

## Packaging of Trawsfynydd Compacted MDHSF FED (Interim stage)

### Summary of Assessment Report

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### **Background**

British Nuclear Group Project Services, acting as agent of British Nuclear Group Reactor Sites, has sought Interim stage endorsement of the proposed packaging of compacted Fuel Element Debris (FED) currently stored in the Magnox Debris Handling and Sorting Facility (MDHSF). These proposals have previously been assessed and endorsed by Nirex at the Conceptual stage, as reported in Advice Report NXA/451460 and Letter of Compliance LOC/452774.

This document summarises the results of the assessment carried out by Nirex in response to the submitted proposals. The assessment has been carried out as part of the Letter of Compliance process, whereby Nirex examines the disposability of the proposed waste packages by assessment against intermediate level waste (ILW) packaging standards and specifications and the Phased Geological Repository Concept (PGRC). Further information on the Letter of Compliance process is available elsewhere<sup>1</sup>. The assessment reported herein builds upon that undertaken and reported at the Conceptual stage.

### **Scope of the Proposals**

The MDHSF was constructed in the late 1980s and operated from 1990 to store FED when the existing Trawsfynydd FED vaults were reaching capacity. The FED generated as a result of fuel element de-splitting was sorted and dried before being packed into 500 litre drums where it was compressed using a 150 tonne hydraulic press. Temporary lids with "Graphex" fire suppressant material suspended from the underside were then placed on the drums and retained with spring clips. The drums were placed in dry, air conditioned storage, where they have remained for up to 16 years.

The proposed waste packaging process will consist of encapsulation of the compacted FED with VERI DT-901® vinyl ester styrene polymer within the existing storage drums. The temporary lids will be replaced with a permanent lid, which will be welded in place.

The proposal covers the entire stock of MDHSF FED, consisting of 104 drums.

The proposed packaging process would lead to a predicted 104 off 500 litre Drums with an average package radionuclide inventory at 2040 of  $<1 A_2$  multiples<sup>2</sup> and a maximum package inventory of  $9.65 A_2$  multiples. When compared to a reference case conditioned volume of Unshielded ILW (UILW) for the 2001 National Inventory of  $152,000 m^3$ , the MDHSF FED would constitute 0.03% of the volume of the UILW waste inventory considered in the 2003 Generic Post-Closure Performance Assessment.

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<sup>1</sup> *Guide to the Nirex Letter of Compliance Process*, Nirex Document WPS/650, June 2006.

<sup>2</sup>  $A_2$  multiples provide a measure of the activity content of transport packages, where each radionuclide is weighted according to its damage potential.

## ***Packaging proposals***

It is proposed that the MDHSF drums containing the compacted FED are transferred to the polymer encapsulation plant within the MDHSF. The temporary lids and associated Graphex fire suppressant would then be removed and discarded. A visual check would be necessary to ensure that no free Graphex powder or other extraneous material remains on top of the FED.

Conditioning of the FED would then be carried out using a vinyl ester styrene polymer introduced into the interstices under a gravity feed to ensure adequate infiltration of the waste. The polymer would be prepared on the plant for each drum of FED by mixing of binder, initiator and finally promoter, at which point, the polymer would be added to the drum. Once the polymer has been added to a defined level, the drum would be re-lidded using a new stainless steel lid. The new lid would then be remotely welded to the body of the drum. The packaged waste would be loaded into a four-drum stillage and the stillage transferred to the Trawsfynydd ILW store in a concrete shielding overpack.

## ***Assessment of Disposability***

The acceptability of the proposed packages has been assessed against criteria established within the Nirex PGRC and associated Generic Waste Package Specification (GWPS).

The Assessment of Disposability is based upon the inventory data supplied by British Nuclear Group for MDHSF FED. Each of the 104 drums of FED has been assayed, providing the basis for both the assessment inventory and waste package inventory data.

Extensive development work has been undertaken by British Nuclear Group, based on simulants of the actual waste. This development work has been assessed by Nirex and provides confidence that a good quality wasteform would be produced by the immobilisation of MDHSF FED in a polymer matrix. It is concluded that the proposed waste packages examined herein are consistent with the requirements of the Nirex GWPS.

The assessment of transport safety shows that it will be possible for drums of MDHSF FED to comply with all relevant criteria if transported in 285 mm thick walled Type B transport containers such as the Nirex Standard Waste Transport Container (SWTC-285). The bounding inventory falls well within the requirements, even if four such packages are transported together. Similarly, the assessment of operational safety shows that it should be possible for 500 litre drums containing MDHSF FED to be handled and stored safely within the repository.

The potential long-term risk resulting from the disposal of the MDHSF FED has been assessed as part of the Generic Post-closure Performance Assessment (GPA03), which includes this waste. Overall, the post-closure assessment revealed no significant issues that should prejudice disposal of packages containing MDHSF FED.

## ***Requirements for further development work***

The Assessment of Disposability has concluded that a Disposability Safety Case ultimately could be made for packages containing MDHSF FED. During the course of the assessment, a number of outstanding technical issues have been identified and four Interim stage Action Points must be resolved prior to the proposals being endorsed at Interim stage. These Action Points relate to:

- the definition of controls which will be implemented to prevent wet polymer from coming into contact with the flange of the 500 litre drum and disrupting the lid welding operation;
- the provision of experimental evidence to define the optimum depth of penetration of the polymer into the aluminium lid retention device, which sits on the underside of the drum lid and acts both as the primary means of closure in attaching the lid to the package and as a heat sink during polymer curing;

- the provision of filter media in the package vent; and
- increasing the gauge of the package lid to ensure that this has a minimum thickness of 2 mm at all points.

### ***Conclusions***

The assessment of the proposals has concluded that packages containing compacted MDHSF FED are potentially consistent with disposal under the Nirex Phased Geological Repository Concept but cannot yet be endorsed at the Interim stage until a number of outstanding Action Points relating to the container design have been adequately addressed.