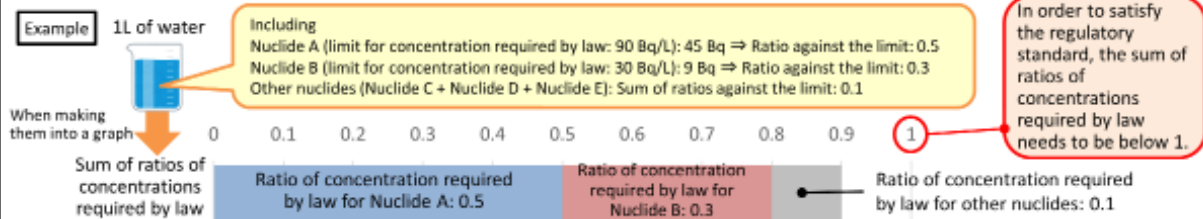


- Whether the regulatory standard is satisfied or not is evaluated based on the sum of radiation effects caused by all types of contained nuclides, irrespective of whether the reactor is an operating one or a damaged one (evaluations are based on the sum of the values converted to the effects on human beings, not simply based on types or amounts of nuclides).
- Contaminated water at TEPCO's Fukushima Daiichi NPS contains radioactive nuclides unique to the broken-down reactors (such as cesium and strontium), but these are surely removed to levels below the regulatory standards by the use of the Advanced Liquid Processing System (ALPS) and other equipment.

< Concept of the sum of ratios of concentrations required by law, the regulatory standard for discharge into the environment of radioactive materials >



[Reference] Results of the performance test regarding re-purification by the use of ALPS and other equipment (sum of ratios of concentrations required by law and ratios against the limits for major nuclides)

	Cobalt 60	Cesium 137	Strontium90	Iodine 129	Other nuclides	Sum for nuclides other than tritium (sum of ratios of concentrations required by law)
Ratio against the limit for concentration required by law	0.0017	0.0021	0.0012	0.13	0.215	0.35

Dilution by more than 100 times so that the sum of the ratios of concentrations required by law for all radioactive materials including tritium becomes less than 1

(Source) Prepared based on "First priority is given to safety and security; Measures related to contaminated water in Fukushima (IV): Regulatory standards for radioactive materials" (<https://www.enecho.meti.go.jp/about/special/johoteikyo/osensuitaisaku04.html>) [in Japanese] and "Safe and secured disposal of treated water for reconstruction and decommissioning (I): Secondary treatment and other nuclides contained in treated water" (<https://www.enecho.meti.go.jp/about/special/johoteikyo/shorisui02.html>) [in Japanese] by the Agency for Natural Resources and Energy, and "Performance test regarding secondary treatment of ALPS treated water" by Tokyo Electric Power Company Holdings



Regulatory standards for radioactive materials contained in liquid and gaseous waste that are discharged into the environment from nuclear power stations, etc. in Japan are set on the basis that an annual public exposure dose additionally caused by discharged radioactive materials (effects on human bodies) will not exceed 1 mSv, according to the recommendations of the International Commission on Radiological Protection (ICRP). More specifically, the maximum concentration for a radioactive material is set so that, supposing that a person continues to drink 2L of water containing that type of radioactive material every day from birth until becoming 70 years old, the resulting dose rate becomes 1 mSv per year on average. The limit thus set for each radioactive material is called the "limit for concentration required by law."

Generally, liquid and gaseous waste discharged from a nuclear power station, etc. contains multiple radionuclides. Therefore, when effects of multiple radionuclides are supposed, the concept of *the sum of ratios of concentrations required by law* as described in Ministerial Notice is adopted in comprehensive consideration of the effects of all radionuclides contained in the waste. Concentration levels are regulated so that the sum does not exceed 1.

When disposing of ALPS treated water, whether *the sum of ratios of concentrations required by law* thus obtained is below 1 is to be checked in the same manner as for other nuclear power stations, etc. currently under operation. At Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS, treatment using ALPS and other equipment is conducted to reduce concentrations of radioactive materials other than tritium, including those unique to the damaged reactors (such as cesium and strontium), so that their concentrations do not exceed the regulatory standards. ALPS treated water which started to be discharged on August 24, 2023, revealed that *the sum of ratios of concentrations required by law* for nuclides other than tritium was 0.28.

Also with regard to tritium, which is difficult to remove by ALPS or other equipment, dilution for reducing its concentration (by 100 times or more with sea water) is conducted in order to ensure that the sum of ratios of concentrations required by law for all radioactive materials, including tritium, remains below 1. Through the dilution, concentrations of nuclides contained in ALPS treated water other than tritium, which are already reduced to below their regulatory standards, are also reduced by 100 times or more and safety can be further ensured.

Annual radiation effects when discharging ALPS treated water into the sea after dilution were assessed to be approx. 1/1,000,000 to approx. 1/70,000 of the exposure doses (2.1 mSv/y) of Japanese people from natural radiation (assessment results as of February 2023). (Related to p.18 of Vol. 2, "Assessment of the Radiological Impact of Discharge of ALPS Treated Water into the Sea")

Included in this reference material on March 31, 2022
 Updated on March 31, 2023