Western Interstate Energy Board

High-Level Radioactive Waste Committee Position Paper

Ship Oldest Fuel First
Number 2017-3

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Statement of Policy

To reduce the potential radiological exposure from spent nuclear fuel (SNF) casks in transport, and to reduce potential radiological releases in the event of a severe accident, DOE should adopt a policy of shipping "oldest fuel first." By designing the initial transport program around the policy of shipping oldest fuel first from shut-down nuclear reactor sites, the potential radiological impacts of SNF shipments to either an interim storage facility or a repository will be lessened.

Background & Context

1. **The pressure to move SNF away from reactors continues to grow.**
   As of September 2015, there was approximately 32,930 metric tons of SNF at 16 shut-down nuclear reactors at 13 utility sites in 10 states. At least three additional reactor sites are scheduled to shut down over the next five years. While the NRC's contested 2010 "Waste Confidence" decision determined that SNF can be safely stored on-site indefinitely, the local political pressures for removal are increasing. Communities near at-risk sites (such as facilities in earthquake or tsunami zones), continue to express concern over the lack of federal action.[1] The level of concern varies among reactor sites and host communities, as observed in a series of consent-based siting meetings hosted by DOE in 2016.[2]

[1] San Onofre Community Engagement Panel Meeting on Consolidated Interim Storage (CIS). June 22, 2016. Information available at https://www.songscommunity.com/cep-events/062216_event.asp.
[2] Department of Energy Consent Based Siting website, http://www.energy.gov/ne/consent-based-siting (site unavailable as of the date of writing, pending updates).

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2. The National Academies on shipment order.

The National Academies of Sciences (NAS) observed that: "The order for accepting commercial spent fuel that is mandated by the Nuclear Waste Policy Act (NWPA)[3] was not designed with the transportation program in mind. In fact, the acceptance order prescribed by the NWPA could require DOE to initiate its transportation program with long cross-country movements of younger (i.e. radiologically and thermally hotter) spent fuel from multiple commercial sites. There are clear transportation operations and safety advantages to be gained from shipping older . . . spent fuel first."[4]

3. The National Academies on the Standard Contract.

NAS followed with a recommendation that "DOE should negotiate with commercial spent fuel owners to ship older fuel first to a federal repository or federal interim storage," and that, "Should these negotiations prove to be ineffective, Congress should consider legislative remedies."[5]

4. The intent of the Academies' recommendations.

NAS posed these recommendations with the intent to reduce potential radiological exposure from the cask in transport, and reduce radiological release in the event of a severe accident. As stated in the NAS Report: "Some of the oldest spent fuel has been in storage for several decades, enough time for the shortest-lived radionuclides to decay to background levels. Shipping this fuel first would provide an additional margin of safety, especially in reducing the potential hazards to workers and the public during both normal and accident conditions."[6]

5. Complications posed by dual purpose (storage-transport) casks.

A factor not considered by the NAS in 2006 is that prospective transport will now include not just assemblies selected from pools for direct transport in relatively small and standardized multi-purpose casks, but assemblies previously loaded into increasingly large "dual purpose" canisters for on-site storage. In removing fuel from pools for on-site storage, utilities have a greater incentive to make ongoing pool operations safer (by including newer as well as older fuel in dual purpose canisters) than to make prospective transport safer (by increasing the portion of older fuel in dual purpose canisters). Utilities have no incentive to

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[3] NAS is referring to the "Standard Contracts for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste" between DOE and nuclear utilities.

[4] "*Going the Distance: The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*," National Research Council, 2006, page 19.

[5] Id., page 20

[6] Id., page 243.

repackage such canisters in still-operating pools in order to reduce the radiological risk during transportation.

6. Independent spent fuel storage installation (ISFSI) only sites.

Currently, the NRC lists seven decommissioned sites as possessing ISFSI only licenses.[7] ISFSI only indicates the plant license has been reduced to include only the spent fuel storage facility, resulting in orphaned or stranded SNF. Over the next decades the number of stranded ISFSIs will only continue to increase. By 2030, many states may be left managing ISFSI only sites located near some combination of critical waterways, large population centers, active fault lines, or coastal zones. These stranded ISFSIs present unique safety, economic, environmental, and security risks to adjoining communities.[8]

Shutdown date of closed nuclear reactors with fuel on-site[9]

1. Indian Point 1 - Shutdown Date: 10/31/1974
2. Humboldt Bay - Shutdown Date: 07/02/1976
3. Dresden 1 - Shutdown Date: 10/31/1978
4. La Crosse - Shutdown Date: 04/30/1987
5. Rancho Seco (ISFSI only) - Shutdown Date: 06/07/1989
6. Fort St. Vrain (ISFSI only) - Shutdown Date: 08/18/1989
7. Yankee Rowe (ISFSI only) - Shutdown Date: 10/01/1991
8. Trojan (ISFSI only) - Shutdown Date: 11/09/1992
9. San Onofre 1 - Shutdown Date: 11/30/1992
10. Millstone 1 - Shutdown Date: 11/4/1995
11. Haddam Neck (ISFSI only) - Shutdown Date: 12/05/1996
12. Maine Yankee (ISFSI only) - Shutdown Date: 12/06/1996
13. Big Rock Point (ISFSI only) - Shutdown Date: 06/29/1997
14. Zion 1 and 2 - Shutdown Date: 02/13/1998
15. Crystal River - Shutdown Date: 02/02/2013
16. Kewaunee - Shutdown Date: 05/07/2013
17. San Onofre 2 and 3 - Shutdown Date 6/07/2013
18. Vermont Yankee - Shutdown Date: 12/29/2014
19. Fort Calhoun - Shutdown Date: 10/24/2016

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[7] Information retrieved from the NRC webpage **Backgrounder on Decommissioning Nuclear Power Plants**, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html.

[8] *Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy,* January 2012. Retrieved from http://energy.gov/ne/downloads/blue-ribboncommission-americas-nuclear-future-reportsecretary-energy.

[9] Information retrieved from the NRC webpage **Backgrounder on Decommissioning Nuclear Power Plants**, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html, and from **Sites Undergoing Decommissioning,** https://www.nrc.gov/info-finder/decommissioning/.

Proposed Policy Recommendations

1. **DOE should adopt a policy of shipping "oldest fuel first" for SNF shipments from shut-down nuclear reactors to either an interim storage facility or a repository.**
   Such a policy will greatly reduce the radiological risk during transportation. It will also reduce associated impacts with orphaned ISFSIs.

2. **DOE should invoke provisions of the Standard Contact to prioritize shut-down nuclear reactors over operating reactors in terms of shipment priority.**
   Addressing these impediments must be a key federal objective in Standard Contract negotiation, litigation, and legislation.

3. **DOE should develop a shipping priority list predicated on risk assessment.**
   Reactor sites in earthquake or tsunami zones should be given priority consideration while still adhering to the oldest fuel first principle. Shipment priority and scheduling should be based upon a site risk assessment with shut-down facilities slotted into the first tier, followed by operating reactors.

4. **Newer fuel already packaged in dual purpose casks should move down in shipment priority.**
   The practice of coupling "hotter" assemblies with "colder" assemblies in dual purpose canisters compromises transport safety by increasing the potential radiological exposure during transport, and increasing the potential radiological release in the event of a severe accident. Alternative options that reduce the radiological risk must be reviewed and addressed by DOE. Whatever solution DOE adopts must still give preference to shutdown sites over operating reactor facilities.