



NUCLEAR PLANT SAFETY COURSE



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Spent Fuel Storage, Transportation and Disposal

Edwin M. Hackett, Deputy Director
Division of Spent Fuel Storage and Transportation
Tel: 301-492-3310, e-mail: emh1@nrc.gov
and

Lawrence E. Kokajko, Director
Division of High-Level Waste Repository Safety
Tel: 301-415-6537, e-mail: lek@nrc.gov

U.S. Nuclear Regulatory Commission
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Spent Fuel Storage

Overview

- History of Independent Spent Fuel Storage Installations (ISFSIs)
- Status of Independent Spent Fuel Storage Installations (ISFSIs)
- Safety of Spent Fuel Storage
- Changes to National Spent Fuel Management Strategy

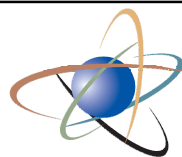


History of Independent Spent Fuel Storage Installations (ISFSIs)

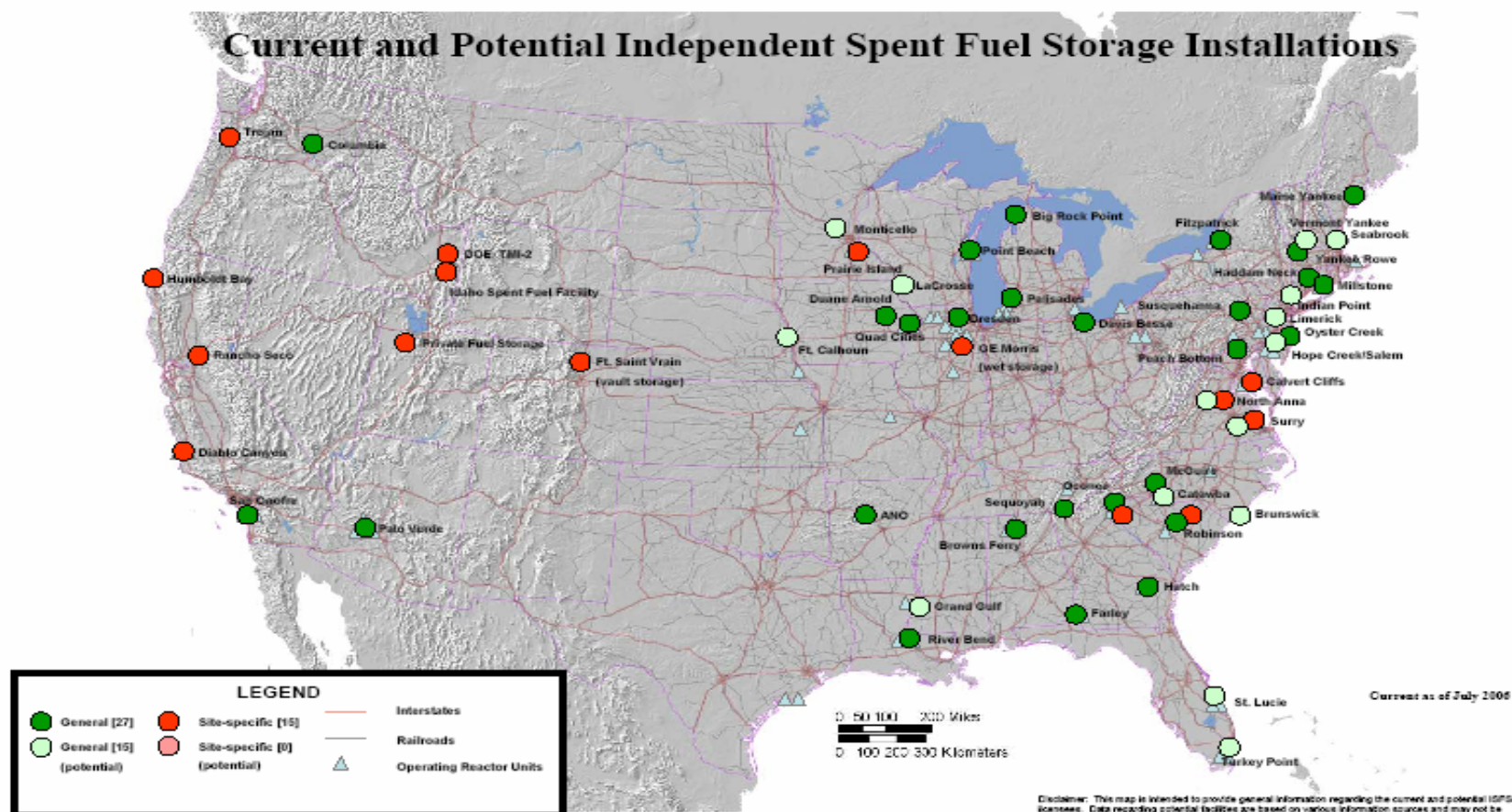
- 10 CFR Part 72 promulgated in 1980
- G. E. Morris licensed in 1982 as first away-from-reactor ISFSI (wet storage)
- Surry Nuclear Power Plant ISFSI licensed in 1986 as first dry storage ISFSI
- Part 72 General License Authorized in 1990
- Multipurpose canister concept developed in early to mid 1990s
- 12 ISFSIs licensed by 1999
- Over 50 ISFSIs projected by 2010 as power plants continue to need expanded spent fuel storage capacity

