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Mr. Chairman and members of the Subcommittees, I am very pleased to be here today to testify on the important subject of the transportation of nuclear wastes. The Federal Railroad Administration (FRA), on behalf of the Secretary of Transportation, administers the Federal railroad safety laws, including those concerning the transportation of hazardous materials by rail. Ranking at the top of FRA's priorities is the safety of rail shipments involving Spent Nuclear Fuel (SNF)[1] and High-Level Radioactive Waste (HLRW)[2]. These materials have been transported safely by rail in the United States for more than 45 years. Since 1957, approximately 1,100 shipments of SNF and HLRW have traversed our Nation's railroad system.

To ensure the safe transportation of nuclear materials by rail, FRA works as part of a multi-agency team that includes, among others: the Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), the Federal Emergency Management

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1 The Nuclear Waste Policy Act of 1982 (NWPA) defines "spent nuclear fuel" as "fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing."

2 NWPA defines "high-level radioactive waste" as "(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation." The term "Commission" as used in the definition means the Nuclear Regulatory Commission.

Agency, the Research and Special Programs Administration (RSPA) and the Federal Motor Carrier Safety Administration (FMCSA). We also work closely with various state governmental organizations, including the Council of State Governments, the Western Governors Association, and the Southern States Energy Board.

DOE, of course, has broad responsibilities in the area of nuclear power that include planning and arranging for the transportation of spent nuclear fuel and high-level radioactive wastes. NRC, in addition to licensing nuclear facilities, has developed the overall design criteria for the casks in which these materials are transported and reviews and approves physical security plans for spent fuel shipments. RSPA, another agency of the Department of Transportation, sets the standards for the transportation of all hazardous materials, including spent fuel and high-level wastes. RSPA's relevant standards cover hazard communication, shipment documentation, packaging safety and training. FMCSA oversees the safety and routing of shipments by highway.

In general, FRA establishes safety standards concerning the design, maintenance and inspection of many elements of our Nation's railroad system, including track, motive power and equipment, signal and train control, operating practices, and hazardous materials transportation. Railroads are required to conduct their own inspections to ensure that these safety standards are being met. FRA leads a cadre of approximately 400 Federal and State safety inspectors whose role is not to conduct safety inspections *for* the railroad industry, but to monitor the railroad industry's own inspection forces to ascertain whether the railroads are in compliance with applicable Federal safety standards. FRA inspectors accomplish this task by conducting routine, random and programmed inspections of railroad properties and comparing their findings to a railroad's own

inspection records. Thus, while primary responsibility for inspecting the railroads rests with the railroads themselves, FRA's inspection strategy is to ensure the integrity and effectiveness of the railroads' own inspection programs.

With regard to rail transportation of SNF and HLRW in particular, FRA conducts inspections to verify that the shipment is properly prepared and in compliance with all applicable hazardous materials regulations. We also help to ensure that the track, signal systems, grade crossings, bridges, and rail vehicles used for these shipments are in safe condition and that responsible railroad employees are properly trained and briefed. In these activities, of course, we work very closely with the railroads, their employees, and the affected communities. We believe the regulatory structure, planning, monitoring, coordination, and experience have produced a very safe system for the transportation of nuclear wastes by rail, but we understand the need to continue to improve that system to meet the new challenges posed by the expected increase in those shipments and the post-September 11th security environment.

Rail Transportation of Radioactive Materials

Railroad transportation is well suited to moving high-level radioactive materials safely and efficiently. Complementary Federal regulations issued by RSPA and NRC require SNF and HLRW, even when shipped in small amounts, to be transported in specially shielded containers or casks that conform to NRC's regulations for Type B containers. Typically, in accordance with NRC's standards, these casks are constructed of multiple layers of stainless steel with shielding sandwiched in between the layers of steel to protect against radioactive emissions. Railroads are ideally suited to moving these large, heavy casks.

