Low-level Waste Disposal Rulemaking: Site-specific Technical Analyses

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Overview

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- Background
- Depleted Uranium
- Low-Level Waste Analyses
- Site-Specific Technical Analyses
- Key Issues

Background

- Order CLI-05-20 – whether waste classification tables needed to be modified for depleted uranium (DU)
- SECY-08-0147 – 10 CFR Part 61 needed amendment
- Four options presented to Commission

Background

- SRM-08-0147 – Commission direction to staff:
  - Don’t change waste classification of DU
  - Specify requirements for site-specific analyses in 10 CFR Part 61 to identify restrictions or prohibit disposal of depleted uranium, if necessary.
- Issued interim guidance to licensees (2010)
- Draft rule and guidance for public comment October 2011

Low-Level Waste – Framework

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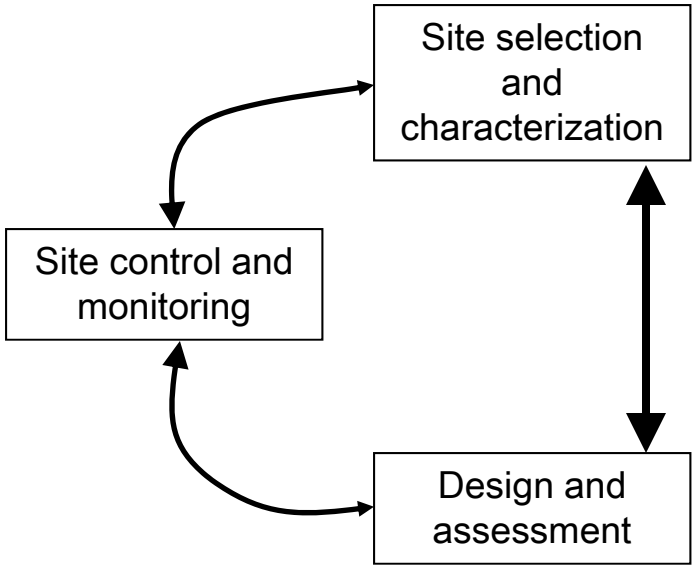
- Cornerstone of the system is stability
- Isolate waste
- Federal and State ownership (allow 100 years institutional control)
- Evaluate public exposures (offsite, workers, inadvertent intrusion)
- Disposal site shall be capable of being characterized, modeled, analyzed and monitored



Depleted Uranium Disposal: Problem Context

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- Large quantities of uranium were not evaluated in the Environmental Impact Statement (EIS) for 10 CFR Part 61:
  - 17 Ci of ^{238}U (in 1 million m^3 of waste)
  - 3 Ci of ^{235}U
- The quantity of DU for disposal in the US is ~ 470,000 Ci ^{238}U

Depleted Uranium : Source Comparison

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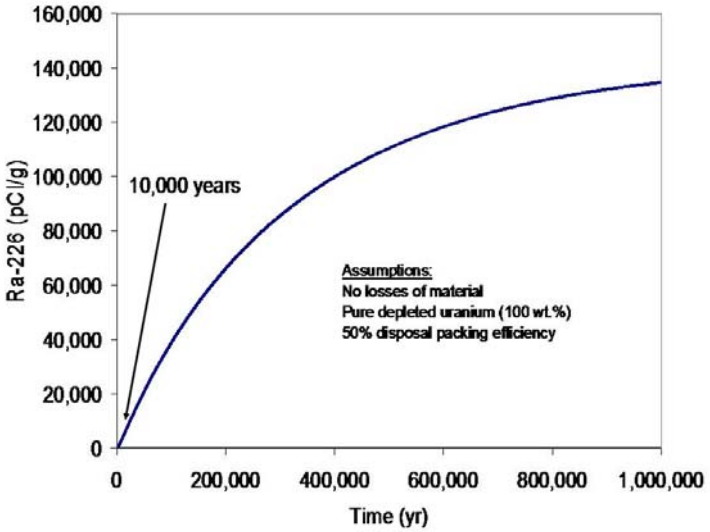
- Uranium mill tailings contain:
  - 0.004 to 0.02 weight percent U_3O_8,
  - 26 to 400 pCi/g ^{226}Ra,
  - 70 to 600 pCi/g ^{230}Th
- DU contains:
  - 99.9 weight percent uranium oxide
  - Greater than 300,000 pCi/g ^{226}Ra and ^{230}Th (one million years after disposal)
  - Time to exceed upper range of mill tailings concentrations is approximately 1400 years for ^{226}Ra and 500 years for ^{230}Th



