

U.S. Experience With Storage Of Spent Nuclear Fuel

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Major Topics of This Presentation

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Background Information

- 1950s-1970s: Initial scientific research conducted on geologic storage of high level waste (HLW)
- 1960s-1970s: Commercial nuclear power industry emerged in U.S. with the expectation that spent nuclear fuel (SNF) would be returned to U.S. Government for reprocessing or storage
- 1977: U.S. Government decision - no reprocessing of SNF
- 1982: Nuclear Waste Policy Act (NWPA, Public Law 97-245)
 - Confirmed U.S. Government responsibility for managing and disposing of commercial SNF in NRC-licensed facility (target date: January 1998)
 - Established DOE's Office of Civilian Radioactive Waste Management
 - Adopted geologic disposal as long-term strategy
 - Waste storage limit: 70,000 MTHM
 - Nuclear Waste Fund established to meet Government costs for managing commercial SNF (\$0.001 per kilowatt-hour generated)
 - Commenced characterization studies of candidate sites for repository

Background Information(continued)

- 1987: NWPA amended (Public Law 100-203) to focus repository site characterization work only on Yucca Mountain site
- 1992: Energy Policy Act (Public Law 102-486) - U.S. Environmental Protection Agency (EPA) directed to develop health and safety standards for Yucca Mountain (NRC to revise licensing requirements after standards are issued)
- 1997: Special “viability assessment” of Yucca Mountain authorized
 - Target date for repository operation: 2010

Current Situation

- Work in progress is intended to support a recommendation by the Secretary of Energy to the U.S. President on the suitability of Yucca Mountain as the site for a central HLW repository
- NRC and EPA discussions continue on the thresholds for Yucca Mountain standards
- After completing several projects to increase the storage capacity of their spent fuel pools, U.S. nuclear power plant (NPP) owners are beginning to lose the full core off-load reserve margin required by NRC regulations (estimate: 60 percent of NPPs will not have full core off-load reserve margin by 2010)
- A number of NPP owners have pursued and obtained separate licenses from NRC for on-site, dry storage of SNF

Spent Nuclear Fuel Storage at U.S. Nuclear Plants

- Spent Fuel Pools - Licensing requirements in NUREG-0800, section 9.1.2, "Spent Fuel Storage"
 - Safety function (pool and racks): maintain spent fuel assemblies in a safe and subcritical array during all credible storage conditions and provide a safe means of loading SNF assemblies into shipping casks
 - Applicable NRC General Design Criteria (10CFR50, Appendix A)
 - Criterion 2: Protection from natural phenomena effects
 - Criterion 4: Protection from environmental and dynamic effects
 - Criterion 5: Sharing of structures, systems, and components
 - Criterion 61: Fuel storage and handling and radiation control
 - Criterion 62: Criticality protection in fuel storage and handling
 - Criterion 63: Monitoring of fuel and waste storage
 - Other "guidance" documents: NRC Regulatory Guide 1.13 and American Nuclear Society Standard 57.2 (design objectives for light water reactor SNF facilities) and NUREG-0612 (control of heavy loads at NPPs)

Spent Nuclear Fuel Storage at U.S. Nuclear Plants (continued)

- Independent Spent Fuel Storage Installations (ISFSI)
 - Concept authorized by NWPA (1982)
 - NRC directed to license installations (generic designs; not site-specific)
 - NRC licensing requirements in 10CFR72 (also the licensing basis for monitored retrieval storage installations operated by DOE)
 - NRC Certificate of Compliance issued for each approved cask design
 - NPPs proposing use of storage cask must verify (in safety analysis report) that plant conditions are within the performance specifications for the storage cask
 - 1999 status: 8 storage cask designs approved by NRC; 11 utilities and one DOE laboratory (Idaho) have NRC-licensed ISFSI

Plans for Centralized Spent Nuclear Fuel Storage

- **Monitored Retrieval Storage (MRS)**
 - Intent: MRS facility to be designed, constructed, and operated by DOE for receipt and storage of SNF (1 year aged) and solidified HLW pending shipment to HLW repository
 - Several sites considered in past studies (Hanford, Oak Ridge), but option is not being actively pursued at the present time

Plans for Centralized Spent Nuclear Fuel Storage (continued)

- Central Repository (Yucca Mountain Project)
 - Sole focus of repository siting work since late 1980s
 - NRC to license facility construction/operation (10CFR60)
 - Other regulatory/scientific organizations involved: U.S. Department of Transportation, EPA, National Academy of Sciences, Nuclear Waste Technical Advisory Board, Advisory Committee on Nuclear Waste
 - Waste forms to be stored: commercial and DOE SNF (includes MOX spent fuel) and HLW (includes immobilized plutonium)
 - Facility to begin receiving SNF in 2010
 - Facility design life: 100 years (could be extended up to 300 years with maintenance and monitoring)
 - Recent project milestones
 - Viability Assessment completed (December 1998)
 - Draft Environmental Impact Statement issued (July 1999)

Actions Planned in the Near Term

- Complete site recommendation consideration report (late 2000)
- Recommendation on suitability of Yucca Mountain as repository site (mid-2001)
- Prepare license application to NRC (2002)
- Continue to license ISFSI facilities for NPP use (since legal actions could continue to significantly influence completion of Yucca Mountain activities)