

## **Overall concept for the return of vitrified radioactive waste from reprocessing**

### **Summary**

The purpose of this overall concept is to initiate the return of vitrified radioactive waste from reprocessing in France within an appropriate time frame to power supply companies (EVU) in line with their obligations.

The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) is competent for nuclear safety issues. Spent fuel originating from Germany which was reprocessed and is still stored abroad must be returned to Germany. The BMUB aims to meet all obligations in a timely manner, ensuring a fair nationwide burden sharing. This overall concept is to serve the EVUs as a guideline:

- Casks of type CASTOR® HAW28M containing vitrified radioactive wastes from reprocessing plants in the United Kingdom and France will be stored in four on-site interim storage facilities.
- The five casks with vitrified intermediate-level wastes from France will be stored at the storage site in Philippsburg. Up to 7 casks of vitrified high-level waste from the UK will be sent to the storage sites in Biblis and Brokdorf each and up to 9 casks to Isar-site.
- In line with the contracts between the German utilities and the foreign reprocessing plants, the return will be carried out consecutively, starting with the five CASTOR® HAW28M casks from France in 2017, followed by the next tranches from the UK starting in 2018.
- The BMUB will ensure that applications made in time by the EVU for granting license to store CASTOR® HAW28M casks at the respective sites will be decided in good time.

- The prerequisites for returning the casks of vitrified wastes from reprocessing to Germany have been fulfilled. The storage of casks is feasible from both the technical and the legal perspective.
- The instructions on the general requirements for technical and legal issues and procedures apply to the return of vitrified wastes to all interim storage sites that are planned to be used. This makes it possible for the return of the waste in tranches and within the agreed timeframe.

## **I. Background**

Five casks of vitrified intermediate-level radioactive waste will be returned from France and up to 21 casks of high-level radioactive waste of reprocessed fuel elements from German nuclear power plants from the UK. The waste will be transported and stored in CASTOR® HAW28M casks, a type of cask that has already been used for previous returns of vitrified high-level radioactive waste from France.

Article 9a (2a) of the Atomic Energy Act stipulates the obligation for EVUs to store radioactive waste, which is also laid down in contracts under private law between utilities producing nuclear energy and reprocessing plants. This approach was confirmed by contracts binding under international law between Germany and both France and the UK. The waste from France will be returned in one transport in 2017, and the waste from the UK in probably three consecutive transports by 2020.

Article 9a (2a) of the Atomic Energy Act obligates utility companies to store the vitrified intermediate-level and high-level waste, which is currently still in France and the UK, at (on-site) interim storage sites. This concept for the return of radioactive waste is based on the principle of fair burden sharing and takes into account the technical and licensing requirements for returning and storing radioactive waste. It is also the basis for upcoming licencing procedures of the Federal Office for Radiation Protection.

## **II. General technical and legal requirements for licensing procedures pursuant to Article 6 Atomic Energy Act and for transport**

### II. 1 Licensing procedure

All on-site interim storage sites (with the exception of Brunsbüttel) are licensed for storing radioactive fuel pursuant to Article 6 of the Atomic Energy Act. These licenses encompass, for example, the type of stored nuclear fuel. They do not apply to storing vitrified waste from other European countries or the handling of CASTOR®HAW28M casks. For these uses it is necessary to apply for modification licenses. It is not necessary to start an entirely new licensing procedure, as the main parameters (maximum amount of heavy metals, maximum total activity and maximum output of heat) are not exceeded.

As the total amount of radioactive waste to be returned is limited and known, it is clear that the crucial parameters laid down in current licenses and relevant with a view to environmental impacts will not be changed in the required modification procedures. Parameters include in particular the approved number of spaces for large casks, total heat output of the interim storage site, the total amount of heavy metals and the total radiation from storage site operations. Changes to licenses which have already undergone an environmental impact assessment (EIA) will not result in any environmental impacts that have not been checked in the previous procedure. Neither the influencing factors nor the environmental impacts will change due to the modifications.

It is not necessary to carry out another EIA.

The documents compiled by the GNS Gesellschaft für Nuklear-Service mbH (as of 3 September 2014) are sufficiently comprehensive for licensing procedures for storing vitrified wastes from reprocessing in other European countries and correspond to the documents from the licensing procedure for the transport cask storage site at

Gorleben (TBLG). There are no reservations against their use in a licensing procedure for another interim storage site. There is generally no need to evaluate them again, as far as they have been already evaluated once. There are no reservations either against the utility companies' plans to treat site-specific conditions in a delta report (utilities as applicants determine content of application). This way, documents may remain unchanged (possible updates due to amended legislation etc. excluded).

The Federal Office for Radiation Protection will take into account the general requirements for upcoming licensing procedures for the storage of vitrified waste from reprocessing in other European countries.

