

A Review on the Status of the Decommissioning Waste Recycling System in the World



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1. Introduction

A large amount of radioactive wastes are generated during the decommissioning of the nuclear power plant. A large part of the generated decommissioning wastes has a very low-contaminated level of radioactivity. In order to manage these effectively, the recycling of these wastes are necessary, so that it is important to develop domestic recycling scenarios for the effective waste management. Accordingly, for the development of domestic recycling scenarios, the overseas waste recycling system and status were surveyed, and its implications were considered. This will provide the necessary data for the development of a domestic decommissioning waste recycling scenario.

2. Overseas status of the clearance system

- When operating or dismantling a nuclear power plant, it is inevitably required to treat radioactive waste, and its clearance levels vary from country to country. Korea has similarly defined the radioactive waste classification system with the same of IAEA, in the NSSC Notice 2020-6 "Regulations on the Classification of Radioactive Wastes and the Self-Disposal Standards". The current status and cases of self-disposal regulations are introduced in various countries in the world.

2.1 The United Kingdom

- Surface contamination standards are evaluated on a case-by-case basis, and volume contamination standards are 0.4 Bq/g for artificial nuclides and 0.37 to 11.1 Bq/g for natural radionuclides depending on the element.
- Currently, we are deregulating based on 10 $\mu\text{Sv}/\text{y}$, a small amount of very low level waste must have a total radioactivity of less than 400 kBq per 0.1 m^3 or a total activity of less than 40 kBq (H-3 and C-14 are 10 times this limit), and a large amount of ultra-low-level waste must have a total radioactivity concentration of less than 4 MBq/ton(4 Bq/g) (H-3 is 10 times this limit).

2.2 Belgium

- Radioactive wastes exceeding the level of natural radiation are regulated in accordance with separate provisions of the Act, and there is no general deregulation level applied to solid wastes.
- Meanwhile, recently, surface and volume contamination standards are partially allowed to be deregulated by each case

2.3 Germany

- very low-level waste is not considered radioactive waste. Germany has limited and unlimited releases.
- According to the recommendation of the Radiation Protection Agency (SSK), the surface and volume contamination standards have nuclide-specific standards based on the individual dose standards (10 $\mu\text{Sv}/\text{y}$) and are permitted to deregulate.

2.4 The United States

- After withdrawing the BRC policy statement, the U.S. NRC resumed research to derive deregulation standards from 1994 and published NUREG-1640 in 1999 to present deregulation concentration standards.
- the American Society of Health Physics published the Industrial Technology Standards ANSI/HPS-N13.12 (1999) on pre-screening standards for deregulation, but it has not yet been applied in practice because regulators have not adopted the standards

2.5 japan

- The surface contamination standard is converted from the surface contamination density to the concentration level of radioactive nuclide, which is 10 μSv per year due to the human body contamination standard is based on the concentration level of radioactive nuclide.
- clearance system: A system was introduced to verify the risk of wastes containing very small amounts of radioactive materials at very low-levels through certain procedures and licensed methods, and then to treat them equally with general wastes through deregulation.

2.6 France

- France does not operate a waste clearance system, and waste generated from radioactive waste areas is classified as very low-level waste

3. Conclusion

- In order to revitalize clearance in Korea, it is necessary to supplement current clearance related systems and regulations.
- First, considering the characteristics of the dismantling waste in the current notice of in-house disposal, it is recommended that the concentration of in-house disposal based on surface contamination should also be presented as in overseas countries. Second, the related notifications and guidelines stipulate the radioactivity concentration of each nuclear species by recycling scenario of metal and concrete waste that is expected to be mass generated and recycled. Third, it is necessary to establish standards for residual radioactivity measurement methods considering the characteristics of wastes to enhance the convenience of operators.
- In Korea, it is necessary to actively respond to the recycling plan of self-disposable waste or very low-level waste in connection with the overseas self-disposal system and current status.