FACT SHEET

Sea Shipments of High Level Radioactive Waste from Europe to Japan

Nuclear power is an established means for generating baseload electricity without emitting gases that could affect the world's climate. Today, nuclear plants generate around 16 per cent of the world's electricity.

By reducing emissions of greenhouse gases, nuclear power provides benefits to citizens everywhere — even in countries that don't operate nuclear power stations — because they reduce potential global impacts on the climate. Worldwide, nuclear power saves more than 2 billion tonnes of CO2 emissions each year.

As global energy demand continues to increase, particularly in developing countries, to meet the needs of higher standards of living and expanding populations, the use of nuclear power is set to expand. At the moment, around two-thirds of the world's population lives in countries that already have nuclear power.

Waste Management

Relatively small amounts of uranium, manufactured into fuel rods, generate the same amount of energy as much larger quantities of coal or oil. As a result, nuclear power plants produce comparatively small volumes of waste, which can be safely isolated and conditioned for long-term storage.

Rokkasho-Mura Storage and Management Facility in Japan

When fuel has been used in a nuclear reactor for 3-4 years it becomes less efficient and is replaced with fresh fuel. It can then be chemically processed to separate out the reusable products (97%) from the waste (3%) it contains.

Nuclear facilities at La Hague in France and Sellafield in England reprocess fuel and condition waste for electricity companies in several countries. High level radioactive waste is transformed into a solid glass through a process called vitrification before being shipped back to the country of origin for long-term storage.

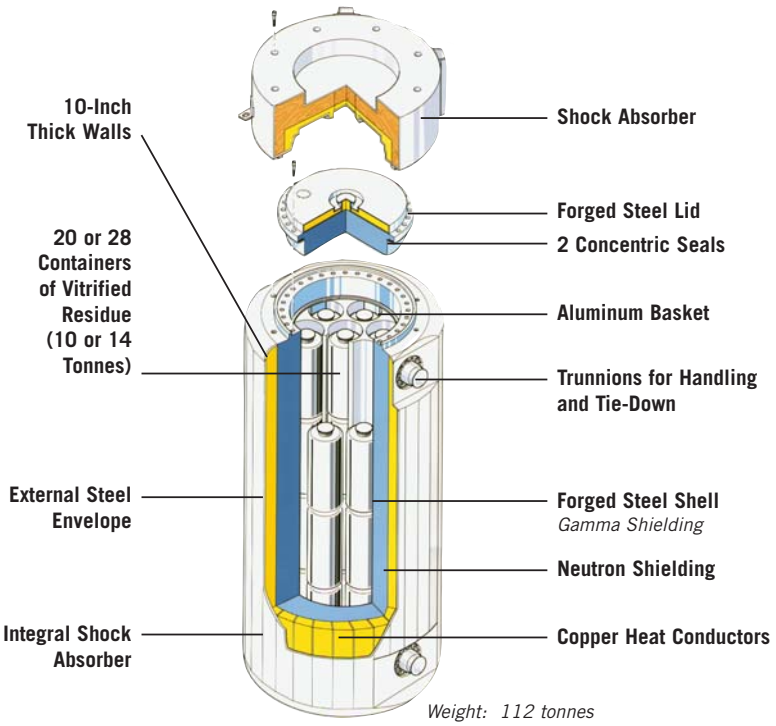
Vitrification is employed by several nations to immobilize radioactive material. Vitrification integrates the radioactive material as part of a solid glass structure that maintains it in a passive form. Vitrification also reduces the overall volume of material that requires disposal.

All of Japan's reprocessed used fuel has been handled in Europe. To date, around half of the vitrified waste has been transported to Japan, where it is housed in a specially engineered storage facility at Rokkasho-Mura.

Shipping Packages

Nuclear materials are transported in packages that will protect workers, the public and the environment in normal transport conditions and in the event of a severe accident. This ensures high levels of safety whatever mode of transport is used. Many shipments of nuclear material involve transport by a combination of different modes — road, rail, air and sea.

TN28 VT Transport Cask



The standards for packages of nuclear material are set by the International Atomic Energy Agency (IAEA), which is a United Nations agency. The standards have been established by experts and national regulators from many of its 145 member countries and are systematically revised on a continual basis.

The IAEA has set standards for packages based on the different characteristics of the nuclear material being transported. Vitrified waste must be moved in "Type B" packages, which are able to withstand a series of challenging tests that demonstrate resistance to severe impact, fire and immersion.

The Type B packages used for the shipments of vitrified waste are robust structures made from 250mm thick forged steel and weigh around 100 tonnes. Each one contains up to 28 stainless steel canisters of solid vitrified waste. Each individual canister of solid vitrified waste weighs around 500 kg.

The Ships

Vitrified waste is transported to Japan in purpose-built UK flagged ships owned by Pacific Nuclear Transport Limited (PNTL). In turn, PNTL is owned by International Nuclear Services Limited, AREVA and Japanese nuclear companies.

PNTL has pioneered standards for the shipment of radioactive materials. It designed and operates a fleet of purpose-built ships that are now into their second generation. The ships meet a range of national and international regulations, including the requirements of the INF code of the International Maritime Organization (IMO). The IMO is the United Nations agency that regulates international shipping. The INF code establishes design and construction standards for vessels carrying nuclear cargoes, with PNTL ships meeting its highest rating.

