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**Testimony of Everett Redmond II**
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**Surface Transportation Board**
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I am Everett Redmond, Senior Project Manager, Used Fuel Storage and Transportation, at the Nuclear Energy Institute (NEI). NEI is the nuclear energy industry's Washington-based policy organization. Before I begin I would like to thank the board for permitting me and my colleague, Paul Seidler, to provide testimony on the Department of Energy's application for Certificate of Public Convenience and Necessity.

My educational background is in nuclear engineering; I hold a PhD from the Massachusetts Institute of Technology. Prior to joining NEI in October 2006, I was employed by Holtec International, a dry fuel storage and transportation cask supplier. Today I am going to take a few minutes to address the transportation safety of used nuclear fuel, otherwise known as spent nuclear fuel.

Transportation casks for used nuclear fuel, which is a solid ceramic material that will not leak or explode, are constructed of many layers of steel, lead and other materials. There are approximately four tons of shielding for every ton of used nuclear fuel inside the casks. Used nuclear fuel will be shipped to Yucca Mountain using both rail and truck, with the majority of the transport occurring by rail. Casks that are shipped by rail are typically larger, weigh up to 250,000 lbs, and hold up to 32 pressurized water reactor fuel assemblies; compared to truck casks which weigh approximately 50,000 lbs and hold up to 4 pressurized water reactor fuel assemblies. The large capacity rail casks that will be used for transportation to Yucca Mountain are not hypothetical. Numerous casks have been constructed and licensed for both storage and transportation. These casks are currently in use at nuclear power plants storing fuel on-site.

Radioactive material and, more specifically, used nuclear fuel have been safely transported for decades in both the United States and abroad. Over the last 40 years there have been more than 3000 used nuclear fuel shipments in the United States covering more than 1.7 million miles. Outside of the United States there have been tens of thousands of shipments of used fuel as documented in the 2006 National Academy of Sciences report, Going the Distance. Within the United States, each transportation cask design for radioactive material is licensed by the Nuclear Regulatory Commission (NRC) and must meet stringent safety requirements. The designs must be able to safely contain their radioactive contents under various normal and hypothetical accident conditions as defined in Title 10 of the Code of Federal Regulations, Part 71. These hypothetical accidents, which are analyzed in sequence, are a 30 foot drop onto an unyielding surface in the orientation that will result in maximum damage, followed by a 40 inch drop onto a steel rod six inches in diameter, followed by a 30 minute exposure to a fire at 1,475 degrees Fahrenheit that engulfs the entire container, and lastly a submergence of the same container under three feet of water. In addition, an undamaged package must be able to withstand a water pressure equivalent to immersion under a head of water of at least 50 feet. Lastly, a package containing used fuel must be designed so that it can withstand a water pressure greater than a depth of 600 feet for one hour without collapsing, buckling, or inleakage of water. For comparison, Sandia National Laboratory has shown that the 30 foot drop onto an unyielding surface encompasses the following real life scenarios: the cask being struck by a train travelling 60 mph or the package running into a bridge support or rock slope at 45 mph. All of the requirements in the regulations are applicable to all truck, rail, and barge transportation casks.

In addition to regulatory design criteria, the NRC requires the establishment and implementation of a security plan to ship used nuclear fuel before shipments begin. The NRC must review and approve the plan and procedures to protect against radiological sabotage or theft in advance. After the plan is developed and approved, the shipper will then track and monitor these shipments carefully over the entire route.

Since 1971, there have been nine accidents involving commercial used nuclear fuel containers in the United States: four on highways, five during rail transport, and none involving barges. Approximately half of these accidents involved empty containers and none of these accidents resulted in a breach of the container or any release of its radioactive cargo. The most severe of these accidents occurred in 1971 when a tractor-trailer carrying a 25-ton shipping container carrying used nuclear fuel swerved to avoid a head-on collision and over-turned. The container suffered minor external damage but, as designed, prevented the release of radioactive material.

In 2001, a train carrying non-nuclear hazardous material derailed and caught fire inside the Howard Street railroad tunnel in Baltimore, Maryland. The NRC analyzed this fire to determine the possible regulatory implications for the transportation of used nuclear fuel. The analysis, which included two rail casks and one legal weight truck cask, determined that the regulatory dose limits for accident conditions would not have been exceeded for the casks analyzed.

In addition to the normal and hypothetical accident conditions that must be designed for, a transportation cask must be designed so that the exposure from direct radiation is less than the regulatory limit of 2 mrem/hr to any individual in a normally occupied space (for example, the engineers in the locomotive or the armed escorts in the caboose) and 10 mrem/hr at 2 meters (6.5 feet) from the edge of the transport vehicle. To put these numbers in perspective, an average citizen in the United States receives approximately 300 mrem in a year from normal activities and I received approximately 1 to 2 mrem from my flight from Washington to Las Vegas as a result of cosmic radiation. Typically the dose rate from a transportation cask will be considerably lower than the regulatory limit. While the limit is already very small, the dose rate continues to decrease substantially as the distance from the cask increases. For example, a dose rate of 5 mrem/hr at 2 meters (6.5 feet) from the edge of the transport vehicle will reduce to between 1.25 and 2.5 mrem/hr at distance of 4 meters (13 feet).

In conclusion, I hope the information that I have presented indicates that the nuclear industry takes its responsibility in the transportation of used fuel very seriously and that transportation of used fuel has been and will continue to be conducted safely and securely. Thank you for your attention.