Status of Independent Spent Fuel Storage Installations (ISFSIs)

- 43 Licensed ISFSIs in 27 States
- 13 announced plans for new ISFSIs
- Over 800 loaded dry casks
- 15 approved storage cask designs
- 8 dual-purpose (storage & transportation) cask designs



Current and Potential Independent Spent Fuel Storage Installations



Safety of Spent Fuel Storage

- First cask placed in service July 1986
- Typical operating power plant loads 3-5 casks per refueling outage
- Continued NRC inspection and monitoring of cask loading activities
- Outstanding safety record - No spent fuel storage cask releases
- Passive systems of dry cask storage pose small risk

Spent Fuel Storage Safety Achieved Through:

- Established legal and regulatory framework
- Regulations, guidance and orders provide framework for safe management
- Rigorous technical and regulatory review
- Inspections, audits, surveys, and continued questioning attitude confirm safe practice
- Collaborative research with DOE and industry on evolving technical issues
- Constant focus on public outreach efforts

Changes to National Spent Fuel Management Strategy

- Global Nuclear Energy Partnership
- Transport, Aging and Disposal Canister
- Possible Consolidation of Interim Storage Facilities

Spent Fuel Storage Summary

- NRC ensures that spent fuel storage, regardless of method (wet or dry), is safe and secure
- Process for licensing spent fuel storage facilities is well understood and practiced
- NRC continues to monitor the changes to the national strategy for spent fuel management

Spent Fuel Transportation

Spent Fuel Transportation Regulations

Tests for normal conditions of transport



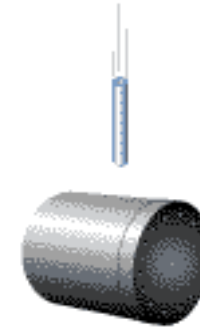
Water spray during 1 hr



Drop from 0.3 to 1.2m on an unyielding surface



Stacking 5 times the package weight

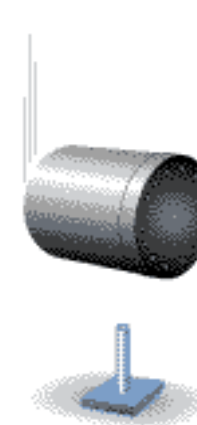


Penetration test with a bar of 6kg dropped from 1m

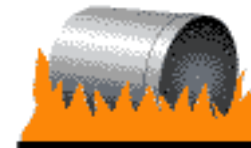
Tests for accident conditions of transport



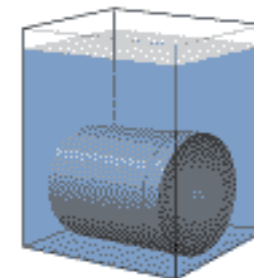
Drops from 9m heights on an unyielding surface



Drop from 1m on a punch bar



Fire at 800°C, 30min



Immersion under 15m

Spent Fuel Transportation Studies



The NRC periodically assesses the effectiveness of Type B standards in addressing real world accidents, including severe rail accidents.

