

Analysis on US NRC Regulatory Position for Blending Radioactive Waste

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1. Introduction

South Korea didn't have any regulatory requirements related with permission or prohibition about blending radioactive waste for reducing radioactive waste level. Recently, radioactive waste generators asked regulatory positions about blending. Therefore, this paper discussed and identified the main considerations for making technical guidelines through analyzing the Concentration Averaging and Encapsulation Branch Technical Position of US NRC.

2. US NRC Position for Blending Low-level Radioactive Waste

2.1 Background

The US NRC(United States Nuclear Regulatory Commission) reviewed blending about mixing wastes of different concentrations to create a product with more uniform radionuclide concentrations. The different concentrations wastes mean high concentration LLW(Low Level radioactive Waste) and low concentration LLW. The blending was conducting for several reasons;

- 1) The integration of radioactive waste which is generated from a variety of sources in a NPP(Nuclear Power Plant) for operational efficiency
- 2) Reducing radiation exposure dose of radiation workers

- 3) To make lower waste class by averaging radioactive concentration.

Similarly, the blending in South Korea may be needed because lots of LLW and ILW(Intermediate Level radioactive Waste) were generating from same waste stream.

2.2 Blending policy

SECY-10-0043 report provided a variety options about blending policy. In those options, US NRC selected Risk-informed and Performance-based. In the two options, the regulatory agency position was based on the public health, safety, security and environmental protection. The main performance indicator was safe disposal of blended waste and additional details were considered;

- 1) Safely managing radioactive waste from human intrusion based on the 10 CFR 61.42
- 2) In accordance with 10 CFR 61.42, ensuring public protection with site-specific performance analysis
- 3) Clarifying the regulatory position to all operators including radioactive waste generator

Therefore, regulatory staffs in South Korea need to consider similar principles as above.

3. Technical Basis for Blending Low-level Radioactive Waste of US NRC

The US NRC allowed blending after conducting a review for the mixed waste in 2010. In the CA BTP (Concentration Averaging and Encapsulation Branch Technical Position, Rev1, the technical basis for blending was explained. The NRC staff evaluated results of intrusion into blendable waste using “Exposed Cuttings Scenario”. In the exposed cuttings scenario, intrusion occurred at 100, 300 and 500 years after site closure for Class A, B and C, respectively. In addition, a variety detail exposure pathways (direct exposure from cuttings, vegetable/grain/fruit consumption from gardening and etc.) were considered. The most effective radionuclides for Class A and B waste were Cs-137. In case of Class C, the main radionuclides were C-14, Pu-241 and Am-241. Through these results, the revised CA BTP Table 1 values were calculated as below.

Table 1. Thresholds for demonstrating adequate blending [1]

Characteristics of Most Concentrated Influent Waste Stream	Volume of Mixture in m ³ (ft ³)		
	Class A Mixture	Class B Mixture	Class C Mixture
Sum of fractions less than 10	No limit	No limit	No limit
Sum of fractions less than 10 and 20	No limit	No limit	50(1800)
Sum of fractions less than 20 and 30	60(2100)	No limit	20(700)
Sum of fractions less than 30 and 50	20(700)	No limit	6(210)
Sum of fractions less than 50 and 100	6(210)	40(1400)	2(70)

4. Conclusion

Currently, there is no certain regulatory requirements about blending radioactive waste in

South Korea. Therefore, blending can only be permitted if pre-disposal management is properly conducted and proved justification of blending. Based on the US NRC’s CA BTP, the specific blending technical guidelines of South Korea will be developed.

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