

Examinations performed by the French authorities and the German Federal Office for Radiation Protection during the production of the canisters

Transport permit pursuant to § 4 of the Nuclear Energy Act granted by the Federal Office for Radiation Protection

Transportation and storage casks loaded under the supervision of independent inspectors of the State Ministry for the Environment of Lower Saxony

Approval for transportation given by the State Ministry for the Environment of Lower Saxony after the loading documents have been examined

Transportation by the French railways and the Deutsche Bahn AG/NCS

Casks taken into storage at the interim storage facility of Gorleben under the supervision of independent inspectors of the State Ministry for the Environment of Lower Saxony

All documentation archived at GNS

GNS Gesellschaft für Nuklear-Service mbH coordinates the return of the reprocessing waste on behalf of the German nuclear energy utilities and operates the interim storage facility in Gorleben.

Brennelementlager Gorleben GmbH (BLG), a subsidiary of GNS, is the owner of the interim storage facilities.

The **German Federal Office for Radiation Protection** issues the permits for the storage facilities. It issues transportation permits for individual cask types as well as for individual transportation procedures. It is a federal authority reporting to the German Federal Minister for the Environment, Natural Protection and Reactor Safety.

The **State Ministry for the Environment of Lower Saxony** is responsible under the provisions of the Nuclear Power Act for surveying the operations of the Gorleben transportation cask storage facility.

The German railway, **Deutsche Bahn AG/NCS**, is responsible for carrying the casks inside Germany.

Die **Compagnie Générale des Matières Nucléaires (COGEMA)** operates the reprocessing plant in Cap de la Hague (France).

Constantly Accompanying the Canisters: Approvals, Examinations and Reports

Numerous examinations are necessary before the glass canisters can be transported and stored. Top priority is always given to safety. Different institutions test and approve the individual steps of the process: from the production and loading of the canisters at COGEMA in La Hague to transportation for interim storage at Gorleben. Some of the key steps are described here:

Guarantee by contracts: Germany takes back reprocessing waste



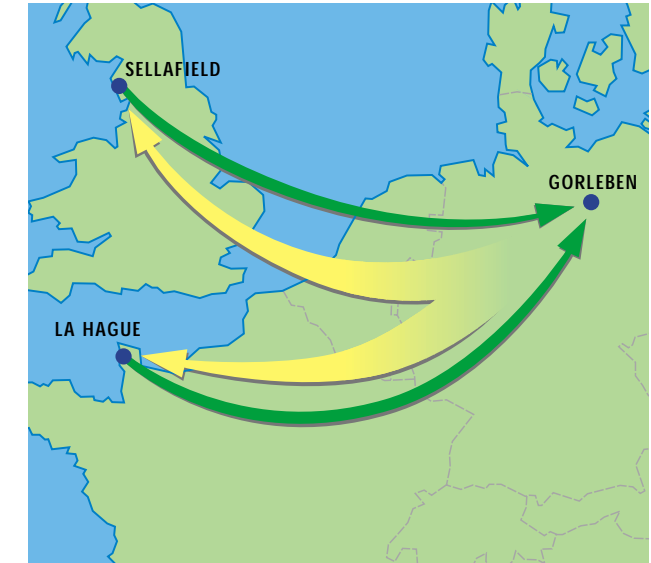
BLG site with the transportation cask storage facility

In Germany, nuclear energy is used to provide reliable sources of electricity: nuclear power stations cover one third of the country's electricity requirements. The fuel assemblies contain the "fuel" for the power stations. After several years of operation, the spent fuel assemblies must be replaced. Until 1994, the only method of disposal permitted by statute was reprocessing. Accordingly, the German power station operators had extensive contracts with the reprocessing companies COGEMA in France and BNFL in the United Kingdom. In addition to recycling nuclear fuel, reprocessing also causes radioactive waste. Under the prevailing contracts, this waste must be returned to Germany. The companies involved have assumed this obligation. Moreover, this matter is governed by treaties signed between the governments of Germany and France or the United Kingdom. In the next years, waste from France will be returned first. This brochure refers to this case.

Whereas low radiation waste which generates no heat can be disposed of immediately, highly radioactive substances must first be stored for another 20 years to allow them to cool down before final disposal. The transportation cask storage facility in Gorleben allows this to be done in compliance with all requirements.

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The Return of Reprocessing Waste from France and the United Kingdom



Interim Storage of Glass Canisters

Optimum Treatment for Reprocessing Waste: the Glass Canister

Reprocessing involves cutting up fuel assemblies and using a chemical process to separate waste from the nuclear fuel suitable for being recycled. Roughly 95 % of the waste material is low or medium active waste, whereas only a small portion is highly radioactive. This latter part accounts for roughly 98 % of the activity of the entire waste and generates heat as a result of the radiation.



A glass canister in a hot cell in La Hague

The highly radioactive waste (High Active Waste – HAW) is integrated in a special glass granulate at a temperature of approx. 1,100 °C to form a vitrified product. The hot liquid glass mass is poured into a stainless steel container, the so-called glass canister, and solidifies as it cools. Then, the glass canister is sealed with a stainless steel lid.

