

Sludge and resin waste at Hunterston A in 3m³ drums

(Interim stage)

Summary of Assessment Report

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Background

Magnox North has sought Interim stage endorsement for the packaging of stored wet waste arisings from operations at the Hunterston Decommissioning site, including all high activity sludges and ion exchange resins. The proposed packaging process comprises retrieval and transfer of the sludges and resin into a 3m³ Drums and immobilisation through addition of cement powders with in-drum mixing. An interim stage Letter of Compliance has previously been issued for sludges from two of the on-site sludge retention tanks and for stored ion exchange resins. Hunterston are now seeking to extend the scope of the Letter of Compliance to encompass sludges from additional sources on site.

This document summarises the results of the assessment carried out by NDA RWMD in response to the submitted proposals. The assessment has been carried-out using the Letter of Compliance assessment process, whereby the disposability of the proposed waste packages is assessed against intermediate level waste (ILW) packaging standards and specifications derived from the geological disposal concept. Further information on the Letter of Compliance process is available elsewhere¹.

The regulators' view is that packages conditioned in anticipation of geological disposal, and assessed under the Letter of Compliance process, will also be suitable for long term management in accordance with Government policy in Scotland. Reference to geological disposal in this report refers therefore to the assessment basis, not to the planned outcome.

Scope of Proposal

Magnox North has tendered an Interim stage submission relating to the packaging of the sludges and ion exchange resin in storage at the Hunterston Decommissioning Site. The waste corresponds to waste streams 9J33, 9J34 and 9J951 for sludges and 9J03 for ion exchange resin, as recorded in the 2007 Radioactive Waste Inventory. The submission has been treated as an extension to the previous Interim stage submission which was limited to consideration Cartridge Cooling Pond sludge and ion exchange resin. The new submission includes consideration additional sources of sludge and this Assessment Report is presented as an extended update of the previous version.

The changes proposed to the position addressed previously and covered by the extant Interim Letter of Compliance are:

- Extension to include sludges from an additional sludge tank and miscellaneous sludges

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

- Mixing of ion exchange resin with these additional sludges
- Extension of the formulation envelope to encompass solids content in the range 0 to 50%, by weight
- Minor changes to the drum design, plant design and waste processing.

The sludge comprises predominantly sand and silicate-based material. The sand has been produced by the back-washing of the sand filters, with the other silicates arising from precipitation of some of the silicate additives used to limit corrosion of the aluminium skips. The sludge also includes magnesium-based precipitates derived from the corrosion of Magnox fuel cladding, and aluminium and iron flocs used in early pond water treatment. Small quantities of hexacyanoferrate and organic materials are also present.

The ion exchange resin was used for pond water treatment to remove dissolved activity and principally caesium ions. The resin is based on a phenol-formaldehyde structure and is present in a spherical bead form.

Packaging proposal

The proposed waste packaging process is based on addition of sludges to the ion exchange resin component of the waste and conditioning to form a single waste product, within the wet waste solidification plant. The waste packaging process involves the following steps:

- The resins would be transferred to a 3m³ Drum waste container, allowed to settle, and excess fluid discharged. The target volume would be 240 litres.
- Sludge would be added to achieve a total waste volume of 1.74m³.
- The sludge resin mixture would be pre-treated with hydrated lime, prior to immobilisation with cement powders.
- The cement powders would be added to the 3m³ Drum and mixed with the waste using an in-drum paddle.
- The in-drum paddle would continue to rotate for a period after the addition of constituents, to ensure production of a homogeneous conditioned wasteform. The paddle would be stopped and the wasteform allowed to cure.
- The wasteform would be allowed to cure for approximately 16 hours, then capped with in-active cement grout.
- Finally, each drum package would be fitted with a lid and subject to quality checks before transfer to a new purpose built ILW storage facility.

The wet waste solidification plant would also include a facility to return supernatant water from the drum to the sludge tank. This facility may be used when the more dilute heel of sludge is being retrieved. The final waste packages will be transferred to an on-site store for storage, pending availability of a national disposal facility.

The proposed packaging process would lead to a predicted 115 off 3m³ Drums with an average package radionuclide inventory at 2040 of 16 A₂ multiples² and a maximum package inventory of 500 A₂ multiples. When compared to a reference case conditioned volume of Unshielded ILW (UILW) of 152,000 m³, the Sludges and

² A₂ multiples provide a measure of the activity content of transport packages, where each radionuclide is weighted according to its damage potential.

Resin wastes from Hunterston would constitute 0.2% of the volume of the UILW waste inventory considered for Generic post-closure Performance Assessment.

Assessment of Disposability

The acceptability of the proposed packages has been assessed against criteria established within the Geological Disposal Facility (GDF) and associated Generic Waste Package Specification (GWPS).

The Assessment of Disposability is based upon the inventory data supplied by Magnox North, and is derived from sampling and radiochemical analysis undertaken on the waste. This position has been accepted as consistent with expectations at the Interim LoC assessment stage.

The proposed 3m³ Drum waste packages examined herein are, at this Interim stage, judged to be generally consistent with standards and specifications for waste packages. Numerous analogues of the proposed wasteform are available and the associated development work assessed previously by RWMD provides confidence that an adequate wasteform could be produced for the Sludges and Resin waste at Hunterston.

The assessment of transport safety shows that it should be possible for the 3m³ Drum packages containing Sludges and Resin waste from Hunterston to comply with all relevant transport safety criteria when transported using the Standard Waste Transport Container (SWTC). It is noted that the ILW Store should provide access and compatibility for the interfaces of the SWTC, to enable transfer of the waste packages to any future disposal facility.

Similarly, the assessments of operational safety also show that it should be possible for 3m³ Drum packages containing the Sludges and Resin waste from Hunterston to be handled and stored safely within a geological disposal facility.

The post-closure safety assessment revealed no significant areas of concern that should prejudice disposal of packages containing Sludges and Resin waste from Hunterston. This is due to the relatively small number of packages containing the materials, and the relatively low and short-lived radionuclide inventory associated with them.

In summary, the Assessment of Disposability has concluded that a Disposability Safety Case could ultimately be made for packages containing the Sludges and Resin waste from Hunterston.

Requirements for further development work

The submission document states that the following waste package data issues will be included in a future submission:

- Waste Product Specification
- Waste Package Data Records

Prior to formal submission for a final stage LoC, Magnox North should finalise the 3m³ drum design, taking account of suggested modifications.

Conclusions

The Interim stage proposals from Magnox North for the retrieval and packaging of Sludges and Resin from Hunterston have been assessed. The assessment has concluded that packaging of Sludges and Resin from Hunterston would be expected to be consistent with disposal within a Geological Disposal Facility and the proposed waste packages can be endorsed at Interim stage.

The consistency of the proposed waste packages with the Geological Disposal Facility has been demonstrated through the provision of an Assessment of Disposability (at this stage to be regarded as a draft of an eventual Disposability Case).

A number of Action Points which have been raised will require to be addressed as part of any future Final stage proposals for the waste packages.