

# Fostering the safe and secure transport of spent fuel in the United Kingdom

By Nathalie Mikhailova

Spent fuel is transported in casks specifically designed to protect people from the radioactive contents contained in them, as well as to survive severe transport accidents without significant leaks.

(Photo: International Nuclear Services)



Spent nuclear fuel is highly radioactive and during transport it can be a potential target of theft or sabotage. Therefore, its transport between facilities requires careful planning and the implementation of numerous safety and security measures.

In the United Kingdom, which has 15 nuclear power reactors, specialized companies have been safely and securely transporting spent fuel both within the country and from overseas over the past several decades, covering a total distance of more than 19 million kilometres. A strong regulatory framework and effective communication between stakeholders have been key to their success, industry players have said.

In the UK, spent fuel shipments take place regularly: a fuel shipment occurs somewhere in the country almost every week. Most of the spent fuel from power reactors has been, and continues to be, transported to the Sellafield facility in Cumbria, England. Much of the transport of spent fuel is provided by Direct Rail Services, which has been transporting nuclear material since 1995 without any incidents involving the release of radiation.

“We have the capabilities and the infrastructure for the safe and secure transport of spent fuel and, above all, we have decades of experience,” said John Mulkern, Secretary General at the World Nuclear Transport Institute (WNTI), a network organization representing the collective interests of the nuclear material transport sector. “This experience is particularly valuable in the context of countries initiating nuclear power programmes and therefore looking to develop the necessary transport systems.”

## Developing and upholding a sound framework for effective transport

The IAEA assists countries in the development and implementation of transport strategies in compliance with the relevant IAEA safety standards. The Specific Safety Requirements under Regulations for the Safe Transport of Radioactive Material (IAEA Safety Standards Series No. SSR-6 (Rev.1)) have been adopted by the International Civil Aviation Authority for transport by air, by the International Maritime Organization for shipment by sea and by national regulatory authorities for land transport — both road and rail.

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—John Mulkern, Secretary General, World Nuclear Transport Institute

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The requirements of SSR-6 (Rev.1), published in 2018, include activity and classification of radioactive material, definition and permitted contents of package types, package design performance and testing criteria for each type. For each package type, it defines the requirements for design approval by national regulatory authorities before use and periodically thereafter; documentation, labelling and package marking; external surface temperature, radiation and contamination limits; consignment limits; and training.

In the case of packaging, requirements are based on the hazard level of the material to be contained. For high-hazard radioactive material, such as spent fuel, packaging needs to comply with prescribed design and performance requirements in order to withstand severe transport accidents that involve impact and fire without significant release of its contents. This is determined through rigorous testing of the material in various situations. British Nuclear Fuels Limited, for example, has conducted a series of public demonstrations simulating accidents of a train hitting a spent fuel cask at speeds of nearly 160 km/h. Little damage was done to the cask, demonstrating its safety (see the Science box).

“Another important aspect of transport is how we reassure the communities these materials travel through that they are safe and secure. When people see casks, they often have concerns,” said Mulkern. International Nuclear Services, a company involved in the management and transportation of nuclear fuel, for example, holds regular community

and stakeholder meetings in Barrow-in-Furness, a port town in the north of England with direct rail links to the Sellafield site, to discuss what they are transporting through the county and worldwide, and how it is safe and secure.

The transport of hazardous materials also entails the prevention of potential acts of theft or sabotage, which requires appropriate physical protection not only through container design, but also through relevant security procedures. The IAEA assists countries, upon request, with the development and maintenance of physical protection regimes, including through support in drafting transport security regulations and transport security exercises. The purpose of such exercises is to identify any potential weaknesses in the transport security regime and make any necessary improvements.

### Planning for the future

“Moving forward, it is important to continue to encourage younger people to be directly involved in the nuclear industry, particularly in the transport sector,” said Mulkern. “New power plants are being built all over the world, so we need to make sure that the existing experience and expertise is handed over in an appropriate way. People need to have not only the information, but also the experience of undertaking shipments, whether they involve spent fuel or decommissioning waste, as well as the confidence to transport them in the right way. We need to continue to transport in a compliant way and properly communicate what we are doing and why it is safe.”

## THE SCIENCE

### Transporting spent nuclear fuel

Package types and their performance criteria for transporting radioactive material are defined according to the hazard posed by their contents and the conditions under which the packages are expected to retain the containment and shielding of the radioactive material. So-called Type B packages are used to transport materials with higher levels of radioactivity, such as spent fuel. They are designed not only to withstand the heat generated by their radioactive contents, but also to survive severe transport accidents without significant leaks of the spent fuel contained within them.

Transport of nuclear material also entails specific requirements for the marking and labelling of packages and placarding of conveyances, as well as for documentation, external radiation and contamination limits, operational controls, quality assurance and notification, and approval of certain shipments and package types.