Western Interstate Energy Board

High-Level Radioactive Waste Committee

2017 Position Papers

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Western Interstate Energy Board

High-Level Radioactive Waste Committee Position Paper

Introduction

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Since the beginning of nuclear power generation in the United States, there has been the assumption and expectation that at some point in time, spent nuclear fuel (SNF) would be transported from the reactors to a final disposal site. That assumption has continued through the decades, though the time frame for when this might begin has repeatedly slipped.

Throughout this time, it has been clear to Western states that other regions of the country fully expect the disposal facility to be located in the West. The federal government has generally seemed to endorse that premise.

For more than 20 years, the U.S. Department of Energy (DOE) studied the viability of constructing a deep geologic repository in the West, at Yucca Mountain in Nevada. Though the Obama Administration cancelled the Yucca Mountain project, legal rulings and Congressional action may yet again lead to active consideration of the site over the next several years.

With the delays in getting a disposal facility operating, two private-led ventures, both in the West – one in New Mexico and the other in west Texas – have begun to pursue hosting a facility for interim storage of SNF. DOE, meanwhile, began a process to seek voluntary host sites for storage and disposal of both SNF and high-level radioactive waste (HLW). That process has since been shelved.

The vast majority of commercial SNF is generated east of the Mississippi River. Transporting the SNF to a Western site would place disproportionate transportation impacts upon the Western and corridor states.

Recognizing these potential impacts, Western states, through the Western Interstate Energy Board's High-Level Radioactive Waste Committee, have engaged with DOE since the 1980s to develop an acceptable transportation program for SNF and HLW.

Western states have considerable experience in working with other DOE programs on the development of a large-scale radioactive material transportation program. Western state representatives worked closely with DOE throughout the 1990s to develop a comprehensive transport safety program for the safe transport of transuranic waste to a deep geologic repository near Carlsbad, New Mexico. Since 1999, more than 11,900 shipments of transuranic waste have safely traversed Western states on their way to the Waste Isolation Pilot Plant

(WIPP), before an accident at the site closed it in early 2014. Shipments subsequently resumed in early 2017. Thousands more shipments will travel Western highways before WIPP eventually closes. That experience provides the Western states with expertise in planning ahead for SNF/HLW shipments.

The High-Level Radioactive Waste Committee, working with other state regional groups and affected Native American tribes, is qualified to assist DOE in developing a comprehensive transport safety program for SNF and HLW.

As a result of its previous and current interactions with DOE, the High-Level Radioactive Waste Committee has collectively developed and agreed to a number of major policy positions related to SNF and HLW transport. These policies are presented to the WIEB Board for their endorsement. If endorsed by the WIEB Board, these policies will be officially submitted to DOE for their consideration and, hopefully, their concurrence.

The first five of these policies follow, and cover these topics: the application of the WIPP transport model to SNF/HLW transport; physical protection requirements for SNF transport; shipping oldest fuel first; implementing a program to support state and federal rail inspectors; and developing a process for robust and consistent inspections of rail shipments.

Additional policy statements related to other aspects of SNF shipment planning will be developed by the High-Level Radioactive Waste Committee in the coming year, and presented to the WIEB Board for their adoption.

Western Interstate Energy Board

High-Level Radioactive Waste Committee Position Paper

The "WIPP Transportation Model" and Its Application to SNF/HLW Transport
Number 2017-1

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Statement of Policy

DOE should work collaboratively with Western states to develop a comprehensive transport safety program for the shipment of spent nuclear fuel and high-level radioactive waste (SNF/HLW) to consolidated storage sites and/or a repository. A previous collaboration resulted in the development of a highly-regarded transport safety program for shipments of transuranic waste to the Waste Isolation Pilot Plant (WIPP).

Background and Context

1. **The Western Governors' policy: use the WIPP process.**
   The policy of the twenty-one Western Governors provides that: "The WIPP Transportation Safety Program Implementation Guide is an excellent model for transportation planning, and a similar guide should be used as a base document for DOE transportation programs for shipments of spent nuclear fuel, High-Level Waste, and/or Greater Than Class C (GTCC) waste to any storage and/or disposal facility."[1]

2. **The Blue Ribbon Commission recommendation: WIPP provides a "successful model."**
   In its January 2012 final report, the Blue Ribbon Commission (BRC) strongly recommended the WIPP transportation program as a model for federal partnership with states, recognizing that "[t]he WIPP facility.....provides a longstanding and highly successful model for partnering with states to achieve shared success in addressing issues related to the transport of nuclear materials."[2] The BRC found that: "States have extensive experience with transportation issues and important roles to fulfill with respect to issues such as routing, inspections, training, emergency preparedness, communications, public information and security for radioactive materials and other hazardous shipments."[3]

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[1] Western Governors' Association Policy Resolution 2016-03.
[2] BRC Report to the Secretary of Energy, Jan. 2012, pg. 85.
[3] Ibid.

