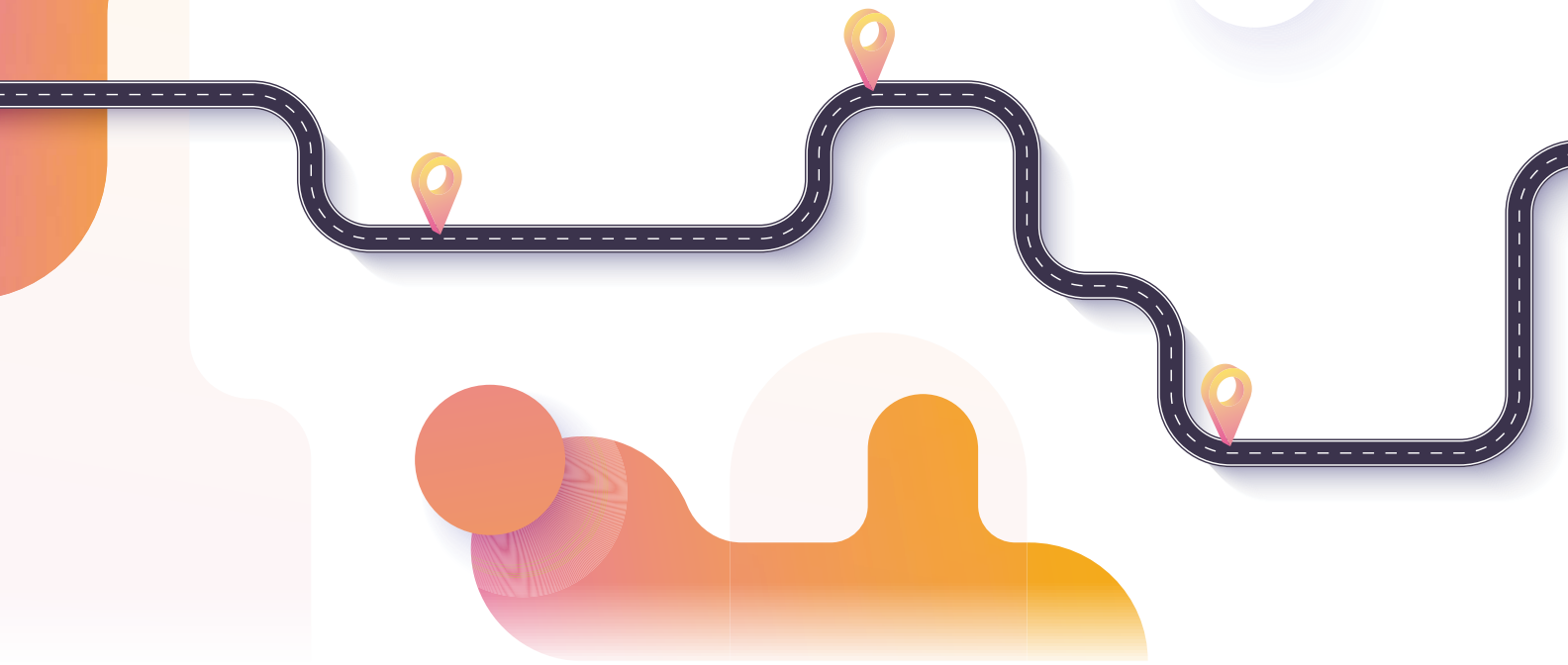
As seen in the November 2022 issue of **Nuclear**News



Route readiness elements in a large-scale spent nuclear fuel transportation system

By Kevin J. Connolly, Lauren S. Rodman, and Matthew R. Feldman

The scale and duration of a national campaign to transport spent nuclear fuel (SNF) from commercial nuclear power plants around the United States would be unprecedented. A meticulous level of planning that considers many elements is needed to inspire public confidence and support.

Under a national transportation plan for SNF, the mode of shipping plays a key role in the determination of routes. Due to the size and weight of transportation casks, rail is expected to be the primary mode of transportation for SNF and high-level radioactive waste (HLW) to repositories or consolidated interim storage facilities (CISF).[1] However, the transportation options to remove SNF from origin sites would be unique to each location. For sites that lack direct rail access, the U.S. Department of Energy will need to determine alternative shipping modes, depending on site-specific factors including infrastructure and additional factors in the vicinity. Alternative modes of transport to a suitable transload location for rail shipments for these sites may include barge or heavy-haul truck.[2]

A crucial planning element is route identification. Rail route identification is expected to be determined by rail carriers once the origin site (and originating railroad) and destination site (and railroad) are known. The U.S. Department of Transportation's (DOT's)

This article does not take into account contractual limitations or obligations under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) (10 CFR Part 961).

