



Safety of Discharge of ALPS Treated Water

Executive Summary of the IAEA Comprehensive Report

- The IAEA activities consist of a technical review to assess whether the actions of TEPCO and the Government of Japan to discharge the ALPS treated water over the coming decades are consistent with international safety standards.
- The IAEA's review is organized into the following three major components to ensure all key safety elements are adequately addressed:
 - Assessment of Protection and Safety
 - Regulatory Activities and Processes
 - Independent Sampling, Data Corroboration, and Analysis
- The Task Force includes experts from the IAEA Secretariat alongside internationally recognized independent experts with extensive experience from a wide range of technical specialties from Argentina, Australia, Canada, China, France, the Marshall Islands, the Republic of Korea, the Russian Federation, the United Kingdom, the United States and Viet Nam.
- Since September 2021 when the IAEA Task Force held its first meeting, there have been five review missions, six technical reports, and numerous Task Force meetings.

Executive Summary of the IAEA Comprehensive Report

- This report includes an assessment of the application of the fundamental safety principles, the relevant safety requirements, and supporting safety guides.
- Based on its comprehensive assessment, [the IAEA has concluded that the approach to the discharge of ALPS treated water into the sea, and the associated activities by TEPCO, NRA, and the Government of Japan, are consistent with relevant international safety standards.](#)
- [The IAEA has concluded, based on its comprehensive assessment, that the discharge of the ALPS treated water, as currently planned by TEPCO, will have a negligible radiological impact on people and the environment.](#)
- In the first interlaboratory comparison, based on the observations of the IAEA, [TEPCO has demonstrated that it has a sustainable and robust analytical system](#) in place to support the ongoing technical needs at FDNPS during the discharge of ALPS treated water.
- The [IAEA is committed to engaging with Japan on the discharge of ALPS treated water not only before, but also during, and after the treated water discharges occur.](#) Additional review and monitoring activities are envisaged that will continue and which will provide additional transparency and reassurance to the international community by continuously providing for the application of the relevant international safety standards.

Overall Picture of Treated Water Discharge into the Sea

IAEA Review 1 Safety of ALPS treated water

(Characterization of Treated Water, Safety of the Facilities, Radiological Environmental Impact Assessment)

Characterization of Treated Water

Safety of the Facilities

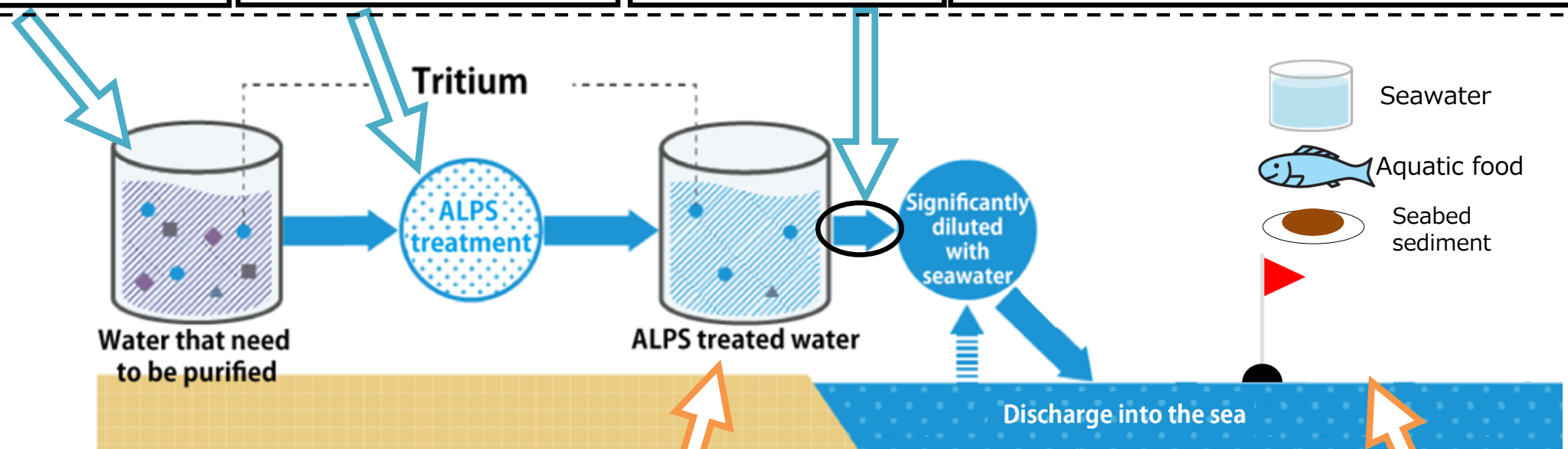
Radiological Impact Assessment (International Approach)

29 nuclides other than tritium were selected for radiation exposure evaluation

Treated water is purified until the concentrations of nuclides other than tritium, fulfill the regulatory standards.

