**Abstract.** This paper presents an overview of the current U.S. policy, strategy, and framework for the disposal and management of commercial waste. The paper describes the framework both for low-level radioactive waste (LLRW), including the U.S. Nuclear Regulatory Commission (NRC)’s partial delegation of regulatory authority to the Agreement States, and for high-level radioactive waste (HLW), for which authority is retained by the Federal government. This paper also discusses a Programmatic Assessment of the NRC’s LLRW regulatory program through which the NRC staff developed a list of high priorities for the LLRW Program. Finally, this paper mentions NRC’s responsibilities for licensing (1) independent spent fuel management facilities for HLW storage and (2) U.S. Department of Energy facilities for the disposal of HLW and spent fuel.

**Key Words:** Low-level radioactive waste, Strategic Assessment, High-level radioactive waste

1. **Introduction**


In response to Commission direction, the NRC is amending 10 CFR Part 61 to require new site-specific technical analyses and to permit the development of site-specific criteria for LLRW acceptance based on the results of these analyses. These amendments ensure that LLRW streams that are significantly different from those considered during the development of the original regulations (i.e., depleted uranium and other unanalyzed waste streams) meet the 10 CFR Part performance objectives for land disposal of LLRW.

Also, in 2007, the NRC conducted a strategic assessment of the LLRW regulatory program. Based on extensive stakeholder input during meetings, the NRC developed a prioritized list of 20 tasks responsive to identified programmatic needs. The NRC published the strategic assessment in late 2007 in SECY-07-0180, “Strategic Assessment of Low-Level Radioactive Waste Regulatory Program” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML071350291).

The NRC has completed several high priority tasks identified in the 2007 assessment, and in 2014, began an updated assessment (now called a programmatic assessment). The objective of this updated assessment is to analyze the progress of the regulatory program from 2007, identify new challenges, and optimize resources going forward.

Finally, the NRC is also responsible for licensing independent spent fuel management facilities and U.S. Department of Energy (DOE) facilities for the disposal of HLW and spent fuel. NRC
regulations for storage and disposal of HLW and spent fuel reside primarily at 10 CFR Parts 50, 60, 63, and 72.

2. Summary of Framework

Section 274 of the Atomic Energy Act of 1954, as amended, provides a statutory basis under which NRC relinquishes to the States portions of its regulatory authority to license and regulate byproduct materials (radioisotopes); source materials (uranium and thorium); and certain quantities of special nuclear materials. LLRW disposal occurs at commercially operated LLRW disposal facilities that must be licensed by either the NRC under 10 CFR Part 61 or the corresponding Agreement State regulations. There are four existing LLRW disposal facilities in the U.S. that accept various types of LLRW. All are in Agreement States.

The Low-level Radioactive Waste Policy Amendments Act of 1985 gave the States responsibility for the disposal of their LLRW. The Act encouraged the States to enter into “compacts” that would allow them to dispose of waste at a common disposal facility. Most States have entered into compacts; however, only one new disposal facility has been built since the Act was passed.

The Nuclear Waste Policy Act of 1982, as amended, assigned responsibilities for deep geologic disposal of HLW and spent nuclear fuel (SNF) to three Federal agencies: (1) DOE to site, construct, and operate a geologic repository, (2) U.S. Environmental Protection Agency (EPA) to develop radiation protection standards for a repository, and (3) NRC to develop regulations that implement the EPA standards, and to license and otherwise regulate DOE activities.

2.1. 10 CFR Part 61 Framework

The LLRW disposal regulations emphasize an integrated systems approach to the disposal of commercial LLRW, including site selection, land disposal facility design and operation, LLRW characteristics, and site closure. To limit reliance on institutional controls, 10 CFR Part 61 emphasizes passive (e.g., site stability) rather than active systems to limit releases of LLRW to the environment. This integrated systems approach is similar to the defense-in-depth concept that has been used for some time for the NRC’s nuclear reactor safety design and licensing regulations; however, defense-in-depth was not explicitly discussed in the original 10 CFR Part 61 regulations. The following are two of the key provisions in 10 CFR Part 61:

- Standards or “Performance Objectives” for: 1) protection of the general population in 10 CFR 61.41, 2) protection of an inadvertent intruder in 10 CFR 61.42, 3) protection of individuals during land disposal facility operations in 10 CFR 61.43, and 4) stability of the disposal site after closure in 10 CFR 61.44.
- An LLRW classification system (Class A, Class B, Class C, and greater-than-Class C (GTCC)) for commercial LLRW in 10 CFR 61.55, based on the concentrations of certain radionuclides.

