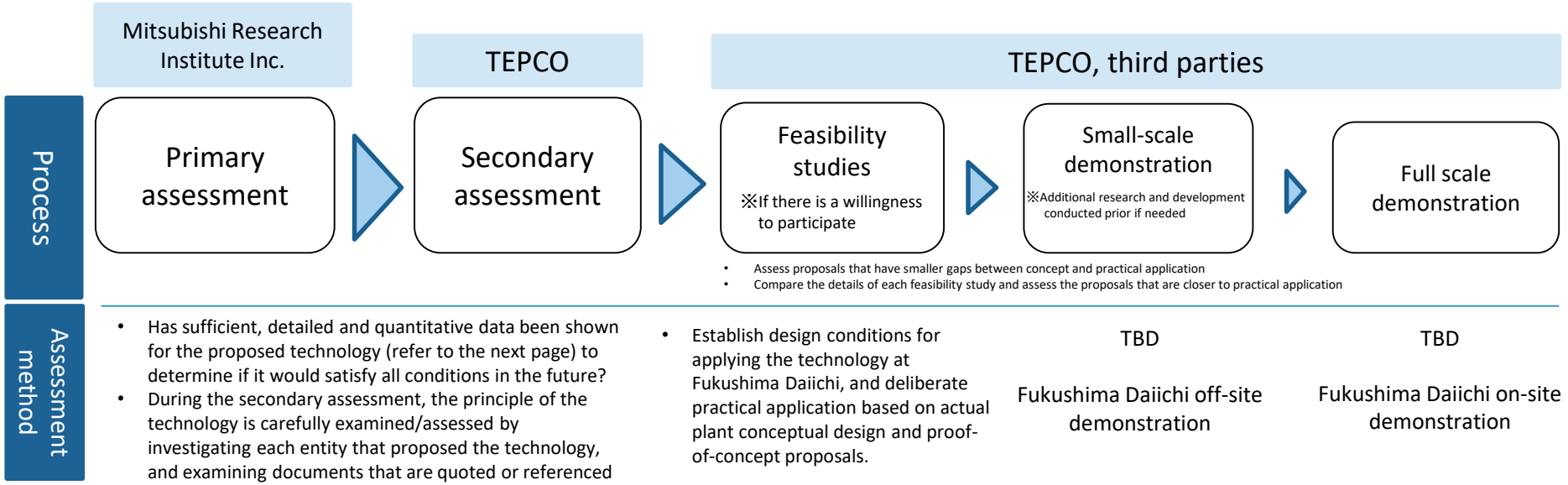
Jan. 10

Start of flounder organically bound tritium (OBT) concentration tests (less than 1,500Bq/liter) excretion tests



Tritium separation technology

- Along with continuously watching trends in new tritium separation technologies, TEPCO also made a public call for technologies used to separate tritium from ALPS treated water in May 2021 in order to proactively incorporate feasible technologies that can be realistically applied to ALPS treated water. As of December 31, 2023, we have received 146 proposals.
- Out of the aforementioned 146 proposals, 10 proposals from both within Japan and overseas have passed the primary and secondary assessments and the entities that submitted them have indicated a willingness to participate. So, nondisclosure agreements (NDA) were signed and feasibility studies based on specific conditions began on May 22, 2023.



[Reference] Primary assessment criteria from Mitsubishi Research Institute Inc.

- The following requirements need to be fulfilled in the future if they are not fulfilled at the time of proposal

＜Requirements＞

Separation/measurement	The following requirements must be fulfilled: • The concentration of tritium after treatment must be less than 1/1,000 of the concentration prior to treatment （When the proposal is submitted the technology must be able to reduce the concentration of tritium to less than 1/100 of the concentration prior to treatment, which is the treatment capability required of the Government's tritium separation technology demonstration project) • The reliability of the tritium concentration measurement system must be explainable • The tritium input/output balance of the entire test system must be clear
Treatment capability	• The technical forecast must show that it is possible to increase operating capability to the target rate of 50~500m³/day

＜Recommendations＞

Principle	One or both of the following recommendations should be fulfilled: • The principle of the separation technology should be widely accepted at academic conferences, etc. • The principle of the separation technology should be accepted by third parties, such as being published in peer-reviewed papers.

- Technologies that have been found feasible through the primary and secondary assessments will be reviewed by TEPCO to examine the attributes and quantity of any waste generated, compliance with the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors, and the required area of facilities.

REFERENCE DOCUMENTS

1. INITIATIVES TO MITIGATE ANY IMPACT FROM THE DISCHARGE OF ALPS TREATED WATER

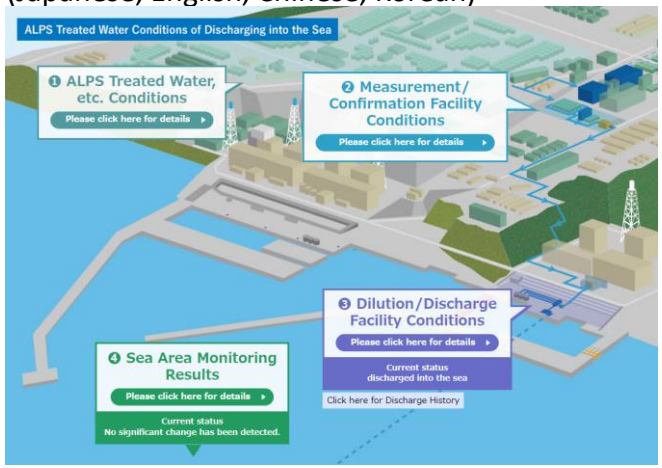
- Proactively communicating information on the sea discharge of ALPS treated water and safety through various channels
- Holding events by leveraging the know-how and networks cultivated through initiatives to promote the distribution of food products from Fukushima Prefecture

Communicating safety information domestically and abroad (using dedicated websites)

- Special websites and leaflets are being used to convey scientifically-based information in an easy-to-understand manner to people concerned about the sea discharge of ALPS treated water in real time.
- A special website translated into multiple languages is being used to convey correct information to the international community

Treated Water Portal Site dedicated website

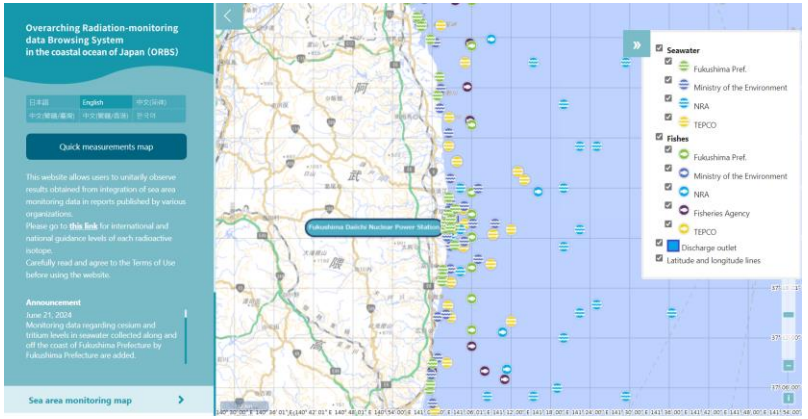
- Detailed information on ALPS treated water, such as real-time data pertaining to the sea discharge of ALPS treated water, etc., can be viewed on this website
- Website has been translated into multiple languages (Japanese, English, Chinese, Korean)



https://www.tepco.co.jp/en/decommission/progress/watertreatment/index-e.html

Overarching radiation-monitoring data browsing system for the coastal sea of Japan (ORBS)

