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IAEA's Review of Safety Related Aspects of ALPS Treated Water discharge at the Fukushima Daiichi Nuclear Power Station

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- ALPS - Process Overview
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Background

Basic Policy

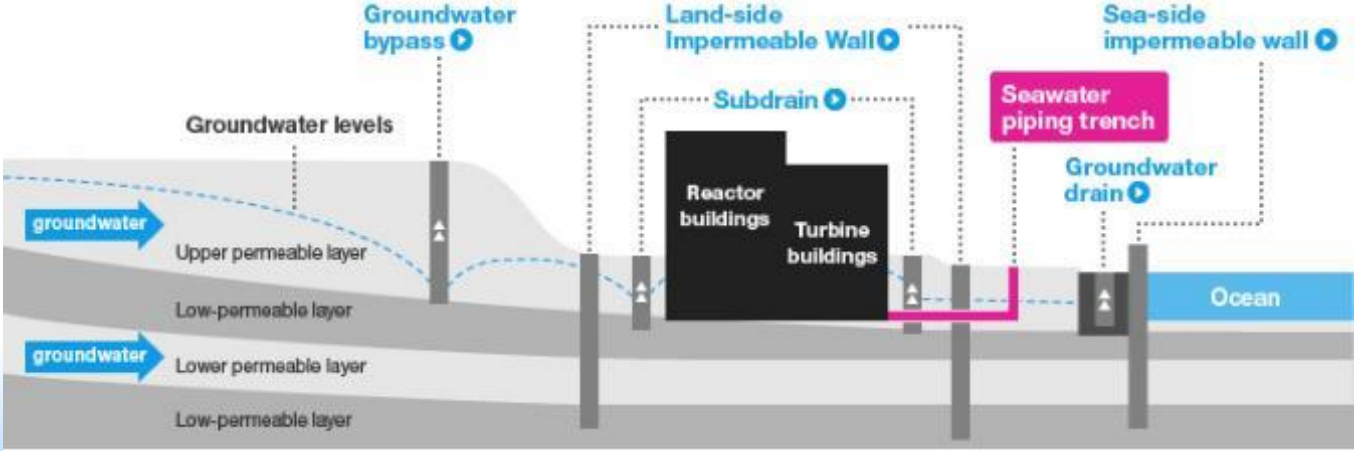
• April 2021, the GOJ announced the **Basic Policy on handling ALPS treated water at TEPCO's FDNPS.**

Focus on:

- Safety of Discharges:
  - Potential impact on humans and the marine environment
  - Sea Area monitoring projects
- Transparency and Accountability of the discharge
  - Scientific evidence and information
  - **IAEA involvement**
- Facilitate the progress for site decommissioning and reconstruction of the area
- ALPS treated water continues to be generated and accumulated in tanks that occupy a large area, restricting the construction of necessary facilities for the decommissioning.
- Compliance with national laws and regulatory approvals.
- Result of many years of experts comprehensive studies, technical discussions, consultations and deliberations.

Background

Status of water in tanks at FDNPS (As of October, 2021)	
Tank storage volume	1.28 million ㎥
Tank capacity (end of 2020)	1.37million ㎥
Increase of treated water	50,000 to 60,000 ㎥/year
Amount of Tritium	About 780TBq (15g)



Background

IAEA Review

• GOJ requested the IAEA to review their discharge plan and activities related to the discharge of ALPS treated water stored at the FDNPS against **International Safety Standards**

• Consistent with IAEA statutory functions to provide for the application of the international safety standards, at the request of Member States (IAEA Statute, Article III.6).

