

**WRITTEN TESTIMONY  
OF  
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UNITED STATES NUCLEAR REGULATORY COMMISSION**

**TO THE**

**COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION  
UNITED STATES SENATE  
CONCERNING THE SAFETY AND SECURITY OF  
SPENT NUCLEAR FUEL TRANSPORTATION**

Introduction

Mr. Chairman and Members of the Committee, I am honored to appear before you today to testify on behalf of the U. S. Nuclear Regulatory Commission (NRC) staff concerning the NRC's role in ensuring the safety and security of the potential transportation of spent nuclear fuel, including the potential transport to the proposed geological repository at Yucca Mountain, Nevada. As you know, the NRC staff has accepted for technical review the application from the Department of Energy (DOE) to construct a geologic repository for high-level waste at this site.

Spent nuclear fuel can be safely and securely transported, including from its current location at operating and decommissioned nuclear power plants to a permanent geologic repository. This conclusion is based on over 35 years of experience with spent nuclear fuel transportation both here in the U.S. and around the world. It is also based on the application of a comprehensive regulatory framework and effective oversight by the NRC, the U.S. Department of Transportation (DOT), the Department of Energy (DOE), States, and Tribal governments. Within the U.S., there have been over 1500 commercial shipments of spent fuel from nuclear power reactors since 1979. All of these shipments have occurred without a single package failure or radiological release. This means that there have been no radiological releases or injuries to workers or the public who live and work along these shipment routes. It is our understanding that the transportation safety record also extends to the approximately 30,000 international spent fuel shipments made primarily by Japanese and European companies engaged in the reprocessing of spent fuel.

Regulatory Framework

The safety and security of spent nuclear fuel shipments are guided by a comprehensive regulatory framework that includes the NRC, DOE, DOT, the States, and Tribal governments. This regulatory framework is informed and closely aligned with the International Atomic Energy Agency (IAEA) Transportation Safety Standard to ensure international alignment of transportation package performance standards and requirements. The NRC's primary role in ensuring the safety and security of spent nuclear fuel and high-level waste shipments is the review and certification of the package designs that are to be used for shipment. NRC would maintain this role for the proposed high-level waste repository. Spent fuel is required to be shipped in extremely

robust transportation packages that are designed and fabricated to withstand normal transportation and hypothetical accident conditions. The certification process requires a comprehensive technical review by the NRC staff of the package's expected performance under hypothetical accident conditions. The specific conditions have been derived from and are intended to envelope the impact forces and thermal environments experienced in severe, "real world" accidents. To be certified by the NRC, a vendor must demonstrate that a transportation package design will prevent the release of radioactive material and the loss of radiation shielding when subjected to the hypothetical accident conditions.

For commercial shipments of spent nuclear fuel by NRC licensees, the NRC also approves the Quality Assurance (QA) programs that apply to the design, fabrication, use and maintenance of transportation packages and requires that shipments comply with NRC regulations for the physical security of spent fuel in transit (10 CFR Part 73). NRC's QA and security regulations do not apply to DOE's shipments to the proposed high-level waste repository.

In general, DOT regulates the transport of all hazardous materials, including spent nuclear fuel, and has established regulations for shippers and carriers regarding radiological controls, hazard communication, training, emergency response, and criteria to determine preferred routes for hazardous material shipment. The States and Tribal governments bear primary responsibility for responding to accidents and incidents within their jurisdictions and in many cases the States have enacted additional requirements for carrier inspections and escorts. For potential shipments to the proposed high-level waste repository at Yucca Mountain, the DOE would be responsible for ensuring the security of the shipments, because DOE plans to take title to commercial spent fuel at nuclear reactor sites. Congress has also directed DOE to abide by NRC requirements for providing advance notifications of shipments to State and local governments.

### NRC's Efforts to Maintain Safety and Security of Spent Nuclear Fuel Transportation

Rather than be complacent with existing safety performance of transportation packages, the NRC continually examines the transportation program to ensure that our standards provide a high level of safety and security. The Commission published transportation risk studies in 1977, 1987, and 2000. These studies indicate that the risk of shipping spent nuclear fuel is very low. To supplement previous efforts, we are currently re-examining spent nuclear fuel transportation risks to account for the spent nuclear fuel, shipping cask and shipment characteristics likely to be encountered in potential shipments to the proposed geologic repository.

In 2002, the NRC co-sponsored an independent safety assessment by the National Academy of Science's (NAS's) Board on Radioactive Waste Management of spent nuclear fuel (SNF) and high-level waste (HLW) transportation, entitled *Going the Distance* which was published in February 2006. The NRC takes this study's recommendations very seriously and addressed them in our program.

The principal finding of the NAS study was:

The committee could identify no fundamental technical barriers to the safe transport of SNF and HLW in the United States. Transport by highway (for small-

quantity shipments), and by rail (for large-quantity shipments) is, from a technical viewpoint, a low-radiological-risk activity, with manageable safety, health, and environmental consequences, when conducted with strict adherence to existing regulations.