When event of occurrence of an abnormality etc. is detected, the discharge will be stopped using two emergency valves.

Long-term effects including bioaccumulation, etc. are evaluated for all nuclides using the IAEA's evaluation method.
Marine dispersion simulation is conducted.



IAEA Review 2

Adequacy of the Regulatory Process

Review by Regulatory Agencies, etc.

Installation of the discharge facilities and operation of the facilities have been authorized by NRA

IAEA Review 3 Independent sampling and data corroboration and analysis

Source (ALPS treated water) monitoring before the discharge

It will be confirmed that nuclides other than tritium are below regulatory standards before the discharge
(If not, the treated water will not be discharged and will be re-purified.)

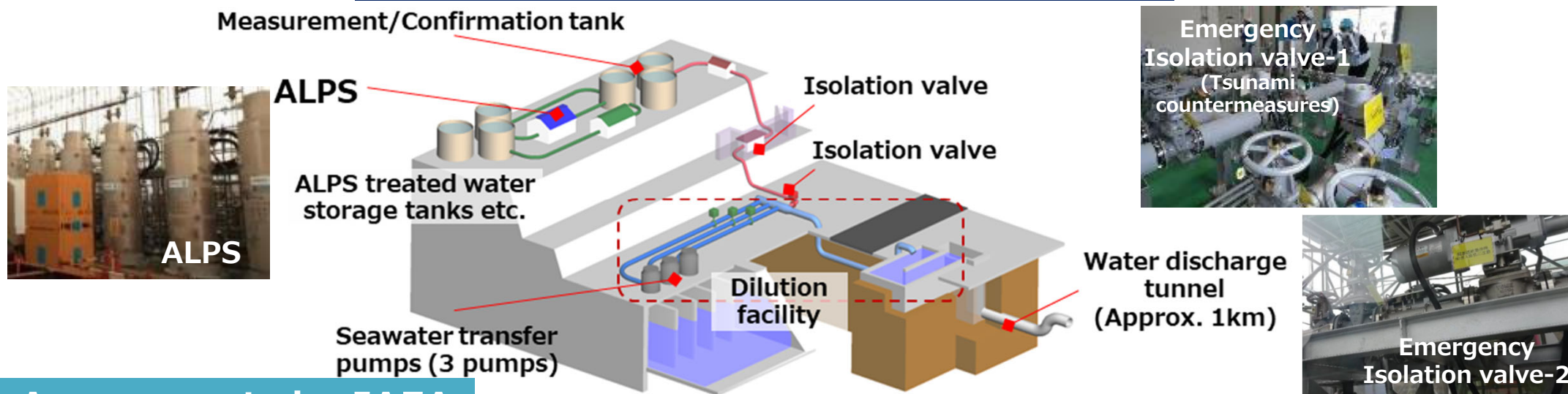
Monitoring in the sea area

Monitoring of seawater, seabed and marine food will be conducted to confirm no significant changes before and after ocean discharge

Safety of the Discharge Related Facility

- For the discharge into the sea
 - 1) The water that needs to be purified will be **purified by ALPS until the concentrations of nuclides other than tritium, fully satisfy the regulatory standards.**
 - 2) Water after the purification (ALPS treated water) **is agitated and homogenized in the "Measurement/Confirmation Facility"** and **the concentration *1 will be confirmed.**
 - 3) The treated water will be **diluted more than 100 times *2 at the "Dilution Facility" to meet the regulatory standard for tritium** and **only the water meeting the regulatory standard will be discharged into the sea*3.**
- If **an abnormality etc., is detected, the discharge will be stopped by closing the two emergency valves.**
 - *1 The third-party laboratories are also conducting analysis to ensure the objectiveness.
 - *2 Tritium concentration after the dilution will be less than 1,500 Bq/L (1/7 of the WHO Guidelines for drinking water quality value).
 - *3 Total annual amount of the tritium to be discharged will be less than the operational target of the FDNPS before the accident(22 TBq) .

