High-Level Nuclear Waste Storage and Disposal

North Dakota High-Level Radioactive Waste Advisory Council
November 4, 2019

Don Hancock
Southwest Research and Information Center
Albuquerque, NM
Discuss Today

- How is spent fuel generated?
- How and where is the waste stored?
- Will it be disposed at Yucca Mountain?
- What is consolidated storage?
- Why could waste come to North Dakota or not come?
- Can DOE change waste classifications?
- What was the DOE borehole program?
- What is WIPP’s role in demonstrating “safe disposal” of defense TRU waste?
- Other questions you have
Nuclear Power Plants

- ~ 94% of operating reactors are east of 100th meridian
- ~ 92% of spent fuel is east of 100th meridian
How much waste?

Current amount of commercial spent fuel = ~80,000 metric tons

About 2,000 metric tons generated each year
Total Radioactivity (23.8 billion Ci)

Commercial Spent Nuclear Fuel (SNF) Radioactivity
23 billion Ci
97%

High Level Radioactive Waste (HLW) and DOE SNF Radioactivity
813 million Ci
3%

DOE SNF 190 million Ci
23%
DOE cesium and strontium capsules 109 million Ci
13%
DOE “German” glass 6.2 million Ci
~1%
DOE sodium-bonded SNF (ceramic and metal HLW products) 1.6 million Ci
<1%

DOE HLW (Hanford Site)
134 million Ci
27%

DOE HLW (Savannah River Site)
332 million Ci
65%

Commercial HLW glass (West Valley Demonstration Project)
15 million Ci
3%

Notes:
(1) Data from Carter et al. (2012) and SNL (2014).
(2) Radioactivity is for the following years: commercial SNF 2011; HLW 2017; DOE SNF 2010; capsules 2006; and “German” glass and sodium-bonded SNF 2000.
(3) Radioactivity for DOE SNF represents the inventory proposed for disposal as SNF. Radioactivity for DOE sodium-bonded SNF is the projected radionuclide inventory of ceramic and metal HLW products that will be created from electro-chemical processing of all DOE sodium-bonded SNF.
“We recommend calculation of the maximum risks of radiation releases whenever they occur as long as the geologic characteristics of the repository environment do not change significantly. The time scale for long-term geologic processes at Yucca Mountain is on the order of approximately one million years.”

Storage Today

Surry - Virginia

San Onofre - California
“the generators and owners of high-level radioactive waste and spent nuclear fuel have the primary responsibility to provide for, and the responsibility to pay the costs of, interim storage of such waste and spent fuel until such waste and spent fuel is accepted by the Secretary of Energy in accordance with the provisions of this Act.” NWPA Sec. 111(a)(5).
Law: DOE does Disposal

“following commencement of operation of a repository, the Secretary [of Energy] shall take title to the high-level radioactive waste or spent nuclear fuel….” NWPA Sec. 302(a)(5)(A).

Yucca Mountain, NV is the only disposal site considered since 12/22/1987. NWPA Sec. 160(a)(2).
Yucca Mountain, NV

State of Nevada and Indian Tribes have many technical & legal objections
Yucca Mountain Timeline

- House overrides on 5/8/2002 by 306-117
- Senate overrides on 7/9/2002 by 60-39
- DOE License application to NRC on 6/3/2008
- DOE asks to Withdraw application on 3/3/10
- DC Court of Appeals decision 8/13/13
- No DOE Yucca Mtn. funding – FY 2010-2019
Existing Consolidated Storage

- Private Fuel Storage is located in Tooele County, Utah
- NRC issued 20-year license on February 21, 2006
- Site not used because of public and state opposition, establishment of Cedar Mountain Wilderness Area, BLM not granting access, and BIA not approving lease
Proposed Consolidated Storage

Either site requires changing NWPA to fund private storage sites. Strong objections from New Mexico and Texas officials.
Hardened On-Site Storage (HOSS)
Why would North Dakota be considered?

- Proposed sites do not proceed
- Borehole proposals revived
- NWPA changes
- No spent fuel or high-level waste
Why would North Dakota NOT be considered?

- State law banning high-level waste
- No nuclear power plants
- No unique geologic/historic features
- One of very few states not on transportation routes – unless waste is coming to ND
Transportation to Yucca Mountain

North Dakota is one of very few states not on likely routes
Can DOE change waste classifications?

- DOE proposes to re-classify some defense high-level waste. That waste is currently in WA, ID, SC, and NY.
  
  *84 Federal Register 26835-47 (6/10/2019)*

- DOE cannot re-classify commercial spent fuel under the NWPA.

- NRC classifies low-level waste.
What was the DOE borehole program?

Geologic Disposal option

- Rugby, ND contract 1/5/2016
  - Moved to SD, failed again
- Four contracts 12/19/2016 - TX, NM (2), SD
- Termination announced 5/23/2017
WIPP Geologic Disposal
What is WIPP’s role in demonstrating “safe disposal” of defense TRU waste?

- Authorized in 1979 Public Law 96-164 § 213
- EPA Certification 63 FR 27354-27406 (5/18/98)
- First shipment – March 26, 1999 from LANL
- NM Hazardous Waste Permit (10/27/1999)
WIPP’s Mission

- “Start Clean, Stay Clean” to dispose of up to 175,564 m³ of defense TRU waste
- Safely transport TRU waste through more than 20 states without serious accidents or releases
- Safely clean up TRU waste at DOE sites
- Safely close, decontaminate, and decommission the WIPP site beginning in about 2030 or earlier
February 2014 Fire & Radiation Release

Location operator saw orange glow.

Event locations more than 2,300 feet apart

Salt Haul Truck Fire Location
(North part of mine)

Continuous Air Monitor Alarm Location
(Panell 7 Exhaust Drift)
Radiation Release Results

More than 8,000 feet of contaminated tunnels

No waste shipments for 3 years, 2 months
Resources

NRC documents:  
https://www.nrc.gov/waste/ql-waste.html

Nuclear Waste Technical Review Board:  
https://www.nwtrb.gov

State of Nevada Nuclear Waste Project Office:  
http://www.state.nv.us/nucwaste/

DOE spent fuel research:  

DOE HLW re-interpretation:  
https://www.energy.gov/em/program-scope/high-level-radioactive-waste-hlw-interpretation

WIPP’s website:  
https://www.wipp.energy.gov
Contact Information

Don Hancock
Southwest Research and Information Center
PO Box 4524
Albuquerque, NM 87196-4524
(505) 262-1862
(505) 262-1864 (fax)
sricdon@earthlink.net
www.sric.org