Most rail shipments of SNF or HLRW move in casks that weigh up to 125 tons when loaded and are capable of carrying large quantities of high-level radioactive material. Many truckloads would be required to move an equivalent amount of nuclear material by highway. To get a sense of the great efficiencies that can be achieved by moving high-level nuclear materials by rail, consider the data projections presented in the environmental impact statement (EIS) for the Yucca Mountain site. Over the 24-year period covered by the EIS, there will be approximately 10,700 shipments of SNF, which means there will be about 150 train movements carrying up to 450 shipments (three shipments per train) annually. To carry this same quantity of SNF by truck would require approximately 53,000 shipments over 24 years, which would mean 2,200 highway movements (one shipment per truck) annually. The inherent efficiency of rail transportation in moving SNF and HLRW has a direct bearing on safety, as fewer shipments of nuclear materials means less public exposure and less opportunity for a transportation incident.

Rail movements of SNF and HLRW have a long and very positive history, and the volume of these shipments is growing. The Navy has been shipping SNF to disposal sites since 1957. In 1989, Carolina Power and Light began sending SNF from its commercial nuclear reactors to temporary storage facilities. Several years ago, FRA realized that the relatively modest number of rail shipments of SNF and HLRW, which had numbered between 15 and 25 annually during the early 1990s, was likely to increase dramatically. In 1995, DOE began shipment of SNF and HLRW as part of its Foreign Research Reactor Fuel Program, which is intended to safeguard SNF shipped from research reactors around the world and is an important element in the Nation's nuclear

non-proliferation efforts. As a result of these programs, rail shipments of SNF and HLRW increased from 38 shipments in 1997 to an average of more than 64 shipments per year in the succeeding years. Furthermore, two separate consortiums of commercial nuclear power producers each anticipate initiating as many as 100 rail shipments per year of SNF and HLRW to temporary storage facilities, possibly as early as next year. Therefore, even without the Yucca Mountain shipments, rail shipments of SNF and HLRW are destined to increase sharply.

FRA's Safety Compliance Oversight Plan (SCOP)

Ultimately, the safe movement of SNF and HLRW depends on the application of sound safety regulations, policies and procedures. This requires extensive planning and coordination among Federal agencies, state and local governments, and commercial transportation companies.

In the mid-1980s, partly as a result of the rail shipments from the Three Mile Island Nuclear Power Plant, FRA implemented its High-Level Nuclear Waste Rail Transportation Inspection Policy for all known rail shipments of SNF and HLRW. Under FRA's Inspection Policy, there has never been a rail accident or incident involving the transportation of SNF or HLRW that has resulted in a release of the material from the packaging. Furthermore, there has never been a single death or injury resulting from a rail shipment of radioactive material.

Taking a proactive approach to railroad safety, FRA recognized the need to enhance its high-level radioactive materials rail transportation inspection policy to ensure that the railroad industry's outstanding safety record for nuclear material shipments could continue unabated despite the sharp increase in nuclear materials shipments. Therefore,

in 1998, FRA developed the Safety Compliance Oversight Plan For Transportation of High-Level Radioactive Waste and Spent Nuclear Fuel (SCOP), which set forth an enhanced FRA policy to address the safety of rail shipments of SNF and HLRW. While the SCOP was originally developed in support of the DOE's Foreign Research Reactor Fuel program, FRA believes this enhanced policy is necessary to ensure the safety of future rail shipments of SNF and HLRW, which are destined to increase significantly with or without the opening of Yucca Mountain.

Development of the SCOP involved a coordinated effort between FRA, DOE, the Association of American Railroads (AAR), railroad labor organizations, and representatives of affected States. Also, through participation in DOE's Transportation External Coordination Working Group, FRA has consulted with Native American groups on the relevant issues. FRA wishes to acknowledge the invaluable contribution of its safety partners, whose insight and wisdom were instrumental in formulating the policies and procedures that are incorporated into the SCOP.

Key elements of the SCOP include: planning the most appropriate routes, training of railroad employees and emergency responders, and enhancing FRA safety inspection practices and overall safety oversight policies.