PNTL ships have a range of safety features far in excess of those found on conventional vessels:

Pacific Sandpiper

- Double hulls and hull reinforcing to withstand collision damage
- Enhanced buoyancy to ensure the ship will continue to float even in extreme circumstances
- Dual navigation, communications, cargo monitoring and cooling systems
- Satellite navigation and tracking
- Twin engines and propellers
- Additional firefighting equipment, including a hold flooding system and spare electrical generators

Each ship undergoes regular maintenance inspections. Operational equipment is checked and tested prior to each voyage from the ships' home port of Barrow, England. The ships all have a fully trained and experienced crew and, while at sea, maintain a communications link with a report center manned 24 hours a day. The ships travel to Japan nonstop, making no port calls.

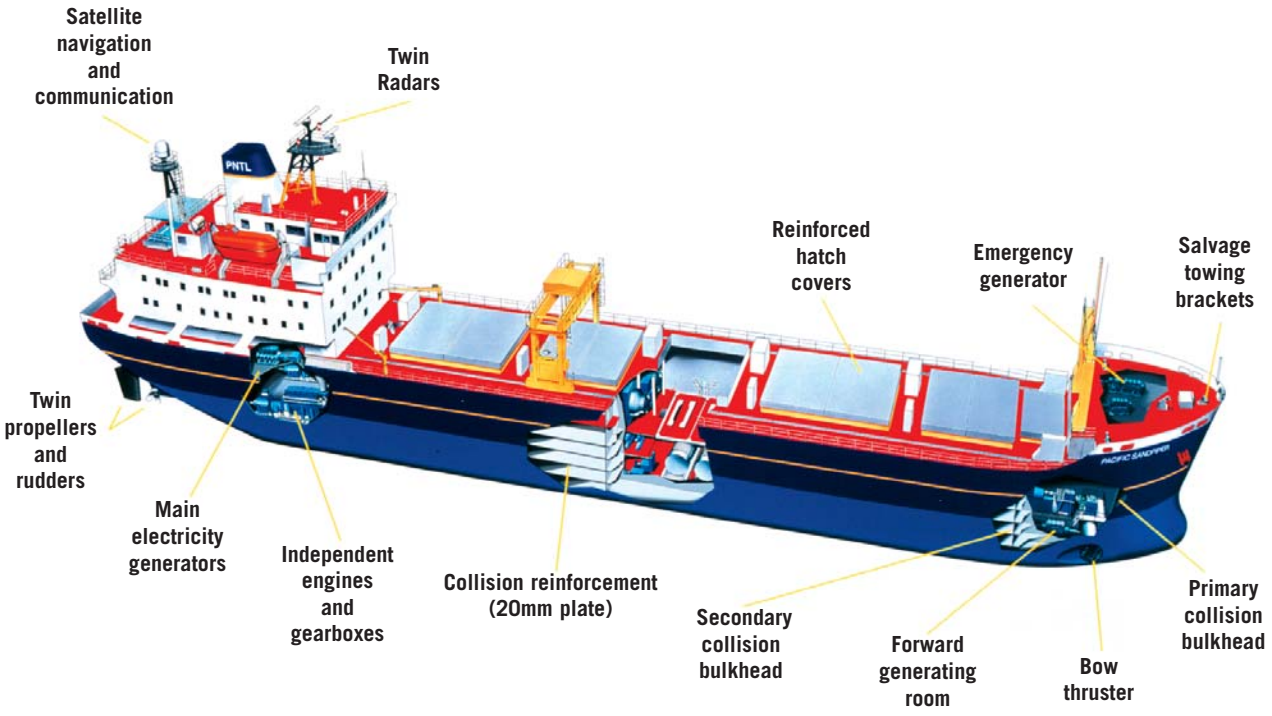
PNTL ships have a safety record second to none, having covered more than 5 million miles without a single incident resulting in the release of radioactivity. Over 2,000 casks of nuclear material have been safely transported since the 1960s.

All the shipments are conducted in full compliance with international laws and the ships carry all the necessary certificates and documentation to demonstrate their compliance with international regulations. The shipments are also covered by shipping and damage insurance.

Safety In Depth

Used nuclear fuel from Japan has been shipped to Europe for reprocessing since 1969, while vitrified waste has been shipped to Japan since 1995. Overall, there have been more than 170 sea shipments of used fuel and vitrified waste between Europe and Japan.

PNTL Purpose-Built Vessel



The shipments are carried out in a carefully managed and well-conceived manner. There are a series of independent barriers between the radioactive material and the outside environment. This system of "safety in depth" encompasses the solid vitrified waste material, the canisters that hold the vitrified waste, the special packages in which the canisters are transported, and the protection provided by the ships with their reinforced double hulls.

Loading a cask of vitrified residue onto a PNTL ship

This safety system provides much greater protection than typically exists for other hazardous cargoes such as chemicals, petroleum products and liquid gases, which are shipped much more frequently. It also removes reliance on specialist emergency assistance being available from countries adjacent to shipping routes.

Because the waste is in a solid form and is characterized by both long-term stability and low solubility, the material would maintain its structural integrity in water without dispersing into the environment.

Emergency Arrangements

In line with IAEA recommendations, a fully trained and equipped team of nuclear experts is available on a 24-hour emergency standby system. In the event of an emergency, this team would be dispatched to the ship and would direct and manage all remedial operations. Regular emergency exercises are held to test these arrangements.

PNTL contracts with the world's most experienced international salvage experts, who have operations in all regions of the globe. They are able to respond quickly to all requests for assistance and have successfully recovered large vessels from the seabed. Special monitors in the holds of each PNTL ship would provide information about the status of the cargo to a salvage team.

Clean Nuclear Energy

Sea shipments of vitrified high level waste are an important part of the infrastructure for providing safe and clean nuclear energy in our modern world. In turn, nuclear power plants make an increasing contribution to global efforts to reduce emissions that could be affecting the world's climate.

For more information, visit:
www.pntl.co.uk | www.innuserv.com | www.areva.com

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