Discharge related facilities for ALPS Treated Water



Assessments by IAEA

- ✓ **The systems and processes** in place **to control the discharges** of ALPS treated water **are robust and more than adequate for the expected low doses and the low risk arising** from the discharge process.
- ✓ **Redundancy was built into the system for some components**, such as emergency isolation valves and detectors.
- ✓ The pre-service inspections conducted by the NRA are sufficient to ensure the installation and operation of relevant **facilities and equipment is consistent with the NRA-approved Implementation Plan.**

Assessment of Radiation Impacts Using International Methods

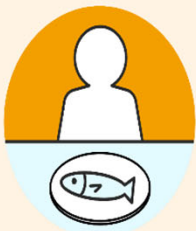
- **"The most affected person"** who frequents the sea area around the discharge point (10km×10km) is assessed.
- All radionuclides including tritium are assessed according to the IAEA evaluation method **considering the effect from food chain and bioaccumulation.**
- **The exposure dose on the public** is approx. 1/1,000,000 to 1/70,000 of natural radiation exposure (average in Japan: 2.1mSv/y).
- **The exposure dose on animals and plants** is approx. 1/3,000,000 to 1/1,000,000 of the level defined by ICRP.

Assume "most affected case" as the target of assessment

Evaluated by people who are active and consume marine products in the surrounding waters.

Pathways and habits

Ingestion of seafood



Two types of persons who ingest the average and large amount of seafood

Swimming and diving
Drinking seawater



Swims 96 hours per year

Beach (on land) inhaling seawater spray



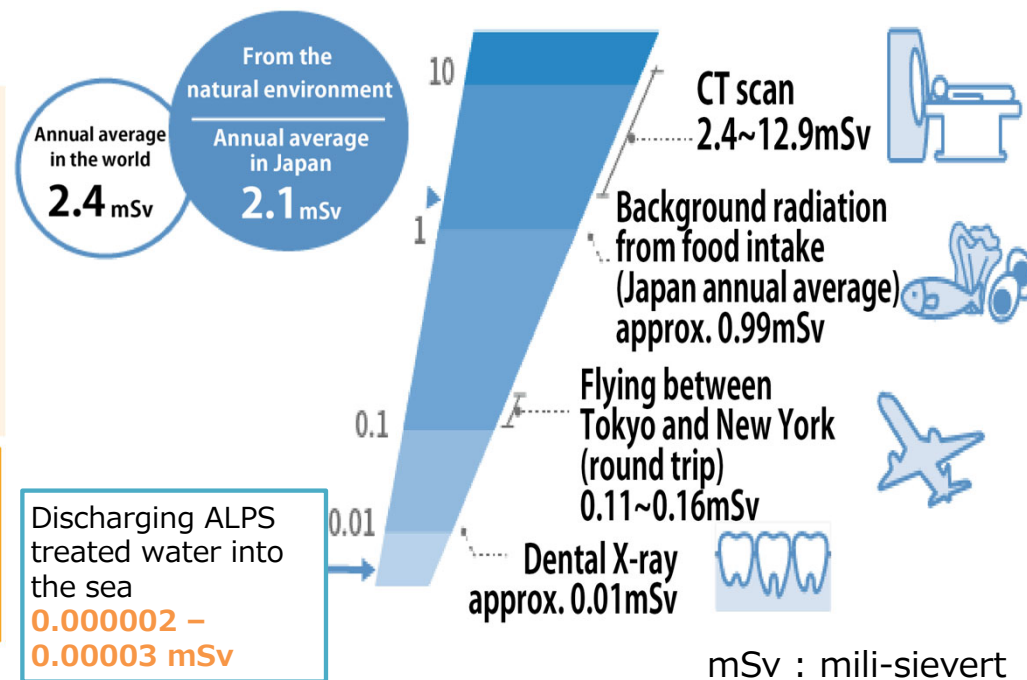
Resides by the seashore 500 hours per year

Ship (on the ship) / Works near fishing nets (on the ship and land)



