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Transporting Nuclear Materials: Design, Logistics, and Shipment

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Good morning Mr. Chairman and members of the subcommittee. My name is Bob Quinn and I am the vice president of Cask and Container Technology for EnergySolutions, a US based international nuclear services company specializing in the safe recycling, processing and disposal of nuclear material. My company is a member of the U.S. Nuclear Infrastructure Council (USNIC), the leading business association advocate for new nuclear energy and global engagement of the U.S. supply chain. I am currently serving as the Chair of the council's Spent Nuclear Fuel Transportation Task Force. My statements today reflect the consensus views of the council and its Spent Fuel Transport Task Force, but do not necessarily reflect the specific views of individual member companies and organizations.

Transportation of nuclear materials including spent nuclear fuel is not new or novel, and has an outstanding safety record over the past 70 years. Nuclear materials are transported on an ongoing basis all over the world by public highway, rail, barge, ocean vessels and air. Per the U.S. Nuclear

Regulatory Commission (NRC), about 3 million packages of radioactive materials are shipped each year in the United States. Spent fuel shipments from commercial nuclear power plants, research reactors, and the Navy have been safely made for decades. The U.S. Navy has completed around 850 shipments totaling over 1.6 million miles of transport, and since the mid-1970's there have been over 1,300 safe shipments of commercial spent fuel in the United States. Between 1990 and 2012, 60 shipments including more that 250 transportation casks of foreign research reactor fuel and been shipped to and within the United States by sea, land and air. There is also a long history of successful, safe transportation of spent fuel globally; over 70,000 metric tons of spent fuel have been transported by road, rail and sea within and among the United Kingdom, France, Germany, Sweden, Japan, and other nations. Coincidentally, this quantity is approximately the same amount of spent fuel currently in storage at commercial US nuclear power plants. In all of these spent fuel shipments there has been no failure of a package and no release of radioactive materials.

Spent fuel is transported in packages (also referred to as shipping casks) that are designed and fabricated to provide shielding of the radiation that is emitted by the fuel, and also to prevent the release of radioactive material, even in severe accidents. The standards for transportation packages are regulated by Federal law and enforced by the U.S. Nuclear Regulatory Commission (NRC) for domestic shipments. International shipments are governed by similar regulations that are promulgated by the International Atomic Energy Agency (IAEA). An independent review of current international standards and U.S. regulations performed by the National

Academies, as documented in their 2006 “Going the Distance” report, concluded these regulations are adequate and proven to ensure package containment effectiveness during both routine transport and in severe accidents. And the Blue Ribbon Commission on America’s Nuclear Future noted that the standards and regulations for spent fuel transportation are proven and well functioning.

The U.S. requirements are contained in Title 10, Code of Federal Regulations, Part 71 (10CFR71) and cover the design, fabrication, operation and maintenance of these packages. The regulations require the demonstration that the package meet demanding criteria for normal operating and accident conditions, including impact, fire, submersion and puncture resistance before NRC will certify them for use. These prescribed hypothetical accident conditions are challenging and have been demonstrated to be bounding of realistic, real world accident scenarios. Demonstration that the regulatory requirements are satisfied by a package design is done by detailed computer simulation analyses using state of the art analytical and modeling tools, and by confirmatory testing of specific features or details, scale models, or in some cases full scale casks. Applicants for certification of packages by NRC must perform the analytical and testing work under an NRC-approved quality assurance program. These safety analysis, and details of the design, fabrication, operation and maintenance requirements for spent fuel packages are documented in a Safety Analysis Report (SAR) that is the basis for an application, which is reviewed in detail by the NRC. The review is extremely thorough and most often results in multiple questions, answers, meetings, and revisions to clarify the application. This thorough process to obtain an NRC Certificate

of Compliance (CoC) typically takes 1-1/2 to 2 years to complete, and certificates must be renewed every 5 years. Moreover, any changes to the design, fabrication, operation or maintenance of the package as described in the SAR or the CoC throughout its lifetime must be approved by NRC and undergo the same review and approval process.

The resulting spent fuel transportation packages that receive NRC certification are extremely robust, state-of-the-art containers comprised of tons of steel and radiation shielding materials. These transportation packages typically are comprised of multiple layers of steel and radiation shielding, and current spent fuel rail casks weigh well over 100 tons. Extreme demonstrations of the robustness of these packages have been performed in the US and UK, showing casks being hit by trains and plowing into solid concrete bunkers at high rates of speed. In each of these demonstrations, the casks maintained their integrity and suffered only superficial damage.

While package design to the regulatory requirements is an integral part of package safety, it does not stop at design. The fabrication of these packages is performed under rigorous manufacturing quality control under an NRC-approved quality assurance program. Validation and certification of materials, welding procedures and qualifications, and measuring and testing equipment calibration are are carefully controlled and thoroughly documented. Fabricators and package fabrication activities are subjected to NRC inspection.

Once fabricated and placed into service, package maintenance, testing and

operational controls are required in accordance with the conditions of the NRC package certification. For example, operating procedures require that package closure seal integrity is tested and verified as meeting the cask certificate of compliance prior to each use, and and radiation levels are checked to confirm compliance with regulatory requirements. Periodic maintenance procedures dictate performance testing of critical container components such as seals and shielding. Performance of all required operations and maintenance activities are a prerequisite for the 5 year recertification of a package for continued use, and package certificate holders and users are subjected to periodic inspections by the NRC to assure that activities are being performed in accordance with the certificate of compliance and regulations.

In summary, USNIC believes that the history of nuclear materials and spent fuel transportation demonstrates a commendable record and history of safety. It is not new or novel. The facts speak for themselves: in more than 70 years of nuclear materials transport in the US and worldwide, no member of the public has ever been harmed from a radioactive release. This is a testament to the effectiveness of the regulatory requirements and processes, which are adequate and well proven, and the industry's implementation of the regulatory requirements in partnership with regional and local governments. The rigorous engineering methods, manufacturing processes, ongoing operational and periodic maintenance requirements and implementing procedures have provided, and will continue to provide, assurance of the safety of spent fuel transportation.

I will be pleased to answer any questions you may have.