3. **The WIPP transportation planning process.**
The "WIPP transportation model" is fully documented in the Western Governors' Association (WGA) WIPP Transportation Safety Program Implementation Guide. Two early WGA reports not only created the foundational program concepts, but demonstrated that the WIPP experience should be used to prepare for future large-scale shipments of SNF, HLW, and other radioactive materials. These WGA reports include the following:

- Report to Congress: Transport of Transuranic Wastes to the Waste Isolation Pilot Plant–State Concerns and Proposed Solutions, June 1989.
- Report to the Western Governors and Secretary of Energy: Safe Transport of Transuranic Wastes to the Waste Isolation Pilot Plant, June 1991.

Key elements of the "WIPP transportation model":

- High-level negotiators represented DOE consistently throughout the process.
- The Western state negotiators were persons with both extensive experience in hazardous materials transport and access to their governors; these negotiators were supported with federal funding so as to make the negotiations a priority and a substantial portion of their jobs.
- The focus of the negotiations was to ensure "safe and uneventful transportation" of transuranic waste, through provisions addressing routing, state inspections, bad weather and road conditions, high quality carriers and drivers, emergency response and emergency response training, notifications and communications, contingency planning, safe parking, carrier audits, and public information.
- Recognizing a heightened public interest in such a large and prolonged radioactive materials transport campaign, the Western states insisted that DOE go beyond minimum federal requirements for many elements of the WIPP transportation program, and adopt extra-regulatory accident prevention and emergency response measures. DOE eventually agreed.
- Full-scale cask testing of the TRUPACT-I and TRUPACT-II transport casks was an important step in establishing credibility for the program.
- The need for casks to be certified by the Nuclear Regulatory Commission (NRC).
- Western states and DOE cooperatively developed a risk communication program including protocols for public information response to accidents and incidents.
- The states' willingness to endorse the WIPP transport safety program was critical in establishing public confidence and reducing opposition to the shipments.

4. **The success of the WIPP transportation program.**
   - More than 11,900 shipments of transuranic waste have been transported safely to WIPP. All of the dozen or so transport incidents that have occurred have been minor. Emergency response has been quick and effective.

- Biennial reviews of the program by the Western states have consistently found it to be a successful system for safely transporting transuranic waste.

5. **Significant differences between rail and highway shipments must be addressed.**
   As the Western states and DOE discovered in 2003-2004 while looking to adapt the WIPP transport program to support WIPP shipments by rail, there are significant differences between the two transport modes. That rail shipments occur on privately owned property instead of in the public right-of-way is just one of the many fundamental differences. These differences must be recognized and accounted for, while still maintaining the integrity of a collaborative process to develop the transport program.

Proposed Policy Recommendations

1. **Use the WIPP transport safety program as a starting point to develop a commensurate transport safety program for rail.**
   Despite the differences between highway and rail, the common-sense principles embedded in the WIPP transport program are also relevant for SNF/HLW shipments: well-maintained equipment; well-trained and experienced crew; rigorous independent inspections; using the best routes and focusing training along those routes; providing advance notification and shipment tracking to the states; and, having provisions in place for bad weather or other off-normal occurrences.

2. **Follow the WIPP model as closely as possible for highway shipments of SNF/HLW.**
   Some shipments of SNF/HLW must be transported by highway instead of rail. Security restrictions related to SNF/HLW transport will require some changes in terms of shipment schedule availability and access to shipment tracking, but otherwise the WIPP program should be readily adaptable to SNF/HLW shipments by highway.

3. **Commit to a collaborative approach to develop a rail transport safety program.**
   The WIPP experience provides the best model for negotiating and conducting large-scale SNF/HLW transportation operations. Its key feature is that high-level federal and state personnel were appointed to negotiate and achieve consensus on the transportation program, and were provided the authorization, funding support and time to work through the details.