The cylinder-shaped glass canister has a diameter of 43 centimetres and a height of 1.43 metres. It can hold approx. 400 kg of vitrified product. Over the next few years, approx. 3,500 “German” canisters will be returned from France.

What Does “Melting” Mean?

When radioactive material is vitrified, it is not merely poured into a glass canister but melted with a glass granulate to form a homogenous product which possesses high chemical stability and is radiation-resistant. This ensures that the radioactive substances are securely encapsulated over long periods of time.

The melting process is comparable to dyeing glass bottles, i.e. the pigment – e.g. iron in the case of green wine bottles and cobalt in the case of blue vases – forms a single unit with the glass and cannot be removed by cutting or heating the glass.

Quality Assurance and Control



Plant in La Hague

The quality and characteristics of a glass canister are determined by the manufacturing process, which is therefore subject to multi-step examination – the plant operator’s quality assurance system, ongoing supervision by the government authorities in France and the German authorities together with their independent inspectors responsible for surveying the interim and final storage of radioactive substances.

These public supervisory and examination measures ensure compliance with the conditions stipulated by the German authorities for the return of waste to Germany and for interim storage in Gorleben.

Thus, for example, the experts of the German Federal Office for Radiation Protection ensure that the quality of the canisters meets the relevant requirements, perform on-site inspections and examine the quality assurance activities.

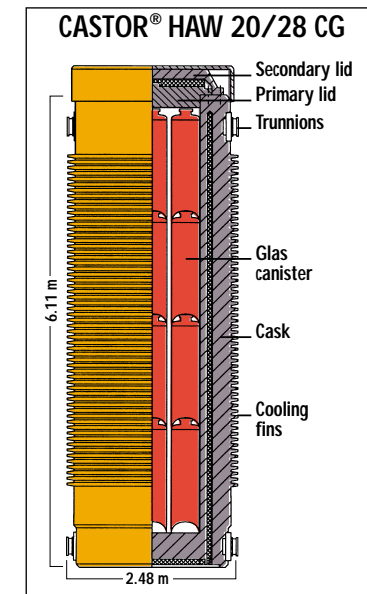
Independent inspectors working on behalf of the State Ministry for the Environment of Lower Saxony witness the loading of the transportation and storage casks in France to make sure that the requirements for acceptance of the casks for interim storage at BLG are complied with.

The Casks: a Pillar of Safety

The CASTOR® HAW 20/28 transportation and storage cask is a key link in the chain for handling glass canisters safely. It holds a maximum of 28 canisters and, when loaded, weighs 113 tons. The casks are made from ductile cast iron. During interim storage, a system with two lids guarantees the leak-tightness of

the cask closure. Prior to being licensed for use as transportation and storage casks, CASTOR® casks had to pass numerous tests conducted by the German Federal Office for Radiation Protection. With CASTOR® casks, for example, drop and fire tests were performed. Even in the most serious accidents, the casks remained leak-tight.

The cask dissipates the heat generated by the glass canisters via cooling fins. The radioactive material is securely contained. The cask shields the substances so effectively that radioactivity remains below the maximum statutory levels.



Also During Transportation: Safety Comes First

A series of organisational, technical and personnel measures guarantees that radioactive material is transported back to Germany free of any risks. The design of the transport casks and extensive examinations to ensure compliance with maximum permitted levels from the loading stage until the casks reach Gorleben ensure that the population along the route as well as the personnel accompanying the casks in transit are never at risk. This has been confirmed by Gesellschaft für Anlagen- und Reaktorsicherheit, an institution which advises the German Federal Ministry for the Environment. Thus, the accompanying personnel’s exposure to radiation during transportation of the casks is less than that of the cabin staff or passengers on a Transatlantic flight.

For the most part, the 127 casks holding the glass canisters from France are transported by rail. Small parts of the route are also by road. The accompanying staff receives special training on the transportation of the casks.

An Important Task: Interim Storage of the Glass Canisters

Interim storage of spent fuel assemblies and radioactive waste is a key element of nuclear waste management. Severe heat generating waste such as glass canisters must be placed in interim storage for about 20 years. During this period, it is allowed to cool down before being taken into a subterranean cavern for final disposal.

The company BLG owns a special interim storage facility in Gorleben for handling spent fuel assemblies and highly radioactive waste. Here, glass canisters kept in CASTOR® HAW 20/28 casks among other things may be stored until



CASTOR® HAW 20/28 in the maintenance area of the interim storage facility

2034. The transport and storage casks already provide the necessary radiation shielding, heat dissipation and accident protection properties. The storage building which is located on the BLG site supports the casks in these functions. Compared with open-air storage, it provides additional shielding and protection from adverse climatic conditions. The special design helps to dissipate heat.



In this way, the environment is always protected from impermissible levels of radiation. Thus, even when the storage facility is full, the levels remain well under the specified limits.

CASTOR® HAW 20/28 arriving at the interim storage facilities