

## Position Statement #18

# Transportation of Radioactive Materials



The transportation of radioactive materials in the United States and worldwide has been conducted with an excellent safety record. The safety 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 as well as the environment. Furthermore, an increase in the number of shipments of radioactive materials, including used nuclear fuel (UNF) or high-level radioactive waste (HLW) shipments to a consolidated storage facility and/or repository, would present no additional radiological risk compared to the natural background radiation and pose no adverse impacts to the public or the environment. **ANS supports the continued safe transportation of radioactive materials under the current regulatory structure.**

### Background

Millions of shipments of radioactive materials have taken place in the United States since the inception of commercial nuclear energy production—by road, rail, sea, and air—at the rate of about three 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.<sup>1, 2, 3</sup> 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 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 requirements. Packages built to contain large quantities of high-activity material, such as UNF and HLW, must demonstrate their ability to withstand hypothetical accident conditions that include 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 (15 meters) of water.<sup>4</sup>

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,<sup>5</sup> concluded that existing regulation protects public health and the environment. This result was confirmed by NUREG-2125,<sup>6</sup> published in 2014. NUREG-2125 estimated that (1) over 99.999 percent of accidents that could involve a UNF shipment would have no impact 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.<sup>7</sup> Moreover, the U.S. Department of Energy has transported over 12,000 shipments of transuranic

waste to the Waste Isolation Pilot Plant in New Mexico—a total transportation distance of more than 15 million miles—without incident since 1999.<sup>8</sup> Analyses demonstrate that 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.<sup>9,10</sup> International experience supports this conclusion. Outside of the United States, at least 20,000 shipments of UNF and HLW have been made safely and without incident since 1962, totaling at least 80,000 tons of material.<sup>7</sup>

A few shipments of UNF or HLW have been involved in transportation accidents.<sup>7</sup> 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 to protect and contain the contents. 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.

Transportation of radioactive materials worldwide has been conducted with an excellent safety record for decades. The regulations currently in place adequately protect the health and safety of the public as well as the environment, and current practices and procedures enable the continued safe transportation of radioactive materials.

## References

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, 2012.
4. U.S. Nuclear Regulatory Commission, “Backgrounder on Transportation of Spent Nuclear Fuel and Radioactive Materials,” March 31, 2021. Accessed May 5, 2021: <https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/transport-spenfuel-radiomats-bg.html>.
5. U.S. Nuclear Regulatory Commission, “Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes,” NUREG-0170, 1977.
6. U.S. Nuclear Regulatory Commission, “Spent Fuel Transportation Risk Assessment,” NUREG-2125, 2014.
7. K. J. Connolly 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.
8. U.S. Department of Energy, Waste Isolation Pilot Plant, “Shipment and Disposal Information: Shipments Received As of April 17, 2021.” Accessed April 27, 2021: [www.wipp.energy.gov/shipments.htm](http://www.wipp.energy.gov/shipments.htm).
9. U.S. Nuclear Regulatory Commission, “Environmental Impact Statement for the Holtec International’s License Application for a Consolidated Interim Storage Facility for Spent Nuclear Fuel and High-Level Waste – Draft Report for Comment,” NUREG-2237, March 2020.
10. U.S. Nuclear Regulatory Commission, “Environmental Impact Statement for Interim Storage Partners LLC’s License Application for a Consolidated Interim Storage Facility for Spent Nuclear Fuel in Andrews County, Texas – Draft Report for Comment,” NUREG-2239, May 2020.



708-352-6611  
askanything@ans.org  
ans.org