4. **Consistent with the Western Governors' charge to their staffs for WIPP, develop and maintain a transport program that is "safe and uneventful" for SNF/HLW transport.**
   For the WIPP transport safety program, DOE eventually agreed to extra-regulatory requirements for all WIPP shipments. These requirements reduce the likelihood of an accident occurring and help provide for a more efficient and robust response if an accident

does occur. Relying strictly on existing regulations and the integrity of the casks is not sufficient to achieve "safe and uneventful" transport.

Western Interstate Energy Board

High-Level Radioactive Waste Committee Position Paper

Physical Protection Requirements for SNF Transport

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Statement of Policy and Objective

The Nuclear Regulatory Commission's (NRC) physical protection requirements[1] should be in place for all shipments of spent nuclear fuel and high-level radioactive waste (SNF/HLW). Utility shipments are currently subject to these NRC regulations. Current DOE spent fuel shipments, and future DOE shipments to storage or disposal facilities, are not at present subject to these regulations.

The objective of this policy is to ensure the physical security of SNF and HLW shipments through Western states. The threat environment in which future shipments will take place is uncertain. It is vital that the shipments receive the highest possible degree of protection regardless of the entity shipping them.

Background and Context

1. **DOE's ability to self-regulate may lessen shipment security requirements.**
   Under the Nuclear Waste Policy Act (NWPA) as amended, SNF shipments to a storage facility or repository by DOE would be largely self-regulated. That would be the case if DOE already owns the material shipped, or if DOE assumes title at the time of shipment. This policy disjunction could create an incongruous situation in which the NRC physical protection regulations would apply to the expected 20 or so licensee shipments each year, but would not apply to the projected 250-500 or more DOE shipments per year to NWPA facilities.[2]

[1] 10 CFR 73.37.

[2] J.D. Ballard, R.J. Halstead, & F.C. Dilger, *"Physical Protection of Spent Fuel Shipments: Resolution of Stakeholder Concerns Through Rulemaking – 12284,"* WM 2012 Symposia, February 26 – March 1, 2012, Phoenix, AZ, available online at http://www.state.nv.us/nucwaste/news2012/pdf/wm2012dilger_pp.pdf.

2. **The consequences of a successful attack on an SNF shipment are potentially severe.** NRC describes physical protection, also referred to as physical security, as consisting of "a variety of measures to protect nuclear facilities and material against sabotage, theft, diversion, and other malicious acts."[3] The NRC system of physical protection requirements for spent fuel shipments (10 CFR 73.37) was originally adopted in 1980. In 2013, NRC updated and expanded these regulations by rulemaking. The current version incorporates regulatory clarifications and security enhancements requested by stakeholders; codifies the findings of NRC and DOE consequence analyses into policy guidance documents; and brings forward into regulations the agency and licensee experience gained since the terrorist attacks of September 11, 2001. Some of those consequence findings are included in the DOE Supplemental Environmental Impact Statement adopted by NRC staff as part of the Yucca Mountain license application in 2009. These findings form the basis of estimates that a successful terrorist attack on a spent fuel shipment in an urban area could release radioactive material and result in thousands of latent cancer fatalities and billions of dollars in clean-up costs.[4]

3. **NRC physical protection requirements are not required for DOE shipments.** The NRC requirements establish a comprehensive system designed to prevent malicious acts and mitigate the consequences of such acts. Licensees must develop shipment plans in advance; use NRC-approved routes; coordinate with local law enforcement agencies; protect information about schedules; and, maintain regular communication between transports and control centers. Armed guards authorized to use deadly force are required, as are vehicle immobility measures to protect against movement of hijacked shipments. These physical protection measures, and other important NRC regulations, are not required of DOE shipments now or in the future.

4. **NRC authority may be limited to package certification.** Richard Meserve, then NRC Chairman, explained in 2002: "If DOE takes custody of the spent fuel at the licensee's site, DOE regulations would control the actual spent fuel shipment. Under such circumstances, the NRC's primary role in transportation of spent fuel to a repository would be certification of the packages used for transport ... However, if NRC licensees are responsible for shipping the spent fuel not only must the transport container be certified by the NRC, but also the shipment must comply with NRC regulations for the physical security of spent fuel in transit (10 CFR Part 73). NRC licensees are subject to inspection for compliance with the NRC's transportation safety and security regulations."[5]

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[3] U.S. NRC, "Physical Protection," http://www.nrc.gov/security/domestic/phys-protect.html.

[4]DOE, *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada,* DOE/EIS-0250F-S1 (June 2008), Pp. 6-26 to 6-27, G-49, CR 418-419, CR 438-439.

