

Windscale Advanced Gas-cooled Reactor (WAGR) Decommissioning Wastes

(Periodic Review)

Summary of Assessment Report

Issue date of Assessment Report: 30 September 2010

Background

The Radioactive Waste Management Directorate (RWMD) of the Nuclear Decommissioning Authority (NDA) provides an assessment service for Site Licence Companies with respect to proposals for packaging waste against the requirements of a Geological Disposal Facility. This is the Letter of Compliance (LoC) assessment process. Full endorsement of such proposals is signified by the issue of a 'Final stage LoC'. The Final stage LoC typically forms a component of a Site Licence Company's Radioactive Waste Management Case, which is expected to be prepared to obtain regulatory approval for implementation of the packaging proposal and manufacture of waste packages.

The issue of a Final stage LoC by RWMD indicates that waste packages manufactured in accordance with a proposed process will be disposable when judged against the requirements of geological disposal. The LoC also provides a key component of the package record that will be needed for interactions with a disposal facility operator at the time of disposal. However, the issue of a Final stage LoC is not a one-off event but rather an initial step in the process of the long-term management of packaged radioactive wastes. Maintenance of the continued validity of the LoC is therefore an essential component of the strategy for managing the risk that waste packages will not remain acceptable for future disposal.

Following issue of the Final stage Letter of Compliance (LoC) and on receipt of any necessary regulatory permissions, it is anticipated that the waste packager will manufacture waste packages in accordance with the endorsed proposals and to an agreed Waste Product Specification. Though the Final stage LoC is not necessarily required before the regulators will accept a Radioactive Waste Management Case, the LoC is considered to be the most appropriate means for demonstrating that waste packages will be compliant with the onward phases of waste management under development by RWMD.

It is generally expected that the currency of Final stage LoCs will be reviewed periodically. The periodic review provides the means for ensuring the continued validity of Final stage LoCs over the extended period from endorsement of a packaging proposal to the time when waste packages are consigned for disposal. Typically, RWMD looks to ensure periodic reviews are undertaken at ten-yearly intervals so that the Final stage LoC remains up to date and consistent with potentially evolving safety and environmental assessments. The result of a periodic review would be the production of an up to date disposability case within an Assessment Report and, if it is concluded that there are no new compliance gaps, this would allow re-issue of the LoCs.

The intent of the periodic review is to confirm (or otherwise) continued disposability and to signify this through the re-issue of the appropriate LoC(s). Where issues are identified which prevent completion of the disposability assessment and immediate re-issue, a programme of work to address the issues would be developed. This programme would need to reach satisfactory conclusion before the disposability case

can be finalised and the LoC re-issued. When the periodic review commences the appropriate LoC(s) are considered to be “under review”. This status will continue whilst resolutions to identified issues are sought. In the unlikely event that there is an intrinsic problem with the basis of the LoC which cannot be resolved through additional R&D, GDF design changes or additional packaging measures as necessary, then the LoC would be withdrawn.

Scope of the Periodic Review

This periodic review considers the following key issues:

- Evolution of the RWMD disposability safety assessments and applicability to WAGR Decommissioning ILW;
- Status of conditions, restrictions and caveats as applied to the current endorsements;
- Actual plant performance relative to the endorsed process;
- Preservation of package records;
- Condition of stored packages;
- Status of facility Quality Management Systems;

This review has generally followed the approach described in NDA RWMD guidance¹.

Waste Processing and Packaging Process

Decommissioning of the Windscale Advanced Gas-cooled Reactor (WAGR) reactor was undertaken as a pilot project to demonstrate the feasibility of safely decommissioning a nuclear reactor. Fuel and associated equipment were removed shortly after shutdown and an encapsulation plant, connected to the WAGR reactor containment shell, installed to house the waste assaying and packaging facilities.

The reactor was decommissioned using a top down approach in a series of decommissioning campaigns spanning a period of circa 5 years commencing in 1999. In operation the size reduction of the WAGR internal structure has been undertaken inside the reactor bio-shield, using a variety of cutting techniques deployed remotely. Waste material from within the bio-shield was transferred laterally from the reactor into a sentencing cell for characterisation. An empty WAGR waste box (complete with any necessary internal furniture) was transferred into the encapsulation plant and the wastes loaded into a WAGR box. Once loaded with wastes a ventilation hood was attached to the box remotely. The ventilation hood was designed to maintain a slight negative pressure during grout/concrete pouring operations and, in addition, positioned the lid reinforcing mesh. Following curing of the grout and concrete lid, the completed ILW WAGR box was transferred by forklift truck to the nearby engineered WAGR box store.