Uranium in the Environment

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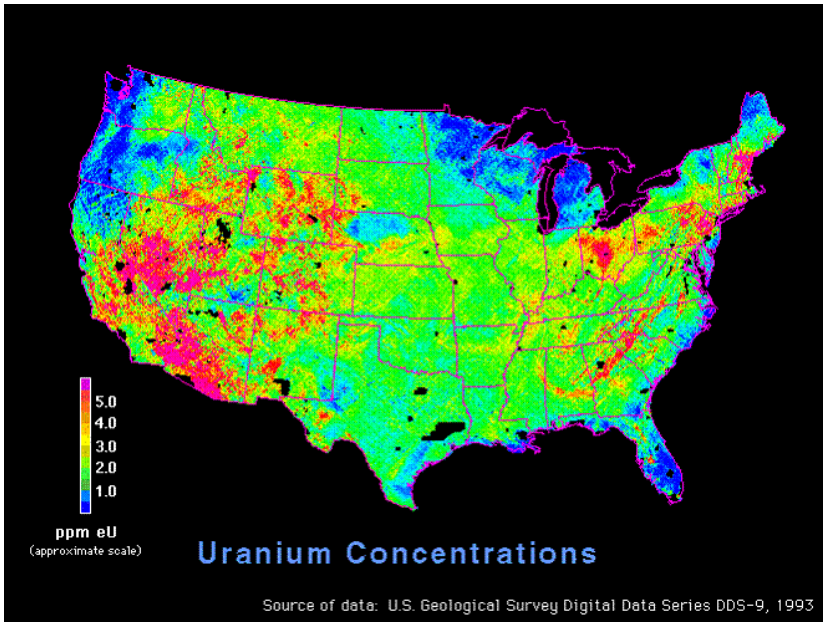
- Uranium in surface soils ~ 1 to 5 ppm
- Mean atmospheric radon is ~ 0.25 pCi/L
- Indoor average radon levels ~ 1.5 to 4.2 pCi/L
- Radon contributes roughly 70% of the average annual dose in the United States (~250 mrem/yr)



Site-Specific Technical Analyses*

- Performance assessment (61.41)
- Intruder assessment (61.42)
- Stability evaluation (61.44)

* For analyses of post-closure

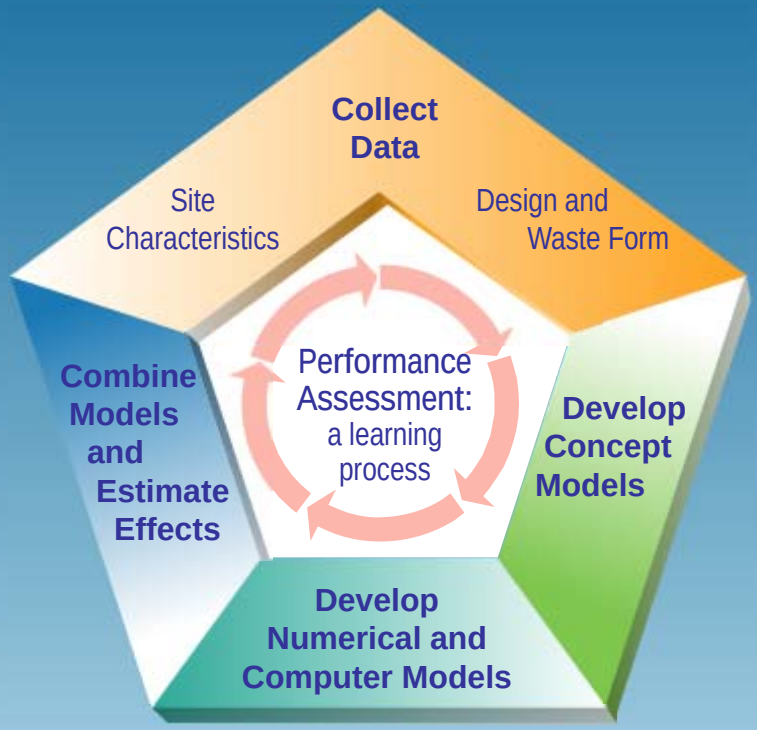
Overview of Performance Assessment

What is Performance Assessment?