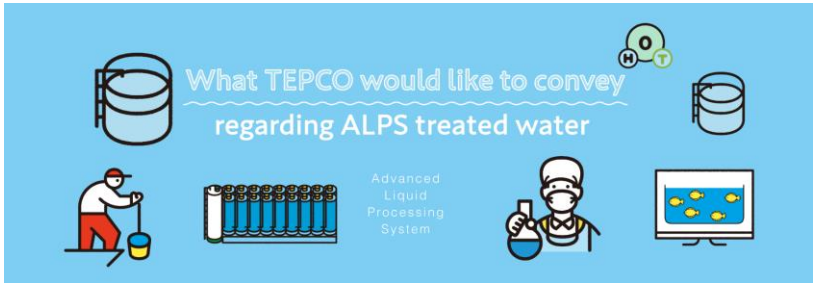
- Multilingual website enables viewing of all sea monitoring results from Fukushima Prefecture, the Nuclear Regulation Authority, the Ministry of the Environment, the Fisheries Agency and TEPCO in order to objectively show sea conditions (available in Japanese, English, Chinese and Korean)

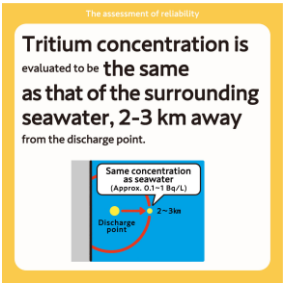


https://www.monitororbs.jp/en/index.html

Leaflets, etc.

- A leaflet for the general public entitled, “Things we want you to know about ALPS treated water" has been created
- A pamphlet has also been created in cooperation with My Navi Child Rearing for households with children



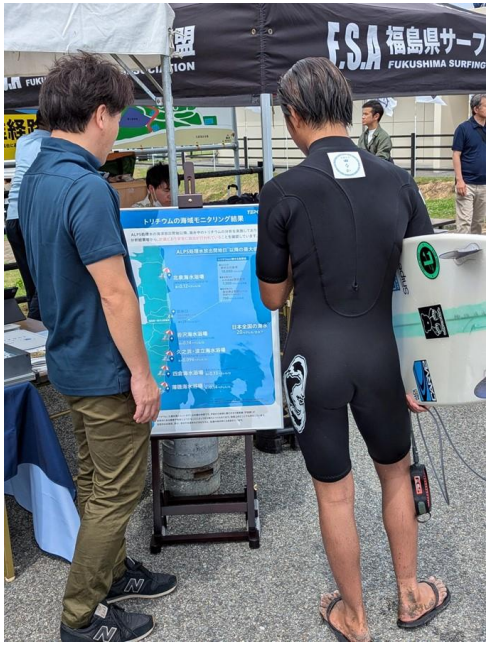


Communicating safety information domestically and abroad (Two-way dialogue)

- Through site tours we are able to explain the safety of sea discharge to the public while getting them to see the actual facilities and also carefully respond to their questions
- By participating in events at beaches and setting up booths that employ quizzes and models of ALPS treated water facilities, we are communicating information in an easy-to-understand manner to families.
- We continue to promote two-way dialogue through various opportunities such as the many events that are held during the summer in the region and near the sea

TEPCO Fukushima Daiichi Nuclear Power Station tours

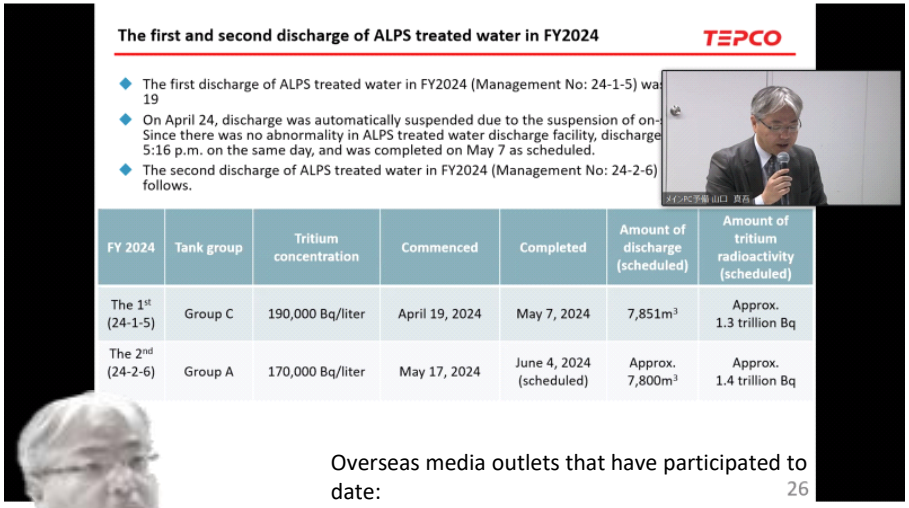
Booth at the All Japan Surfing Ranking Championship (2024/7/6) in Minami Soma



[Reference] Communicating information overseas

- Online press conferences are regularly held for overseas media outlets and representatives from foreign embassies in Japan (the most recent (sixth press conference) was held in May 2024)
- At the press conferences, the Chief Decommissioning Officer and the ALPS Treated Water Contaminated Measures Officer carefully explain the safety of sea discharge, etc.

Sixth press conference for overseas media outlets



FY 2024	Tank group	Tritium concentration	Commenced	Completed	Amount of discharge (scheduled)	Amount of tritium radioactivity (scheduled)
The 1st (24-1-5)	Group C	190,000 Bq/liter	April 19, 2024	May 7, 2024	7,851m³	Approx. 1.3 trillion Bq
The 2nd (24-2-6)	Group A	170,000 Bq/liter	May 17, 2024	June 4, 2024 (scheduled)	Approx. 7,800m³	Approx. 1.4 trillion Bq

Overseas media outlets that have participated to date:

Associated Press (USA)

Reuters (UK)

AFP (France)

Xinhua (China)

