

Contract No:

This document was prepared in conjunction with work accomplished under Contract No. DE-AC09-08SR22470 with the U.S. Department of Energy (DOE) Office of Environmental Management (EM).

Disclaimer:

This work was prepared under an agreement with and funded by the U.S. Government. Neither the U. S. Government or its employees, nor any of its contractors, subcontractors or their employees, makes any express or implied:

- 1) warranty or assumes any legal liability for the accuracy, completeness, or for the use or results of such use of any information, product, or process disclosed; or
- 2) representation that such use or results of such use would not infringe privately owned rights; or
- 3) endorsement or recommendation of any specifically identified commercial product, process, or service.

Any views and opinions of authors expressed in this work do not necessarily state or reflect those of the United States Government, or its contractors, or subcontractors.

HB-Line Plutonium Oxide Data Collection Strategy
Robert W. Watkins, Jeffrey M. Jordan, and Jason L. Varble
Savannah River Nuclear Solutions

ABSTRACT

HB-Line and H-Canyon will handle and process plutonium material to produce plutonium oxide for feed to the Mixed Oxide Fuel Fabrication Facility (MFFF). However, the plutonium oxide product will not be transferred to the MFFF directly from HB-Line until it is packaged into a qualified DOE-STD-3013-2012 container. In the interim HB-Line will load plutonium oxide into an inner, filtered can. The inner can will be placed in a filtered bag which will be loaded into a filtered outer can. The outer can will be loaded into a certified 9975 with getter assembly in compliance with onsite transportation requirement, for subsequent storage and transfer to the K-Area Complex (KAC). After DOE-STD-3013-2012 container packaging capabilities are established, the product will be returned to HB-Line to be packaged into a qualified DOE-STD-3013-2012 container.

To support the transfer of plutonium oxide to KAC and then eventually to MFFF, various material and packaging data will need to be collected and retained. In addition, data from initial HB-Line processing operations will be needed to support future DOE-STD-3013-2012 qualification as amended by the HB-Line DOE Standard equivalency. As production increases, the volume of data to collect will increase. An organized method to collect and retain the necessary information was needed.

The internal and external campaign documents requiring HB-Line plutonium oxide processing data collection and retention are:

- KAC Authorization to Ship (ATS) Form
- DOE-STD-3013-2012 and equivalency (including MFFF Plutonium Oxide Powder Interface Control Document)
- Alternate Feed Stock (AFS)-2 Early Feed Performance Metric
- HB-Line Process Control Plan

KAC ATS FORM

A memorandum of understanding between HB-Line and K-Area identifies the requirements for HB-Line Phase II plutonium oxide and the K-Area ATS documentation. All data needed to satisfy the KAC facility requirements is identified on the ATS form. Prior to HB-Line initiating a transfer to KAC, all required material information must be provided to KAC for transfer authorization. KAC will review the HB-Line ATS data, using the KAC Engineering Reviews for Approval to Ship Program and KAC procedures. After KAC authorization HB-Line will transfer the accepted items to KAC.

Transfers of HB-Line plutonium oxide to KAC are governed by an Onsite Safety Assessment (OSA). Compliance with the OSA requirements is addressed in the HB-Line procedures submitted to the Packaging Review Committee (PRC) and listed on the Radioactive Packaging Approval Log (RPAL) after PRC concurrence. Some of the OSA requirements are specifically identified by the ATS while others are covered in the generic statement that the shipping package contents and packaging are compliant with the OSA.

DOE-STD-3013-2012 AND EQUIVALENCY

DOE-STD-3013-2012, "Stabilization, Packaging, and Storage of Plutonium-Bearing Materials" outlines general requirements to stabilize plutonium materials, package them in 3013 containers, populate a 3013 product certification database, and place them in long-term storage. In accordance with the protocol outlined in the standard, HB-Line has requested and received approval of an equivalency to the DOE-STD-3013-2012 to allow for a reduced minimum stabilization temperature of HB-Line Phase II plutonium oxide at 625°C. Meeting the SRS requirements for stabilization and packaging to the standard and obtaining DOE-SR approval of the implementation strategy ensures DOE-STD-3013-2012 compliance.

Although HB-Line will not be producing qualified 3013 containers at this time, the stabilization is being credited as such, and there is associated stabilization data which will be needed to demonstrate 3013 compliance once packaging capabilities are provided.

An interface control document (ICD) with MFFF identifies interface requirements particularly with respect to an oxide material specification for the plutonium oxide that will be produced in HB-Line for disposition through MFFF. Until HB-Line starts packing material for MFFF into a 3013 container, compliance with the entire ICD cannot be demonstrated. However, HB-Line will demonstrate compliance with stabilization requirements which are invoked by the ICD.

AFS-2 EARLY FEED PERFORMANCE METRIC

A memo addressing the documentation package format for AFS-2 Feed identifies the product information for the AFS-2 early feed performance metric to be provided to National Nuclear Security Administration (NNSA) as evidence of MFFF quality plutonium oxide production. The memo identifies the applicable sections of the ICD for the interim HB-Line material. The purpose of the metric is to show compliance with the SRNS commitment to NNSA for AFS-2 production. For the metric there are two data collection aspects: 1.) data that is supplied to NNSA and 2.) documents that provide the bases for the supplied metric data. The documents that supply the metric data may be subject to NNSA audit.

