NRC Regulation of Spent Nuclear Fuel Storage and Transportation

Presentation to the SONGS Community Engagement Panel

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Overview

• Spent Fuel Storage and Transportation Regulations
• Spent Fuel Storage System Design Review
• Transportation
• High Burnup Fuel
Regulations

• 10 CFR Part 71: *Packaging and Transportation of Radioactive Material*
  – Transportation of all radioactive material, including spent nuclear fuel

• 10 CFR Part 72 – *Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste*
U.S. Independent Spent Fuel Storage Installations

Legend:
- 54 Operating General Licensed ISFSIs at Reactor Sites
- 11 Reactor Sites Pursuing a General licensed ISFSI
- 15 Specific Licensed ISFSIs (At or Away from Reactor Sites)
  [No known sites are pursuing a future Specific Licensed ISFSI]

3 Reactor sites have not announced intentions regarding ISFSI
34 States have at least one ISFSI

Railroads  Interstate Highways

Disclaimer: This map provides only general and approximate locations regarding the current and potential ISFSI licensees. The map will be updated when changes occur.
Part 72 Regulations

• General Design Criteria
  – Off-site radiation dose
  – Subcriticality
  – Confinement

• Quality Assurance

• Siting

• Physical Protection

• Training and Certification of Personnel

• Reporting
Technical Review Disciplines

• Structural
• Materials
• Thermal
• Confinement
• Criticality
• Shielding and Radiation Protection
• Quality Assurance
Storage System Design Review

- Normal Conditions
- Off-Normal Conditions
- Accident Conditions and Natural Phenomena
  - Tornado winds and tornado missiles
  - Earthquakes
  - Floods and tsunamis
  - Fires and explosions
- Structural review demonstrates that confinement is maintained under all conditions
Storage System Design Review, cont’d

- Criticality review - fuel is subcritical under all conditions
- Shielding review:
  - System meets off-site radiation dose rate requirements
  - Radiation dose rates are “As Low As Reasonably Achievable”
- Thermal review - cladding is protected under normal conditions
- Materials review:
  - Materials properties assumed in other evaluations are appropriate
  - Materials integrity is maintained throughout expected storage period
Transportation

• Same set of technical discipline reviews as for storage
  – Ensure that package meets external dose rate limits
  – Ensure fuel remains subcritical
  – Ensure containment is maintained
Transportation, cont’d

- Normal and accident conditions differ from storage:
  - Normal transport
    - Vibration
    - Small drops and impacts
    - Heat and cold
  - Accidents
    - 30-ft. drop onto unyielding surface
    - Puncture
    - Fire
    - Water immersion
High Burnup Fuel

• High Burnup Fuel is safe in storage and transportation
  – Research activities that NRC has conducted
  – Research activities at other institutions

• Continuing confirmatory research
  – Material properties testing
  – DOE high burnup fuel demonstration
High Burnup Fuel
High Burnup Fuel
Summary

• Regulations in 10 CFR Parts 71 and 72 assure safety for storing and transporting both low and high burnup spent nuclear fuel
  – Multi-disciplinary technical review
  – Confinement maintained under wide range of routine and accident conditions