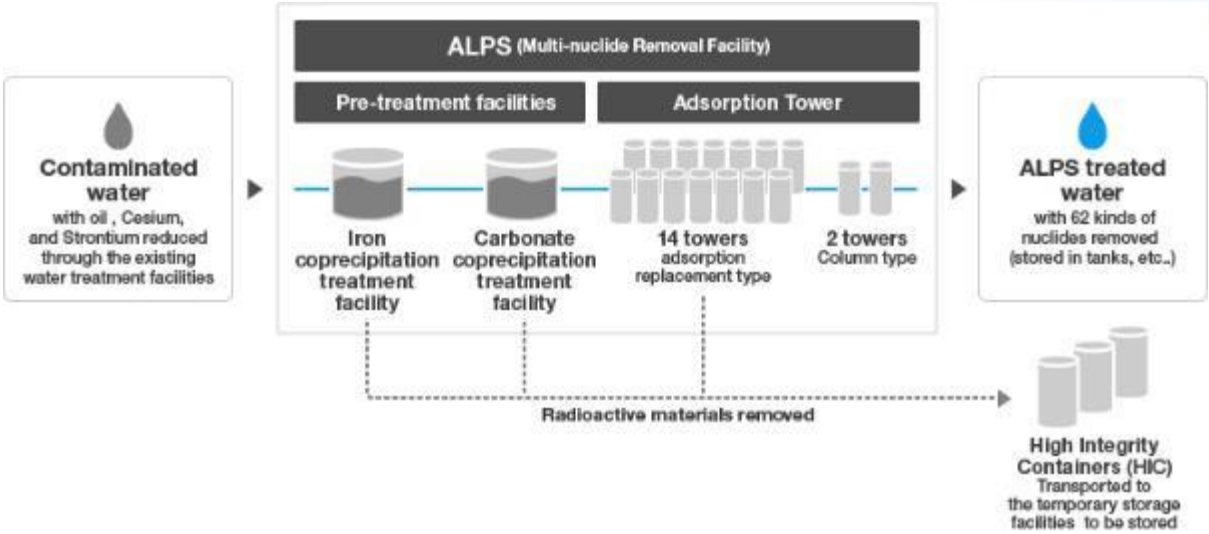
• IAEA safety review and the associated activities will be implemented before, during, and after the planned water discharge.

- GOJ will continue to consider and reflect any feedback from the IAEA throughout the process.

• IAEA will ensure safety and transparency are key concepts of this review.

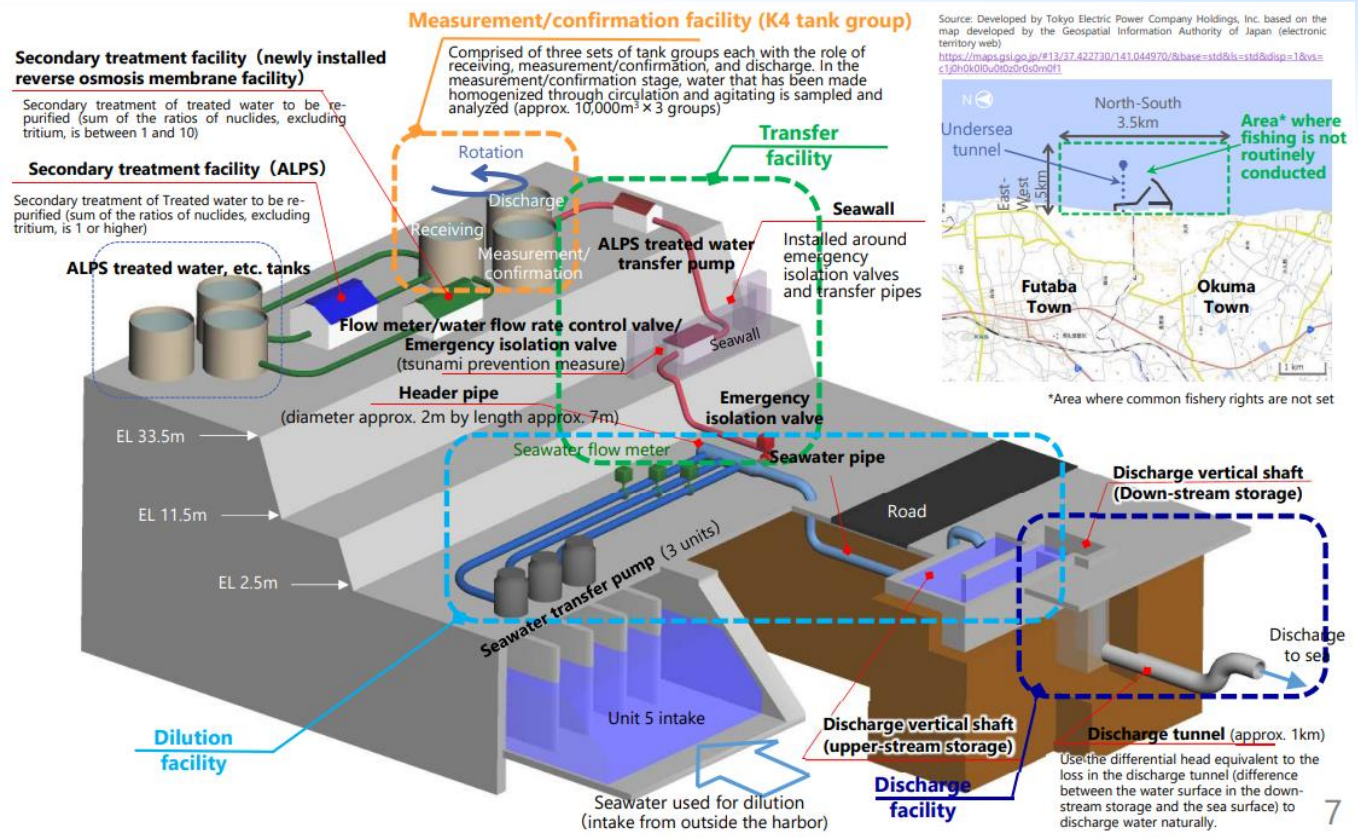
• IAEA carry out a comprehensive safety review to determine whether TEPCO and GOJ are implementing the relevant IAEA Safety Standards in their activities associated with the proposed ALPS treated water discharge.

