Topical Report Overview

The Role of the DOE Standardized SNF Canister in Transportation Safety

Presented to:
Nuclear Regulatory Commission

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Topical Report Objectives

- Near Term…

  To confirm that DOE SNFs repackaged into DOE standardized SNF canisters will be acceptable for transportation

- Longer Term……

  To provide a starting point for an applicant to prepare an application for (or an amendment to) a certificate of compliance for a package to transport DOE spent nuclear fuels

Transportation Safety Approach

- Credit transportation cask for all containment, shielding, and other traditional cask functions
- Demonstrate that….
  - canisters will remain leaktight
  - all canister loadings are critically safe in their most reactive credible configuration with moderator by water to the most reactive credible extent (i.e. moderator exclusion) and with close full reflection by water on all sides
  - all canister loadings are critically safe in their as-loaded configuration even with the nonmechanistic assumption of full flooding

Canister Leaktightness

- Canisters are designed and tested to comply with 10CFR71.73 drop test requirements
- Flaw propagation testing demonstrated that undetected material or fabrication flaws will not propagate through the canister wall under strains well beyond those encountered under 10CFR71.73 test conditions
- Material impact testing indicates strain-rate hardening effects will provide additional margin to failure

Criticality Safety Under Worst Credible Conditions

- A bounding scenario is used in order to minimize fuel-specific analyses and associated data needs
- Credit is taken for canister remaining leaktight
- No credit is taken for fuel or basket geometry
  - Canister contents are assumed to be fully degraded and reconfigured to maximize reactivity
- **Conclusion:** Criticality safety in a leaktight canister can be assured by adhering to a fissile loading limit (i.e. fissile mass/canister)

The Flooded “As-Loaded” Condition

- Again, a bounding scenario is used in order to minimize the need for fuel-specific analyses and associated data
  - Canister is assumed to flood (nonmechanistic assumption)
  - Credit is taken for canister and basket geometry
  - Partial credit is taken for fuel geometry
- **Conclusion:** Criticality safety in a flooded, as-loaded canister can be assured by adhering to a linear loading limit (i.e. fissile mass/cm)

Criticality Safety Summary

The requirements of 71.55(b) and (e) as well as the NRC staff's request to evaluate a nonmechanistic flooding of the canister are satisfied

- canister breach is not credible
- canister is critically safe with contents fully degraded and optimally reconfigured
- canister is critically safe in flooded, as-loaded condition

Review of Detailed Outline

- Two tables are being distributed
  - The first shows each section of the proposed report along with a summary of its content, the applicable sections of Reg Guide 7.9, NUREG 1617, and 10CFR71
  - The second is a cross reference from each of the 10CFR71 requirements to the section of the topical report where it is addressed, if applicable

Summary

- Section 1 – The what, why, and how of our request
- Section 2 – Our canister will not breach
- Section 3 – Conclusions of section 2 are valid over entire range of canister temperatures and pressures
- Section 4 – The cask provides all containment functions
- Section 5 – The cask provides all shielding functions
- Section 6 – Based on fissile loading limits, criticality safety
  - » is assured in a leaktight canister in any configuration
  - » is assured in a flooded canister in its as-loaded configuration
  - » is readily achievable for an array of canisters in a typical cask
- Section 7 – Canister drying, loading, sealing, and interim storage operations assure canister integrity
- Section 8 – Acceptance tests and subsequent monitoring program ensure canister performance objectives are met