

Packaging of Sellafield Fuel Handling Plant Swarf at the Magnox Encapsulation Plant - WPrS

Summary of Assessment Report

Issue date of Assessment Report: 6 December 2007

Background

The Nuclear Decommissioning Authority (NDA) Radioactive Waste Management Directorate requires all waste packagers to produce and manage a Waste Product Specification (WPrS) for each type of waste package manufactured. In 2003 BNFL provided a Waste Product Specification (WPrS 2003) for waste packages manufactured at the Magnox Encapsulation Plant (MEP). The format of the WPrS follows that established for Sellafield waste packaging plants, comprising three parts. The first part defines the Quality Assurance requirements, the second part defines the packaging process and product, and the third part defines the waste package data to be recorded.

Provision of this WPrS resulted in an assessment by UK Nirex Ltd and provision of an advice letter in September 2003, which identified a number of areas where Nirex believed improvements were required to adequately define the waste packages. At a meeting in May 2006, the activities required to complete the WPrS were summarised in the form of Action Points to be addressed, listed in the Table below.

Sellafield Ltd have now provided a revised Waste Product Specification (WPrS 2007), and requested closure of the relevant Action Points.

During 2008 it is planned to undertake a review of existing Letters of Compliance (LoCs) for waste packages manufactured by MEP, through provision of a periodic review. Even though the primary purpose of such a review is to ensure the continuing currency of the LoCs, it will also provide an opportunity to make further improvements in future issues of the WPrS. Recommendations for potential future improvements are also made in this Assessment Report.

Format and Content of the Waste Product Specification

The WPrS 2003 for MEP products was intended to cover all MEP waste package types. It appears that Parts 2 and 3 of the WPrS 2007 are only intended to cover packaging of swarf from the Fuel Handling Plant (FHP) packaged at MEP. Part 1 of the revised WPrS continues to cover QA documentation relevant to all MEP products, including existing packaging of retrieved swarf from the Magnox Swarf Storage Silos and potential future packages of Tokai Mura End Crops (TMECs). Sellafield Ltd has proposed to provide further separate Parts 2 and 3 WPrS documents to cover these other MEP waste products and to close their relevant associated Action Points.

An assessment of the responses to the Action Points has been completed. It has been found that of the 11 Action Points which relate to the format and content of the MEP FHP Swarf WPrS, 7 have been successfully addressed and are considered closed. Two of the remaining Action Points (B06/041 and B06/055) relate to data recording for radionuclides, which are proposed to be addressed in the future. These would most appropriately be addressed during a planned review of MEP endorsements.

Table: Action Points relating to Completion of a WPrS for MEP

Action Point	Activity
B06/037	Confirm whether the waste materials listed under Waste Composition cover all materials packaged at MEP, and modify list if necessary.
B06/038	Specify any limits on waste package composition, including those derived from the Residue Specification, which formed major input to Nirex LoC assessment, and make appropriate references.
B06/039	Confirm how the product quality for packaging of uranium re-cans, in-cave scrap and de-canner sump arisings has been demonstrated, and reference appropriate R&D.
B06/040	State limits on container surface contamination in format consistent with Nirex Waste Package Specification.
B06/041	In subsequent issues of the WPrS, update the MEP radionuclide data recording methodology to cover all significant radionuclides (Note: this action may require significant effort, but should not prevent issue of the WPrS prior to updating of the methodology).
B06/042	Modify Part 3 of the WPrS to state what information is being recorded on the physical and chemical contents of packages and any related enabling data.
B06/043	WPrS to refer to the developing MEP CCAD(s).
B06/045	Correct the statement that empty new waste containers are wrapped in PVC by the manufacturer, and also include explanation of waste package storage location and environmental conditions.
B06/047	Provide a note to append to WPrS to identify minor historical changes and associated drum numbers/dates.
B06/055	Update MEP radionuclide data recording processes to ensure all radionuclides at significant concentrations are recorded.
B06/062	Confirm whether RSW baskets are monitored by the SIM, identify what data are recorded on the package record and inform Nirex of the findings.

Note: B06/044 and B06/046 were closed between issue of the draft and final versions of meeting minutes issued in May and June 2006.