Spends 2,880 hours (120 days) on a ship at sea, of which 1,920 hours (80 days) are spent working near fishing nets

Comparison with radiation impacts in daily life



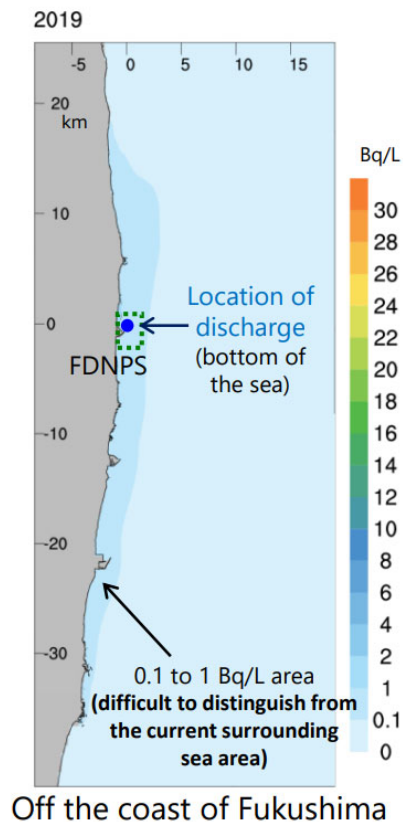
Assessments by IAEA

- ✓ The discharge of the ALPS treated water will have **a negligible radiological impact on people and the environment.**
- ✓ **A REIA has been produced and is compliant with the international safety standards.**

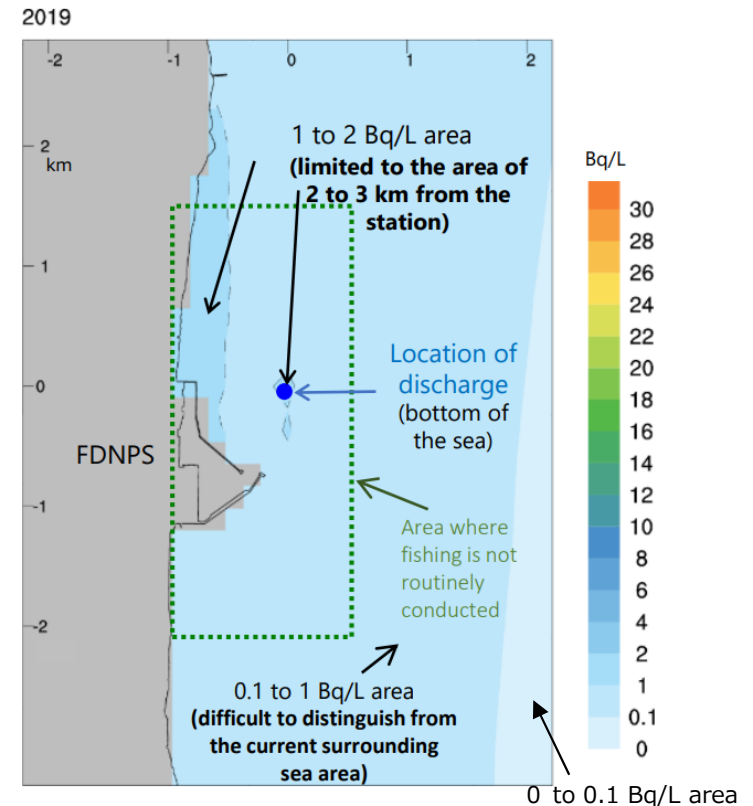
Results of Dispersion Simulation at Sea

- Results of the simulation by TEPCO, the area assessed to have higher tritium concentration than current levels in the surrounding sea area (0.1 to 1Bq/L) will **be limited to the area of 2 to 3km from the FDNPS** for the annual average.
- It is **not distinguishable from the 'background' values**, at distances of **a few km from the FDNPS**.

Tritium concentrations have changed only slightly, and changes have been observed only in the sea area around the FDNPS.