HB-LINE PROCESS CONTROL PLAN

In addition to data needed to satisfy performance, qualification, or production requirements, other data is needed to maintain control of the HB-Line plutonium oxide process. The HB-Line AFS-2 plutonium oxide process control plan outlines the controls to ensure that HB-Line produces high purity, low moisture plutonium oxide during the AFS-2 campaign. This control plan addresses parameters from all facility unit operations: anion exchange,

precipitation/filtration, and mechanical line. The identified data from the process control plan is needed to understand how the process is performing, develop optimization methods, and assist with troubleshooting so that adjustments/corrections can be implemented as needed. Portions of this data set will be used in the future to justify 3013 compliance, satisfy MFFF feed requirements, or glean insight into past operations.

Items from the process control plan which are the responsibility of the assigned system engineer are not included as part of the process data set. Items that are not identified in the ATS but support ATS compliance are included as part of this data set. The metric data bases documents subject to NNSA audit are included.

HB-LINE PLUTONIUM OXIDE REQUIREMENTS MATRIX

A summary of the identified required data was put into a single matrix which showed the campaign requirement source and listed the implementing document(s). The required data was subdivided into the following process area groupings: general, anion, precipitator, stabilization, material properties, and packaging.

Each of the campaign documents were reviewed by a team consisting of personnel from HB-Line engineering, HB-Line operations, Nuclear Materials Management engineering, Nuclear Non-Proliferation Programs, and SRNL. From this review, the summary of the required data was developed. Then the applicable requirements for ATS, 3013, Metric, and Process were marked with an "X". Documents that will be the basis for showing compliance with the identified requirements are listed in the implementation column. These documents consist of procedures, technical basis "white" papers, and distributed control system (DCS) printouts, and laboratory reports/sample results that will be needed for each interim can of plutonium oxide.

A considerable amount of effort was spent discussing/distinguishing the difference between a requirement and a data point (value) to support a requirement so that each was represented accurately. Designated within the Process column are footnoted items that are not ATS or Metric required data, but are necessary to show evidence of compliance with the requirement identified by the campaign document. The ATS footnoted process requirements satisfy the moisture content requirement. The Metric footnoted process requirements identify data bases documents that contribute to completing the metric AFS-2 Early Feed Performance Metric and may be subject to additional review by NNSA.

The matrix illustrates that several of the required data items are shared (overlap) between the various campaign documents. It also shows that multiple required data items are available in the same document.

CONCLUSION - DATA COLLECTION PROCESS

The HB-Line data collected will be in the form of paper copies and electronic media. Paper copy data will, at a minimum, consist of: facility procedures, nonconformance reports (NCRs), and DCS print outs. Electronic data will be in the form of Adobe portable document formats (PDFs). Collecting all the required data for each plutonium oxide can will be no small effort for HB-Line

and will become more challenging once the maximum annual oxide production throughput is achieved due to the sheer volume of data to be collected.

The majority of the data collected will be in the form of facility procedures, DCS print outs, and laboratory results. To facilitate complete collection of this data, a traveler form will be developed which identifies the required facility procedures, DCS print outs, and laboratory results needed to assemble a final data package for each HB-Line plutonium oxide interim oxide can. The data traveler may identify the specific values (data) required to be extracted from the collected facility procedures and DCS print outs. The data traveler may also identify associated criteria to be checked. Inevitably there will be procedure anomalies during the course of the HB-Line plutonium oxide campaign that will need to be addressed in a timely manner.

The resources needed for data collection, storage, and retrieval may include but are not limited to:

- Personnel to collect data – includes retrieving procedures, obtaining DCS printouts, obtaining laboratory results, organizing collected data by run/batch/can following a data traveler or checklist
- Personnel to review collected data – includes verifying all items identified by the data traveler or checklist were collected, addressing any missing data, reviewing procedures for completeness, addressing procedure discrepancies
- Storage of collected data – includes maintaining adequate office space, file cabinets, fire king file cabinets, repositories, storage space within and outside of HB-Line, and submitting data packages to document control
- Management of data collection process – includes establishing points of contact for various data collection points, identifying personnel to review collected data, identifying personnel who will assemble the data package, and identifying personnel who have access to collected data and data packages, maintaining adequate space and materials to efficiently collect/store data

The data traveler used to collect HB-Line plutonium oxide data could consist of three sections. Section one of the traveler would consist of a checklist for the specific HB-Line data campaign documents (i.e. facility procedures, DCS print outs, and laboratory results) to be collected. Section two would consist of confirmation that the identified documents are complete and legible. A third section of the traveler should confirm the plutonium oxide meets identified requirements (i.e. weight, isotopics).

REFERENCES

1.) Watkins, R.W., Varble, J.L., Jordan, J.M., Elkourie, J.E., G-ESR-H-00207, “HB-Line Phase II Plutonium Oxide Data Collection Strategy” Revision 0, June 2013