ALPS – Process Overview



**Concentration of the nuclides other than tritium becomes negligible in purification/re-purification process.
*** Annual emission of tritium will be less than 22 trillion Bq/year.

ALPS – Process Overview



Source: https://www.tepco.co.jp/en/hd/newsroom/press/archives/2022/pdf/220803e0101.pdf

Authorization Process

- The authorization includes approvals of amendments to TEPCO's Implementation Plan for managing the discharge of ALPS treated water at the FDNPS.
- NRA utilized the Reactor Regulation Act as the foundation to conduct their domestic regulatory review and also referenced the Basic Policy for the Radiological Impact Assessment.

Fig. Schematic Representation of the authorization process.

*The Implementation Plan will continue to be developed, updated and reviewed, as necessary, before final approval is granted by the NRA, through the completion of pre-service inspections, for the discharges to start.

IAEA Review

Focus and Scope

- The IAEA's near-term review will focus on answering two key questions:
  - Are the plans and actions of the applicant, in preparing the discharge application, compliant with the international safety standards?
  - Are the plans and actions of the regulatory body, in assessing/inspecting the application and issuing an authorization, compliant with the international safety standards?

- The focus of the IAEA Review will change between the near-term (prior to regulatory authorization), mid-term (between regulatory authorization and water discharge), and long-term (after the start of water discharge).

- The IAEA Review will use all applicable Safety Standards as the benchmark to draw conclusions and answer the questions highlighted above.

IAEA Review

IAEA Safety Standards

- IAEA mandated to *"establish or adopt… standards of safety for protection of health and minimization of danger to life and property…"*
- IAEA has identified relevant standards for radioactive discharges to apply to this project.

IAEA Review

Task Force

- IAEA Director General (DG) established a Task Force as the primary tool to implement the IAEA Review.

- The Task Force includes internationally recognized experts from Member States, appointed by the DG and experts from the IAEA Secretariat in fields related to the water discharge plan and monitoring.
  - IAEA serves as the Chair of the Task Force

- The Task Force brings together diverse backgrounds and experience to adopt a collective approach to the IAEA Review.