## II. 2 Handling at on-site interim storage sites

For investigating handling incidents with casks of vitrified waste in interim storage sites, the retrofitting of the overhead crane is especially important pursuant to the relevant rules and regulations of the Nuclear Safety Standards Commission (KTA) - in particular considering the time required for providing proof for the licensing procedure. The upper trunnion has been qualified correspondingly for the CASTOR<sup>®</sup> HAW28M cask. As long as the load chain of crane and trunnion remains closed, incidents from handling waste in the interim storage site are no longer to be expected and the corresponding scenarios do not have to be taken into account. This simplifies the licencing procedure tremendously.

## II. 3 Heat generation

At the interim storage site, heat from radioactive waste in the casks is exchanged through passive natural convection cooling. The additional heat generated by the stored vitrified waste from France and the UK remains within the scale already approved for the interim storage site and the heat output of a cask for irradiated fuels.

The heat output of vitrified high-level radioactive wastes from reprocessing is around one kilowatt per canister (in 2013); at the time of transport, the scale of the heat output is expected at 30 kW. That is significantly below the licensed 45 kW for CASTOR<sup>®</sup> HAW28M casks and below the 39 kW for a CASTOR<sup>®</sup>V. Also regarding the possible storage of TN24E-casks for fuel elements of high heat output, possible limitations occur only regarding the positioning of the casks. In addition, the modification licensing procedure is to take into account only the actual heat output of stored casks, not the potential one.

#### II. 4 Primary lid seal

Owing to the comprehensive experience gained so far with the seals, it can be ruled out that large openings occur spontaneously in a seal. In contrast to canisters for storing irradiated fuel elements, the cask itself is mostly free from activity due to the vitrification of the mass of liquid fission products and the sealed-in canister. There is no reason for concern that significant amounts of volatile radioactive substances are released even from casks that do not meet the specifications for storing any longer.

Pursuant to the current transport license for CASTOR<sup>®</sup> HAW28M, these casks can be transported with only a primary lid as containment system. When repair work becomes necessary, it is possible to close the cask with a welded lid for storage operations. However, before transporting casks to a final repository, a condition in line with the respective license has to be restored. This could be realised by modifying the transport license for CASTOR<sup>®</sup> HAW28M casks, for example in such a way as to include a secondary or a welded lid as containment system, as it is done in case of CASTOR<sup>®</sup> V casks.

There is also no question about the general feasibility of a facility for changing primary lids, if there is need for repair. The pilot conditioning plant in Gorleben (PKA), for example, has such a facility which is constructed like a hot cell. In order for a storage license for vitrified waste to be issued, a qualified concept for a changing facility must

be presented outlining in particular the facilities on the premises of the interim storage site and the fundamental steps of carrying out the exchange of primary lid seals. A licensing procedure for establishing and operating such a facility would only be necessary if the primary lid failed and if the transport license of the canister cannot be adapted. The Federal Environment Ministry commissioned the Nuclear Waste Management Commission by letter of 4 August 2014 with assessing the concept. By letter of 10 September 2014 the Federal Environment Ministry asked the Commission to also take a potential adaptation of the transport licence into consideration. In its opinion of 30 October 2014, the Commission came to the following conclusion: For the improbable event of problems with the seals, the repair concept for interim storage of CASTOR® HAW28M casks does not differ from the concept for CASTOR® V casks.

To ensure the option of transport should the primary lid fail, the qualification and licensing of an alternative transport configuration can generally be considered. However, the information currently available is not sufficient to conclusively judge whether this solution can actually be realised. For this reason, the concept of a hot cell as a fall back option for changing primary lids or a transfer of the canister in question must be examined in a licensing procedure and updated periodically in order to guarantee that the necessary precautions are taken.

## II. 5 Transport

As before, the transports from France will be using railways. In contrast to transports to the storage site at Gorleben, the selection of on-site interim storage facilities now results in significantly shorter distances and casks do not have to be transferred to another train on the way.

Transport by ship is the only option for vitrified high-level radioactive waste from the United Kingdom. The Federal Environment Ministry will be actively involved in providing ports suitable for transferring the casks.

## **Other aspects**

### III. 1 Monitoring cask assembly

To ensure the assembly of CASTOR®HAW28M casks already underway, the Federal Office for Radiation Protection monitors the assembly based on the original application for storing, for example, the five casks of vitrified intermediate-level radioactive wastes at the Gorleben storage site for transport casks without prejudice to the provisions of Article 9a (2a) of the Atomic Energy Act.

### III. 2 Staff capacity at the Federal Office for Radiation Protection

The number of staff of the competent division at the Federal Office for Radiation Protection was increased in line with the demand caused by the need to swiftly process licensing procedures for the interim storage site Philippsburg and to ensure that ongoing licensing procedures will be concluded soon. In addition, it is reviewed whether temporary support from external experts could be an option.