

Regulatory Perspectives of Extended Storage and Transportation of Spent Fuel in the United States

16th International Symposium on the Packaging and Transport of Radioactive Material

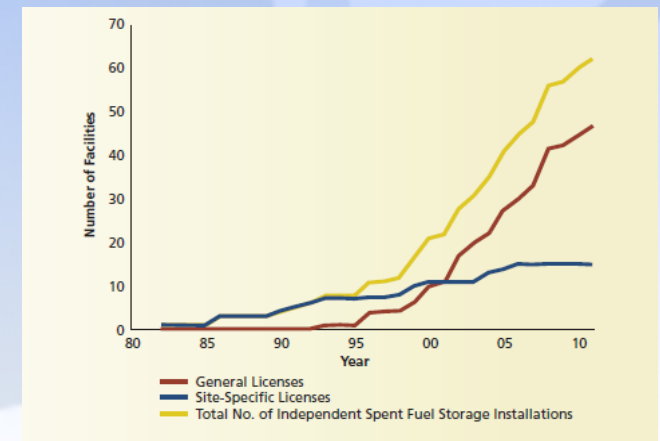
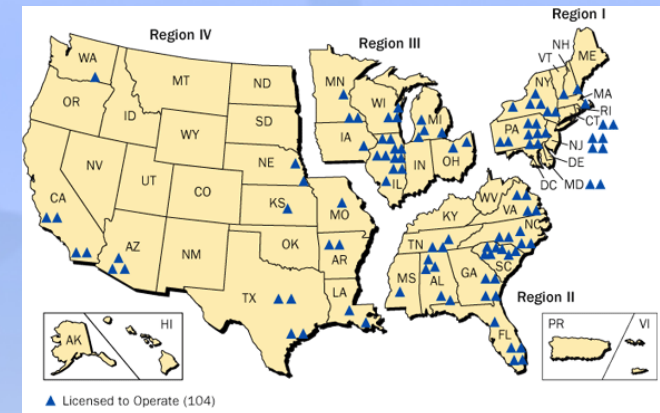
October 7, 2010

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NRC Oversight of Commercial Spent Fuel

- Spent fuel pools at 65 reactor sites in 31 States
 - 170,000 fuel assemblies
- Dry storage casks at 55 storage facilities in 35 States
 - 50,000 fuel assemblies
 - Over 1300 loaded dry storage casks
 - Over 50 approved storage cask design variations





Storage Cask Aging

- Basic Regulatory Framework -

- **Forty-year License Periods**
- **Aging Management Plan**
 - Time-Limited Aging Analyses
 - Prevention
 - Monitoring
 - Maintenance
 - Mitigation
 - Corrective Actions





Transportation Package Aging ***- Basic Regulatory Framework -***

- **Five-year Certificate Periods**
- **Maintenance and Testing Program**
 - Visual Inspections
 - Structural and Pressure Tests
 - Closure Seals Leak Tests
 - Neutron Absorber Tests
 - Thermal Tests
 - Shielding Tests





Extended Storage and Transportation (EST) Program

- **Regulatory Process Improvements**
 - Licensing
 - Inspection and Enforcement
- **Extended Storage and Transportation**
 - Safety
 - Security
 - Environment

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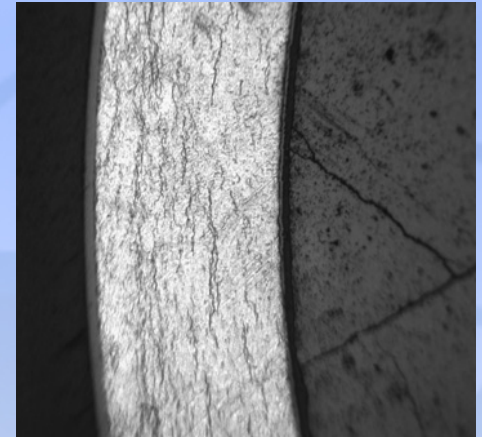
EST Program Approach

- **Phased Activities**
 - Identify gaps and rank phenomena/issues
 - Conduct additional research and analyses
 - Participate in external research programs
- **Regulatory Enhancements**
 - Develop Technical Basis
 - Engage Stakeholders
 - Implement regulatory enhancements (if needed)



Cladding Integrity

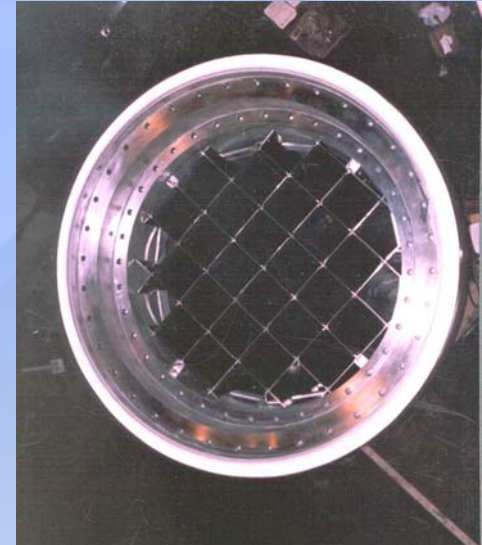
- **Safety Functions**
 - Primary Fission Product Barrier
 - Geometry Control
 - Defense-in-Depth
- **Technical Challenges**
 - Higher Burnup Levels
 - Temperature Effects
 - Other Variations





Canister Integrity

- **Safety Functions**
 - Confinement
 - Inert Environment
 - Criticality Control
- **Technical Challenges**
 - Long-Term Corrosion
 - Basket properties





Overpack Performance

- **Safety Functions**
 - Shielding
 - Heat Transfer
 - Robustness Against Severe Events
- **Technical Issues**
 - Long-Term Degradation
 - Severity of External Natural Phenomena





Environment

- **Environmental Impacts**
 - Human Health
 - Resources
- **Issues**
 - Defining Future Storage & Transportation Scenarios
 - Defining Surrounding Environment
 - Stakeholder Concerns





Technology and Regulatory Considerations

- **Assessing Long-term Aging Phenomena**
- **Packaging/Conditioning of Spent Fuel**
- **Aging-Resistant Cask Components**
- **Aging-Monitoring Design Capabilities**
- **On-site Fuel Handling Capabilities** (if needed)
- **Future Transportation Standards** (after loading)
- **Quality Assurance and Documentation**