IAEA Review

Task Force

- The Secretariat will serve as the leading component of the Task Force, responsible for:
  - Planning, coordinating, and implementing the IAEA's review and missions needed
  - Providing technical expertise and consistency throughout the project
  - Compiling, drafting, and editing major technical outputs
  - Liaising with senior officials in the GOJ, IAEA Member States, and other relevant stakeholders

- The International Experts will serve in an advisory role for the Secretariat, performing functions such as:
  - Reviewing relevant information and providing advice to the Task Force Chair
  - Highlighting relevant best practices and international experience
  - Attend and participate in Missions, upon request, and provide written feedback and assessments to the Task Force on the outcomes
  - Attend and participate in meetings and other activities necessary to support the IAEA's review

IAEA Review

Components

Assessment of Protection and Safety	• Review TEPCO's implementation plan and supporting documentation. • Focus on technical considerations such as source characterization, safety related aspects of the approach, occupational radiation exposure, radiological environmental impact assessment.
Regulatory Activities and Process	• Review NRA actions and processes relevant to the project. • Focus on safety objectives, regulatory requirements, regulatory assessment, regulatory inspections.
Independent Sampling, Data Corroboration and Analysis	• Independent sampling and analysis to corroborate data from Japan. • Perform analysis of source term and environmental samples. • Corroborate monitoring results for occupational exposure.

IAEA Review

Outputs

The IAEA Review will have multiple components, which will extend **over several years**. Progress will be reported in different ways depending on the project status and the stakeholders involved.

Reports will be issued periodically to update the public on progress for all components of the review.

Reports are prepared by the Task Force, approved by the Director General and published by the IAEA.

Prior to the beginning of the water discharge (estimated to occur in 2023), the IAEA will

- Issue the Task Force's collected findings and conclusions for the entire review in order to summarize the stage "before".
- Establish all activities to be carried out on the stage "during"

Sampling and analysis, monitoring, and periodic reviews will continue for years to come.

IAEA Secretariat will provide technical briefings and updates periodically to IAEA Member States.

IAEA Review

Recent Progress

- The GOJ and TEPCO have been providing information and data to support the Task Force's ongoing review.

- In early **2022**, a series of on-site activities took place to further plan, and implement, the IAEA Review.

- The Task Force has conducted 8 meetings since September 2021 to review submitted information and plan for on site missions, and other activities.
- Additional meetings are envisaged to occur approximately monthly throughout 2022 and early 2023.

Assessment of Protection and Safety

Assessment of Protection and Safety	• Review TEPCO's implementation plan and supporting documentation. • Focus on technical considerations such as source characterization, safety related aspects of the approach, occupational radiation exposure, radiological environmental impact assessment.
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Independent Sampling, Data Corroboration and Analysis	• Independent sampling and analysis to corroborate data from Japan. • Perform analysis of source term and environmental samples. • Corroborate monitoring results for occupational exposure.

Review Mission to TEPCO and METI

- Conducted over 7 working days involving an IAEA review team comprised of 15 members, including:
  - Gustavo Caruso, Chairman, Task Force
  - Abel Gonzalez, Argentina
  - Senlin Liu, China
  - Jean-Luc Lachaume, France
  - Hong Suk Kim, ROK
  - Sergey Shinkarev, Russia
  - Jo Nettleton, UK
  - Mike Boyd, USA
  - Nguyen Hao Quang, Viet Nam
  - Multiple IAEA experts

- Activities spread between Tokyo and FDNPS, including interviews with a wide range of technical experts and senior officials.

Review Mission to TEPCO and METI

- The IAEA Review Team looked at 8 different technical areas, organizing the relevant requirements contained in IAEA safety standards:
  - Crosscutting Requirements and Recommendations
  - Characterization of Discharge and Source Term
  - Safety Related Aspects of Systems and Processes for Controlling Discharges
  - Radiological Environmental Impact Assessment (REIA)
  - Regulatory Control and Authorization
  - Source and Environmental Monitoring Programmes
  - Involvement of Interested Parties
  - Occupational Radiation Protection

- Early results showed good cooperation from the GOJ, and the Task Force has identified some topics for continued dialogue and review moving forward.
- The mission report was released on April 29th, 2022.

Review Mission to TEPCO and METI

Main Observations and Outputs 1/2

The Task Force will continue assessing Japan's compliance with the IAEA Safety Requirements and will draw final conclusions at the end of the review process once all relevant information has been considered and a holistic assessment can be performed.

The Task Force achieved a more robust understanding of the key technical documents relevant to this review, such as the REIA and the revised Implementation Plan.

