

# Windscale Advanced Gas-Cooled Reactor (WAGR) Stringer Steel wastes at Sellafield (Extension to Final stage)

## Summary of Assessment Report

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### **Background**

The Windscale Advanced Gas-Cooled Reactor (WAGR) Stringer Steel wastes consist almost entirely of various stainless steel items that were irradiated during the operation of the reactor. The bulk of this waste comprises stainless steel components from fuel and experimental stringers with the remainder consisting of items such as an in-reactor detector, thermocouples and an antimony/beryllium neutron starter assembly.

Although the WAGR Decommissioning project holds a Final stage LoC for the packaging of this waste, a revised (or an extension to) LoC has been requested because:

- the scaling factor applied to assay results has been re-evaluated; and
- the methodology for immobilising stainless steel swarf that forms a small part of these wastes has been reviewed.

This document summarises the results of the assessment carried out by NDA Radioactive Waste Management Directorate (RWMD) in response to the submitted proposals. The assessment has been carried out as part of the Letter of Compliance process, whereby RWMD examines the disposability of the proposed waste packages by assessment against ILW packaging standards and specifications and the Geological Disposal concept. Further information on the Letter of Compliance process is available elsewhere<sup>1</sup>.

### **Packaging proposal**

Items of WAGR activated operational steel have been size-reduced and packed into 62 litre mild steel disposal cans fitted with perforated lids. Each packed can has been weighed and assayed using a multi-point gamma dose rate assay system before transfer to the WAGR packaging plant.

On receipt at the packaging plant the 62 litre cans would be loaded into handling baskets and loaded into a concrete WAGR disposal box. Two baskets each containing twelve cans would be loaded into each disposal box. The void space around the cans and baskets would be filled with high density grout mix which is designed to enter and infiltrate the waste cans through the perforated lids.

The small amount of activated steel swarf would be loaded into a single 62 litre can and immobilised in a pre-treatment step using normal density grout. The infiltrated 62 litre can would then be treated as for the remainder of the cans.

A two stage grout pour would be utilised to anchor waste cans. The first pour would be to fill the WAGR box until the lower 10cm of cans in the upper basket is covered.

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<sup>1</sup> *Guide to the Nirex Letter of Compliance Process*, Nirex Document WPS/650, March 2009.

After this anchoring first pour has cured, a second pour will fill the WAGR box. Such a procedure eliminates the need for an anti-flotation plate.

The latest submission reports a more detailed packaging plan for the wastes than was given previously. This plan makes use of some dose rate modelling work designed to minimise the cooling time needed for the external surface and 1m dose rates to fall to the IAEA transport regulation limits.

The modelling established that the waste packaged in the minimum possible number of high density boxes (three) will meet transport dose limits (2 mSv/hr at contact and 0.1 mSv/hr at a distance of 1m) by 2015, 25 years prior to the earliest estimated date for transport to a geological disposal facility. However, no modelling of the 3m bare waste dose rate was undertaken.

In order to ensure that the activity is appropriately distributed within the boxes, packaging arrangements have been specified for the cans. The cans that have been identified as containing the highest activity will be placed in the top baskets of each of the waste boxes in order to benefit from the maximum shielding from the grout above and below. The three highest dose cans would be kept in separate boxes. The can of swarf will be placed in a top basket to ensure that if any swarf has accumulated in the base of the can there will be no breach of dose limits at the box base.

### ***Assessment***

This assessment is restricted in scope limited to consideration of the information provided by Sellafield Limited in re-evaluating the scaling factor applied to assay results and the methodology for immobilising stainless steel swarf that forms a small part of these wastes.

A full assessment of disposability has not been performed for this proposal at this time as it is considered appropriate to incorporate the WAGR Stringer Steel waste within an overall disposability safety case to cover all WAGR wastes. RWMD is currently preparing an overall disposability assessment of all WAGR wastes and this document is expected to be available shortly. It should be noted that the previously assessed and endorsed WAGR Decommissioning ILW waste inventory is bounding for the WAGR Stringer Steel wastes.

### ***Conclusions***

Revised waste package radionuclide inventory data have been derived. In comparison to the previous inventory data the re-evaluation has caused an increase in the average waste package inventory of about a factor of 7 and an increase in maximum package inventory of about a factor of 4.

Some new dose rate modelling has been undertaken to generate 3m bare waste dose rates that according to the IAEA Transport Regulations must be within 10mSv/hr at the time of transport. The calculations, which conservatively neglect the shielding by the immobilisation grout, confirm that by about 2028 the waste will be transportable and by 2040 the 3m bare waste dose rate is only around 25 to 30% of the limit.

The proposed change to the immobilisation of the WAGR stainless steel swarf in a 62 litre can, where swarf is flooded with grout (i.e. no active mixing taking place) prior to over-packing in B60, is unlikely to have an effect on the overall performance of the waste package from that endorsed previously.

The proposal has been judged against the regulatory prioritisation scheme and the view of RWMD is that it be considered as LOW priority<sup>2</sup>. Sellafield Limited is advised to seek the necessary interaction with regulators to confirm this position.

An Assessment of Disposability for all WAGR Decommissioning ILW is currently being undertaken by RWMD, which will encompass WAGR Stringer Steel waste packages.

RWMD has concluded that the proposed WAGR Stringer Steel waste packages can be endorsed. An extension Final stage Letter of Compliance will be issued.

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<sup>2</sup> *The Management of Radioactive Waste on Nuclear Licensed Sites – Part 1: The Regulatory Process*, Guidance from the Health and Safety Executive, the Environment Agency and the Scottish Environment Protection Agency to nuclear licensees, December 2007.