Spent Fuel Transportation Safety Record

Favorable Transportation History

- Over 1,400 spent fuel shipments since 1979 in NRC approved packages
- ZERO spent fuel package failures
- Greater than 10,000 daily shipments of radioactive materials (all types)

Spent Fuel Transportation Summary

- Type B accident condition tests provide a high degree of protection against real life rail accidents
- NRC periodically re-assesses the effectiveness of Type B standards to reflect changes in package design and accident statistics
- There has never been a release from a spent fuel cask in a rail (or highway) accident

Spent Fuel Disposal

High-Level Nuclear Waste Legislative History

- Nuclear Waste Policy Act of 1982
 - Established permanent disposal as a national policy

- Nuclear Waste Policy Act of 1987
 - Characterization of a single site at Yucca Mountain

- Energy Policy Act of 1992 (Section 801)
 - Directs new site-specific U.S. Environmental Protection Agency (EPA) standards

Roles and Responsibilities

- Nuclear Waste Policy Act of 1982
 - U.S. Department of Energy (DOE) responsible for repository design, construction, and operation
 - EPA responsible for establishing environmental protection standards for repository
 - U.S. Nuclear Regulatory Commission (NRC) responsible for developing regulations to implement the EPA standards and for licensing the repository



NRC's Role At Yucca Mountain

- Establish Safety Regulations, consistent with standards set by the Environmental Protection Agency
- Decide whether or not to authorize DOE to construct the proposed repository
- If authorization is granted, assure DOE complies with the NRC rules and license conditions
- Decide whether or not to allow DOE to operate the proposed repository and dispose of waste

Part 63 Regulatory Framework

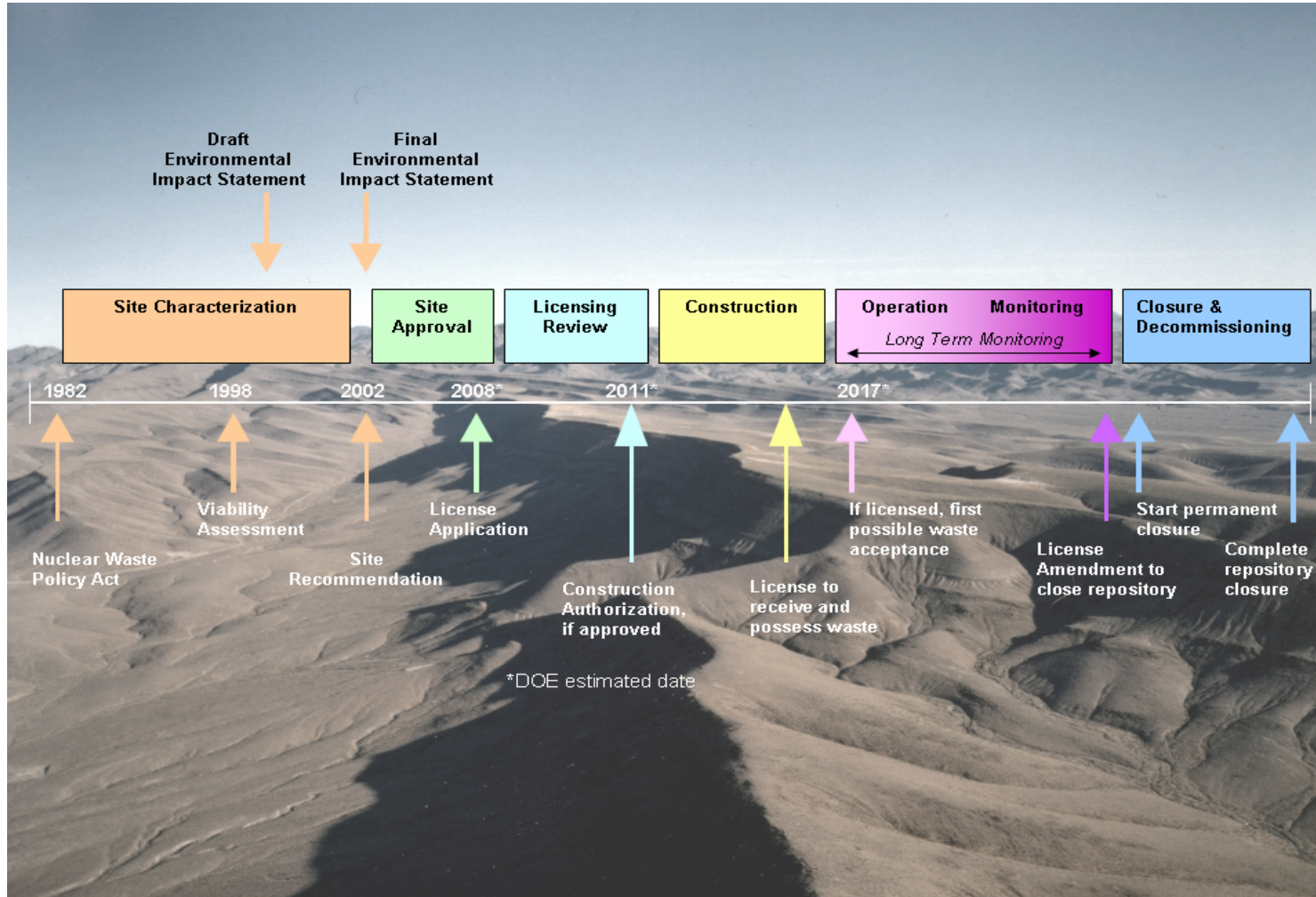
- 10 CFR Part 63 has one license application (LA) with two regulatory decisions:
 - Construction Authorization (CA) (§ 63.31)
 - Safety of the proposed design
 - License to Receive and Possess (§ 63.41)