This manuscript has been authored by UT-Battelle, LLC, under contract DE-AC05-00OR22725 with the DOE.

route requirements for the identification and analysis of rail routes for shipments of certain hazardous materials, including SNF, are found in "Additional planning requirements for transportation by rail" (49 CFR 172.820), which requires rail carriers to perform an annual comprehensive safety and security rail transportation route analysis to determine and select practicable routes that pose the least overall safety and security risk. Rail carriers determine routes first by conducting a route clearance review to determine which routes can be cleared for shipment height, width, weight, and turning radii, among other items. Next, rail carriers use their proprietary Rail Corridor Risk Management System, which analyzes cleared routes based on 27 risk factors, such as track class and curvature, number of grade crossings, population density, and emergency response capability along the route. Of the options identified, the lowest-risk routes are chosen. Including state, tribal, and local governments in routing conversations will be instrumental to planning, so that all parties are aware of the operational considerations necessary for rail route identification. Furthermore, 49 CFR 172.820 requires that rail carriers seek relevant information from state, tribal, and local officials regarding security risks to high-consequence targets along or in proximity to the route(s) used. Although this activity is a regulatory requirement for rail carriers, the DOE may assist in facilitating these conversations.

Route selection for heavy-haul truck (highway route–controlled quantities) is different from that for rail and is dictated by 49 CFR Part 397, Subpart D. These regulations dictate that SNF be transported by highway using "preferred routes," which include interstate highways, including bypasses and beltways around cities, unless a state or tribal routing agency has designated an alternative route in accordance with applicable DOT requirements.

Training

Section 180(c) of the Nuclear Waste Policy Act (NWPA) of 1982, as amended, requires that for shipments of SNF and HLW to a CISF or repository authorized by the NWPA,[3] the DOE shall provide technical assistance and funds to states and tribes for training for public safety officials along transportation routes. In 2007, the DOE began meeting with tribes to discuss funding allocation options for grants to tribes and that a proposed funding allocation approach would apply only to states. In October 2008, the DOE issued an updated version of the revised proposed policy, which stated that the DOE will send a letter to the office of the governor or tribal leader notifying them of their eligibility to apply for Section 180(c) grants approximately five years before shipments are scheduled through their jurisdiction. Subject to the availability of appropriated funds, the proposed policy states that the DOE would begin making assessment and planning grants available approximately four years prior to the first

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shipment to an NWPA-authorized facility through a tribe's or state's jurisdiction to support assessing the need and planning for training.[4] Following that assessment, the DOE would issue training grants in each of the subsequent three years prior to a scheduled shipment through a state's or tribe's jurisdiction and every year that shipments are scheduled.

Communications planning and stakeholder engagement

Communications planning and stakeholder engagement are vital, interrelated elements of a successful transportation program. Stakeholder engagement consists of the identification, analysis, planning, and implementation necessary to engage with stakeholders. Identification of key stakeholder groups and their level of involvement regarding transportation issues can assist the DOE in developing a more tailored approach to public engagement, outreach, and communications, which, in turn, helps the DOE increase public trust and confidence in the program.

The DOE has historically coordinated its plans for specific shipping campaigns with tribes and states along the route(s),[5] particularly because state, tribal, and local officials have the primary responsibility for public health and safety and for protection of the environment. The DOE's communications strategy should include various means for effectively communicating with state, tribal, and local officials and citizens along routes. Communications plans should include a media strategy and identification of key messages and audiences. Planning activities should include the development of procedures and mechanisms for stakeholders to request information and file comments.

National transportation operations plan

The DOE has issued numerous transportation plans for a number of radioactive materials shipments and shipping campaigns. Topics coordinated through development of a transportation plan typically include communications plans and materials, emergency response plans, routing, training, security, driver or carrier requirements, safe parking, emergency notification, recovery and cleanup, prenotification, shipment tracking, and transportation contingencies. The established practice for a typical transportation plan is for the DOE to consult with state, tribal, and carrier representatives when developing transportation plans.[6]

A national transportation operations plan for a large-scale SNF shipping campaign could include additional elements beyond what is typically included. It could describe the generalized concept of transportation operations, including descriptions of such things as the equipment—for example, the transportation cask fleet, necessary ancillary equipment, and railcar fleet—as well as the facilities used to maintain and store the transportation equipment. General summaries of transportation functions should be provided in the plan, including descriptions of routing methodology; required notifications; shipment dispatch and vehicle tracking; vehicle communications and inspections; protocol for rail crossings, road construction, inclement weather, and other delays; and transportation system activities at the destination site. Overviews should be provided for shipment planning and scheduling and emergency considerations. The plan should also include a general communications plan that identifies audiences, messages, activities to be undertaken, and, importantly, a general security plan.

Site-specific transportation operations plans

The DOE should develop site-specific transportation plans one to two years prior to the first shipment with input from carriers, as well as states and tribes along the routes. These plans should include site-specific details that go beyond the general information contained in the transportation operations plan. Each plan should include a logistics overview with a timeline reflecting the planned start and end of shipments and the schedule for obtaining approval of the route plan and notifying the appropriate authorities of shipments. Detailed information, such as the type of cask to be used, the number of casks moved per shipment, and the total number of shipments planned, should also be included. It should outline the responsibilities of each organization participating in the site deinventory campaign and should also provide information on tracking, emergency management, and training activities. Any additional activities to be undertaken for routine safe transport should also be included, and other considerations, such as site-specific public communications plans and contingency plans for severe weather, should also be in the site-specific operations plan.

