

Vitrified Residue Returns

This factsheet explains Sellafield Ltd site activities and transport operations carried out in partnership with International Nuclear Services as part of the overall Vitrified Residue Returns programme.

For more than 30 years, overseas used nuclear fuel has been reprocessed under contract at Sellafield in order to recover and separate the 97% reusable nuclear materials from the 3% waste.



The Residue Export Facility at Sellafield

Since 1976 all UK reprocessing contracts have contained an option for this radioactive waste to be returned to its country of origin. In 1986 HM Government took the decision that this option should be exercised.

The Highly Active Waste is in a solid glass form (vitrified) and encased in a stainless steel canister. These canisters will be returned to the Nuclear Decommissioning Authority's overseas customers in a programme of work known as the Vitrified Residue Returns (VRR) Programme.

Highly Active Waste

Liquid Highly Active Waste is a result of reprocessing used fuel. At Sellafield, the liquid waste is solidified in a process called vitrification, which mixes the liquid waste with a special type of molten glass which forms a solid matrix when cooled.

This method is very effective at enabling the vitrified nuclear waste to be encased securely in stainless steel canisters, either for safe and secure interim storage in the Vitrified Product Store (VPS), or for future transportation to customers.

If canisters are designated for return to overseas customers, the next stage is for the canisters to be retrieved from VPS and placed in the Residue Export Facility (REF) where a number of witness checks are carried out in conjunction with the customers and their regulators. REF loads the canisters of solid HAW into a flask for export back to the overseas customers.



The Vitrified Product Store

REF history

The Vitrified Product Store Export Facility (VPSEF) was first built in early 1990's and handed over to operations in 1993.



The Residue Export Facility railway



A VRR flask within the REF flasking cell where vitrified waste canisters are loaded into flasks

In the late 1990's customers requested changes to VPSEF and the project known as Residue Export Facility commenced. Sellafield Ltd undertook internal modification to REF to meet revised customer requirements, with the main purpose to confirm that the vitrified product canisters being returned would meet all quality requirements.

Following the confirmation of those requirements, Sellafield Ltd innovated a suitable solution from a number of options within the confines of the Sellafield site. The solution chosen was to knock down the internals of the existing facility and rebuild a new one within the original floor plan.

The demolition and reconstruction took place next to the Vitrified Product Store – which is the UK's only interim store of vitrified highly active waste - and adjacent to key services on the site. Therefore all preparation had to be meticulous and confirmed as safe to start. The demolition and construction was initiated in 2003 with new foundations being placed in mid-2004. Safety has always been the number one priority of the project and in many ways this determined the pace the project could proceed.

Construction was completed in 2008 and then REF successfully completed its active commissioning in 2009/10. Active commissioning is the term used to describe the phase where a full radioactive inventory is introduced into the facility.

Overall the UK will return approximately 1850 canisters of vitrified waste. The return of the waste will be completed in accordance with all regulatory requirements. The relevant UK regulators have been and will continue to be involved throughout.

REF Process

The REF facility has state-of-the-art safety systems with practical, fit-for-purpose plant and equipment designed to deliver customers requirements.

It consists of a series of heavily shielded cells containing equipment that prepares, checks and confirms that the product canisters meet the requirements of the customers. With the customer present, the canisters are accepted and then safely loaded into a shielded flask.

The first stage in this process is for the canisters to be retrieved from VPS and placed in the REF where there are three main process cells, the cleaning cell (prepares the canisters), the inspection cell and the flasking cell.

Two more cells – the buffer and transfer cells - are required to assist with the logistics of loading the flask. Before transporting the flask with its loaded contents of solid waste, it is checked to confirm it meets the regulatory requirements for transport.



An operator carries out final commissioning inspections in the cleaning cell

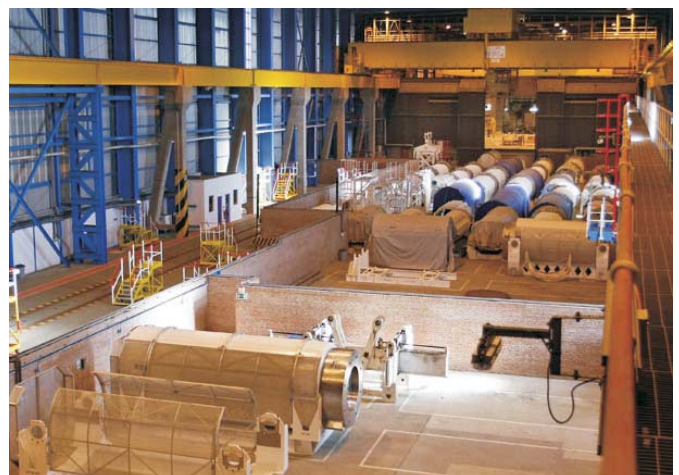
Only when Sellafield Ltd and its customers confirm that the flask has passed all its checks is it allowed to be transferred off site and transported back to the customer's country of origin.

Moving flasks on site

The flasks containing solid highly active waste (HAW) canisters are transported via the Sellafield internal rail system to the Flask Marshalling Area. This facility is designed to accommodate laden and empty flasks. This area will be used to marshal the flasks ready for export and receive flasks ready for loading in REF. This facility has been refurbished ready for the return process.



An operator at the REF inspection cell



The Flask Marshalling and Storage Area at Sellafield

There are two types of flask used to transport solid HAW canisters:

- transport flasks that are used to transport the solid HAW canisters to storage facilities in the receipt country where the canisters are removed from the flask and re-stored in a facility similar to the VPS.
- transport and storage flasks that are used to transport and store the solid HAW canisters. The storage facilities in the receipt country house the flasks.

Moving flasks off site

Transportation to overseas customers begins with a rail journey from Sellafield to the Port of Barrow. To enable this transport, six newly designed wagons have been manufactured to carry a laden flask that weighs approx 120te.

The new wagons, weighing 53.5 tonnes and made of carbon steel, are lighter than the current stock but can carry 6.5 tonnes extra payload (122.5 tonnes rising to 126.5 tonnes under certain operational restrictions).

The advantages of the new rail wagons is that they have been designed to carry the VRR flasks, which are larger and heavier than flasks that have previously been transported on the Sellafield to Barrow line. The new wagons are also quieter, and have improved suspension and braking. This has been achieved through state of the art modelling, and the use of lighter and stronger materials.

The first wagon was tested on-track twice in 2008, the first time without any cargo and the second time with an unused flask. All of the new wagons have been delivered to Sellafield site ready for use.

Once the flasks reach the port, they are loaded by shore-based crane on to a specially designed vessel for their sea journey.

If you want to see more information concerning international transport visit the Pacific Nuclear Transport Limited (PNTL) or the International Nuclear Services websites: www.pntl.co.uk/ www.innuserv.com.



One of the newly designed wagons arrives at Barrow transporting a flask.



Sellafield Site

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