To demonstrate that the general population is protected from releases of radioactivity, LLRW disposal facility licensees are required to prepare an analysis of exposure pathways leading to potential radiological doses to the general population. The original 10 CFR Part 61 did not impose a specific performance timeframe (i.e., compliance period) for use in this analysis.
Licensees also must demonstrate that potential inadvertent intruders into the LLRW disposal site will be protected. Inadvertent intruders might occupy the disposal site at any time after closure of the land disposal facility and may not be aware of the radiation hazard from the LLRW. Disposal site land owners or custodial agents are required to carry out an institutional control program that ensures that no such occupation or improper use of the site occurs. The original 10 CFR Part 61 also did not include explicit dose limits for an inadvertent intruder.

The NRC published the “Proposed Rule: Low-Level Radioactive Waste Disposal (10 CFR Part 61)” in March 2015 (80 FR 16081). The proposed rule included the following:

- Revised the existing technical analysis for protection of the general population to include a 1,000-year compliance period;
- Added a new site-specific technical analysis for the protection of inadvertent intruders that would include a 1,000-year compliance period and a 5 mSv (500 mrem) dose limit;
- Added a new analysis for certain long-lived LLRW that would include a post-10,000-year performance period;
- Added a new requirement that would identify and describe the features of the design and site characteristics that provide defense-in-depth protections; and
- Added a new requirement to develop site-specific criteria for the future acceptance of LLRW for disposal based on either the results of technical analyses or the existing LLRW classification requirements.

After conducting extensive public outreach including seven public meetings across the country and an extended public comment period, the NRC staff incorporated stakeholder input into the final rule, which was submitted to the Commission in September 2016. The NRC has also developed a guidance document to facilitate the development of analyses that assist licensees in addressing the regulatory requirements. The final rule and its guidance document are expected to be published early in 2017.

2.2 Programmatic Assessment of LLRW Program

The NRC has completed several high priority tasks identified in a previous assessment of the LLRW program (2007), including updating guidance for LLRW storage and evaluating the disposal of depleted uranium and the measures needed to ensure its safe disposal. The NRC continues to work on the revisions to 10 CFR Part 61 (discussed in Section 2.1) and implementation of the recently issued Concentration Averaging and Encapsulation Branch Technical Position (BTP) (ADAMS Accession No. ML12254B065 (Volume 1) and ML12326A611 (Volume 2)).

In the 2014 and 2015 programmatic assessment, the NRC solicited public comment through public meetings, webinars, and the Federal Register on what changes, if any, should be made to the current LLRW program’s regulatory framework as well as specific actions that the NRC might undertake to facilitate such changes. Based on comments received, the staff ranked seven tasks as high priority, as follows:

1) Complete and Implement Site-Specific Analysis Rulemaking (10 CFR Part 61).
2) Address update to the 10 CFR Part 61 Waste Classification Tables.
3) Implement the Updated Concentration Averaging and Encapsulation BTP.
4) Further evaluate potential regulatory changes to address financial material assurance to account for life-cycle cost and provide recommendations to Commission on path forward.
5) Draft a regulatory basis and conduct rulemaking for GTCC and transuranic waste disposal.

NRC staff is currently in the process of implementing these high priority tasks that have been identified to improve the current LLRW program.

2.3. High-Level Waste Storage

The NRC authorizes storage of spent fuel at independent spent fuel storage installations (ISFSIs) under two licensing options: site-specific and general licenses. To obtain a site-specific license, an applicant submits an application to NRC and NRC performs a technical review of all aspects of the proposed ISFSI. The application must contain general and financial information; the applicant’s technical qualifications to be able to safely operate the ISFSI; a safety analysis report; quality assurance program; an operator-training program; physical protection, decommissioning, and emergency plans; an environmental report; and specific license conditions.

Upon approval, NRC issues a license for up to a 40–year term. The licensee has an option for renewal at the end of the license term. A general license to store spent fuel at an ISFSI is automatically granted, via 10 CFR 72.210, to any nuclear power plant licensee that has a license under 10 CFR Part 50 or 10 CFR Part 52. The general license is valid for 40 years from the loading date of each storage cask, as long as the as the licensee maintains its 10 CFR Part 50 or 10 CFR Part 52 license and continues to meet the other requirements of the general license.

2.4. High-Level Waste Disposal

Currently, 10 CFR Parts 60 and 63 prescribe the rules governing the licensing of the DOE to receive and possess HLW and spent fuel at a geologic repository. The NRC regulations incorporate the applicable environmental standards issued by the EPA for a geologic repository.