

IAEA activities relating to the discharge of ALPS treated water

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Report on the Fukushima Daiichi Accident





Report by the Director General



Technical Volume 1/5 Description and Context of the Accident



Technical Volume 2/5 Safety Assessment



Technical Volume 3/5 Emergency Preparedness and Response

Technical Volume 4/5 Radiological Consequences



Technical Volume 5/5 Post-accident Recovery







Q48-C5







Advanced Liquid Processing System (ALPS) and related systems





Key Aspects:

- April 2021 Government of Japan (GOJ) announced its Basic Policy for handling ALPS treated water stored at the FDNPS.
- GOJ requested that the IAEA conduct a detail review of the safety related aspects of ALPS treated water discharges, applying the relevant international safety standards.
- In compliance with its relevant IAEA statutory functions Article 3.A.6 of the IAEA Statute.
- IAEA's commitment to being involved <u>before, during, and after</u> the ALPS treated water discharges.
- As part of this approach, the IAEA will continue evaluate the consistency with the international standards and to corroborate and review data over the duration of the discharges.
- The IAEA has not endorsed or approved the Japanese water discharge approach. This is neither the IAEA's role nor the purpose of its ongoing safety review.



Background





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Discharge Facility









IAEA International Safety Standards

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IAEA Safety Standards

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IAEA has identified relevant standards for radioactive discharges to apply to this review

IAEA Safety Standards for protecting people and the environment	IAEA Safety Standards for protecting people and the environment		Radiation Protection of the Public and the Environment	Environmental and Source Monitoring for Purposes of Radiation Protection
Fundamental Safety Principles	Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards		General Safety Guide No. GSG-8	Safety Guide No. RS-G-1.8
Safety Fundamentals No. SF-1	General Safety Requirements Part 3 No. GSR Part 3	IAEA Safety Standards fer protecting people and the environment	IAEA Safety Standards	IAEA Safety Standards for protecting people and the environment
		Regulatory Control of Radioactive Discharges to the Environment	Prospective Radiological Environmental Impact Assessment for Facilities and Activities	Occupational Radiation Protection
		General Safety Guide No. GSG-9	General Safety Guide No. GSG-10	General Safety Guide No. GSG-7

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IAEA Safety Standards

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Task Force

The Task Force:11 internationally recognized experts from Member States,^E appointed by the Director General, **and** experts from the Secretariat in fields related

to the water discharge plan and monitoring.

IAEA serves as the Chair of the Task Force

Argentina Australia Canada China France Marshall Islands Republic of Korea Russia USA United Kingdom Viet Nam









Components of IAEA Review



Assessment of Protection and Safety Review TEPCO's implementation plan and supporting documents.
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.
- Analyze levels of radionuclides in samples taken for source and environmental monitoring.
- Corroborate capabilities for assessing occupational radiation exposure.

Technical Topical subjects:



- Characterization of the source term (the water being discharged).
- Safety related aspects of systems and processes for controlling discharges (i.e., the equipment and facilities being constructed).
- The radiological environmental impact assessment (REIA) conducted by TEPCO and included in the revised implementation plan approved by NRA.
- Source and environmental monitoring programmes being conducted by TEPCO and the Government of Japan.
- The involvement of interested parties.
- Occupational radiation protection related to the operation of the ALPS discharge equipment and facilities.



Regulatory Topical subjects:



- Responsibilities and functions of the Government
- Principles and safety objectives applicable in this safety case.
- The NRA's authorization process
- Reviewed of the radiological environmental impact assessment
- Regulatory requirements
- Source and environmental monitoring
- Involvement of interested parties in regulatory processes.

Review Missions and Reports – Before Discharge

- **Report 1** April 2022
 - Summarizes first mission to TEPCO/METI in February 2022.
- **Report 2** June 2022
 - Summarizes first mission to NRA in March 2022.
- Report 3 December 2022 ٠
 - Provides the status of the IAFA's corroboration activities
- Report 4 April 2023
 - Summarizes second mission to TEPCO/METI in November 2022.
- **Report 5** May 2023
 - Summarizes second mission to NRA in January 2023.