[5] R. A. Meserve, *"Responses to Questions from Senator Durbin,"* letter dated March 22, 2002, NRC ADAMS acquisition ML021060662.pdf, May 10, 2002.

5. **DOE can exempt itself from NRC standards.**
DOE and NRC assure stakeholders that DOE self-regulation would meet or exceed NRC physical protection requirements. But DOE may exempt itself from NRC standards "if there is a determination that national security or another critical interest requires different action." DOE maintains that NWPA shipments would be in compliance as long as their physical protection requirements were "the equivalent" of 10 CFR 73.37. Stakeholders are concerned that DOE self-regulation lacks credible independent oversight and fails to ensure performance of the comprehensive system of critical security planning and operations tasks required by NRC.[6]

6. **DOE could skip the NRC route approval process.**
The NRC physical protection route approval process is a particularly important example of the difference between NRC regulation and DOE self-regulation. Once a spent nuclear fuel shipment route request is received, NRC reviews it closely. NRC conducts a detailed review, considering route length and minimizing transit time, local law enforcement and emergency response contact information, adequacy of safe haven locations, and communications capability along the route. NRC also reviews the licensee's consideration of DOT routing requirements, and the licensee's interactions with the affected States. This comprehensive, independent regulatory guidance and oversight would be absent with DOE self-regulation.

7. **NRC regulations are comprehensive.**
NRC regulations also require licensees to pre-plan and coordinate SNF shipments with states. These pre-planning requirements, combined with the requirements for state involvement under the new Transportation Security Administration and Pipeline and Hazardous Materials Safety Administration rail security regulations, would allow affected states to address unique local conditions important for physical protection of shipments along rural as well as urban routes. Other provisions require continuous and active monitoring of the shipment by a telemetric position monitoring system or an alternative tracking system; require an immediate investigation if a shipment is lost or unaccounted for after the designated no-later-than arrival time; and require notification to NRC two hours before the commencement of the shipment, and notification when the shipment arrives at its final destination.

Proposed Policy Recommendation

1. **Apply NRC physical protection requirements to DOE SNF shipments.**
Shipments of SNF and HLW pose a viable target for human initiated events. NRC regulations establish a comprehensive physical protection system designed to minimize the potential for theft, diversion, or radiological sabotage of such shipments, and facilitate the location and recovery of such shipments that may have come under the control of unauthorized persons.

[6] Ballard et al 2012.

Western Interstate Energy Board

High-Level Radioactive Waste Committee Position Paper

Ship Oldest Fuel First
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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).

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

[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.

Western Interstate Energy Board

High-Level Radioactive Waste Committee Position Paper

Rail Route Safety: Track, Grade Crossings, Bridges, and Switches

Number 2017-4

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Statement of Policy

The U.S. Department of Transportation Federal Railroad Administration (FRA) Rail Safety Program and revised Safety Compliance Oversight Plan (SCOP) should be fully implemented to help ensure the safe transport of spent nuclear fuel and high-level radioactive waste (SNF/HLW).

Background and Context

1. **Though the railroads have done much to reduce the accident rate, rail accidents are not rare.**
According to FRA statistics for 2013-2015, about 1,850 railroad accidents occur each year. Many cause no injuries and are cleared within one day. Some accidents involve hazardous materials and result in evacuations, injuries, and deaths.

2. **Rail accidents have several causes.**
Steel wheels on steel rail provide low "rolling friction" on high-quality track and enable efficient transport of very heavy loads. But the system is sensitive to curves, speed, and track geometry. Many derailments involve defects in track such as broken rails or poor track geometry, or weather conditions in combination with track deficiencies. Accidents are also caused by problems in rail equipment, like bearing failure or broken wheels, or problems in train handling, like inadequate signaling.

3. **Train collisions with vehicles are common.**
Operation Lifesaver, a non-profit public education program, reports that "about every three hours, a person or vehicle is hit by a train."[1] Grade crossings of railroads and highways provide plentiful opportunities for such collisions. There are over 46,000 rail-highway crossings in twelve Western states (including Texas and Nebraska), including over 27,500

[1] Operation Lifesaver homepage, https://oli.org/.

rail crossings of public highways. The number of rail-highway crossings on routes directly affected by SNF/HLW transport would be much lower, but as yet is unknown.

4. **The FRA Rail Safety Program is intended to reduce rail accidents and increase rail transport safety.**
   The Rail Safety Program involves six key "disciplines"[2]:
   1. Operating practices;
   2. Track;
   3. Motive power and equipment;
   4. Hazardous materials;
   5. Highway-rail grade crossings; and
   6. Rail infrastructure (e.g., bridges).