Federal railroad administration safety compliance oversight plan

In 1998, the Federal Railroad Administration (FRA) released a safety compliance oversight plan (SCOP)[7] that established procedures for promoting the safe

transport of foreign research reactor fuel by rail. The SCOP was written to coordinate actions by the FRA; other federal agencies; tribal, state, and local governments; and the rail carriers to ensure safe transport of SNF. SCOP tasks cover operational integrity, emergency response, route infrastructure integrity, grade crossing safety, and security for shipments. Recently, an effort has been made to update the SCOP to ensure applicability to large-scale rail transport of commercial and DOE-owned SNF and HLW.

Reciprocal railcar safety inspection protocol

In the 1980s, in anticipation of truck transport of SNF and at the request of the DOE, an inspection protocol was developed by the Commercial Vehicle Safety Alliance, which became known as "North American Standard Out-of-Service Criteria and Level VI Inspection Procedures and Out-of-Service Criteria for Commercial Highway Vehicles Transporting Transuranics and Highway Route Controlled Quantities of Radioactive Materials as defined in 49 CFR Part 173.403" (Level VI). The Level VI inspection is now required by the DOT for all commercial shipments of highway route–controlled quantities of radioactive material.[8] Commercial SNF shipments conducted via heavy-haul truck fall under this category. Trucks transporting transuranic waste to the Waste Isolation Pilot Plant in New Mexico are also inspected using this protocol.

An analogous inspection protocol for rail shipments is currently under development by the DOE, working with the SNF Rail/Routing Ad Hoc Working Group of the DOE's National Transportation Stakeholders Forum.[9] It is intended to create a consolidated inspection document that the DOE can share with tribes and states along SNF shipment routes for the purpose of promoting rail shipment inspection reciprocity, thus eliminating the need or desire for each jurisdiction along the route to inspect the rail conveyance. It is not intended to replace inspections conducted by the FRA, state rail inspectors, or rail carriers.

Transportation tracking and communications system tracking

All SNF shipments will be tracked in real time during all transportation operations. Association of American Railroads Standard S-2043, under which all railcars for SNF transport will be certified, requires safety monitoring to prevent derailments and equipment failures.[10] DOE Order 460.2B also requires telemetric tracking of SNF shipments.[6] The DOE is developing its Integrated Security and Safety Monitoring System to ensure that safety and security monitoring requirements, including tracking requirements, are met. This system will allow rail shipments of SNF using the Atlas railcar to be in communication with the DOE's Transportation Tracking and Communications System (TRANSCOM) in Carlsbad, N.M.

Currently, the DOE tracks waste shipments to the Waste Isolation Pilot Plant using TRANSCOM, which allows for appropriate levels of information sharing between the DOE and states and tribes along routes. Enabling TRANSCOM or a similar tracking capability for road, rail, and waterway shipments of SNF will be necessary before commencing transportation operations. Work is currently in progress to provide this functionality for rail shipments; adaptation of the tracking and communications technology for other modes is expected to commence in the near future.

Mechanism for conducting route security reviews

Safety and security requirements address a range of issues, including physical protection, escorts, and preshipment planning. Preshipment planning includes assessment of potential security threats (e.g., malevolent acts, civil unrest, or activities intended to interfere with shipments), as well as security conditions and assessments specific to routes. For shipments conducted via rail, such assessments would be conducted in coordination with rail carriers and their security organizations.

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Security requirements specific to commercial SNF shipments by the DOE are found in DOT and Nuclear Regulatory Commission regulations and DOE orders. DOT regulations in 49 CFR 173.22(c) require that a shipper of irradiated reactor fuel (i.e., SNF) provide physical protection in compliance with a plan established under NRC requirements or equivalent. In addition, the DOE requires that its shipments be conducted in a manner that achieves the same level of security to that required by the DOT and the NRC for comparable commercial shipments.

Security escort program

To minimize the likelihood of theft, diversion, or sabotage of SNF in transit, all shipments will be required to have an escort of at least two armed security personnel. For shipments by road, state law enforcement officials may act as primary or secondary security escorts for SNF shipments. Details of arrangements with state and tribal law enforcement, including security roles, heavy-haul shipment permits, and other requirements for heavy-haul shipments, have yet to be determined and will likely be decided on a case-by-case basis with individual tribes and states.

The primary security escorts for rail shipments of SNF are expected to be teams of DOE federal security officers or DOE-contracted private security guards stationed on the rail escort vehicle.

For barge transportation, the DOE would need to coordinate with the U.S. Coast Guard to establish a protocol for armed escorts while shipments are docked at ports.

For all transportation modes, coordination among the DOE, the DOT, and local law enforcement will be necessary, following protocols and procedures developed as described in the previous section. Additional agreements and coordination among agencies, such as the Department of Homeland Security and the NRC, may also be part of transportation security planning.

Kevin J. Connolly is a policy and systems specialist who supports the Transportation Security, Engineering, and Analysis Group at Oak Ridge National Laboratory. Lauren S. Rodman is an earth scientist at Pacific Northwest National Laboratory, specializing in environmental resource management and energy development issues, with a focus on nuclear energy, renewable energy, and tribal policy. Matthew R. Feldman is a senior technical advisor at PNNL.

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