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Publication of a report on Second Interlaboratory Comparison on the Determination of Radionuclides in the Marine Environment

The International Atomic Energy Agency (IAEA) has been conducting Interlaboratory Comparison (ILC)^{*1} since 2022 to corroborate Sea Area Monitoring related to ALPS treated water, as part of its review of the safety related aspects of handling ALPS treated water stored at TEPCO's Fukushima Daiichi Nuclear Power Station (FDNPS). In this ILC, marine samples in the vicinity of the TEPCO's FDNPS are collected jointly with the IAEA and the Government of Japan (GOJ), the samples are analyzed individually by the IAEA and the Japanese analytical laboratories, and the IAEA assesses the comparison of the analytical results.

We announce that the IAEA has released a report on the results of the second ILC. The report summarizes the analytical results of the samples taken in October 2023, in which IAEA-designated ALMERA laboratory from Canada, China and the Republic of Korea also participated.

In the published report, the IAEA concluded that "Japan's sample collection procedures follow the appropriate methodological standards required to obtain representative samples. The accurate results obtained in this ILC demonstrate a high degree of proficiency on the part of the Japanese laboratories involved in the analyses of radionuclides in marine samples for environmental monitoring related to the discharges of ALPS treated water as part of the Government of Japan's CRMP".

For your information, the report on ILC (2023), which has been conducted since 2014 to assist the GOJ in ensuring Sea Area Monitoring related to the accident at TEPCO's FDNPS is credible and transparent, has already separately published by IAEA in December 2024.

- 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 the Marine Environment")

- ◆ Full report:

<https://www.iaea.org/sites/default/files/25/03/second-interlaboratory-comparison-on-the-determination-of-radionuclides-in-the-marine-environment-200325.pdf>

^{*1} Please refer to "Sea Area Monitoring Conducted within the Framework of the IAEA (Report)" (50th Nuclear Regulation Authority Meeting, December 18, 2024, Document 2).

*2 The ALMERA network (Analytical Laboratories for the Measurement of Environmental Radioactivity) is a network established in 1995 and comprising 20 member laboratories globally that is coordinated by the IAEA to maintain and develop capability on the determination of radionuclides in environmental samples.

*3 Statistical analysis showed that 84 out of 87 total data points (approximately 96%) were at a high level of confidence (99.7%). Please refer to report conclusion.

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(The following is quoted from the IAEA report.)

EXECUTIVE SUMMARY

In 2021, the IAEA started its review of safety related aspects of handling ALPS (Advanced Liquid Processing System) treated water at TEPCO's Fukushima Daiichi Nuclear Power Station (FDNPS). Consistent with the request from the Government of Japan, the IAEA statutory functions and the mandate of the Task Force, the scope of the IAEA review is tailored to assessing safety related aspects of the implementation of Japan's Basic Policy on Handling of ALPS Treated Water at the Tokyo Electric Power Company's Holdings' Fukushima Daiichi Nuclear Power Station against the IAEA's Safety Standards. The approach outlined in the Basic Policy is to conduct a series of controlled discharges of ALPS treated water into the sea ('batch discharges') over a period of decades.

Consistent with the relevant IAEA's Safety Standards, TEPCO is required to determine the characteristics and activity of the ALPS treated water (e.g., through the radiological environmental impact assessment) to be discharged into the sea, and to establish and implement monitoring programmes to ensure that public exposure due to the discharges is adequately assessed and that the assessment is sufficient to verify and demonstrate compliance with the authorization granted by the Nuclear Regulation Authority (NRA).

To conduct its safety review, the IAEA has organized the work of the Task Force into three main components, the assessment of protection and safety; regulatory activities and processes; and sampling, independent analysis and data corroboration. The latter activities include three elements:

- Sampling, analysis and interlaboratory comparison for ALPS treated water from the FDNPS.
- Sampling, analysis and interlaboratory comparison for environmental samples (e.g., seawater, fish) from the surrounding environment of FDNPS.
- Assessment of the capabilities of dosimetry service providers involved in the monitoring of internal and external radiation exposure of workers at FDNPS.

The IAEA's sampling, independent analysis and data corroboration activities also include a review of sampling and analytical methods used by TEPCO and any other relevant technical institutions.

The corroboration of source and environmental monitoring conducted by TEPCO and relevant Japanese authorities is based on interlaboratory comparisons (ILCs). ILCs, along with proficiency tests (PTs), are standard methods for laboratories to assess the quality of their measurement results in comparison with those of other participating laboratories, and to identify any potential improvements. PTs involve the evaluation of performance against pre-established criteria whereas ILCs involve the organization, performance, and evaluation of measurements on the same or similar items by two or more laboratories in accordance with predetermined conditions.