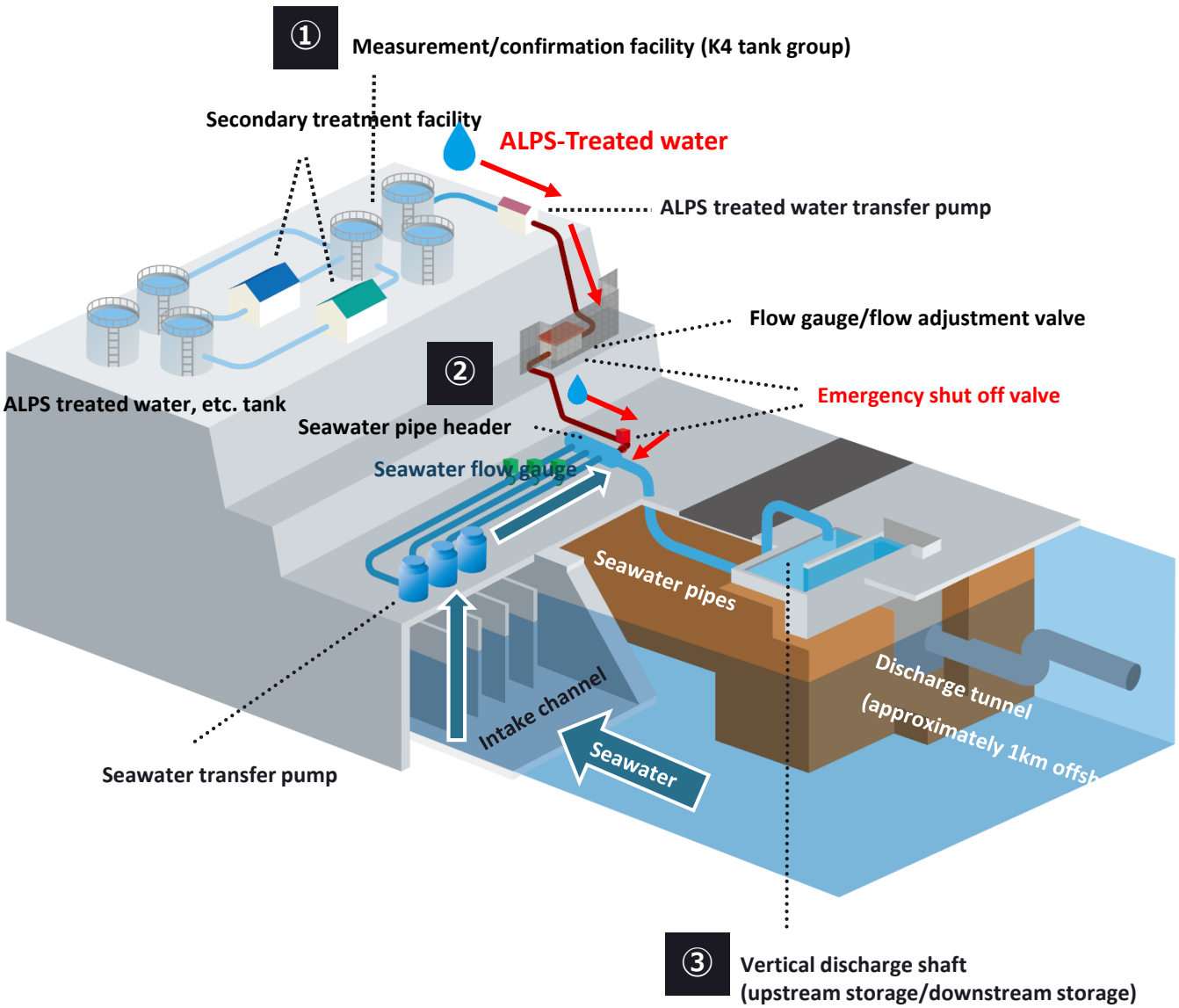
Yonhap News Agency (South Korea)

Phoenix TV (Hong Kong)

ABC (Australia), etc.

2-1. DISCHARGE FACILITY OVERVIEW

ALPS treated water sea discharge flow



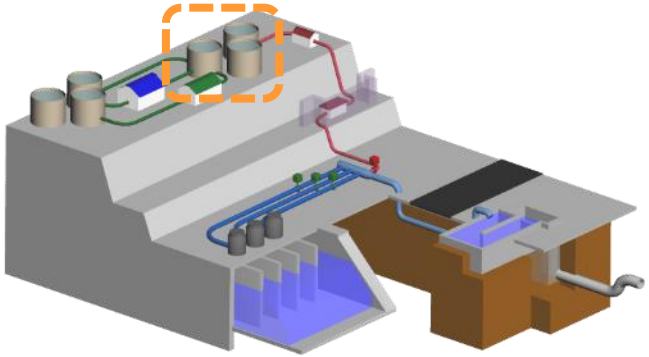
①

- Firstly, 62 radioactive substances are removed from the contaminated water by ALPS.
- At the measurement/confirmation facility (K4 tank group) the aforementioned water is put into receiving tanks and circulated/agitated so that it becomes homogeneous after which measurements are taken. After it is confirmed that sum of the ratios of legally required concentrations of radioactive substances is less than 1, which is the requirement discharge for radioactive substances, the ALPS treated water is sent to the pipe header by the transfer pump.

② In the pipe header, the water is diluted with an amount of seawater that is more than 100 times the amount to be diluted

③ The water is transferred from the upstream storage to the downstream storage while confirming that the concentration of tritium is less than 1,500Bq/liter and then discharged into the sea via the discharge tunnel

Measurement/confirmation facility overview



Measurement/confirmation facility safety measures

After circulating and agitating the multi-nuclide removal equipment treated water (hereinafter, ALPS treated water) to ensure that it is homogeneous, TEPCO and outside agencies measure/confirm the concentrations of each radioactive substance to ensure that only water with a sum of the ratios of legally required concentrations of radioactive substances that meet regulatory requirements (with the exception of tritium) is discharged.

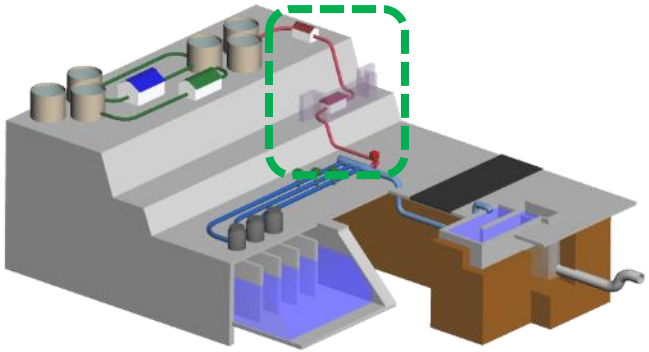
Inspection of the K4 tank area by the International Atomic Energy Agency (IAEA) [Photo taken on June 2, 2023]

The sum of the ratios of the concentration of each radionuclide to the regulatory concentration limit in the ALPS treated water to be discharged first (K4-B tank group) has been measured to be

0.28

(Regulatory requirements call for this value be less than 1)

Transfer facility overview



Transfer facility safety measures

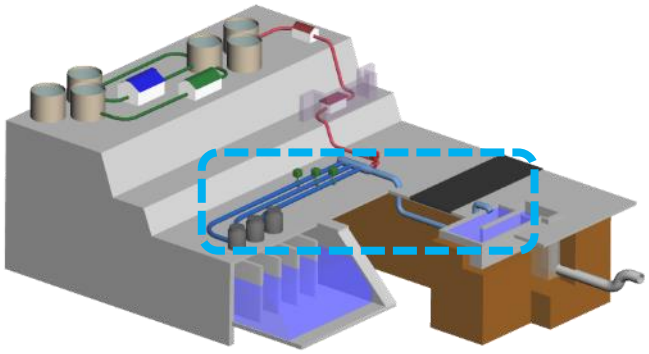
If an abnormality is detected during the dilution/discharge of ALPS treated water, an emergency isolation valve will automatically close to stop the discharge into the sea until it can be confirmed that the conditions for discharge are safe.

Inspection of emergency isolation valves by the International Atomic Energy Agency (IAEA) [photo taken on June 2, 2023]

Inspection of transfer facility by the International Atomic Energy Agency (IAEA) [photo taken on May 24, 2023]

Dilution facility overview

TEPCO



Dilution facility safety measures

ALPS treated water being discharged must have a concentration of tritium that is less than 1,500Bq/liter ※1, with less than 22 trillion Bq※2 total of tritium discharged annually.

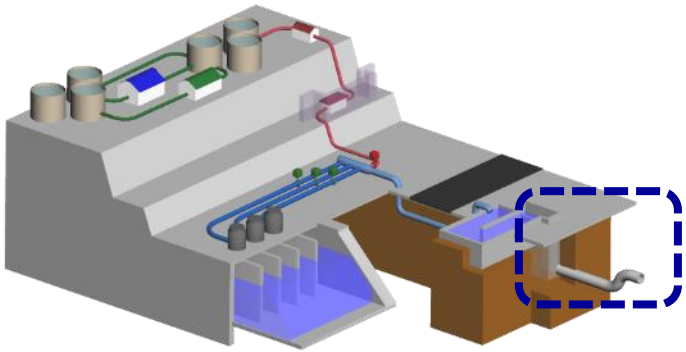
※1 1/40 of government regulatory requirements (60,000Bq/liter)
※2 Target discharge control value of the FDNPS before the accident

Seawater transfer pipes and seawater header pipe
(Header pipe: ALPS treated water is mixed and diluted with seawater)
[photo taken on June 25, 2023]

Discharge vertical shaft (upper-stream storage)
[photo taken on June 23, 2023]

Discharge facility overview

TEPCO



Discharge facility safety measures

ALPS treated water being discharged must have a concentration of tritium that is less than 1,500Bq/liter ※1, with less than 22 trillion Bq※2 total of tritium discharged annually.

