

Reprocessing Waste Issues

Implementation of spent nuclear fuel reprocessing in the US will likely require changes in the current regulatory framework for the management of domestic nuclear waste. Although reprocessing has the potential to significantly reduce the domestic inventory of spent nuclear fuel, the processes and methods used in these facilities may generate waste streams that could be different, both in types and amounts, than those currently generated by existing US nuclear facilities. Accordingly, NRC is evaluating the current waste management regulatory framework to determine if revisions to existing nuclear waste regulations are necessary.

REGULATORY GAPS DISCUSSED IN THIS SECTION:

- ✓ Gap 2 – Independent Storage of High-Level Waste
- ✓ Gap 3 - Waste Incidental to Reprocessing
- ✓ Gap 16 – Waste Classification

NRC REGULATIONS FOR WASTE MANAGEMENT

Radioactive wastes are the remnants from the use of nuclear materials in nuclear reactors, nuclear fuel cycle facilities, and other uses, including medical and industrial applications. Certain types of radioactive wastes are subject to regulatory oversight by the NRC or State agencies.

NRC regulations classify radioactive waste among the following categories:

- **Low-level waste (LLW)** – the lowest of NRC’s waste categories. Low-level waste can be further classified as Class A, Class B, or Class C waste.
- **Greater than Class C waste** - waste that exceeds the limits of Class C low-level waste specified in NRC regulations.
- **High-level waste** – consists of highly radioactive spent nuclear fuel, and other radioactive waste materials remaining after reprocessing of spent nuclear fuel.

Low-Level Waste

Most LLW consist of lightly contaminated equipment protective clothing, tools, filters, rags, medical tubes, and others. NRC regulations establish a waste classification

system for LLW based on its potential hazards, and specifies disposal and waste form requirements for each of the general classes of waste. Class A waste is the least radioactive and Class C is the most radioactive; approximately 95% of LLW is Class A. For disposal, LLW is typically placed in containers and disposed in landfill-like facilities specifically authorized for this purpose. The disposal depth and degree of isolation generally required for LLW increases with the radioactivity of the waste. Class A waste requires shallower depths, whereas Class B and C are buried progressively deeper, with stricter isolation requirements. Class C wastes also require an engineered intruder barrier.

Greater than Class C Waste (GTCC)

Waste that exceeds the limits of Class C waste is classified as GTCC. Most GTCC waste consists of sealed sources, activated metal wastes from reactor internal components, and other waste containing transuranic elements. Federal Law assigned the Department of Energy (DOE) the

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responsibility for disposal of GTCC. Currently, there is no facility for the permanent disposal of GTCC.

High-Level Waste

High-level wastes take one of two forms: spent nuclear fuel, and reprocessing wastes. Reprocessing wastes consist of the liquid and solid waste byproducts (containing significant concentrations of fission products and transuranic isotopes) that remain after spent fuel is reprocessed. High-level waste contains longer-lived radionuclides that require isolation for hundreds to thousands of years. In accordance with current Federal law, high-level waste must be permanently disposed in a deep geologic repository.

Until a repository is available, spent nuclear fuel is safely stored at nuclear reactor sites, or in NRC-licensed independent storage facilities. Spent fuel is stored in either storage pools (wet storage), or dry storage casks. Both storage methods are safe and ensure that spent fuel will be protected until a repository is available for permanent disposal.

INDEPENDENT STORAGE OF REPROCESSING HIGH-LEVEL WASTE

NRC regulations in 10 CFR Part 72 establish the requirements for the independent storage of spent nuclear fuel and high-level waste. The storage of high-level waste is only authorized in a

monitored retrievable storage (MRS) facility, which can only be operated by DOE. Currently, NRC regulations do not allow independent storage of commercially reprocessed waste. However, in the absence of a geologic repository, any future commercial reprocessing facility will need interim storage capacity for reprocessing wastes. The NRC will consider options for authorizing the safe interim storage of commercial waste from reprocessing facilities, including the option of onsite storage at the reprocessing facility, or at a commercial independent storage facility.

WASTE INCIDENTAL TO REPROCESSING

Reprocessing operations create certain waste streams for which NRC currently does not have definitions, and therefore, no applicable requirements for their safe handling and disposal. The NRC identifies these waste streams as incidental to reprocessing. Examples of incidental wastes include tank residues, chopped and leached fuel hulls, and irradiated fuel hardware, among others. However, in the past, some of

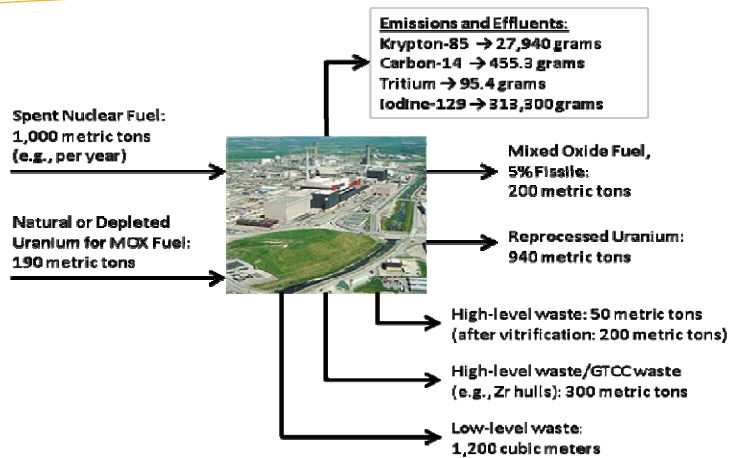


Figure 1: Approximate material balances for a 1,000 metric ton reprocessing facility, using modern PUREX technology (Source: ACNW&M, 179th Meeting, May 16, 2007)

the performance objectives found in NRC LLW regulations have been used to evaluate DOE wastes, consistent with Congressional direction. The NRC will rely on this experience to consider similar criteria that are applicable to commercial reprocessing wastes.

WASTE CLASSIFICATION

NRC LLW classification tables in 10 CFR 61.55 include many radionuclides that would be present in commercial reprocessing waste streams. Based on these tables, NRC regulations establish specific disposal requirements for these radionuclides. However, the types and quantities of these radionuclides in some reprocessing waste streams may be too large, and the type of disposal required by current regulation may not be sufficient. The NRC will consider if additional restrictions on its disposal may be necessary to ensure adequate protection of public health and safety.