The Task Force identified several areas for further discussion and clarification:

- Characterization of the source term
- How optimization is being addressed
- Application of a dose constraint and discharge limits
- How abnormal events and external hazards, and their impacts, are considered.

The Task Force was able to witness the early design and preparations taking place at the FDNPS site, including the planned construction of the infrastructure needed for discharging the water.

Review Mission to TEPCO and METI

Main Observations and Outputs 2/2
The Task Force will continue to follow the development of Source and Environmental Monitoring Programmes and will take them into account for IAEA's independent sampling, data corroboration and analysis activities.
The Task Force noted the significant efforts made so far with the involvement of interested parties and the public, and will continue observing how interested parties will be involved moving forward.
The Task Force noted significant progress from the review mission and highlighted its satisfaction with the next steps identified by TEPCO, METI and the review team. The work is still in progress and the IAEA Task Force will continue its thorough review in order to be able to provide its conclusions.

Review of Regulatory Activities and Process

Assessment of Protection and Safety	• Review TEPCO's implementation plan and supporting documentation. • Focus on technical considerations such as source characterization, safety related aspects of the approach, occupational radiation exposure, radiological environmental impact assessment.
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Independent Sampling, Data Corroboration and Analysis	• Independent sampling and analysis to corroborate data from Japan. • Perform analysis of source term and environmental samples. • Corroborate monitoring results for occupational exposure.

Review Mission to NRA

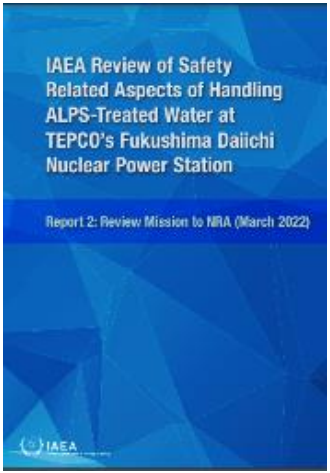
- Conducted over 6 working days involving an IAEA review team comprised of 16 members, including:
  - Gustavo Caruso, Chairman, Task Force
  - Abel Gonzalez, Argentina
  - Rick Tinker, Australia
  - Senlin Liu, China
  - Jean-Luc Lachaume, France
  - Hong Suk Kim, ROK
  - Sergey Shinkarev, Russia
  - Mike Boyd, USA
  - Nguyen Hao Quang, Viet Nam
  - Multiple IAEA experts

- Comprised of detailed discussions on a wide range of technical/ regulatory issues involving experts and senior officials from NRA.

Review Mission to NRA

- The IAEA Review Team looked at 5 different technical areas, organizing the relevant requirements contained in IAEA safety standards:

  - Responsibilities and Functions of the Government
  - Major Principles and Safety Objectives
  - Authorization Process
  - Source Monitoring and Environmental Monitoring
  - Public Consultation and Involvement of Interested Parties



- Early results showed good cooperation from the NRA and the Task Force observed a robust commitment to align the regulatory plans related to the treated water discharge with the IAEA safety standards.
- The mission report was released on June 16th, 2022.

Review Mission to NRA

Main Observations and Outputs 1/2

The Task Force confirmed that the NRA:

- Serves as the *independent regulatory body* within Japan
- Has promulgated and implemented an appropriate *legal and regulatory framework* for safety
- Holds the responsibility for *assessing the safety* of the proposed discharge of ALPS treated water.

The Task Force stressed the importance of fully *documenting* the process that the NRA is using to authorize the discharge of ALPS treated water. NRA will further develop its detailed approach and the criteria used within the regulatory review.

The Task Force noted the involvement of the NRA in Japan's current Comprehensive Radiation Monitoring Plan for environmental monitoring and specifically how this supports the requirement for independent monitoring by the regulatory body.

Review Mission to NRA

Main Observations and Outputs 2/2

The Task Force highlighted the importance of:

- Maintaining a strong *connection between* the characterization of the source term and the design of source and environmental monitoring programmes
- Linking the environmental monitoring programme to the results of the REIA
- Establishing and communicating a clearly defined plan for source monitoring.

The Task Force noted that the NRA is following an open and transparent approach for communicating with interested parties and recognizes that their main concern is the reputational damage caused by the discharge. As a result, societal acceptance constitutes an important factor in the optimization process.