Under the SCOP, FRA works with DOE, the offeror or its agent, and the rail carriers in planning and selecting the routes, emphasizing the selection of the highest classes of track. (FRA regulations define various classes of track; each class of track has a maximum allowable operating speed and specific design, maintenance and inspection requirements. The higher the class of track, the higher the permissible operating speed and the more stringent the safety standards.) FRA also prepares an accident prediction

model for the highway-rail grade crossings along the intended route and uses this model to assist DOE in coordinating with appropriate State, local, and tribal agencies in route planning activities. We also coordinate with Operation Lifesaver, a private safety organization, to increase grade crossing safety awareness and education in communities along designated routes. We also work with DOT's Office of Intelligence and Security in coordinating security precautions, such as the identification of "safe havens," with the offeror, law enforcement officers, and intelligence communities. As the new Transportation Security Administration begins its work in the Department, we will be coordinating closely with them to ensure the security of these shipments. Finally, FRA reviews the emergency response plans of the offeror, rail carrier, and DOE to ensure that they adequately address the actions to be taken in the unlikely event of an accident or incident involving the train.

Training is another important element of the SCOP. It is FRA's policy to assist DOE, and the offeror or its agent, in the development of emergency response training and safety briefings and to monitor the industry to verify that requisite training and briefings have been performed. FRA also conducts reviews to ensure that train crews who operate the trains in which nuclear materials are transported are properly certified, trained, and experienced in running over the designated routes. FRA also checks to see that these crews have received specific training concerning the nature of the shipments.

As explained above, FRA's safety inspection program is primarily designed to monitor the safety performance of railroads, which are responsible for performing their own inspections and ensuring the safety of their operations. However, under the SCOP, FRA plays a more direct role by conducting more focused and intensive safety

inspections to ensure the highest level of safety for rail shipments of SNR and HLRW. For example, instead of inspecting a limited sample of locomotives and freight cars as we do for routine rail operations, FRA equipment inspectors conduct a thorough inspection of each and every locomotive and freight car for every train that transports SNF and HLRW. These inspections ensure that locomotives, freight cars, and the train's braking systems meet all applicable Federal safety standards. Furthermore, along a designated route, it is FRA's policy to observe the operation of all automated warning devices at highway-rail grade crossings, to ascertain that they are operational before the shipment. FRA signal inspectors also conduct inspections of selected grade crossing warning devices to gauge the reliability and integrity of the grade crossing warning system. Furthermore, FRA places operating practices experts in the rail carriers' dispatching centers during SNF and HLRW shipments on designated routes to observe firsthand the progress of the shipments and any operational problems that might arise. It is also FRA's policy to inspect all the tracks along the entire route of a nuclear shipment; this includes both visual inspections and automated inspections by FRA's track geometry vehicle (the T-2000), which is capable of measuring the alignment, gage and cross-level of every foot of railroad track. In addition, FRA reviews the rail carrier's rail flaw detection vehicle data to ensure that rail flaw inspections have been performed on the designated route, and necessary rail repairs have been made prior to the shipments.

It must be emphasized that the SCOP is a living document that has evolved from 45 years of accumulated experience regarding the safe movement of nuclear materials by rail. FRA will continue to work in partnership with the rail community to periodically review, evaluate and update the SCOP to keep pace with the latest developments and

technologies involving the safe transportation of nuclear materials.

From this brief description of FRA safety inspection policies under the SCOP, one can understand why FRA inspection resources are stretched to their limits, even with the relatively modest number of nuclear rail shipments that are currently taking place. We are working within the budget process to anticipate the resources needed to maintain the highest level of safety for SNF and HLRW rail shipments. For example, one of the budgetary challenges FRA will need to overcome involves our automated track geometry vehicle, which is capable of inspecting 30,000 miles of track per year. When the interim nuclear storage facilities or Yucca Mountain begin accepting shipments of SNF and HLRW, the number of track miles over which SNF and HLRW travel will most assuredly exceed 30,000, and we must be prepared to respond to the challenge.

