

Packaging of Sizewell B ILW Resin in DCICs (Final stage)

Summary of Assessment Report

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Background

EdF Energy Nuclear Generation Ltd (EdF) has proposed adopting the GNS-designed thick-walled Type II-15 EI Ductile Cast Iron Container (DCIC) for the packaging of current stocks and future arisings of spent ILW ion exchange (IEX) resins at Sizewell B power station.

The proposed container, hereafter the Type II DCIC, is constructed from Ductile Cast Iron (DCI). It is designed to be sufficiently robust to provide all safety functions required for transport and disposal of appropriate waste in Germany without the need for the encapsulation of the waste or for additional external shielding. These properties offer the potential to package wastes for disposal at short notice without encapsulation. It is understood that realising this opportunity would offer essential benefits in managing the accumulation of IEX resins at Sizewell B.

To progress these proposals, advice on the disposability of the proposed packages has been sought from the NDA Radioactive Waste Management Directorate (hereafter RWMD). In particular, EdF has sought Final stage endorsement for the transport and disposal of Sizewell B IEX resins using Type II DCICs.

RWMD Reference Basis for Assessment and Endorsement

Disposability assessment considers the compatibility of the proposed packages with the requirements for safe long-term management, including storage, transport, emplacement and potentially extended storage underground, and disposal. The current reference basis for this assessment of disposability is the conceptual designs for a Geological Disposal Facility (GDF) derived from the published generic Disposal System Safety Case (DSSC). Further information on the Disposability Assessment process is available elsewhere¹.

The general requirements placed on ILW packages for disposal in a GDF are embodied in the Generic Waste Package Specification (GWPS)².

Scope of the Assessment

The assessment has considered the proposed packages containing Sizewell B ILW resin falling within the Lower Activity Envelope (LAE), which corresponds to waste stream 3S12 in the 2010 UK Radioactive Waste Inventory (UK RWI). The LAE comprises current stocks of waste and approximately half of future arisings, to 2026. Further arisings beyond this are expected to fall within the Higher Activity Envelope

¹ NDA, *Guide to the Letter of Compliance Process*, NDA Document WPS/650, March 2008.

² NDA, *Generic Waste Package Specification*, NDA Report NDA/RWMD/067, March 2012.

(HAE); these will be packaged into in a third campaign around 2038, which is excluded from the scope of this assessment.

An Assessment of Disposability for these proposals has been reported previously. The current assessment has focused on the responses from EdF to the Final stage Action Points placed previously.

In addition to these submission documents, the following documents have been considered at this stage:

- Quality Plan;
- Data and Information Recording Specification (DIRS);
- Waste Product Specification (WPrS);
- Criticality Compliance Assurance Document (CCAD).

Packaging Proposals

Nature of the waste

EdF has prepared Final stage proposals for the packaging of IEX resins at Sizewell B in two campaigns, covering both current stocks and approximately half of the future arisings. The currently stored resins (to be packaged in the initial campaign) consist of a variety of spent organic ion exchange resin products comprising mixed anion and cation bead resins. All resins are based on styrene divinylbenzene (DVB) co-polymer. It is anticipated that future arising of resins (to be packaged in campaign 2) would not be significantly different to those in storage. The total volume of waste to be packaged in the initial campaign in 2013 is approximately 25 m³, with a further 25 m³ of arisings in 2026.

Waste processing and packaging

Based on the assumed radionuclide inventories and the period available for decay, EdF has determined that the resins would be compatible with the requirements for low specific activity (LSA) and therefore could be transported under IP-2 arrangements.

The resin would be retrieved from the current storage tanks using existing site infrastructure and transferred into Type II-15 EI DCICs using the German FAFNIR V processing plant. Subsequently, the resins would be further dewatered using the NEWA processing plant. This process would reduce the 'free water' content to a target of less than 1% by volume, or about 5 litres per package. The currently proposed process would not seek to remove 'bound water' directly associated with the resin beads. The quantity of 'bound water' would be considerably greater than that of 'free water'.

The waste package would then be sealed and placed in an interim store until the currently assumed earliest date of transport to a GDF, namely 2040. The performance of the container seal would be confirmed to be compliant with the requirements of the Transport Certification immediately before transport.