Sellafield Ltd has not confirmed how the product quality for packaging of uranium re-cans, in-cave scrap, de-canner sump arisings and accumulated de-watering fines has been demonstrated, and has not referenced appropriate R&D as requested by Action Point B06/039. We understand that the referenced research and development report in Part 2 of the WPrS has yet to be produced. We believe the report, similar to that produced for other Sellafield packaging plants, was planned as a summary report of existing historical R&D. It is recommended that either the existing R&D is referenced or the summary report produced. In either case this work needs to demonstrate MEP package product quality for packaging the range of waste described.

Sellafield Ltd has not provided a note to append to WPrS to identify minor historical changes and associated drum numbers/dates. The Action Point B06/047 is thus on-going.

It is understood that Action Points relating to WPrS's for packaging of other wastes at MEP, for example the wastes retrieved from the Magnox Swarf Storage Silos, will be addressed at a later date, and thus remain on-going.

Other Observations on the Waste Product Specification

Recommendations for further improvements in future issues of the WPrS or for issues to be addressed during periodic review of the LoCs for MEP have been made. The main observations are identified below.

Two LoCs are missing from the list provided in Part 1 of the WPrS. In the early 1990's separate LoCs on radionuclide data recording were issued in support of packaging of both FHP swarf and retrieved swarf from the Magnox Swarf Storage Silos. It is recommended that these documents are listed in future issues of Part 1 of the MEP WPrS.

It is noted that the WPrS does not contain a detailed description of the vibro-grouting process used to ensure adequate infilling of the swarf, and does not specify any limits for vibration frequency or duration of the process. The vibration process is important for product quality, and therefore it is important that the process variables and minimum requirements are specified.

The WPrS lists a number of items that are included in Drum Information Wallets, and will contain some information relevant to process conditions. The exact information that is recorded is not identified in the WPrS. It will be necessary to confirm that the data recorded is sufficient to demonstrate compliance with the WPrS. This may best be undertaken during the planned periodic review of the LoCs for MEP.

It is noted that fine particles of swarf (and presumably associated fuel) that are captured in the ejected liquor from the drum de-watering process prior to swarf grouting are accumulated at MEP and periodically added back into some waste containers. There is no indication that the addition of fines to individual packages and associated radionuclides and materials is recorded and account taken of the radionuclide and fissile material burden. The adequacy of the information recorded is not considered in detail here and should be addressed in the planned periodic review.

It is noted that the section of the WPrS that addresses waste package storage location and conditions has been expanded and comes closer to meeting the structure and format described in NDA RWMD guidance on WPrS's. It is nevertheless not completely consistent, we believe probably because the monitoring regime at MEP is not sufficiently comprehensive. This issue needs to be addressed during the planned periodic review.

Consistency with Letters of Compliance

Some of the issues raised in the advice letter of 2003 related to concern whether the products described in Parts 2 and 3 of the WPrS 2003 were the same in all respects as that endorsed through the Letters of Compliance listed in Part 1 of the WPrS. Therefore, the NDA Radioactive Waste Management Directorate (RWMD) offered to give separate consideration to where there may be differences between the product described in the WPrS and the existing LoC endorsements for FHP Swarf MEP products. The assessment has concluded that the waste package described by the WPrS 2007 differs from that endorsed in the follows areas:

- addition of de-canner sump arisings was not assessed and endorsed;
- addition of uranium re-cans was not assessed and endorsed;
- addition of steel scrap was not assessed and endorsed;
- addition of fines accumulated from de-watering operations was not assessed and endorsed;
- extent of uranium fuel carryover appears to differ from that endorsed and does not appear to be controlled in terms of achieving product quality;
- the minimum encapsulation grout fluidity as measured using Colflow appears to differ from that endorsed.

The maximum fuel burn-up also appears to significantly exceed the fuel burn-up addressed for the LoC assessment in 1990, which may result in differences in package characteristics such as radiogenic heat output. The maximum radiogenic heat output at the time of transport needs to be limited to 50W per waste package according to the Generic Waste Package Specification (GWPS) supporting the NDA's Phased Geological Repository

Concept. The WPrS refers to a limit of 196W per package at the time of packaging. Even though radioactive decay between the time of packaging and the time of transport may allow packages to comply with the GWPS, this is not demonstrated. These inconsistencies may have consequences and need to be addressed through the planned MEP LoC periodic review to allow a disposability case to be generated.