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NUCLEAR WASTE
MANAGEMENT
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SOCIÉTÉ DE GESTION
DES DÉCHETS
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Transportation of Used Nuclear Fuel

Transportation of used nuclear fuel to a centralized facility is a necessary component of Adaptive Phased Management (APM). On the basis of Canadian and international experience, the Nuclear Waste Management Organization (NWMO) believes that nuclear fuel waste can be safely moved. Addressing concerns that people have about transportation will be important to implementing APM.

Used nuclear fuel is currently safely stored at nuclear power reactor sites and nuclear research sites in Ontario, Québec, New Brunswick and Manitoba (Figure 1). Small amounts of fuel are also present inside university research reactors in Alberta, Saskatchewan, Ontario, Québec and Nova Scotia.



Figure 1: Current storage locations of used fuel

Transportation Concerns

In the NWMO's public consultations, many participants expressed concerns about the potential risks associated with transporting of used nuclear fuel. During transportation, used fuel would not be at a nuclear site with its associated security and monitoring, but rather it would be in the public environment, exposed to other traffic, and potentially close to homes, schools and other unrestricted spaces.

Specific concerns were raised about the potential for radiation exposure as a result of an accident, contamination of water supplies, and accidents resulting from poor transportation infrastructure maintenance, and apprehension about the availability of emergency personnel and equipment required to respond to any accident.

Other study participants feared that transportation of used nuclear fuel could offer an easy target to terrorists who might seek to either damage the shipment or to acquire it for undesirable purposes.

The NWMO acknowledges the concerns of citizens about the transportation of used nuclear fuel and the need to demonstrate the safety of any transportation system before proceeding.

Regulatory Framework

In Canada, the movement of radioactive materials, including used fuel, other nuclear wastes, industrial radiography sources and medical isotopes, is regulated by the Transport Dangerous Goods Directorate of Transport Canada and the Canadian Nuclear Safety Commission.

Transport Canada is primarily responsible for:

- » establishing and enforcing transportation requirements for the consignors and carriers;
- » establishing requirements and undertaking compliance inspections for aspects such as training and documentation;
- » setting and enforcing requirements for Emergency Response Assistance Plans.

The Canadian Nuclear Safety Commission is primarily responsible for:

- » setting transportation package performance requirements;
- » certification of transportation package designs;
- » establishing and enforcing the radiation protection program for the carriers;
- » investigating in the event of a dangerous occurrence;
- » all aspects of physical security measures.

The provinces and territories have included Transport Canada's regulations for the transportation of dangerous goods within their regulations and may have additional ones for their province or territory.

Transportation Packages

Used nuclear fuel transportation packages are massive structures, providing both protection and shielding. For example, a package currently certified in Canada for used fuel transportation consists of a solid stainless steel box with walls nearly 30 cm thick and a lid attached by 32 bolts. This cask can carry about 4 tonnes of used fuel, but the overall package weighs about 35 tonnes. Transport packages must meet a series of stringent regulations which require protection against impact, fire and immersion in water.

Transportation Experience

In Canada, about 1 million packages of radioactive materials, mostly medical isotopes, are shipped each year. Limited amounts of used nuclear fuel are transported, including demonstration reactor fuel for storage, and a few used fuel

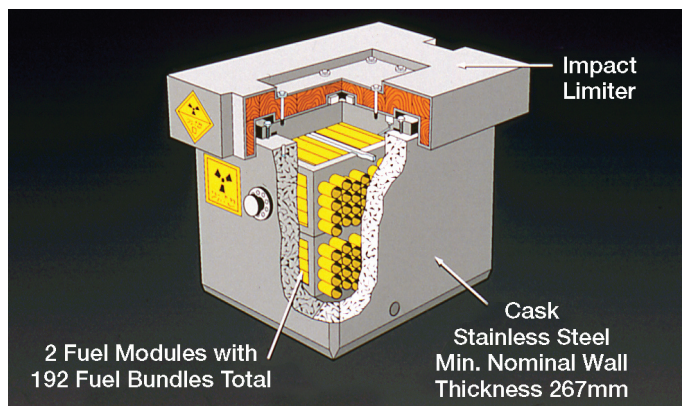


Figure 2: Transportation package licensed for used CANDU fuel

bundles each year from nuclear power stations to Chalk River Laboratories for research and examination purposes.

Radioactive materials are routinely transported internationally. Safety provisions are similar in all countries and based on regulatory standards developed by the International Atomic Energy Agency (IAEA). It has been estimated by the IAEA that throughout the world, between 18-38 million packages of radioactive materials are shipped each year, and used fuel is routinely transported in Europe. There have been no reported transport accidents with serious radiological consequences.

Implications for NWMO

The regulatory regime for regulation and oversight of used fuel transportation is well-established. There is practical experience in Canada and internationally. The NWMO believes that with sufficient effort, resources, preparation, oversight and continued vigilance, used nuclear fuel can be transported safely.

As part of its study, the NWMO examined possible transportation systems based on road, rail and water. Because of differing weight capabilities, the number of used fuel shipments to a central facility would vary between modes. Based on a projected used fuel inventory of 3.6 million used fuel bundles, the number of shipments would be:

- » **Road:** about 53 road shipments/month for 30 years, or
- » **Rail:** about 5 rail shipments/month + about 36 road shipments/month for 30 years, or
- » **Water:** about 2 water shipments/month + about 36 road shipments/month for 30 years.

The NWMO will need to demonstrate the safety of any transportation system before beginning to move used nuclear fuel to a centralized facility. Implications for APM include:

- » Monitoring of international practices, and updating the technology for transportation;
- » Adopting an integrated approach to siting, including transportation implications;
- » Having a phased approach, which allows future generations to participate in decisions;
- » Consulting communities of interest, and developing implementation plans collaboratively, including factors such as mode, routes and rate of transportation, and emergency response training and equipment.



Figure 3: Tractor-trailers for road transport of used fuel



Figure 4: Ship for used fuel transport in Sweden

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