- Part 63 licensing process is not analogous to Parts 50, 52, 71, and 72

Transport, Aging and Disposal (TAD) Canister

- To demonstrate compliance with Part 63 performance objectives, DOE will need additional evaluation of TAD canisters, licensed based on Parts 71 and 72 deterministic requirements (e.g., seismic hazard evaluation during aging at Yucca Mountain)
- For successful implementation of the TAD canister approach, DOE will need
 - Quality Assurance program processes for oversight and verification of TAD canister fabrication and loading activities
 - to coordinate with various parties involved in the TAD canister approach (vendors, and utilities)

Project Schedule



Current NRC Activities

Preparatory Activities Continue in Several Areas:

➤ Regulatory

- Revise Part 63 Regulations
- Finalize revisions to the Yucca Mountain Review Plan

➤ Technical

- Resolve remaining pre-licensing technical issues
- Develop independent review capabilities

➤ Administrative

- Develop/refine organizational readiness
- Continue public outreach

Program Uncertainties

- Establishment of a final regulatory framework
- Dates of DOE document certification for Licensing Support Network (est. December 2007), and LA submission (est. June 2008)
- Quality of DOE LA and supporting data
- Number and complexity of issues for hearing
- Other developments (DOE's proposed legislation and Global Nuclear Energy Partnerships)

Upcoming NRC Activities

- Perform acceptance review of DOE LA
- Conduct license review
- Develop safety evaluation report
- Conduct formal adjudicatory hearings
- Make decision on DOE Environmental Impact Statement adoption
- Make CA decision on DOE LA in 3-4 yrs

Spent Fuel Disposal Summary

- NRC has a program in place to conduct a fair and independent review of a DOE LA for a proposed geologic repository at YM
- 10 CFR Part 63 has one license application (LA) with two regulatory decisions
- Successful implementation of the TAD canister approach will require integration of technical requirements of Parts 71, 72, and 63, and close coordination among various parties
- NRC is actively engaging DOE, during the pre-licensing phase, to address and resolve technical and regulatory issues relevant to NRC meeting its statutory responsibilities