   The rail safety program applies to the entire U.S. rail network (140,000 track miles), but available resources do not support full implementation. Generally, available resources are allocated according to train-miles, which prioritizes the Class 1 network (about 90,000 track miles), and, within the Class 1 network, the 36,000-mile STRACNET system.[3]

5. **The Rail Safety Program has challenges with increased rail traffic.**
   Since the early 1980s, U.S. rail freight tonnage has increased by over 50 percent, rail ton-miles have increased by over 70 percent, and rail carloads have increased by over 125 percent. The rail safety program is challenged to keep pace with these increases.

6. **States augment the rail safety system.**
   Under the Federal Railroad Safety Act of 1970 and the Interstate Commerce Commission Termination Act of 1995, state and local regulation of railroad activities is "preempted,"[4] leaving the federal government almost solely responsible for asserting public interests in railroad construction, operation, and abandonment.[5]

   The FRA has, however, established a "state partnership program," under which state agencies assign appropriately-trained state personnel to work with FRA regional offices (generally using matching state-federal funds) to help implement the FRA Rail Safety Program. With the exception of Colorado and Wyoming, all Western states participate to some degree. However, only in California and Texas can participation be termed "significant." In 2003, these states had 39 inspectors spread over five disciplines.[6] Nine

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[2] This policy focuses on the fuller implementation of disciplines #2, #5, and #6 on routes used for SNF/HLW transport in Western states. The implementation of disciplines #1 and #3 is addressed separately.

[3] The Strategic Rail Corridor Network, or STRACNET, is an interconnected and continuous rail line network serving over 120 U.S. defense installations.

[4] I.e., actions that would have the effect of preventing or unreasonably interfering with railroad transportation are preempted.

[5] Exceptions include voluntary agreements entered into with the railroad, traditional police powers on railroad property (e.g., electrical and fire codes), and zoning of land for non-railroad purposes.

[6] None in the "grade crossing and signal system" discipline.

other Western states (not including Montana) had just 31 state inspectors spread over six disciplines.

7. **The FRA SCOP also augments the rail safety system.**
The FRA's 1998 SCOP was developed in anticipation of Foreign Research Reactor Fuel being returned to the United States and shipped to one of two DOE sites. The SCOP adopted safety enhancements in planning, inspection, training, and oversight, and identified tasks to better ensure operational integrity, emergency response, route infrastructure integrity, highway-rail grade crossing safety, and security. The SCOP also anticipated that FRA may apply basic principles and major elements to future rail shipments involving SNF and HLW. States expect the Rail Safety Program to ensure the needs created by shipment of SNF and HLW are met.

Proposed Policy Recommendations

1. **Fully implement the FRA rail safety program: disciplines #2, #5 & #6.[7]**
Along any rail route affected by prospective SNF/HLW transport in any Western state, the FRA Rail Safety Program *and* the safety enhancements identified in a revised SCOP should be fully implemented.

2. **Achieve and maintain FRA rail safety: disciplines #2, #5 & #6.**
Five years prior to SNF/HLW shipment in the West, each affected Western state should receive financial and technical support from DOE in order to provide trained inspectors in rail safety disciplines #2, #5, and #6. These state inspectors will focus on the portions of the rail system likely to be used for SNF/HLW transport, with the purpose of bringing these portions into full compliance with the FRA rail safety program before SNF/HLW shipments begin, and to maintain compliance while shipments continue.

   In Western states that do not participate in the FRA's Rail Safety Program (Colorado and Wyoming), FRA Regions VI and VIII should provide equivalent levels of inspection and compliance.

3. **Require state affirmation of rail safety implementation: disciplines #2, #5, and #6.**
Before SNF/HLW rail shipments begin, and annually as long as shipments continue, Western states should express confidence that the rail routes used are in compliance with rail safety disciplines #2, #5, and #6. SNF/HLW shipments should not continue if significant elements are not in place.

[7] Rail Safety Discipline #2: Track; #5: Highway-rail grade crossings; #6: Rail infrastructure.

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High-Level Radioactive Waste Committee Position Paper

Rail Shipment Inspection

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Statement of Policy

Trains transporting spent nuclear fuel and high-level radioactive waste (SNF/HLW) should be inspected by fully qualified inspectors, using a consistent approach which has been developed cooperatively with the help of Western states. The inspection protocol, to the extent practical, should be commensurate with the Commercial Vehicle Safety Alliance (CVSA) Level VI inspection program.

