



Certification/Licensing Approaches for High Burnup Spent Fuel

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Overview

- Purpose
- Storage
 - Regulatory Requirements and Guidance
 - Certification/Licensing Approach
- Transport
 - Regulatory Requirements and Guidance
 - Certification Approach
- On-going Research and Other Activities
- Summary

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Purpose

- Develop certification/licensing approaches for high burnup spent fuel storage and transportation applications while on-going research and other activities continue

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Geometric Form – Storage
Current Regulatory Requirements and Guidance

- Confinement barriers and systems
 - Maintain cladding integrity 10 CFR 72.122(h)
- Retrievability
 - Be able to readily retrieve fuel per 10 CFR 72.122(l)
- Guidance
 - ISG-11, “Cladding Considerations for the Transportation and Storage of Spent Fuel”
 - ISG-2, “Fuel Retrievability”

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Licensing Approach – Storage

- Initial 20-Year License Term
 - 10 CFR 72.42(a) authorizes licenses up to 40 years
 - Idaho cask inspection of low burnup fuel and discussion in ISG-11 give staff reasonable assurance for 20 year initial license
- License Renewal
 - Demonstrate that fuel and canister will remain as expected for period of less than or equal to 40 years through data from time limited aging analysis, research, demos, etc.

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Canister Qualification for Storage

- Appropriate learning aging management program and inspections/tests of canisters if relied on as a component important to safety
- Conservative assumptions with respect to canister behavior under accident conditions

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Geometric Form – Transport
Current Regulatory Requirements and Guidance

- Normal Conditions of Transport:
 - geometric form of the package contents would not be substantially altered per 10 CFR 71.55(d)(2)
 - Loading/Unloading procedures per 10 CFR 71.89

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Certification Approach – Normal
Conditions of Transport

- Verify assembly condition, if not canned, at the time of loading
- Evaluate fuel structural performance using best estimate materials data
- Evaluate thermal, containment, shielding, and criticality safety requirements assuming worst credible fuel configuration (defense in depth)
- Verify loading/unloading safety requirements and procedures based on fuel conditions after transport to meet 71.89

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Geometric Form – Transport
Current Regulatory Requirements and
Guidance

- Hypothetical Accident Conditions:
 - fissile material evaluated in the most reactive credible configuration per 71.55(e)
 - Certification approach already developed and historically used
- Guidance
 - ISG-19, “Moderator Exclusion Under Hypothetical Accident Conditions and Demonstrating Subcriticality of Spent Fuel Under the Requirements of 10 CFR 71.55(e)”

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Canister Qualification for Transport

- If used as a second barrier for moderator exclusion, appropriate tests and analyses are needed to determine canister condition prior to transport
- Conservative assumptions with respect to canister behavior under accident conditions

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On-Going Research and Other Activities on High Burnup Fuel

- Vibration tests for Normal Conditions of Transport
- Bend tests to characterize cladding properties
- Fuel reconfiguration consequences evaluation
- High Burnup Dry Storage Cask Demo
 - Licensees expected to monitor and take appropriate action
 - NRC will monitor results

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Summary

- Certification/licensing approach necessary to address current high burnup fuel applications.
- Licensees will be expected to monitor research and other activities to determine applicability.
- Approving high burnup fuel for storage and renewal beyond 20 years.
- Defense in depth, operational controls, oversight and inspection have significant role in certifying high burnup transportation packages

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