Safety and Security Protocols

Federal regulations for shipment of nuclear material by rail are augmented by a series of safety and security protocols and special operating restrictions that have been agreed upon by DOE and the railroads. These protocols and operating restrictions have evolved over the years and are often tailored to the particular needs of the individual shipments. Under these protocols, a train carrying SNF or HLRW would typically include the cask cars, two buffer cars (one on each end of the shipment to cushion against impacts in the event of a collision), and an occupied escort car staffed by security personnel. Special operating restrictions have included limitations on the maximum speed of trains carrying nuclear materials, requirements to stop opposing trains on adjacent tracks when they meet a train carrying nuclear materials, and requirements that nuclear material cars be switched only with an attached locomotive rather than allowing

them to roll to a stop on their own during switching.

Another convention involving the shipment of SNF and HLRW by rails concerns the use of dedicated trains. Until the mid-1970s most rail shipments of these radioactive materials were handled in regular service trains that carried a wide variety of freight in addition to the radioactive materials cars. In 1974, the railroad industry began insisting that radioactive materials shipments move in dedicated trains that solely transport the radioactive material cars. There has been much debate about this topic over the years; while many nuclear materials shipments do move in dedicated trains today, this is not the case for all such shipments. (In 1977, the Interstate Commerce Commission issued a decision that prevented railroads from mandating the use of dedicated trains.) FRA has engaged the services of the John A. Volpe National Transportation Systems Center to conduct a thorough study of the safety and security implications surrounding the transportation of high-level radioactive materials in dedicated trains versus regular service trains. We hope to have the study completed by the end of this year or early next year.

The security of rail shipments of radioactive materials has long been a priority even before the tragic events of September 11th. Some of the protocols described above contain stringent security measures to protect against terrorist threats, including the accompaniment of these shipments by armed security forces and requirements to protect the cars when sitting in rail yards or sidings.

More recently, Global Positioning Satellite (GPS) technology is being used to track the location of trains carrying radioactive materials. FRA is leading a departmental effort to build a Nationwide Differential Global Position Satellite (NDGPS) system that

can greatly improve the accuracy of conventional GPS to several centimeters. This level of precision permits the system's user to determine exactly which track (where there are adjacent tracks) a train is occupying. Our goal is to have dual NDGPS coverage for the entire United States. Presently, 80 percent of the continental U.S. has NDGPS coverage while 40 percent has dual coverage.

Although security concerns have long played a prominent role in the safety of rail shipments of radioactive materials, the events of September 11th have reinforced the fact that we must constantly reassess our assumptions and beliefs. A few weeks after the attacks on the World Trade Center and the Pentagon, the Association of American Railroads secured the services of an experienced security firm to conduct a comprehensive review and assessment of the security of our Nation's freight railroad system. The security of hazardous materials, including radioactive materials, and defense-related shipments are two areas that have received special emphasis in the security review. FRA has obtained the services of its own security experts to review the AAR security assessment. We will provide input into the security review, which may include proposed enhancements for the security of rail shipments of nuclear materials.

Nothing that we do in transportation after last September 11th can ignore the threats to security posed by terrorist organizations. The Federal agencies responsible for direction or oversight of these movements have worked successfully over the years through the Governors' offices of the respective States to ensure that emergency planning and emergency response agencies have the information and training they need to do their jobs. This sharing of information and cooperation must continue. However, it will be particularly important that specific information regarding routes and timing of individual

shipments is kept secure by those with a need to know. The Transportation Security Administration and other participating agencies, including FRA, will need to evaluate how best to address this security concern.

Conclusion

FRA believes that it is critical that rail shipments of high level radioactive materials continue to be conducted with a maximum degree of safety and security. This can only be accomplished through a sound and meaningful safety partnership involving all relevant elements of the nuclear industry, the railroad community and appropriate Federal, State and local governmental bodies. Our current safety requirements and practices have evolved over a period of 45 years. We must build upon the knowledge and experience we have gained over that period to meet the challenges that are likely to arise with the projected increase in rail shipments of SNF and high-level radioactive materials in today's railroad environment. As noted above, new challenges will arise regardless of whether or when the Yucca Mountain storage facility becomes operational, and when they do, FRA and its many partners are determined to be prepared to successfully meet these challenges.