

# Packaging of WPEP Packages Arising from Reduced Salts Washing at EARP

(Final stage)

Summary of Assessment Report

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## **Introduction**

British Nuclear Group Sellafield Ltd (BNGSL) has sought an amendment to an extant Final stage Letter of Compliance for the packaging of flocs arising from the treatment of reprocessing effluents in the Enhanced Actinide Removal Plant (EARP), within the Waste Packaging and Encapsulation Plant (WPEP) at the Sellafield site.

The proposed amendment to the extant Final stage endorsement for WPEP relates to the residual soluble salts content of a number of different flocs. BNGSL proposes to wash certain flocs with less water, resulting in an increase in the sodium nitrate salt content of these flocs from the current limit of 1 g/l up to a new limit of 5 g/l. The driver for this change is to reduce the volume of water that is used to wash the flocs at EARP prior to encapsulation at WPEP. A reduction in the volume of water used in this process would significantly reduce water consumption on plant, as well as the volume of secondary effluent sentenced for off-site discharge, and hence operational costs. BNGSL has therefore requested Nirex to determine whether the changes in waste product composition would affect the disposability of the WPEP product drums.

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 underpinning Phased Geological Repository Concept (PGRC). Further information on the Letter of Compliance process is available elsewhere<sup>1</sup>.

The process of obtaining a Letter of Compliance is embedded in the regulators' arrangements for the conditioning and packaging of ILW, as described in the guidance issued by the regulators<sup>2,3</sup>. In line with regulatory guidance, Nirex carries out independent assessment of the specific waste packaging proposals in particular to assess disposability of the proposed waste packages by consideration of requirements for future storage, transport and disposal as embodied in the Nirex standards and specifications for waste packaging and underpinning PGRC.

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

<sup>2</sup> *Improved Regulatory Arrangements for the Conditioning of Intermediate Level Radioactive Waste on Nuclear Licensed Sites: Provision of Advice to the Health and Safety Executive by the Environment Agency and the Scottish Environment Protection Agency, Regulators' Position Statement, December 2003.*

<sup>3</sup> *Conditioning of Intermediate Level Radioactive Waste on Nuclear Licensed Sites: Provision of Advice by the Health and Safety Executive, the Environment Agency and the Scottish Environment Protection Agency, Guidance to Industry, March 2005.*

This assessment does not include a detailed disposability case, as the product drums arising from the encapsulation of flocs at WPEP have previously been determined to be disposable. This report summarises a review of the proposals for reduced salts washing on the composition of the waste product and comments on whether the changes would have any implications for the disposability of the waste packages.

### ***Summary of Proposals***

The Nirex assessment focussed on the following key areas in respect of the potential implications of reduced salts washing:

- Changes to the nature and composition of the floc wastes as a result of the reduction in washing;
- Changes to the wasteform properties of the encapsulated waste and resulting implications for disposability;
- Safety consequences associated with the increase in salts content of the packages in the post-closure period of the ILW repository, to ensure that an adequate case can continue to be made for the disposability of WPEP products.

The BNGSL submission consisted of a report on small-scale trials that were undertaken on simulant floc samples dosed with sodium nitrate up to a concentration of 5 g/l. This work was supported by earlier trials undertaken in the 1990s on similar samples, dosed up to 20 g/l sodium nitrate. These trials reported the following properties of the simulated wastes:

- Viscosity of the mix of floc and cement powders;
- Set time and volume of bleed water;
- Compressive strength of product and its evolution;
- Dimensional stability of product and its evolution.

Based on these trials, the Nirex assessments concluded that it would be very unlikely that product quality would be impaired by the reduction in salts washing at EARP and the resulting WPEP products would ultimately be disposable. It is concluded that an amended Letter of Compliance can be issued.

The reduction in salts washing could potentially have implications for an increase in retained species other than the predominant salt, sodium nitrate. Such species could include other salts, process reagents, organic species from reprocessing operations and radionuclides. A pro-rata increase in these species was judged unlikely to have any significant impact on WPEP product quality or affect off-site discharges.

Although the small-scale trials provide sufficient confidence to enable endorsement of the proposals, it was recognised that the effects of the reduction in salts washing has not been demonstrated at full-scale nor using real flocs. It is possible that the active plant and real flocs could behave differently, due to the many complexities of the real system. Although Nirex recognises that the production of non-compliant waste packages carries a low risk, BNGSL, should, nonetheless proceed with caution when processing the first full-scale active operations on plant.

### ***Associated Requirements***

The operation of a robust quality management system has been recognised as a fundamental aspect of the operation of EARP and WPEP. The quality management system (QMS) should define the controls that will be implemented to ensure that the salts washing process in EARP is carried out to the appropriate degree of salts washing, that is, up to 5 g/l sodium nitrate. The QMS must define the controls which ensure that flocs whose salt content is dominated by ammonium nitrate instead of sodium nitrate should continue to be washed down to 1 g/l. BNGSL is requested to provide such evidence prior to the

implementation of the reduction in salts washing on plant. This will give confidence that compliant waste products can be subsequently prepared.

BNGSL is also requested to provide an updated Waste Product Specification (WPrS) document prior to the commencement of reduced salts washing. This revision should encompass the endorsed changes to the salts content of the relevant flocs. Furthermore, this document should clarify the methodology that is used on plant to determine the point at which the appropriate salts target end-point is achieved during the salts washing process.

## **Conclusions**

On the basis of the submitted information, assessment of the proposal to implement a reduction of salts washing of flocs at EARP has concluded that the resultant packages containing sodium nitrate up to 5 g/l are expected to be compliant with the requirements of the Nirex Phased Geological Repository Concept (PGRC) and can be endorsed as an amendment to the following existing Final stage Letter of Compliance for WPEP products:

- LOC/153401: This was the original Final stage LoC issued in 1993 for encapsulation of bulk and Medium Active Concentrate (MAC) flocs;
- LOC/328945: This LoC was issued in 2000 to incorporate Solvent Treatment Plant (STP) effluents as part of the bulk stream;
- LOC/446879: This LoC was issued in 2004 as an extension to the original LoC (LOC/153401) for bulk and MAC flocs to include the use of Tetraphenyl Phosphonium Bromide (TPPBr);
- LOC/491026: This LoC was issued in 2005 for the packaging of all future campaigns of Salt Evaporator Concentrate (SEC) floc.

In assessing the proposal, Nirex has identified a number of issues that should be given due attention prior to the implementation of the reduction in salts washing of the flocs at EARP. BNGSL is encouraged to proceed with caution during the full-scale active processing operations at WPEP on those flocs subject to the reduced washing cycle, until experience of operation at this high salts content is developed, to ensure that the resulting waste product is consistent with the Waste Product Specification.