



National Spent Nuclear Fuel Program

Licensing Approach for DOE SNF

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*Providing for safe,
efficient disposition of
DOE spent nuclear fuel*

Background

- EM and RW have discussed licensing of DOE SNF for the past 4 years as the overall repository requirements and strategy evolved
- RW issued the YMP Licensing Strategy in August 2002
- At the March 2002 Quarterly Meeting, DOE-RW requested BSC & INEEL reach agreement before a DOE SNF meeting is held with the NRC



Objectives of the Workshops

- Develop the approach for implementing the safety case for DOE SNF
- Develop the framework for defending the safety case in the license application
- Identify potential waste acceptance criteria
- Identify any licensing risks with the safety case



Scope of the Workshops

- Only addressed DOE SNF sent for codisposal, specifically excluding
 - Navy SNF
 - Commercial-like SNF to be sent bare
 - Sodium-bonded SNF to be treated prior to shipment
- Addressed preclosure (confinement), criticality (above and below ground), and postclosure (TSPA). The workshops excluded
 - Radiation protection
 - Transportation
 - Safeguards & Security



Workshop Process

- Participants included BSC and NSNFP representatives; some DOE involvement
- Specific questions were distributed to focus discussions on appropriate topics
- Conference calls allowed participants to consider the BSC and NSNFP perspectives
- Meetings were held to discuss the strategy and its implementation
- Results were documented



Safety Case Philosophy

The overall approach is to minimize reliance on DOE SNF information by:

- Relying on engineered solutions where practical
- Use bounding values where the information is not important (i.e., the results are not significantly affected)
- Use stylized approaches and hypothetical fuels to demonstrate compliance for all DOE SNF



DOE SNF Preclosure Workshop

June 10-11, 2002



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Preclosure Licensing Strategy

- The canister handling system will be designed to avoid drops
- The DOE SNF canisters will be designed to survive a drop without breaching
- A facility HEPA filtration system will be provided as defense-in-depth
- Analyses will demonstrate that the Category 2 performance objectives are not exceeded even for a drop, breach, and HEPA failure



Bases for the Canister Strategy

- Low breach probability meets the regulation
- Canisters are designed and fabricated according to the ASME code
- Analysis of a drop event is beyond the code, but will be performed according to the ASME code
 - Dynamic analysis
 - Proof testing
 - Drop tests with leak tests performed to validate analyses
 - Aging, material interactions and weld flaws are accounted for in the code



Bases for the Low-Breach-Probability Strategy

- NRC is expected to accept the low-breach-probability because:
 - Proof testing is accepted by ASME and the NRC
 - There are precedents (e.g., PFS, MOX fuel canisters)



Additional Preclosure Consensus

- Important to Safety SSCs are the DOE SNF canister (includes MCOs) and the canister handling equipment
- The LA will not present DOE SNF Beyond Category 2 results
- Licensing specifications and WAC will be limited to the use of the DOE SNF canisters
- A description of canister contents will be provided based on existing information with no additional characterization



DOE SNF Criticality Workshop

August 5-6, 2002



Preclosure Criticality Strategy

- Surface facility will have moderator controls
- Loss of DOE SNF canister water-tightness will be low probability
- Storage racks will neutronically isolate canister arrays
- Calculations with hypothetical fuels will demonstrate DOE SNF canisters are subcritical for 'rubblized' SNF without moderator
- As defense-in-depth, all canisters will be Part 71 compliant (i.e., $k_{\text{eff}} < 0.95$ for optimum moderation and reflection)



Postclosure Criticality Strategy

- Criticality for all fuels is expected to be screened out based on moderator exclusion
- Preclosure basis will be used to demonstrate criticality will not occur without moderator
- Degraded mode analyses with poisons will be performed to provide additional confidence and to address beyond-regulatory-period concerns



Basis for the Moderator Exclusion Strategy

- Meets regulatory requirements
- There are additional assurances of adequacy:
 - Criticality analyses for transportation
 - Degraded mode analyses
 - Consequences of a criticality event are low
- NRC has accepted this approach for PFS



Additional Criticality Consensus

- Preclosure IS-SSCs are DOE SNF canisters, canister handling equipment, and moderator controls
- HVAC system is a defense-in-depth measure
- WP and drip shield are important to waste isolation
- Double-contingency criteria are implicitly addressed



Additional Criticality Consensus (cont.)

- LA will not include a discussion of consequences for preclosure
- Postclosure consequences will not be calculated
- Licensing specifications and WAC will be limited to the use of the DOE SNF canisters
- A description of canister contents will be provided based on existing information with no additional characterization



DOE SNF Postclosure Strategy



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Postclosure Licensing Strategy - Nominal Scenario

- Ensure DOE SNF is adequately dried prior to shipment
 - Cannot compromise WP from inside
- Existing DOE SNF information will be used for all safety case needs including the multi-barrier analysis



Postclosure Licensing Strategy - Nominal Scenario (cont)

- If early WP failures are screened out, then DOE SNF information does not affect mean annual dose
- If early WP failures are not screened out, then sensitivity studies will be used to show DOE SNF information does not significantly affect the mean annual dose



Postclosure Licensing Strategy - Human Intrusion Scenario

- Human intrusion calculations are not planned to be submitted in the LA
 - No credible releases during regulatory period
- If performed, the human intrusion consequence calculations will use the DOE SNF radionuclide inventory being developed by the NSNFP



Postclosure Licensing Strategy - Disruptive Events

- The DOE SNF information required for the safety case is:
 - Nominal radionuclide inventory being developed by the NSNFP
 - Total number of canisters
- Sensitivity studies will be performed to:
 - Demonstrate that DOE SNF does not affect the expected annual dose and is not capable of challenging the 10 CFR 63 performance objectives



Bases for the Postclosure Licensing Strategy

- Meets the performance objectives by large margins
- Uses risk-informed performance-based approach to focus attention on the most important aspects (i.e., engineered and natural barriers)
- Additional measures (e.g., prescriptive WAC limits) would not reduce risk



Additional Postclosure Consensus

- License specifications or WAC limits for DOE SNF will be limited to drying to ensure degrading the waste package from the inside is highly unlikely
- A description of canister contents will be provided prior to shipment based on existing information
- DOE SNF will be represented in the LA in a manner similar to CSNF



Path Forward

- BSC and NSNFP have reached consensus
- DOE consensus is now needed
- Following DOE consensus, the approach can be presented to the NRC
- Implement the strategy
 - demonstrate the canister performance
 - complete analyses
 - package fuel



Recommendation to Sites

- Package DOE SNF in robust canisters
 - Standardized canister or MCO
- Continue to provide existing DOE SNF information to NSNFP/YMP for design and analyses
- Neutron absorbers should be added to canisters as needed as a defense-in-depth measure



Summary

- The proposed licensing strategy
 - Accomplishes the EM mission
 - Is cost effective
 - Provides real risk reduction
 - Supports RW mission

