

Position Statement #18

The Safety of Transporting Radioactive Materials



Millions of shipments of radioactive materials have taken place in the United States over the last five decades—by road, rail, sea, and air—at the rate of about 3 million per year. Shipments of radioactive materials on public rights-of-way are regulated by the U.S. Department of Transportation and the U.S. Nuclear Regulatory Commission; these regulations are effective and consistent with International Atomic Energy Agency safety standards.^{1,2,3} Taken together, the experience base and the mature regulatory oversight structure provide confidence that radioactive materials have been and will continue to be transported safely.

Transporting radioactive material is necessary to provide for the use, storage, processing, and disposal of the material. Federal regulations address packaging, radiation shielding, labeling, loading and unloading, storage, transportation routes, and vehicle requirements. They impose strict limits on external radiation from the transported package, on the amount of fissile material that can be transported, on the radiation exposure of workers and crews of transport vehicles, and on the amounts of radioactive materials that can be released to the environment. There are also requirements to protect against the diversion of radioactive materials. All shippers and carriers are licensed, and all storage and shipping containers are certified. A graded approach is taken to regulations, so that the greater the potential radiological hazard of the material being shipped, the more stringent the packaging safety requirements. Packages containing material with the highest levels of radioactivity, such as used nuclear fuel (UNF) and high-level radioactive waste (HLW), must demonstrate their ability to withstand hypothetical accident conditions, including a high-speed impact simulated by a 30-foot drop onto an unyielding surface, 30 minutes in a completely engulfing fire at 1475°F (800°C), and immersion under 50 feet of water.

Studies of the risk posed by the transportation of radioactive materials have repeatedly confirmed that current regulations protect public health and safety. The 1977 environmental impact statement on radioactive materials transportation, NUREG-0170,⁴ concluded that existing regulation protects public health and the environment. This result was confirmed most recently by NUREG-2125,⁵ published in 2014. In addition, NUREG-2125 estimated that (1) over 99.999 percent of accidents that could involve a UNF shipment would have no impact at all on the cargo, and (2) the amount of ionizing radiation exposure to the public along the transportation route from a routine, incident-free UNF shipment would be a negligible fraction of annual background ionizing radiation.

More than 4,000 shipments of UNF have been made over U.S. highways and railroads since 1964.⁶ Moreover, the U.S. Department of Energy has transported to the Waste Isolation Pilot Project in New Mexico nearly 12,000 shipments of transuranic waste over 14 million miles since 1999 without incident.⁷ The environmental impact statement for the proposed Yucca Mountain repository (DOE/FEIS-0250),⁸ published in 2002, estimated that if UNF were to be transported to the repository primarily by truck, about 2,200 shipments per year over a 24-year period would be needed to support Yucca Mountain. This would constitute an increase of less than 0.1 percent over the current number of radioactive shipments and less than 0.0007 percent of the 400 million shipments of hazardous materials taking place per year in the United States. If UNF were to be transported primarily by rail, even fewer shipments would be required. Analyses demonstrate that the projected shipments of UNF to a consolidated storage facility or a repository can be accomplished without adding any significant radiological risk to the population along the shipping routes. International experience supports this conclusion. Outside of the United States, in the past

50 years, at least 20,000 shipments of UNF and HLW totaling at least 80,000 tons of material have been made safely.⁶

There have been a few instances in which shipments of UNF or HLW have been involved in transportation accidents.⁶ While extremely rare, severe accidents have taken place, including a trailer hauling UNF overturning, and a grade-crossing accident involving a train carrying UNF. In each case, the packages performed as they were designed. The UNF cargo was not damaged, the material was contained within the package, and the health and safety of the public was not put at risk from the radioactive material.

The transportation of radioactive materials in the United States and worldwide has been conducted with an excellent safety record. The historical record of shipments of radioactive material has demonstrated that the regulations currently in place are sufficient to protect the health and safety of the public and the environment. Furthermore, an increase in the number of radioactive materials shipments, specifically of UNF shipments to a consolidated storage facility and/or repository, would not present any additional radiological risk, when compared to the natural background radiation, or any adverse impact to the public or the environment. ANS is confident that the current regulations are adequate and sufficient to protect the health and safety of the public and the environment in the future. ANS supports the continued safe transportation of radioactive materials under the current regulatory structure.

Reference

1. U.S. Code of Federal Regulations, Title 49, Parts 163–168.
2. U.S. Code of Federal Regulations, Title 10, Part 71.
3. International Atomic Energy Agency, “Regulations for the Safe Transport of Radioactive Material,” IAEA Safety Standards Series No. SSR-6, Vienna, Austria, 2012.
4. U.S. Nuclear Regulatory Commission, “Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes,” NUREG-0170, Washington, D.C., 1977.
5. U.S. Nuclear Regulatory Commission, “Spent Fuel Transportation Risk Assessment,” NUREG-2125, Rockville, Md., 2014.
6. Connolly, K. J., and R. B. Pope, “A Historical Review of the Safe Transport of Spent Nuclear Fuel,” Oak Ridge National Laboratory, ORNL/SR-2016/261, Rev. 1, 2016.
7. U.S. Department of Energy, Waste Isolation Pilot Plant, “Shipment and Disposal Information: Shipments Received As of May 15, 2017,” available at www.wipp.energy.gov/shipments.htm, accessed on May 31, 2017.
8. U.S. Department of Energy, “Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada,” DOE/EIS-0250F, Washington, D.C., 2002, Chapter 6 and Appendix.



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