Radioactive waste disposal in Japan, especially focused on geological disposal of high-level radioactive waste

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Disposal of radioactive waste is one of the important issues for peaceful utilization of nuclear power. Trench and pit disposals have been performed for low- and intermediate-level radioactive waste in many countries: however, progress on geological disposal program varies from country to country.

In Japan, there are four principles of the treatment and disposal of radioactive waste: 1) the liability of generators, 2) minimization of radioactive waste, 3) rational treatment and disposal, and 4) implementation based on mutual understanding with the people. Under these principles, it is important to make appropriate classifications of the wastes and treat and dispose of them safely for each classification based on the recognition that the wastes may include materials with characteristics that take an extraordinary long time for the radioactivity to drop to insignificant levels (Japan Atomic Energy Commission, 2015).

Radioactive wastes generated by nuclear power are generally classified into low-level waste (LLW) and high-level waste (HLW), based on its origin and level of radioactivity in Japan. HLW is produced through the reprocessing spent fuel, and the others are classified as LLW. Disposal method is selected from the following four methods according to waste properties and radioactivity levels etc.; sub-surface trench, sub-surface pit, mid-depth underground and deep geological disposals.

A disposal business has already been established for most of the LLW generated at nuclear power plants. While the selection of a high-level waste repository site will be undertaken via a three-stage process based on the “Final Disposal Act”. The site selection procedure specified in the Final Disposal Act consists of three steps; literature survey, preliminary investigations and detailed investigations. Literature survey has actually been initiated in two municipalities of the northern part of Japan.

Geoscientifically, Japan is located on plate-boundary and affected by intense geological phenomena such as volcanic and fault activities, and erosion. A LLW disposal facility is regulated to locate in an area without influence of earthquake, tsunami and volcano (Sema, 2020). As for the mid-depth disposal, a repository should be located in an area without influence of volcanic activity, faulting and erosion for at least 100,000 years.

Since HLW will last higher radioactivity than natural uranium ore in the order of 100,000 years, it is necessary to consider longer time safety. In Japan, the Nationwide Map of “Scientific Features” relevant for Geological Disposal” was published. The map shows nation-wide distribution of unfavorable and preferable geoscientific features.

In this presentation, the speaker will introduce outline of radioactive waste disposal in Japan and geoscientific features preferable for HLW disposal.

Reference

Japan Atomic Energy Commission (2015) Framework for Nuclear Energy Policy

http://www.aec.go.jp/jicst/NC/tyoki/taikou/kettei/eng_ver.pdf

Sema (2020) Journal of Nuclear Fuel Cycle and Environment, vol.27, pp.40-42.

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