The NAS study recommended that full-scale testing continue to be used as part of an integrated approach, along with technical analysis, computer simulation, scale-model, and package component testing programs, to confirm that transportation packages perform acceptably under both regulatory and credible conditions that exceed regulatory requirements. The study also concluded that “deliberate full-scale testing of packages to destruction through the application of forces that substantially exceed credible accident conditions would be marginally informative and is not justified given the considerable cost for package acquisitions that such testing would require.” The study’s recommendations are consistent with NRC’s current plans in the Package Performance Study (PPS) to perform a demonstration test involving a realistic rail impact and fire scenarios. We believe that the NAS study also supports NRC’s decision not to test a full-scale transportation package to destruction in the PPS. Work on the PPS has been deferred by the NRC and DOE until the final transportation cask designs, including the transport, aging, and disposal (TAD) canisters, are deployed. We are currently working with international counterparts in Japan and Germany to learn from their full-scale and model testing to prepare for full-scale testing in the U.S.

NAS recommended that NRC undertake additional analyses of transportation accidents involving very long-duration, fully engulfing fires to determine whether there is a need for regulatory change or additional operational controls during spent nuclear fuel shipments. The NRC has completed two studies on the performance of representative spent nuclear fuel packages in severe rail and highway tunnel fires: “Spent Fuel Transportation Package Response to the Baltimore Tunnel Fire Scenario,” NUREG/CR-6886 (published December 2006), and “Spent Fuel Transportation Package Response to the Caldecott Tunnel Fire Scenario,” NUREG/CR-6894 (published February 2007). These studies confirmed that the spent nuclear fuel packages would not be expected to release any radioactive material from the spent fuel, even under these severe accident conditions.

Through this work, the NRC identified an additional operating control for rail shipments that could be implemented to prevent or mitigate the consequences of long-duration fires: to prohibit a train carrying flammable gases or liquids from being in a tunnel at the same time as a train carrying spent nuclear fuel. Because the NRC does not have regulatory authority over rail carriers, we requested in March 2006, that the Association of American Railroads (AAR) consider revising AAR Circular No. OT-55, ***Recommended Railroad Operating Practices For Transportation of Hazardous Materials***. As a result, the AAR did issue a revision in July 2006 (AAR Circular No. OT-55, Revision I) which states “. . . when a train carrying SNF or HLW meets another train carrying loaded tank cars of flammable gas, flammable liquids or combustible liquids in a single bore double track tunnel, one train shall stop outside the tunnel until the other train is completely through the tunnel.”

Finally, the NAS study also recommended that, “. . . an independent examination of the security of spent fuel and high-level waste transportation should be carried out prior to the commencement of large-quantity shipments to a federal repository or to interim storage.” In light of the elevated threat that the U.S. experienced following the

terrorist attacks on September 11, 2001, the NRC issued safeguards advisories and orders to enhance transportation security of spent nuclear fuel and other large quantities of radioactive material. The NRC issued these security enhancements in coordination with DOT, the Department of Homeland Security, State agencies, and other Federal agencies. The NRC security assessments of transportation, which were completed after the publication of the NAS report, evaluated a number of representative transportation package designs against a variety of credible land-based threats and a deliberate plane crash. The results of these security assessments, which we have shared with DOT, DOE, and other organizations that have a “need to know,” demonstrate that the current requirements, combined with the security enhancements put in place after September 11th, provide adequate protection of public health and safety, and the environment, and common defense and security. These safeguards advisories and orders are only an interim solution and will not be relied on indefinitely. In late 2009, the NRC intends to issue a proposed rule for public comment that would revise the requirements for secure transport of spent nuclear fuel. The proposed rule would include additional measures to address the current threat environment.

In addition, we believe that the security measures for future shipments must defend against the threat that exists at the time of shipment and take advantage of enhancements in technology, such as shipment tracking and monitoring techniques, which are constantly evolving. If the Yucca Mountain repository is approved, any shipments of spent nuclear fuel to this site would not begin until 2020 at the earliest, based on current DOE estimates. Therefore, it may be more appropriate to conduct an independent examination of shipment security closer to the time of actual shipments, if needed.

While the NRC is responsible for overseeing the security requirements for commercial shipments to an interim storage facility, DOE would be responsible for implementing and overseeing the security requirements for Yucca Mountain shipments. Therefore, a comprehensive independent security assessment that encompasses both potential shipments to Yucca Mountain or to an interim storage site would require the participation of both NRC and DOE as well as resources to support such a study.

In an effort to further inform our program, the NRC is also examining two recent transportation accidents involving severe highway fires. One is the MacArthur Maze (Interstate I-880) accident in Oakland, California that occurred on April 29, 2007, in which a gasoline tanker truck with a capacity of 32,500 liters (8,600 gallons) of gasoline crashed and overturned on an interstate highway. The resulting fire was intense enough to cause the collapse of a highway overpass located above the overturned tanker truck. The second accident being studied occurred on October 12, 2007, within the southbound “truck only” bypass tunnel at the I-5/14 interchange in northern Los Angeles County (Newhall Pass). In this accident, multiple commercial trucks were involved in a severe fire occurring in a short, well-ventilated tunnel. We expect the results of these studies to be published in early 2009.

## Summary

In conclusion, spent nuclear fuel can be safely and securely transported from its current location at operating and decommissioned nuclear power plants, including potentially to a permanent geologic repository, under the existing regulatory framework.

This conclusion is supported by the outstanding safety record for spent nuclear fuel shipments to date and numerous safety and security assessments conducted by the NRC, the NAS, and other agencies. Nevertheless, the NRC staff is committed to continually examining our transportation safety and security program to ensure that it remains effective in protecting people and the environment.

Thank you for the opportunity to discuss NRC's transportation safety and security program for spent nuclear fuel. I look forward to answering any questions you may have.