Enlarged



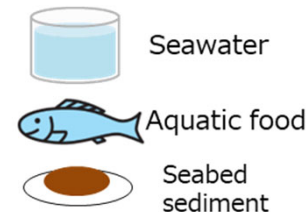
Assessments by IAEA

- ✓ Based on the results of the marine dispersion model, activity concentrations in international waters will not be influenced by the discharge of ALPS treated water into the sea and **the transboundary impacts are therefore negligible.**

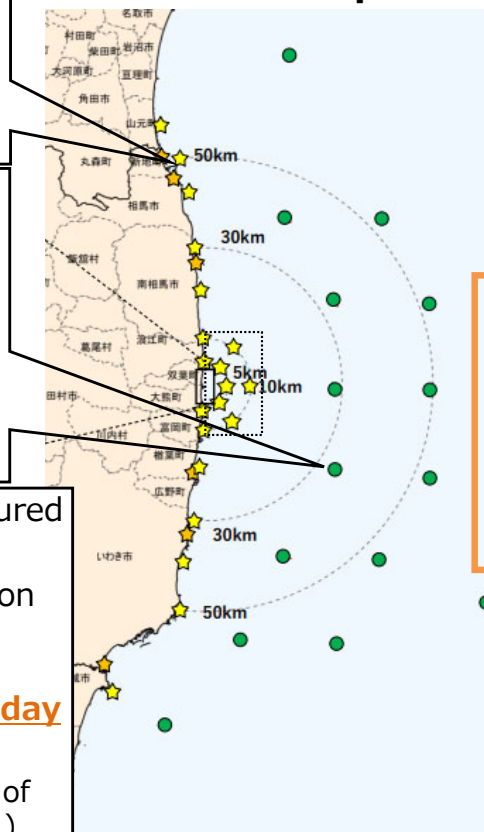
Monitoring in the Sea Area

- **Monitoring is conducted by the relevant ministries, agencies, local governments and TEPCO, etc.,** based on the “Comprehensive Radiation Monitoring Plan,” which was designed to systematically confirm the radioactive materials in the environment.
- **Monitoring in the sea area has been conducted even before the start of the discharge and it will be confirmed that there is no significant change after the start of the discharge.**
- **Strengthen and expand monitoring by increasing the frequency of the ordinally precise measurement as well as by adding the measurements using a method that provides results rapidly (Rapid Analysis Method).**

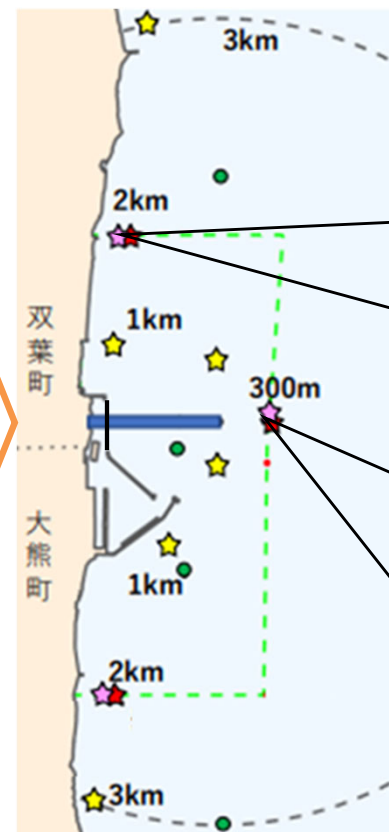
【Target】




【Broad Map】






【Area of radius of 3 km】



Enlarged

- For the points ,
– Measurement to shorten the period of analysis will be conducted for the time being.
(Weekly at maximum for about 10 sampling points)
- **precise measurement** will be conducted **monthly**.
(Basically 4 times a year, taking into account seasonal changes)

- For the points , nuclides other than tritium is measured
– 7 main nuclides (Cesium etc.): 4 times a year
– Even broader range of nuclides: Once a year
- **Aquatic organisms are also measured 4 times a year or less**
– Tritium in fish (FWT, OBT), Carbon-14
– Iodine-129 in seaweeds (Ukedo Fishing Port, Tomioka Fishing Port)

- Additional sampling points  from FY 2022, mainly within 10km.
(, the tritium is measured at the swimming beach)

- Tritium is also measured at the points, several tens of kilometers away (Points approx. 30 km and 50km away, Southern area of off sea from Miyagi Prefecture and Northern area of off-sea from Ibaraki Prefecture)

- For aquatic foods, tritium are measured for approximately 200 samples.
- Additionally, Rapid analysis (detection limit is approx. 10Bq/L) has been conducted **for 180 samples**, which data available the **next day or the day after that**.