Report 1: Review Mission to TEPCO and METI (February 2022)

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IAEA Review of Safety Related Aspects of Handling ALPS-Treated Water at TEPCO's Fukushima Daiichi Nuclear Power Station

Report 2: Review Mission to NRA (March 2022)

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Report 3: Status of IAEA's Independent



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Report 4: Review Mission to TEPCO and METI (November 2022)

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Report 5: Review Mission to NRA (January 2023)

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IAEA Comprehensive Report – Before Release



Assessment of Consistency with the fundamental safety principles

- Assessment of Consistency with Safety Requirements
- □ Monitoring, Analysis, and Corroboration
- Future Activities

The Agency global conclusion:

"Based on its comprehensive assessment, 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 discharge of the ALPS treated water, as currently planned by Japan, will have a negligible radiological impact on people and the environment."

IAEA COMPREHENSIVE REPORT ON THE SAFETY REVIEW OF THE ALPS-TREATED WATER AT THE FUKUSHIMA DAIICHI NUCLEAR POWER STATION



Topical subjects:



- The discharge limit for tritium 22 TBq/y, equivalent to the pre-accident conditions
- The operational limit has been defined as **1,500 Bq/L** prevailing circumstances within the optimization process.
- Limit set by WHO in drinking water is 10,000 Bq/L.
- Dilution is not performed for the purposes of radiation protection and safety.
- Dose constraint **0.05 mSv/y** established by the Regulator (NRA)
- Important to note that in this situation the doses predicted in the environmental impact assessment are significantly low (1,000 times lower than dose constraint).
- The sum of the ratios of the concentration of each radionuclide to the regulatory concentration **less than 1**.

Topical subjects:



Results and Verification of Compliance with the international safety standards

Radiological Impact Assessment	International Safety Standards Criteria	Assessment results for representative person (adult) due to discharge of ALPS treated water
Radiological impact on hu- mans in normal operations	Dose limit for public 1 mSv / year	0.000002 - 0.00003 mSv/year
Radiological impact in case of potential exposure	Typically 5 mSv/event	0.0002 to 0.01 mSv/event

Radiological Impact Assessment on animals and plants in the sea	International Safety Standards	Assessment results
Flatfish	1-10 mGy/day	0.7 x 10 ⁻⁶ mGy/day
Crab	10-100 mGy/day	0.7 x 10 ⁻⁶ mGy/day
Brown seaweed	1-10 mGy/day	0.8 x 10 ⁻⁶ mGy/day





- People and the environment, present and future, must be protected against radiation risks.
- Ensure that the sum of all doses to which critical groups may be exposed at any time in the future is below established limits.
- It refers to the total radiation dose that an individual is expected to receive during lifetime to assess any long-term effects of radiation exposure.
- Dose commitment accounts for future radiation exposure resulting from an initial intake of radioactive material, particularly for long-term exposure scenarios.

Discharge Status



Fiscal Year 2023

Four batches discharged:

- □ 1st batch of 7,800 tons Aug-Sep 2023
- $\hfill 2^{nd}$ batch of 7,800 tons Oct 2023.
- □ 3rd batch of 7,800 tons Nov 2023.
- □ 4th batch of 7,800 tons Feb-March 2024 *Fiscal Year* **2024**

Seven batches are planned to be discharged.

- □ 5th batch of 7,800 tons April-May 2024.
- □ 6th batch of 7,800 tons May-June 2024
- □ 7th batch of 7,800 tons June-July 2024
- □ 8th batch of 7,800 tons August 2024
- □ 9th batch of 7,800 tons will start soon



IAEA confirmed tritium concentration of the discharged batches was far below the international safety standards and Japan's operational limit.



ACTIVE

TEPCO is currently discharging a batch of ALPS treated water. Details for this discharge can be found on TEPCO's webpage.





Review Missions to Japan after the Start of ALPS Treated Water Discharge

- Report 1: First Review Mission October 2023 (January 2024)
- Report 2: Second Review Mission April 2024 (July 2024)
- Next Mission: December 2024
 - Technical aspects
 - Regulatory aspects
 - Visits to the ALPS facilities processes and discharge activities

IAEA Review of Safety Related Aspects of Handling ALPS-Treated Water at TEPCO's Fukushima Daiichi Nuclear Power Station

Report 1: First Review Mission to Japan after the Start of ALPS Treated Water Discharge (October 2023)

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IAEA Review of Safety Related Aspects of Handling ALPS-Treated Water at TEPCO's Fukushima Daiichi Nuclear Power Station

Report on the Mission to Japan conducted in April 2024



Global conclusions from IAEA Missions after the start of ALPS treated water discharge:

- Task Force did not identify anything that is inconsistent with the requirements in the relevant international safety standards.
- Robust regulatory infrastructure is in place. Strong NRA On-site presence.
- Equipment and facilities are installed and operated consistent with the Implementation Plan and international safety standards.
- Optimization of radiological protection of the discharge.