Background and Context

1. **The CVSA Level VI inspection for highway shipments.**
The Level VI inspection for highway shipment of radioactive materials, developed in the 1990s by the CVSA in anticipation of spent nuclear fuel shipments, has been successful. Such inspections are conducted at the shipment origin, when the truck is loaded and ready to go, when the inspector creates a record of initial shipment conditions. Some states inspect shipments en route, and the shipment is inspected upon arrival at the destination. The Level VI inspection criteria require that equipment be "defect free." Any defects detected as a result of the inspection must be corrected before a shipment continues.

2. **Designing comparable inspections for rail shipments.**
Several initiatives have been undertaken through the years to develop a comparable protocol for rail shipment of SNF/HLW. The initiatives suggest that, compared to truck shipments on public highways, rail inspection standards will be more complex, and the inspection process more time consuming. A current initiative in this vein is being undertaken by the National Transportation Stakeholder's Forum "Rail/Routing Ad Hoc Working Group."

3. **Rail shipment inspection elements.**
   While the particulars and processes have not yet been worked through, it is generally agreed that the rail inspection should include:
   - the "motive power" (i.e., the locomotive);
   - the crew (i.e., training and experience regarding the special features of dedicated trains);
   - the rail equipment (i.e., the rail cask, buffer, and escort cars)[1];
   - the cargo (i.e., the casks, their radiation levels, their loading on cask cars).
   - the consist (i.e., the entire train and its cargo as prepared for shipment).

4. **En route inspection requirements.**
   The Federal Railroad Administration (FRA) requires an en route inspection of shipments that travel greater than 1,500 miles, and advises (for safety reasons, and to avoid impeding other rail traffic) that such inspections be conducted at crew change and/or refueling points, which are generally rail-yards. It is not yet clear how this requirement would be implemented. For example, should an en route inspection be conducted at a rail-yard near the middle or towards the end of a 1,700-mile rail route?

5. **State inspection mandates.**
   While most states do not currently mandate en route inspections of rail shipments of radioactive materials, some states (e.g., Illinois) do mandate such inspections. It is not yet clear, however, how states requiring en route inspections would coordinate the implementation of these mandates with FRA requirements and advice.

6. **Addressing departures from initial conditions.**
   An en route update of a detailed initial inspection is likely to identify departures from initial conditions. It has not yet been determined what degree of variation from which initial conditions should be "noted for observation" and which should require an en route fix, which would add to the time in transit.

7. **Origin inspection locations.**
   At origin sites with rail access (e.g., San Onofre, Rancho Seco), the initial inspection would likely be conducted on-site, on utility property, after dedicated train "make-up."[2] At origin sites without rail access (e.g., Humboldt Bay), SNF would be transported by other modes to a mainline railhead for make-up of the dedicated train. The initial inspection would

[1] DOE's "AAR S-2043" railcar is being designed to continuously monitor several conditions for each car in the consist (location, speed, truck hunting, rocking, wheel flats, bearing condition, ride quality, braking performance, and vertical, lateral, and longitudinal acceleration). The data is provided to the conductor, with indicators whether one or a combination of conditions require a check at the next scheduled stop (yellow), or that the train must be stopped as soon as possible (red). If made available to affected states, this data, which is more detailed than that obtained in a visual inspection, could reduce the need for en route inspections.

[2] Dedicated train "make-up" involves: delivery of the requisite casks, cask loading onto rail cars, assembly of loaded rail cars in a train with buffer and escort cars, and delivery of locomotive power and crew.

presumably occur at this railhead, on rail carrier property. The particulars of such arrangements have not yet been worked through.

Proposed Policy Recommendations

1. **Western states must be involved with the development of a SNF/HLW rail inspection protocol.**
   The protocol for rail shipment inspection and inspection reciprocity should be developed in a process that includes significant involvement of Western and other states, tribal governments, federal agencies such as DOE and FRA, and rail carriers, represented by organizations such as the American Association of Railroads.

2. **The SNF/HLW inspection protocol should be comprehensive.**
   In addition to the particulars of initial and en route inspections, the protocol should address:
   - Initial inspections for sites without rail access;
   - Arrangements to conduct en route inspections, desirably in conjunction with necessary crew changes and refueling;
   - Clarifications regarding which variations from the protocol require an en route correction before continuing;
   - That improvements in sensor and communications technology will be applied and adapted.