※1 1/40 of government regulatory requirements (60,000Bq/liter)
※2 Target discharge control value of the FDNPS before the accident

Discharge vertical shaft (down-stream storage)
after it has been filled with water [photo taken on June 6, 2023]

Inside of the discharge tunnel after excavation [photo taken on May 23, 2023]
(The lights and the air ventilation duct were removed prior to discharge)

2-2. HANDLING TROUBLES

Methods for shutting down the discharge of ALPS treated water into the sea in the event that an abnormality is detected

TEPCO

- Emergency isolation valves have been installed in the transfer facility in order to be prepared for an event, such as malfunctioning equipment, etc., that results in a "discharge of ALPS treated water into the sea in a manner that is not intentional." If it is determined that there has been a deviation from normal operation status, interlocks will cause emergency isolation valves to close automatically. Actions can also be taken by operators if necessary to shut down discharge.

(1) Interlock (emergency shutdown)

In the following instance, emergency isolation valves will be automatically closed and stop the discharge of ALPS treated water into the sea.

① The dilution and discharge of ALPS treated water will take place after stipulating seawater flow and ALPS treated water transfer flow, but in the event that the sea water pump stops, or if the ALPS treated water transfer flow exceeds the stipulated amount, interlocks have been installed to enable the emergency isolation valves to close automatically.

② In the event that an abnormality is detected by radiation monitors installed on the ALPS treated water transfer line, interlocks have been installed to enable the emergency isolation valves to close automatically.

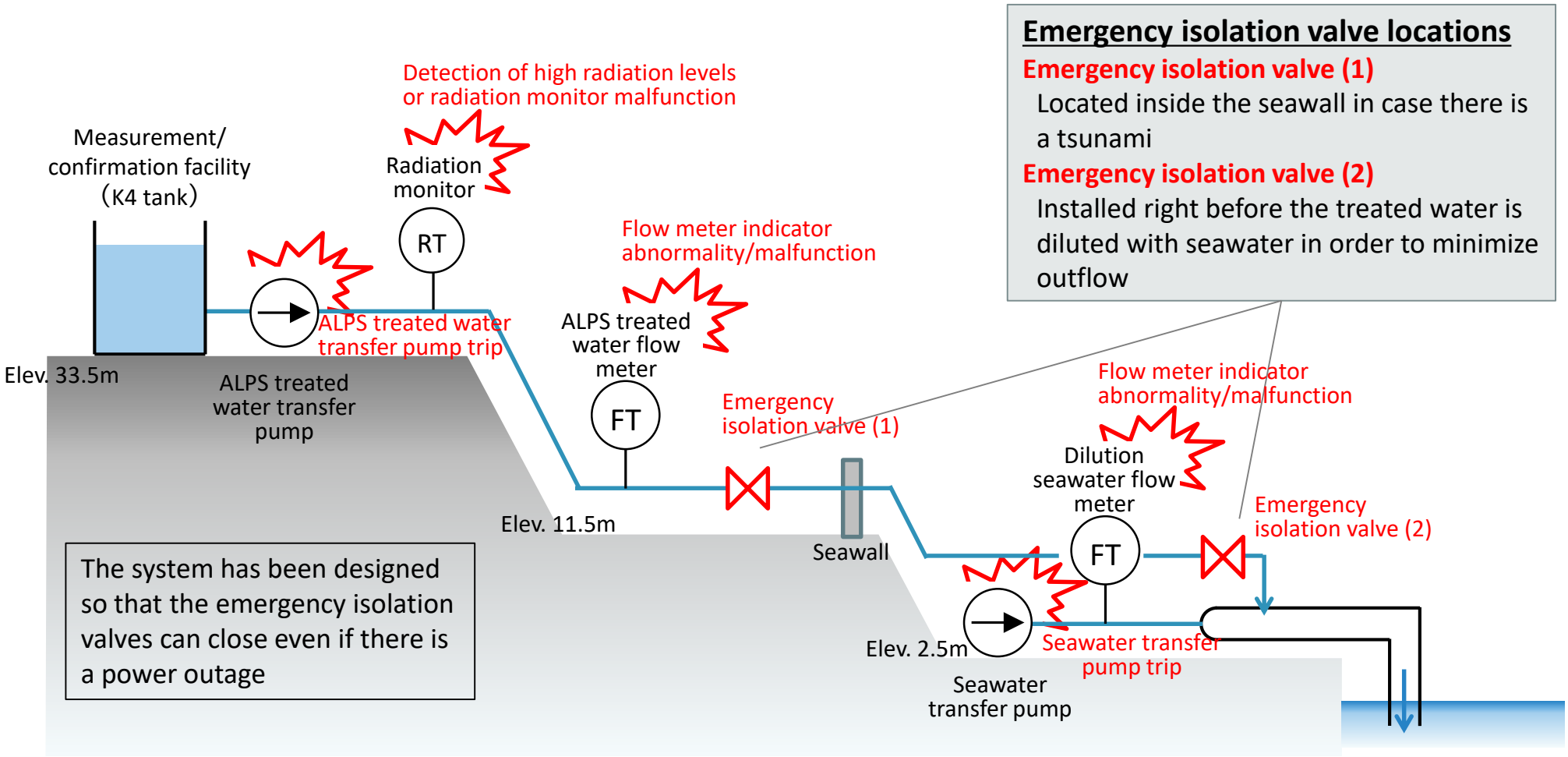
(2) Shut down by operators (manual shutdown)

Operators will shutdown the discharge of ALPS treated water into the sea if a natural phenomenon occurs that may impact ALPS treated water dilution and discharge facilities and/or related facilities, if sea area monitoring detects concentrations of radioactive substances that exceed the "Discharge Suspension Level," or if the Shift Supervisor deems it necessary to shut down discharge for any other reason.

(Reference) What is an emergency isolation valve?

TEPCO

- One emergency isolation valve has been installed right next to the seawater transfer pipe in order to minimize the outflow of ALPS treated water in the event of an abnormality. Another is within the seawall in case of flooding by tsunami, etc.



Emergency shutdown by interlocks

- Emergency shut down by interlocks refers to the following mechanism, by which emergency isolation valves automatically close if the following signals are detected:

ALPS treated water dilution rate is abnormal or cannot be confirmed

	< Detected signal >
ALPS treated water transfer system	Pump malfunction
	Flow meter malfunction
	High flow

	< Detected signal >
Seawater transfer system	Pump malfunction
	Flow meter malfunction
	Low flow

ALPS treated water radiation level is abnormal or cannot be confirmed

	< Detected signal >
ALPS treated water transfer system radiation monitor	Malfunction
	Level high

Emergency isolation valve: Closed ※1

ALPS treated water transfer pump: Shutdown※2

※1： Designed to shut down the discharge of ALPS treated water into the sea in the event of an abnormality, such as a power outage, etc.
※2： Seawater transfer pumps that are working normally will continue operating to enable the dilution of ALPS treated water

Manual shutdown by operators (shutting down discharge due to natural phenomena, etc.)

