Used Fuel Management
Where are we and how did we get here?

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Nuclear Energy Institute
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- Architect/engineering firms
- Radiopharmaceutical manufacturers
- Fuel suppliers
- Universities
- Labor unions
- Law firms
What Will We Do with Nuclear Waste?

- Decisions to build new nuclear plants will turn on electricity generation fundamentals, not whether a particular used fuel facility is successful.
- We must, however, have a plausible, durable policy and plan to manage used fuel responsibly including storage and disposal in a deep geologic repository.
Deep Geologic Repository

- Yucca Mountain: Nye County, NV
- Waste Isolation Pilot Plant: Carlsbad, NM
Used Nuclear Fuel in Storage in the U.S.

December 2014

- **Used fuel inventory**
  - 74,258 MTU (pools and casks)
  - Increases ~2000 MTU annually or less than 180 casks per year

- **ISFSI* storage**
  - 22,233 MTU (casks)
  - 2079 casks/modules loaded
  - 65 Operating ISFSIs

*ISFSI = Independent Spent Fuel Storage Installation
Dry Storage Systems

Vertical Storage Cask

Horizontal Storage Module
Quantities of Used Fuel Stored By State (metric tons as of end 2014)

Data Source: Gutherman Technical Services

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Shutdown Sites Without An Operating Reactor

- **California**
  - Humboldt Bay*
  - Rancho Seco*
  - San Onofre
- **Colorado**
  - Ft. St. Vrain
- **Connecticut**
  - Connecticut Yankee*
- **Florida**
  - Crystal River
- **Illinois**
  - Zion*
- **Maine**
  - Maine Yankee*
- **Massachusetts**
  - Yankee Rowe*
- **Michigan**
  - Big Rock Point*
- **Oregon**
  - Trojan*
- **Vermont**
  - Vermont Yankee
- **Wisconsin**
  - LaCrosse*
  - Kewaunee

* total of 248 used fuel casks and 11 GTCC casks at these sites
Yucca Mountain Timeline

1982 - Nuclear Waste Policy Act (NWPA)

1987 - NWPA amended – Site study narrowed to Yucca Mountain

1998 - contractual deadline for DOE waste acceptance

2002 - Yucca Mountain Development Act – licensing begins

2004 - DOE misses License Application (LA) commitment, initiates changes

2008 November - DOE submits LA

2010 February - NRC staff questions on LA answered

2010 August - NRC issues Vol. 1 of Safety Evaluation (SER)

2011 Sept. - NRC suspends licensing process

2013 Aug. - Court orders license restart

2015 Jan. NRC completes SER

2010 October - DOE Terminates Project
Impact of Lack of Federal Program

• Challenges to NRC regulations
• Used fuel continues to accumulate at reactor sites – safely and securely managed
• Lack of confidence in federal government
• U.S. has lost leadership in international community
Who Pays?

• Rate payers
  - one mill/kWh - one tenth of a cent/kWh - adjustable
  - $750 million per year prior to 2014
  - Nuclear Waste Fund – more than $35 billion – investment income more than $1 billion per year

• All taxpayers
  - Payments from taxpayer funded Judgment Fund for lawsuits resulting from failure to accept used fuel beginning in 1998
Taxpayers Paying Billions For Federal Government’s Failure to Accept Used Nuclear Fuel

- $4.5 Billion paid from taxpayer-funded Judgment Fund as of September 2014 for damages incurred because DOE did not begin accepting used nuclear fuel in 1998
- Liabilities will continue to grow after DOE begins accepting used fuel until backlog eliminated (decades)
- DOE estimates the total taxpayer liability at $27.1 Billion if it begins accepting used fuel in 2021
- Every year of delay in opening a facility will cost the taxpayer an additional $500 million (estimated)
- Taxpayer liabilities not paid from Nuclear Waste Fund
Key Used Fuel Events

- Yucca Mountain project suspended 2010
- Blue Ribbon Commission on America’s Nuclear Future recommendations January 2012
- DOE Strategy January 2013
- Court ordered NRC to restart review 2013
- Nuclear Waste Fee suspended by Court order, May 2014
- NRC Yucca Mountain Safety Evaluation Report issued January 2015
De-Comingling Defense and Civilian Radioactive Waste

• March 2015 - Secretary of Energy recommended, and the President authorized, pursuing a Defense HLW Repository for some defense waste

• DOE’s view:
  - Yucca Mountain is not workable.
  - A defense high-level waste repository could be selected, licensed, and built sooner than a common NWPA repository.
  - In parallel, DOE will move forward to address storage and disposal of commercial spent fuel. Consolidated interim storage.

• Congress does not currently agree with this approach
Industry Strategy

• New management entity – board and CEO
• Access to the waste fund and fees
• Completion of the Yucca Mountain licensing process
• Consolidated interim storage for commercial used fuel and DOE high-level waste
• Research, development and demonstration on advanced fuel cycles
Legislation Introduced

- **111th Congress**
  - Voinovich and Upton on Fedcorp

- **112th Congress**
  - Senator Murkowski – used fuel storage
  - Senators Feinstein, Alexander, Bingaman, and Murkowski – used fuel storage in appropriations
  - Senator Bingaman – Nuclear Waste Administration Act 2013

- **113th Congress**
  - Senators Wyden, Murkowski, Feinstein, and Alexander—Nuclear Waste Administration Act 2014

- **114th Congress**
  - Senators Murkowski, Cantwell, Alexander and Feinstein—Nuclear Waste Administration Act 2015
  - Senate appropriations – used fuel storage
The Political Landscape

- Legislation will be considered in both Houses of Congress
- Senate – no deal that does not eliminate Yucca Mountain as an option
- House – no deal that does not include Yucca Mountain
Possible Timelines for Yucca Mountain Repository

2014: $4.5 Billion* in damages already paid from Judgment Fund

2015: Yucca Mountain licensing resumes

Estimate of total damage awards that will eventually be paid from taxpayer-funded Judgment Fund if acceptance of used fuel begins on this date (billions)

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Funding Options

- **2028: Yucca Mountain** opens - assumes annual average funding of $1.4 billion**

- **2038: Yucca Mountain** opens – assumes a max of $750 million/year funding***

- **2042: Yucca Mountain** opens – assumes a max of $600 million/year funding***

* Taken from 2014 DOE Audit Report of Nuclear Waste Fund OAS-FS-15-03 – out years estimated assuming $500 million per year increase based on Blue Ribbon Commission Final Report

** These dates assume that the land and water rights have been obtained by the time NRC completes its review. Construction will not be permitted to begin until land and water rights are secured.

*** Historical maximum appropriation was $576 million
Artist Rendition of a Transport Cask

- Nuclear fuel is transported in strong vault-like containers
  - Truck containers weigh 25 to 40 tons
  - Rail containers weigh 75 to 125 tons
- Multiple barriers provide “defense in depth protection”
Transportation Safety Record

- Four decades of safety.
- Over 3,000 shipments in US.
  - 78% by truck and 22% by rail.
  - Transported over 1.7 million miles
- Over 24,000 shipments internationally.
  - More than 73,000 MTHM SNF/HLW transported
- No injuries, fatalities or environmental damage as a result of the radioactive nature of the cargo
Questions?

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