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US NRC's Perspective on Commercial Low Level Waste Management

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Radioactive Waste Categories in the US

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graph TD; RW[Radioactive Wastes] --> FCW[Fuel Cycle Wastes]; RW --> NFCW[Non-Fuel Cycle Wastes]; FCW --> MT[Mill Tailings]; FCW --> TW[Transuranic waste]; FCW --> LLW[Low-Level Waste]; FCW --> HLW[High-Level Waste]; FCW --> SF[Spent Fuel]; NFCW --> APM[Accelerator Produced Material]; NFCW --> NORAM[Naturally Occurring Radioactive Material];
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NRC's Regulatory Basis for LLW Management

- ▶ Safety:
 - ▶ Protection of the Public (10 CFR 61.41);
 - ▶ Protection of Inadvertent Intruder (10 CFR 61.42);
 - ▶ Protection of Workers (10 CFR 61.43);
 - ▶ Radiation Protection/License Termination/Effluent Releases (10 CFR Part 20);
 - ▶ Siting & Stability (10 CFR 61.50 - §61.53 & § 61.44);
 - ▶ Avoid FEPS (e.g.; flood, seismic, natural resources, etc.);
 - ▶ Long-Term Site Performance Criteria & Design.
- ▶ Waste Classification/Waste Characteristics (61.55 & 61.56)
- ▶ Institutional Controls/Custody (10 CFR 61.59)
- ▶ Interactions with States/the Public/Stakeholders (10 CFR 61 Subpart F)
- ▶ Defense-In-Depth & Safety Case Concepts (SRM-SECY-13-0075, 02/12/2014)

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LLW Classification Scheme & Disposal Sites

Principal basis in deriving waste classification limits was protection of the inadvertent intruder.

Secondary bases:

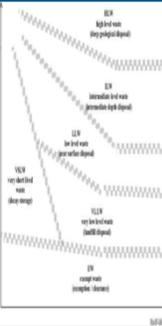
- Long-term environmental concerns
- Disposal facility stability
- Institutional control costs
- Financial impacts to small entities




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Comparison of NRC's vs. IAEA RW Management Systems



International Atomic Energy Agency Waste Categories	US Waste Categories
High Level Waste	High Level Waste
Intermediate Level Waste	Greater-than-Class C LLW
Low Level Waste (LLW)	Class A, Class B and C LLW
Very Low Level Waste	Class A
Very Short Lived Waste	Material held for decay storage
Exempt Waste	Liquids/Air: Effluent releases Solids: Case-by-case analysis

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LLW Generators - Overview

- ▶ U.S. has approximately 20,000 users of radioactive materials and 100 nuclear power reactors in operation, 18 nuclear power reactors, and 7 research and test reactors are undergoing decommissioning.
- ▶ Dozens of previously contaminated commercial sites (16 complex material sites), 11 decommissioning Title II uranium recovery, and two fuel cycle facilities are being remediated to be released for other uses.
- ▶ All of the above activities generate LLW that requires safe disposal, in accordance with U.S. laws and regulations.
- ▶ Large volumes of special waste streams such as DU.

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Atomic Energy Act – Role of Agreement States

- ▶ States may enter into agreements with the NRC to regulate possession and use of source, by-product and small quantities of special nuclear material within their borders (Agreement States)
- ▶ 37 Agreement States regulate over 16,000 specific material licenses and more than 100,000 general licenses
- ▶ All commercial LLW disposal sites are regulated by Agreement States
- ▶ The NRC conducts periodic review of States LLW programs to ensure compatibility with NRC regulations and key guidance.



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Disposal of LLW Large Components



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Hot Issues in LLW Management

- ▶ Exempt & Clearance Waste
- ▶ VLLW and Low-Activity Waste (EPA ANPR) 20,2002 disposal
- ▶ Unified waste classification scheme for the Joint Convention manifest
- ▶ Compliance with safety criteria
- ▶ Deep borehole disposal
- ▶ Site-specific analysis - safety case & Compliance period
- ▶ DU disposal
- ▶ GTCC