TEPCO

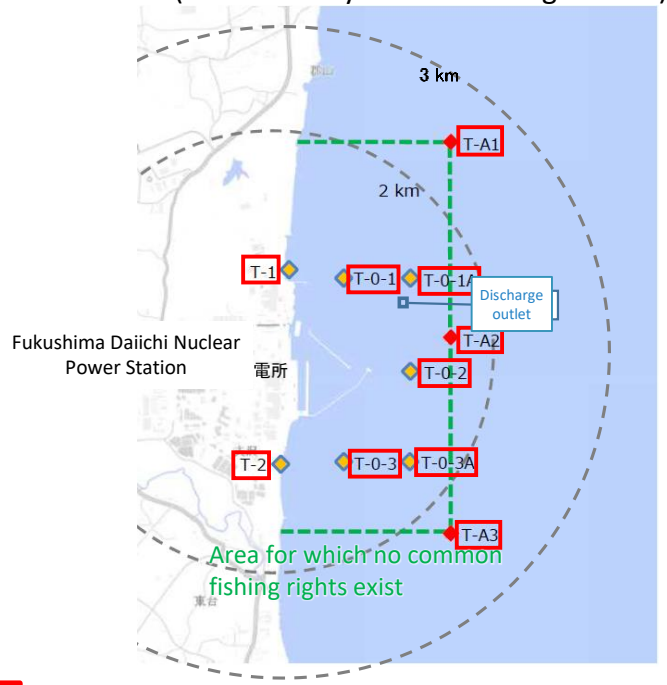
- In the event of the following natural phenomena, etc., operators will manually shut down the discharge.

Earthquake with a seismic intensity of a lower 5 or higher	• In order to minimize the impact of the loss of equipment function due to an earthquake
Tsunami advisory	• Because a tsunami may damage equipment located 2.5m above sea level
Tornado warning	• Because a tornado may damage equipment
Storm surge Warning	• Because the difference in water level between the discharge shaft and the sea surface may hinder normal discharge
Miscellaneous	• If the Shift Supervisor deems that shutdown is necessary due to any other symptoms of abnormalities not mentioned above

Manual shutdown by operators (in response to sea area monitoring)

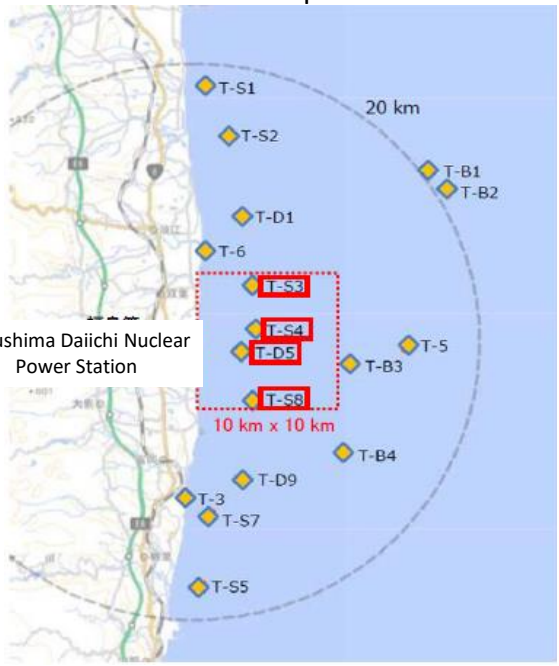
- Seawater tritium analysis is implemented once a week at all points on Figures 1 and 2 below, with the detection limit set to 0.1-0.4Bq/liter.
- In addition, quick tritium measurements with the detection limit set to 10Bq/liter will be implemented at the locations outlined in the red frames in Figures 1 and 2 below. In the case "discharge suspension level" indicators are exceeded, the discharge into the sea will be suspended.
- In light of the monitoring frequency outlined by the various organizations within the Comprehensive Monitoring Plan, frequency of quick tritium measurements specifically near the discharge outlets shown in Figure 1 will be increased from once a week to every day for approximately one month after the start of the discharge into the sea.

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



: Monitoring locations for quick tritium measurements (10 locations)
Indicator (discharge suspension level): 700Bq/liter
Analysis frequency: once a week → every day for approximately one month after the start of the discharge into the sea

Figure 2. Sampling locations within a 10km square in front of the power station



: Monitoring locations for quick tritium measurements (4 locations)
Indicator (discharge suspension level): 30Bq/liter
Analysis frequency: Once a week (T-D5),
Once a month (T-S3, T-S4, T-S8)

2-3. NOTIFICATION/ANNOUNCEMENT CRITERIA

Notification/announcement criteria [ALPS treated water Dilution/Discharge facilities]

TEPCO

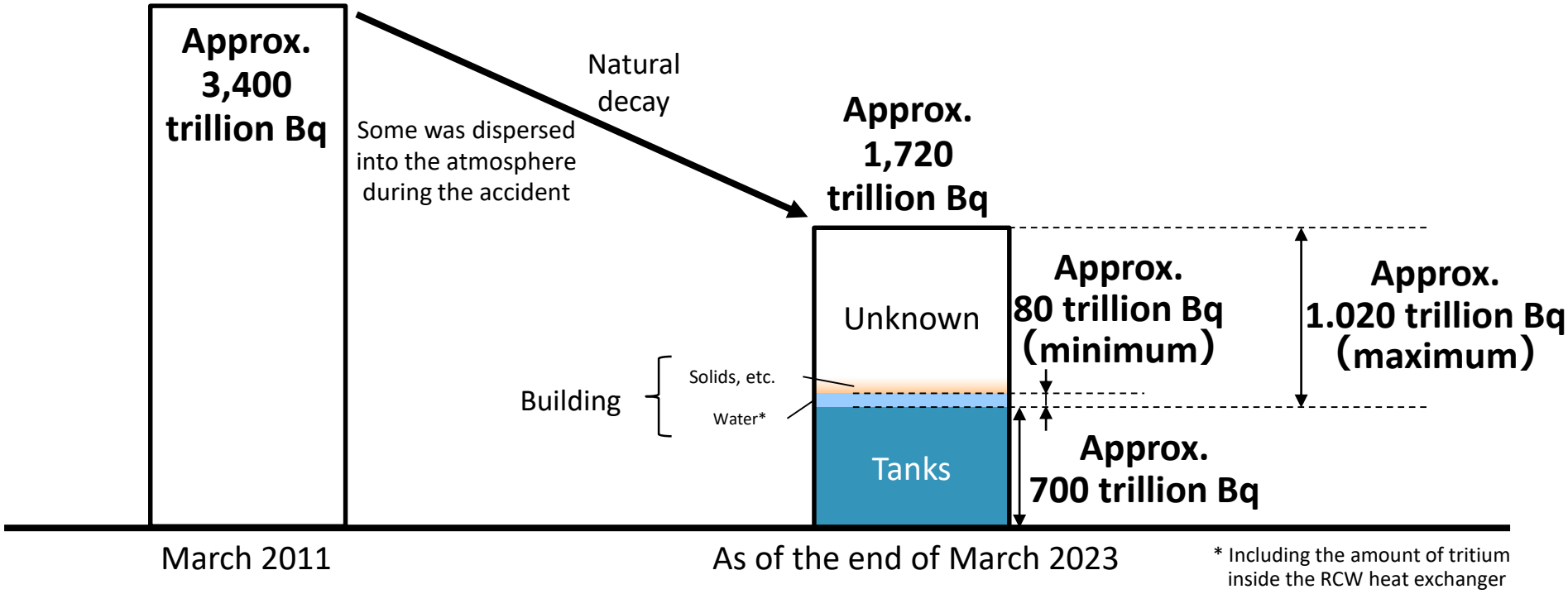
Classifications of troubles/accidents, etc.			Notification criteria (timing)	Announcement category ★
Discharges that do not satisfy discharge criteria	Trouble	• If ALPS treated water is discharged without being measured/sufficiently verified due to equipment abnormalities or troubles, etc.	• Notice given within 30min. of event confirmation • Details of emergency measures and implementation period • After implementation of emergency repairs (if implemented) • After repairs have been made	B
Facility shutdown	Trouble	• If facility operation (receiving, measurement/confirmation, discharge) is halted due to facility abnormality or trouble, etc.	• Notice given within 30min. of event confirmation • Details of emergency measures and implementation period • After implementation of emergency repairs (if implemented) • After repairs have been made	C
Discovery of water leaks/ puddles	Trouble	• If the concentrations of radioactive substances in the leaked water exceed discharge criteria and it is possible that the water leaked into the port ❖ Excluding cases where it can be positively determined that the leaked water was only seawater	• Notice given within 30min. of event confirmation (Initial announcement made after the event is discovered, and then a second announcement will be made after more information is received. Subsequent announcements will be made as necessary if changes have been made to leak prevention, emergency repairs, or the implementation period of emergency repairs)	B
	Trouble	• If it cannot be confirmed if the concentrations of radioactive substances in leaked water exceeds discharge criteria ❖ Excluding cases where it can be positively determined that the leaked water is only seawater, cases where the leak has been controlled through the application of tarps, etc., cases where the amount of leakage outside the weir is minuscule, limited in scope (the leaked water has not accumulated) and it has had no impact on surrounding equipment or the external environment. ("minuscule" refers to approximately 1 liter)	• Notice given within 30min. of event confirmation. (Initial announcement made after the event is discovered, and then a second announcement will be made after more information is received. Subsequent announcements will be made as necessary if changes have been made to leak prevention, emergency repairs, or the implementation period of emergency repairs)	C
Intake monitor/ vertical shaft monitor	Trouble	• If there is a "High" alarm from intake monitors/vertical shaft monitors ❖ Excluding cases where alarms are expected due to work being done in the vicinity of the monitors (confirmations, cleaning, etc.)	• Notice given within 30 minutes of confirming through manual analysis that the measurement results exceed the "High" alarm threshold	C
Sampling results	—	• K4 tank sampling results prior to discharge	• Prior to discharge commencement	Misc.
Discharge history	Operation	• Discharge commencement/completion	• Discharge operation commencement/completion record	E
		• Discharge volume record	• Announcement of daily discharge volume record	Misc.