Agency Independent Sampling, Measurement and Corroboration approach



- Isotope Hydrology Laboratory (Vienna, Austria)
- IAEA Environment Laboratories, Terrestrial Environmental Laboratory (Seibersdorf, Austria)
- IAEA Environment Laboratories, Radiometric Laboratory (Monaco)
- Third-party laboratories as a confidence building measure and to enhance transparency for external stakeholders.

IAEA Independent Sampling, Measurement and Corroboration

IAEA Interlaboratory Comparisons (ILCs):

Reviewed relevant sampling and analytical methods
 employed by TEPCO for source and environmental monitoring

Source monitoring (Tanks):

 Activity concentrations of 30 radionuclides in the ALPS treated water source to corroborate TEPCO's source monitoring data and verify that TEPCO's analytical methods and implementation. IAEA and ALMERA laboratories.

Environmental monitoring:

 Sampling, analysis and ILC for environmental monitoring. Activity concentrations of H3, C14, Sr90, I129 and gamma-emitting radionuclides in seawater, sediment, seaweed and fish samples from locations around FDNPS are measured and assessed to corroborate Japan's environmental monitoring. IAEA and ALMERA laboratories.





IAEA Independent Sampling, Measurement and Corroboration

- High level of accuracy in the measurements and technical competence.
- Sample collection procedures follow the appropriate methodological standards.
- Analytical methods for different radionuclides were appropriate and fit for purpose.
- The reported detection limits were less than 1% of regulatory limits for all radionuclides.





IAEA Review of Safety Related Aspects of Handling ALPS-Treated Water at TEPCO's Fukushima Daiichi Nuclear Power Station

First Interlaboratory Comparison on the Determination of Radionuclides in ALPS Treated Water

IAEA Review of Safety Related Aspects of Handling ALPS-Treated Water at TEPCO's Fukushima Daiichi Nuclear Power Station

First Interlaboratory Comparison on the Determination of Radionuclides in the Marine Environment IAEA Review of Safety Related Aspects of Handling ALPS-Treated Water at TEPCO's Fukushima Daiichi Nuclear Power Station

Second Interlaboratory Comparison on the Determination of Radionuclides in ALPS Treated Wate

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IAEA On-site Independent Verification – "Independent Tests"



- On-site source water tanks sampling and measurement.
 - IAEA sampling and corroboration measurements of each tank before discharge
- On-site diluted water sampling and measurement.
 - IAEA sampling and corroboration measurements of diluted water of each batch before and during discharge
- On-site Seawater sampling and measurement.
 - IAEA sampling and corroboration measurements of seawater in different locations during discharge







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





Monitoring locations for measurements to obtain results quickly (10 locations)
 Indicator (discharge suspension level): 700Bq/liter
 Analysis frequency: once a week → Every day for the time being







Occupational Corroboration data



Radiation Safety Technical Services Laboratory (Vienna, Austria)

- Proficiency testing independently demonstrating reliability and robustness of individual monitoring
 - Evaluation of laboratory performance for specific measurements
 - Identification of inconsistencies in results between laboratories
 - Establishment of effectiveness and comparability of analytical methods
 - Provision of additional confidence to interested parties
 - Validation of measurement uncertainties





Final Remarks:



- Since 2021 the IAEA has been conducted an independent, impartial, transparent and science-based safety review against the international safety standards. Our findings and conclusions were systematically shared in a timely manner.
- The IAEA review includes explanations and insights over a broad range of topics that are important to understanding the overall safety-related aspects of this process.
- The IAEA and Third Parties Laboratories will continue corroborating the Japanese data related to the ALPS treated water discharge.
- Until now Japan discharged approximately 64.500 tons of ALPS treated water in line with the International Safety Standards.
- The IAEA is maintaining continuous presence at the FDNPS to engage in independent tests, analysis and assessment activities during the discharges of ALPS treated water.
- The IAEA will continue working in this direction and will publish its safety reports on a regular basis. This
 approach will help build confidence to people in Japan and beyond.



Thank you

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