* The range of the are is the pacific side of eastern Japan (Hokkaido to Chiba Pref.)

Assessments by IAEA

- ✓ The activities and approach taken by TEPCO and NRA are **consistent with the relevant international safety standards**. [p.94]
- ✓ A clearly defined plan for **enhanced environmental monitoring** by **TEPCO and the Government of Japan** to address the discharges of ALPS treated water is in place. [p.94]

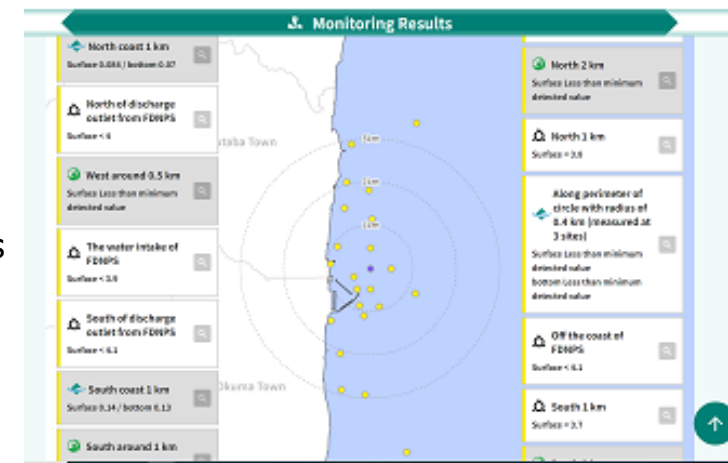
Discharge of ALPS Treated Water

Environmental Monitoring after Discharge

- GoJ and TEPCO have conducted environmental monitoring and daily published results showing the first discharge has been carried out safely.
- In addition, the IAEA has conducted independent sampling and measurement of the sea water, and confirmed that tritium levels are below Japan's operational limit to stop the release.

	TEPCO	MOE	FA
Subject for Sampling	Seawater: 10 point	Seawater: 11 point	Fish: 2 sample
Monitoring frequency	Every day *around one month after discharge	Every week *around three month after discharge	Every day *around one month after discharge

The website which shows the monitoring results▼



※Fukushima Prefectural Government also conducted rapid tritium analysis
 ※NRA conducts the thorough examination (around one month required)

**Up to now, the concentration of tritium is confirmed below the operational limit.
 The discharge is being conducted safely.**