Assessment Inventories and Number of Packages

To assess the disposability of the proposed packages, and to provide general background to the consideration of the submitted documents, it is necessary to define waste package inventories that capture the range and variability of the package contents.

The basis of the assessment inventory is the characterisation of the resin stocks as sampled in 2008, augmented by FISPIN calculations and Station Safety Report (SSR) 'best estimate' data for arisings. The inventory associated with the waste is moderate and is dominated by Cs-137, due to the selective nature of the wastes. The average assessment inventories for Campaigns 1 and 2 are derived by applying different decay periods corresponding to differing elapsed time between packaging and transport.

It is assumed that the containers would have a total waste loading of 0.466 m³ of resin per package. Based on the assumed waste loading and the volume of waste in the LAE, it is expected that 110 packages would be produced, 55 in each of the two campaigns.

Assessment of the Submitted Documentation

Storage, Monitoring and Inspection

The storage, monitoring and inspection regime proposed by EdF has been assessed and overall, RWMD concludes that the pragmatic approach should ensure waste package integrity for the required timescales.

Management System

RWMD is aware that EdF continues to develop the Management System arrangements and that while some documents have been supplied in draft for assessment, preparation of others is pending. RWMD assumes that all quality management-related documents relevant to waste package quality will be issued internally prior to waste processing. Notwithstanding this, RWMD is confident that if implemented as described, then this system would meet our requirements.

The draft Quality Plan is generally consistent with what would be expected, both in form and general content, although a number of general observations and suggestions for improvement have been made. It is strongly recommended that these comments are taken into account before the document is issued prior to processing.

The WPrS has been significantly revised since submission at Interim stage and has been supplied pending internal approval. RWMD considers that, providing there are no significant changes prior to approval, the WPrS is fit for purpose and no further revision is required.

Data Recording

The proposed strategy for recording information and data is compatible with the requirements specified in the GWPS and the Data and Information Recording Specification (DIRS) provides adequate reassurance that relevant data will be recorded and maintained. However, it is apparent that the DIRS now requires some minor updates based on changes and revisions to some of the underlying documents and record templates.

Criticality Safety

EdF has supplied a revised and approved issue of Criticality Compliance Assurance Documentation (CCAD) which identifies the basis for the safe fissile mass (SFM) that should be applied to the proposed packages containing Sizewell B ILW resin; namely the fissile exception limit for transport of 15 g. Both the arguments relating to the SFM and the CCAD itself have been reviewed and in general, the revised document is compatible with the requirements for CCAD for Sizewell B ILW resins in Type II

DCICs. A number of improvements have been noted, however, and EdF should consider updating the document to take account of comments and new information.

Emergent Technical Issues

A number of technical issues have emerged following parallel assessments of proposals for Magnox wastes in DCICs, including an outstanding Interim stage requirement for substantiation of the impact performance of Type II DCICs. Most of these issues are generic to both Magnox and EdF proposals and RWMD is aware that Magnox is addressing these and will take credit, where applicable, for EdF. However, some issues relate to container design and are specific to the Type II-15 EI DCIC proposed by EdF. Therefore, to provide the necessary emphasis on the key issues that remain to be resolved, three further formal Final stage Action Points have been placed at this time.

Conclusions

A preliminary Final stage assessment has been undertaken for the proposed packages containing Sizewell B ILW resin in the Lower Activity Envelope, based on vacuum dewatering of the waste in Type II-15 EI DCICs. This assessment has provided preliminary assessment on the documentation submitted in response to Final stage Actions Points placed at Interim stage. A full Assessment of Disposability has not been reported at this time.

RWMD concludes that the information submitted in response is sufficient to close the 13 Final stage Action Points raised at Interim stage; some documents would benefit from minor revisions, but would not necessarily preclude endorsement. Also, a number of key documents have been submitted in draft; RWMD has assessed these and provided commentary, but assumes that any management system documents pertinent to waste package quality will be issued internally prior to processing.

Three additional Final stage Action Points have been identified, based on emergent technical issues relating specifically to container design. A number of other issues have also been identified, including an outstanding Interim stage requirement for substantiation of the impact performance of Type II DCICs, and are currently being addressed by Magnox. At this time, 3 Final stage Action Points remain open. Once the generic issues and EdF-specific Final stage Action Points have been resolved to RWMD's satisfaction, the existing Assessment of Disposability would be updated and issued.