For this second ILC to corroborate the results of environmental monitoring under the IAEA's ALPS safety review, samples of seawater, sediment, fish and seaweed were taken in October 2023 from offshore locations and a fish market close to FDNPS.

Extensive monitoring of the marine environment around the FDNPS is conducted according to the

Comprehensive Radiation Monitoring Plan (CRMP). TEPCO and other relevant Japanese authorities including the NRA, the Ministry of the Environment (MOE), and the Japan Fisheries Agency (FAJ), have responsibilities under the CRMP. Enhancements to the CRMP to specifically address the discharge of ALPS treated water were introduced in March 2022. As this ILC is based on samples collected in October 2023; it constitutes the first corroboration by the IAEA of the results of this monitoring since the discharges started in August 2023.

This publication reports the results of the second ILC. It describes the joint sampling mission undertaken to collect seawater, sediment, fish and seaweed samples; the analytical techniques used by participating laboratories – from Japan (participating on behalf of the Japanese authorities); the IAEA and third -party member laboratories of the IAEA ALMERA network (Analytical Laboratories for the Measurement of Environmental Radioactivity)¹; the measurement results and the statistical evaluation of the results. In total, ten laboratories undertook analyses and reported results for the ILC. Analyses were undertaken by Japanese laboratories participating in marine monitoring relevant to the ALPS treated water discharges within the CRMP and by the following two IAEA Nuclear Sciences and Applications Laboratories:

- IAEA Marine Environment Laboratories, Radiometrics Laboratory (RML), Monaco,
- Isotope Hydrology Laboratory (IHL), Vienna, Austria.

Additionally, under the coordination of the participating IAEA laboratories, selected third-party laboratories – a consortium of Canadian laboratories, including Canadian Nuclear Laboratories (CNL), Canadian Nuclear Safety Commission (CNSC), and the University of Ottawa (OttawaU), led by the Radiation Protection Bureau (RPB) of Health Canada; Third Institute of Oceanography, Ministry of Natural Resources, China; and the Korea Institute of Nuclear Safety (KINS), Republic of Korea – all members of the network of Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA) with demonstrable competence in the methods required, also conducted analyses of samples as ILC participants.

The results of the analyses undertaken at each laboratory were reported to the IAEA. For results that could be intercompared (i.e. for radionuclides for which activity concentrations above detection limits were reported by at least two laboratories) a statistical evaluation to assess agreement was carried out by the IAEA. The results are presented in tables and charts in this report.

Although some discrepancies were found, the low number was impressive since the analytical methods are often complex (e.g. for OBT, TFWT and ¹⁴C in fish) and relatively new to some participating laboratories, being implemented specifically to assess the ALPS treated water discharges. It can be noted that higher uncertainties are usually associated with complex analyses of low, and close to detection limit, levels. There were no order of magnitude variations, and no systemic deviations identified between the results reported by

¹More information on the ALMERA network is available from the following website:

<https://nucleus.iaea.org/sites/ReferenceMaterials/Pages/ALMERA.aspx>

Japanese laboratories and those reported by the IAEA and the ALMERA member laboratory. Therefore, despite the discrepancies, the key findings of this ILC are:

- Sample collection procedures follow the appropriate methodological standards required to obtain representative samples.
- Japanese laboratories have reported accurate results that demonstrate a high degree of proficiency.

The IAEA notes that these findings provide confidence in Japan's capability for conducting reliable and high-quality monitoring related to the discharge of ALPS treated water.

Additional ILCs will be conducted in the future for ALPS treated water and environmental samples, as well as occupational radiation protection. Future ILCs will continue to allow for an assessment of Japan's capability to evaluate any changes in the levels of relevant radionuclides in the marine environment, relative to the baseline.

Furthermore, the corroboration of environmental monitoring complements a separate project – NA3/38 Marine Monitoring: Confidence Building and Data Quality Assurance – addressing the quality of data from marine monitoring undertaken in Japan following the accident at FDNPS. Through project NA3/38, which has been implemented since 2014, the IAEA is assisting the Government of Japan in ensuring that sea area monitoring carried out under the regularly updated CRMP is comprehensive, credible and transparent and is helping to build confidence of the stakeholders in the accuracy and quality of the marine monitoring data. Within project NA3/38, the IAEA has organized a series of ILCs and PTs to test the sampling and analytical performance of the Japanese laboratories for the analysis of radionuclides in seawater, sediment and fish samples. Data from this project are available online².

² <https://www.iaea.org/about/organizational-structure/department-of-nuclear-sciences-and-applications/division-of-iaea-marine-environment-laboratories/marine-monitoring-confidence-building-and-data-quality-assurance>