★ Blanket emails will be sent to the mass media for announcement categories B and C. Details will be published in daily logs and explanations will be provided at press conferences as needed, for announcement categories E and "miscellaneous"

2-4. DISCHARGE SIMULATION

[Reference] The total amount of tritium at the Fukushima Daiichi Nuclear Power Station

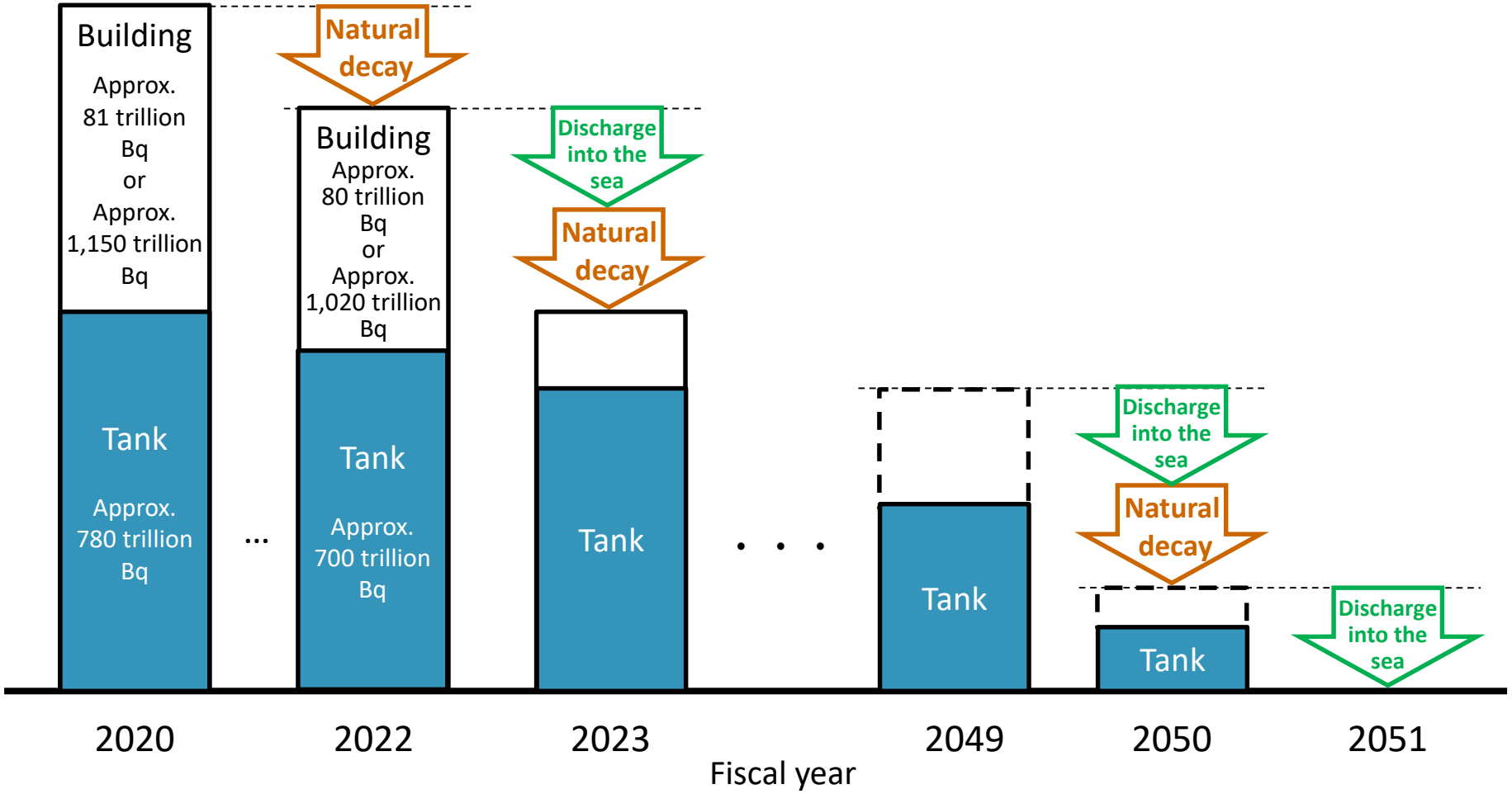
- Tritium is produced during the operation of nuclear power stations, but the Fukushima Daiichi Nuclear Power Station has been shut down since the accident, so **no new tritium has been produced since March 2011**.
- Therefore, the maximum amount of tritium on site is the maximum amount that existed as of March 2011 (approximately 3,400 trillion Bq), and if we consider natural decay, **as of the end of FY2022, there should have been approximately 1,720 trillion Bq on site**.
- As part of the Unit 1 reactor building dose reduction work in February 2023, water with tritium concentrations of 29.4 million Bq/liter was found inside the Unit 1 RCW heat exchanger, but the amount of tritium contained in the approximate 20m³ of water inside heat exchanger was only **approximately 0.6 trillion Bq**, which is much less than the amount of tritium stored in tanks. Furthermore, in addition to this, even if we consider uncertainty and possible amounts at Units 2/3, they would only amount to several trillion becquerels and most certainly would not exceed 10 trillion Bq.