- Systematic analysis of what could happen at a site

Why use it?

- Complex system
- Systematic way to evaluate data
- Internationally accepted approach



What is assessed?

- What can happen?
- How likely is it?
- What can result?

How is it conducted?

- Collect data
- Develop scientific models
- Develop computer code
- Analyze results

NRC would require a Performance Assessment to:

- Provide site and design data
- Describe barriers that isolate waste
- Evaluate features, events, and processes that affect safety
- Provide technical basis for models and inputs
- Account for variability and uncertainty
- Evaluate results from alternative models, as needed

Performance Assessment - Example

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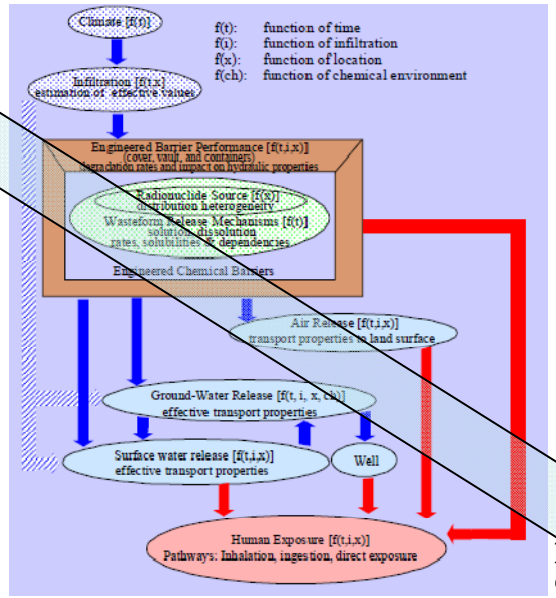
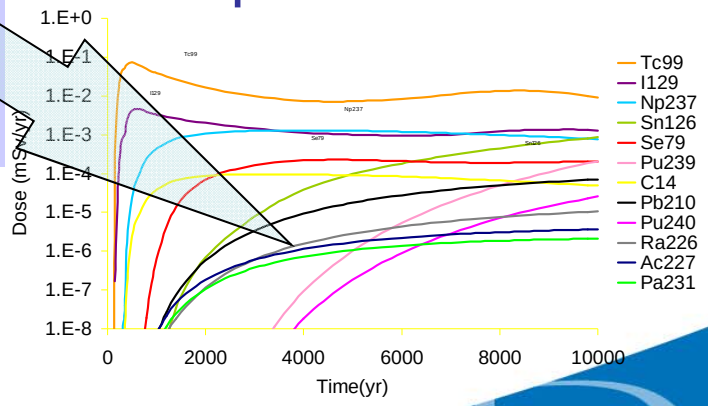
Real system



Mathematical model (abstraction)

Estimated future performance



Performance Assessment

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- The technical information for performance assessment is essentially contained in 61.12
- Performance assessments incorporate uncertainty
- Disposal of long-lived waste can make a performance assessment more challenging (e.g. climate change, geomorphology)

Intruder Assessment

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- In 10 CFR Part 61 an intruder assessment is not required to demonstrate compliance with 61.42
- Licensee must demonstrate:
  - waste classification and segregation
  - adequate intruder barriers
- Waste not in NRC's classification tables should be subject to an intruder assessment

Technical Issues

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- Uncertainty
- Period of performance
- Near-surface stability
- Scenarios and receptors
- Waste specific issues (e.g. uranium geochemistry, radon)

Period of Performance

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- US NRC LLW regulations do not provide a value for period of performance
- Outside of Yucca Mountain, a period of performance longer than 10,000 years has not been applied in the US
- There is not an international consensus

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Questions?