Evolution of Disposability Safety Assessment

Since the initial final stage LoC for WAGR was issued in 1992, RWMD's assessment process and regulatory processes have evolved significantly to the current Letter of compliance (LoC) process, with the extension of the advice to include disposability cases and production of Assessment Reports.

¹ NDA RWMD, Waste Package Specification and Guidance Documentation WPS/909: *Guidance on the Scope of Periodic Review of Final stage Letters of Compliance*, January 2009

The disposability of WAGR wastes has been assessed against the current safety and environmental assessments supporting the geological disposal facility (GDF) concept and encompasses the 109 WAGR ILW packages currently held in store. The assessment of disposability has demonstrated the acceptability of the packages against the criteria established for geological disposal and the associated Generic Waste Package Specification (GWPS).

The assessment recognises that there remains a residual risk of the packages exceeding the prescribed surface contamination limits before, during or after transport as a result of caesium 137 migration through the box walls.

The potential for deterioration of the waste packages from chloride induced corrosion of the reinforcing has been identified as a potential corrosion mechanism that could compromise the WAGR package performance over the envisaged storage periods.

In respect of transport it is recognised that the current regulatory transport approval has lapsed. Consequently, a transport licence application will need to be made at some time before transport of the packages to a GDF is required.

Qualifications - Conditions, Restrictions and Caveats

A number of conditions, restrictions and caveats were attached to the early LoCs for WAGR. This periodic review has evaluated the status of the conditions based on current knowledge of the WAGR packaging campaigns and review of the waste package records supplied. The review concludes that a number of the conditions either no longer apply, or that adequate evidence has been provided to confirm their closure. As a consequence of this review only a single specific condition remains. This condition relates to the potential for radionuclide migration through the box walls, which, if levels exceed regulatory limits, would necessitate the requirement to overpack of WAGR boxes at the time of transport.

Actual Plant Performance

The need to monitor plant performance and document production deviations was recognised at an early stage by the WAGR project and the Box Discrepancy Committee established to consider such matters. Review of a representative number of WAGR ILW waste package records indicates that a number of deviations were referred to Box Discrepancy Committee for endorsement. This review concludes that suitable controls were in place to monitor plant performance and to record deviations. It is noted that a definitive list of all non-conformances/box deviations endorsed by the Box Discrepancy Committee has not been provided for assessment, although it is understood that the more significant deviations were referred to RWMD (Nirex at the time).

Closure of Plants and Preservation of Manufacturing Records

WAGR package records have been reviewed in terms of content, physical format and long-term storage arrangements against current guidance. This follows the 2006 records audit which identified the need for some potential improvements in this area. Since this records audit Sellafield Ltd has continued to work with RWMD to close out the remaining actions with respect to records management – this interaction is ongoing.

Condition of stored packages

Review of the package inspection records and current WAGR box monitoring arrangements indicate that the current storage conditions provided by the engineered WAGR box store appear appropriate to prevent external degradation of the waste packages. This review highlights the need to consider extending this monitoring and inspection programme to include measurement of the chloride deposition rates on the

waste packages to allow early identification of potential degradation from chloride induced corrosion of the reinforcing.

Status of Quality Management System

An overview of the status of the QMS audits and assessment of the assessment of the package records has been undertaken to ensure that there are no issues requiring resolution. It is apparent from this review that the packaging of the WAGR waste was undertaken under an appropriate regime of Quality Management. Specific recognition is made in relation to the need to maintain control of the waste packages, their storage environment and the associated waste package records under a quality management system.

RWMD has requested that copies of the Waste Product Specification documentation be provided for record purposes.

Conclusions

The principal conclusions of the periodic review of WAGR ILW are that sufficient information exists to make a robust disposability case for WAGR ILW packages manufactured to date, and that satisfactory performance of the waste packages has been established to allow re-issue of the Final stage LoCs associated with the packaging of WAGR ILW considered in this periodic review. In providing this acceptability recognition is made of the need for WAGR to undertake the following:

- Continue the monitoring programme to confirm the condition of the waste packages and to demonstrate that the surface contamination levels remain within the prescribed limits for storage and transport.
- Establish the current levels of surface chloride contamination on the WAGR packages, such that preventive measures could be introduced well in advance of the critical chloride deposition levels being reached.
- Update/maintain the regulatory transport licence for WAGR waste packages.
- Provide copies of the final Waste Product Specifications used during the packaging campaigns and details of all box discrepancies and re-work applied.

These issues do not preclude re-issue of the Final stage LoCs for WAGR decommissioning ILW and replacement LoCs (or LoC) will be issued in due course. The issues will be recorded on the re-issued LoCs (or LoC) as appropriate qualifications.