[Reference] Discharge simulation

- **In addition to the reduction due to the discharge,** the amount of tritium **decreases approximately 5% annually as a result of natural decay**.
- When creating our discharge simulation, we considered this change and **set of the amount of tritium to be discharged annually as small as possible so that the amount of tritium in tanks on site will reach zero by the end of 2051.**

Concept drawing of the trends of the total volume of tritium at the power station over time in the discharge simulation



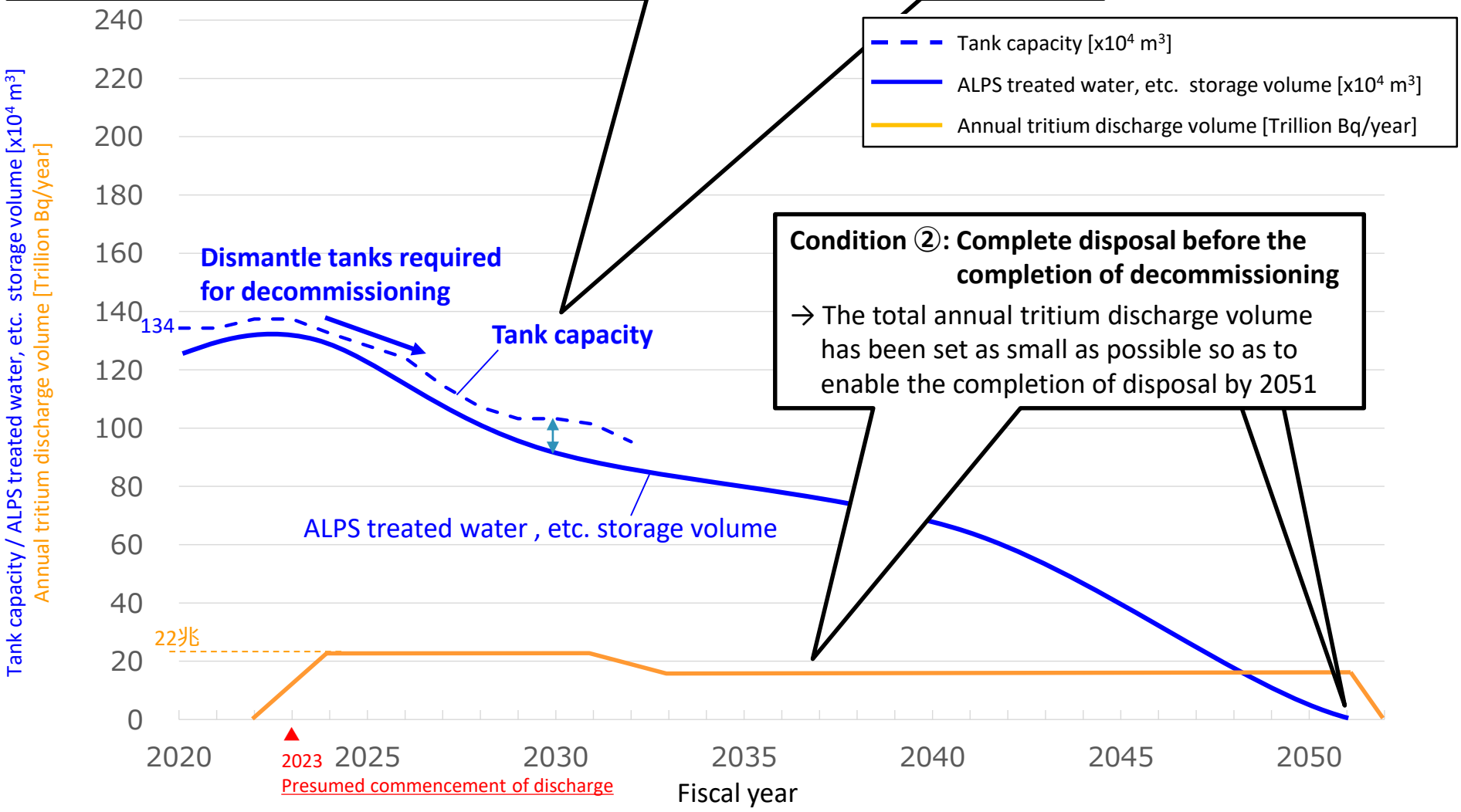
[Reference] Things to consider when examining of the total annual tritium discharge volume

Excerpt from "ALPS Treated Water Discharge Status Update" (September 28, 2023)

TEPCO

Condition ①: Reduce the number of tanks and gain space on site through such reduction to build facilities required to proceed with decommissioning

→ We need to secure space needed on site for decommissioning while ensuring enough tank volume for storing ALPS treated water, etc.



Condition ②: Complete disposal before the completion of decommissioning

→ The total annual tritium discharge volume has been set as small as possible so as to enable the completion of disposal by 2051

[Reference] Simulation conditions in light of the most recent status

TEPCO

Common conditions

Annual tritium discharge volume (Less than 22 trillion Bq/year)	Discharge volume set so that discharge is completed by FY2051 to the extent that there is no impact on site usage plans
Simulated discharge commencement fiscal year	FY2023 (simulation for each fiscal year)
ALPS treated water flow volume	Max: Approximately 460m³/day
Diluting seawater flow volume	Approximately 340,000m³/day (seawater transfer pumps: 2)
ALPS treated water discharge order	The approximate 30,000m³ of water in the K4 tank, which is being used as the measurement/confirmation facility, will be discharged first starting with water with low concentrations of tritium. Thereafter, the water in other tanks and newly generated ALPS treated water will be discharged starting with water with low concentrations of tritium as much as possible.
Tritium decay	Half-life considered to be 12.32 years (approximate 5.5% decrease annually). Decay of the newly generated tritium also considered.
Amount of ALPS treated water generated	FY2023: 120m³/day, FY2024: 110m³/day, FY2025: 100m³/day, FY2026: 90m³/day, FY2027: 80m³/day, FY2028 - FY2051: 70m³/day
Number of discharge days	292 days/year (Operating rate: 80%)

Parameters

Scenario	**A (Largest amount of tritium)**	**B (Least amount of tritium based on current information)**
Tritium concentrations of daily treated ALPS treated water	589,000 Bq/liter (maximum volume during FY2022: December 23, 2022)	254,000 Bq/liter (minimum volume during FY2022: April 8, 2022)
Total amount of tritium inside buildings (as of March 31, 2023)	Approximately 1,020 trillion Bq (the 3,400 trillion Bq that existed when the accident occurred all still remains in buildings/tanks)	Approximately 80 trillion Bq (estimated from the amount of stagnant water in buildings and tritium concentrations in that water)