The Task Force noted significant progress from the review mission and highlighted the cooperation with the NRA during the discussions. As the authorization process is still in progress, the Task Force will continue its thorough review.

Independent Sampling, Data Corroboration and Analysis

Assessment of Protection and Safety	• Review TEPCO's implementation plan and supporting documentation. • Focus on technical considerations such as source characterization, safety related aspects of the approach, occupational radiation exposure, radiological environmental impact assessment.
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Independent Sampling, Data Corroboration and Analysis

- In order to reinforce the independence of the IAEA's safety review, and to provide confidence in the accuracy of data provided by national authorities, additional sampling and monitoring will be included as a component of the IAEA's review.

- IAEA activities will corroborate more comprehensive Japanese sampling and monitoring programmes.
  - The purpose of the corroboration is not to perform exhaustive independent monitoring but rather to selectively analyze samples to then infer **confidence** in all the data reported by TEPCO and relevant Japanese authorities.

- While all elements of the IAEA review are important, this particular element remains one of the most visible and understandable elements to external stakeholders.
  - "Trust but verify"

Independent Sampling, Data Corroboration and Analysis

Under this component, the IAEA will look at three main technical aspects:

Sampling of source term material

(ALPS treated water prior to discharge)

Conducted on site at the FDNPS prior to dilution and discharge.

Environmental samples

(e.g., seawater)

Taken from outside FDNPS and in the surrounding sea, based on fixed sampling sites.

Occupational Radiation Exposure Data

Corroborate monitoring results

Independent Sampling, Data Corroboration and Analysis

IAEA and Third-Party Laboratories

- Multiple IAEA laboratories will provide support for this effort.
  - Isotope Hydrology Laboratory (Vienna, Austria)
  - Radiation Safety Technical Services Laboratory (Vienna, Austria)
  - IAEA Environment Laboratories, Terrestrial Environmental Laboratory (Seibersdorf, Austria)
  - IAEA Environment Laboratories, Radiometrics Laboratory (Monaco)

- IAEA laboratories will have the lead for conducting the analyses, reviewing the results, and for reporting on the findings.

- The IAEA will also include third-party laboratories as a confidence building measure and to enhance transparency for external stakeholders.
  - Third-party labs will be involved in the analysis through an inter-lab comparison (ILC), however results will be published by the IAEA only.

Independent Sampling, Data Corroboration and Analysis

Source and Environmental Monitoring

Implementation

The initial corroboration activities are taking place from the end of 2021 up to the end of 2022 in preparation for the first discharge that is currently planned to take place in 2023.

Samples for corroboration of **source monitoring** have been collected from the K4-B tank group at FDNPS in February and March 2022 by TEPCO, with observation from IAEA.

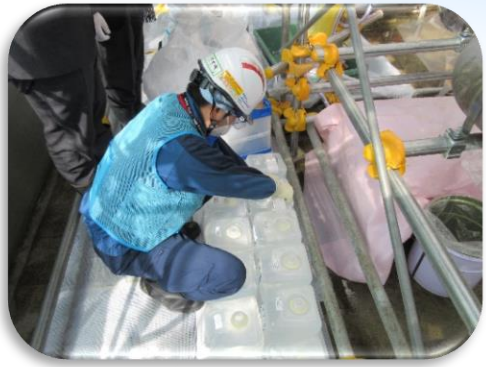
Further sampling for the purposes of both corroboration of **source and environmental** baseline monitoring is scheduled for the final third of 2022.

Ongoing corroboration of the continuing discharges from 2023 onwards **will be defined** at a later date.

Independent Sampling, Data Corroboration and Analysis

Recent Progress

2021 and 2022 have presented many challenges due to the global pandemic, however the Task Force and the IAEA still has ensured significant progress.



The IAEA has facilitated the sampling of ALPS treated water twice:

- In February 2022 to provide initial characterization and to validate the analysis techniques.
- In March 2022 to support the first formal ILC and analysis of ALPS treated water.
- Currently planning for an additional batch of ALPS treated water samples in 2022, as well as the first round of environmental sampling (to establish a baseline) later in 2022.

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Thank you