

Investigation of Legal and Regulatory Frameworks of Waste Management System for Very Low Level Waste

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1. Introduction

The Korean government determined permanent shutdown of Kori 1 unit in 2017. As a result of decommissioning, large amounts of decommissioning waste will be generated. The proportions of the wastes by waste categorization were reported to be 4.2% for intermediate level waste (ILW), 28.7% for low level waste (LLW), and 67.1% for very low level waste (VLLW) [1]. The half of VLLW is estimated to be clearance waste after the delay and decay process.

Article 6 and 9 of Radioactive Waste Control Act in Korea require management for transport, storage, processing, and disposal of radioactive waste. Consequently, the government should consider a countermeasure for transport, packaging, and acceptance criteria of radioactive waste. Due to high generation volume of VLLW resulting from nuclear power plant (NPP) decommissioning, waste management system for VLLW is necessary. However, there is no such waste management system for NPP decommissioning in Korea.

Final objective of this study is to develop a waste management system. As a beginning step for the objective, we investigated legal and regulatory framework of waste management system for VLLW.

2. Radioactive Waste Management System

To manage radioactive waste, cooperation of at least 3 organizations is required. They include NPP licensee, radioactive waste disposal agency, and the government.

General radioactive waste management system is given in Fig. 1 [2]. If decommissioning wastes are generated to NPP licensee, the wastes are classified by generation and classification of the radioactive wastes (See Fig. 2). The classified wastes are processed based on the radioactive waste properties. For example, combustibility radioactive waste may be processed by incineration. After treatment, waste is inserted in a container. It is radioactive waste management system for NPP licensee.

Packaged waste is inspected by legal and regulatory requirements of transport, packaging, and disposal. Legal and regulatory requirements are documented by the national acts. The government provides legal and regulatory requirements for transport, packaging, and disposal of the radioactive wastes. It is radioactive waste management system for the government.

Moving to disposal site, waste is stored and disposed following radioactive and non-radioactive characteristics. It is radioactive waste management system for radioactive waste disposal agency.

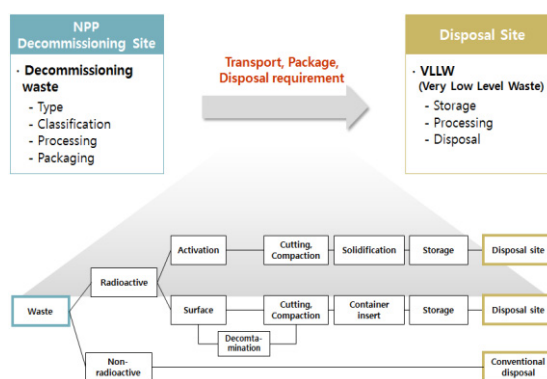


Fig. 1. Radioactive waste management system.

<IAEA>	<UK>	<Korea>
High Level Waste	High Level Waste	High Level Waste
Intermediate Level Waste	Intermediate Level Waste	Intermediate Level Waste
Low Level Waste	Low Level Waste	Low Level Waste
Very Low Level Waste	Very Low Level Waste	Very Low Level Waste
Very Short Level Waste		Exempt Waste
Exempt Waste		

Fig. 2. Radioactive waste classification of IAEA, UK, and Korea.

3. Legal and Regulatory Frameworks of Radioactive Waste Management System

In this study, we investigated legal and regulatory frameworks of waste management system for VLLW of IAEA and UK.

3.1 IAEA

3.1.1 Transport and storage criteria. Waste packages are designed and fabricated to have sufficient mechanical strength to bear loads and to comply with following requirements for waste handling, stacking, transport and storage.

- Weight, volume or dimension limits
- Stress and corrosion resistance
- Mechanical properties etc.

3.1.2 Waste Acceptance criteria. Waste acceptance requirements are qualitative or quantitative criteria to safely storage or disposal. General requirement are initially defined (1) national radioactive waste disposal policy, (2) general information on the type and quantities of waste package, (3) the availability or certain sites. General radiological criteria are established in national regulations. Dose rate restrictions can be achieved when using standard package and waste containers by limiting the activity of certain radionuclides. Non-radiological criteria are based on chemical or biological hazards. For example, explosives or products capable of strong exothermic reactions should be limited.

3.2 UK

3.2.1 Transport and storage criteria. The acceptable range of waste packaging for disposal includes 210 L drum and soft-side packaging. The acceptable range of waste transport include 1/3 height, 2/3 height and full height ISO container. Radiation level on the waste package shall be controlled to less than 5 $\mu\text{Sv/h}$ at contact and less than 2.5 $\mu\text{Sv/h}$ at a distance of 1 meter.

3.2.2 Waste Acceptance criteria. Radioactivity limit for disposal is given Table 1. Most of radionuclide shall be as low as 4 MBq/ton and tritium as low as 40 MBq/ton. In case of metallic waste, radionuclide concentration shall be as low as 200 MBq/ton. External non-fixed contamination levels shall be not more than 0.4 Bq/cm² for all alpha-emitting radionuclide and 4 Bq/cm² for all other radionuclides averaged over an area of 300 cm².

For physical and chemical properties, waste shall not contain reactive metal, explosive materials, corrosive materials, liquid with flashpoint less than

21 °C, strong oxidizing agents etc. Therefore, chemical materials affecting human and environment shall not be contained. In addition, surface of package shall not be contaminated chemically [3].

Table 1. The radioactivity limit for disposal in the UK

Radionuclide	Specific Activity (MBq/ton)	
	Acceptable	Likely to be Accepted
All	< 4	< 200
Tritium	< 40	< 200

4. Conclusion

We investigated legal and regulatory frameworks of waste management system for VLLW of IAEA, UK. Suggested comprehensive information are given in the literature. In addition, detailed numeric values are provided for transport, package, and disposal. Based on this information, we will develop a waste management system for NPP decommissioning. It will contribute the establishment of overall management system in accordance with the characteristics of decommissioning wastes.

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