The Discharge of the 1st Batch has been Completed

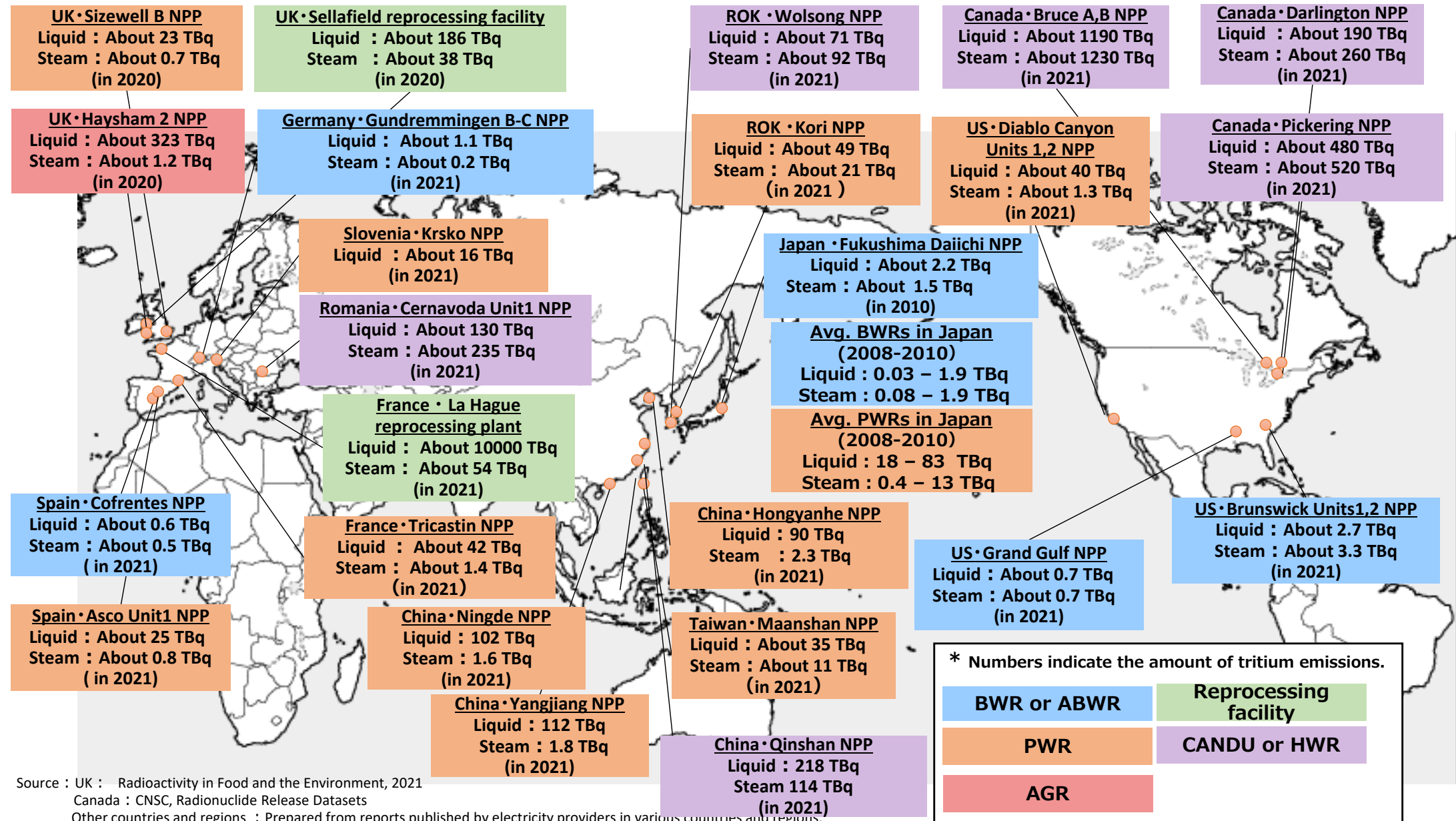
- Four batches will be discharged until the end of March 2024.
- The amount of discharge until the end of March 2024 will be 31.2 thousand m³ (2.3% of the water in the whole tanks at the site 134 million m³)

- ◆ Discharge period of the 1st batch : **August 24 to September 11, 2023**
- ◆ Amount of discharge : **7,788 m³** (※The amount of tritium is 1.1 trillion Bq)
- ◆ Results of monitoring
 - TEPCO and Ministry of Environment : Rapid analysis of sea water showed the concentration of tritium is far below 700Bq/L (TEPCO's self-imposed operational limit)
 - **IAEA also analyzed sea water and confirmed that the tritium levels are below operational limit (700Bq/L).**
 - Fishery Agency : The result of rapid analysis of fish showed that the concentration of tritium is below detection limit (10Bq/L) as the same as before.
- ⇒ **These monitoring results show that the discharge is conducted safely as planned.**
- ◆ Future schedule
 - ✓ TEPCO conducts checking of dilution and discharge facilities of ALPS treated water
 - ✓ TEPCO reviews the performance of the discharge of the 1st batch and considers the necessity of any improvement.
 - ✓ **TEPCO started the discharge of the 2nd batch on October 5, 2023.**
 - ✓ Two batches will be discharged until the end of March 2024
(7,800m³/discharge) The amount of tritium will be 5 trillion Bq.

Ref. Annual Amount of Discharge of Tritium over the World

- At nuclear facilities in the world, tritium is discharged as liquid waste into rivers and the sea etc.*, and also into the atmosphere through the ventilation process, in compliance with the laws and regulations of each country and region.

*Discharge from vessels into the sea is prohibited by the London Convention



<Ref.> $1 \times 10^{12} \text{Bq} \approx \text{about } 0.019 \text{g}$ (Tritiated water)

Detailed information on handling ALPS treated water is as below.

(METI ALPS treated water portal site)

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/atw.html>



(IAEA website: Fukushima Daiichi Treated Water Discharge)

<https://www.iaea.org/topics/response/fukushima-daiichi-nuclear-accident/fukushima-daiichi-treated-water-discharge#faq>



(TEPCO portal site)

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