[Reference] Simulation results (1/2)
Scenario A: Largest amount of tritium

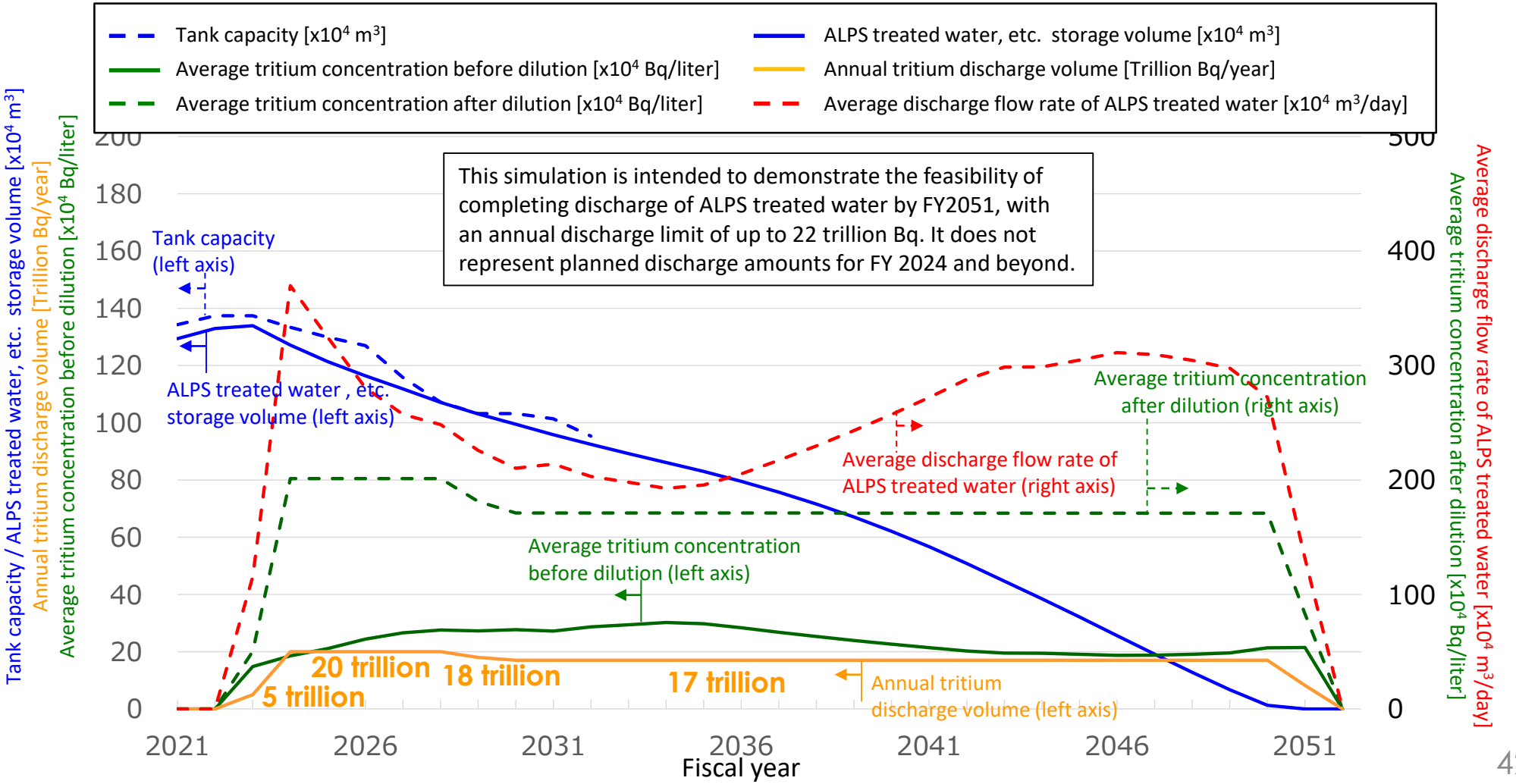
TEPCO

(Annual tritium discharge volume)

- 2023FY : 5 trillion Bq/year (carefully discharge small amounts)
- 2024 - 2028FY : 20 trillion Bq/year
- 2029FY : 18 trillion Bq/year
- 2030FY - : 17 trillion Bq/year

(Reference: simulation conditions published in August 2021)

- 2023FY : 11 trillion Bq/year
- 2024 - 2029FY : 22 trillion Bq/year
- 2030 - 2032FY : 18 trillion Bq/year
- 2033FY - : 16 trillion Bq/year



[Reference] Simulation results (2/2)

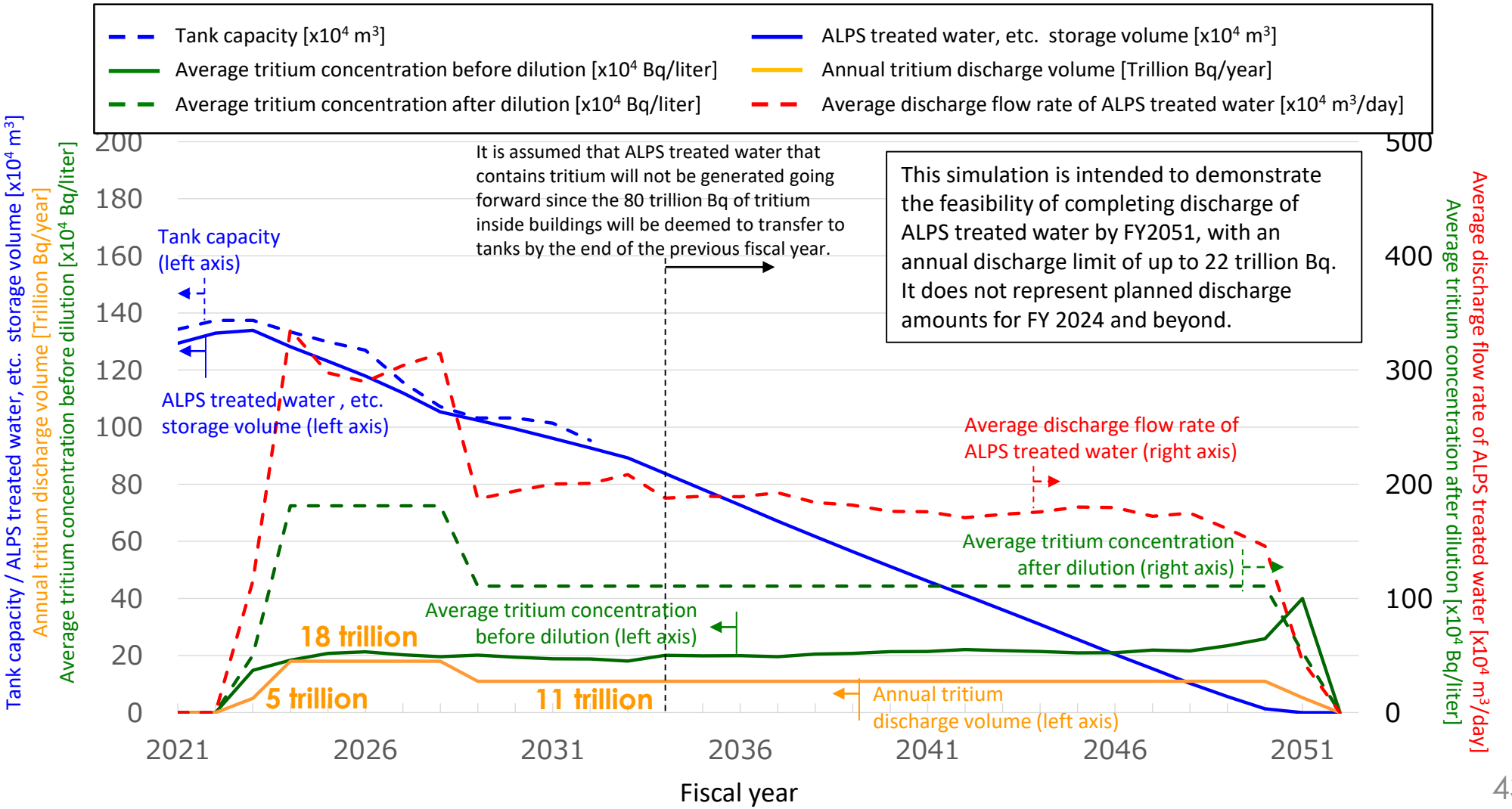
Scenario B: Least amount of tritium based on current information

(Annual tritium discharge volume)

- 2023FY : 5 trillion Bq/year (carefully discharge small amounts)
- 2024 - 2028FY : 18 trillion Bq/year
- 2029FY - : 11 trillion Bq/year

(Reference: simulation conditions published in August 2021)

- 2023FY : 8 trillion Bq/year
- 2024 - 2028FY : 16 trillion Bq/year
- 2029FY - : 11 trillion Bq/year



END OF PRESENTATION