

Disposition of Unirradiated Sodium Bonded EBR-II Fuel Elements and HEU Scrap: Work Performed for FY 2007

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Introduction

Specific surplus high enriched uranium (HEU) materials at the Idaho National Laboratory (INL) Materials and Fuels Complex (MFC) will be transferred to a designated off-site receiving facility. The DOE High Enriched Uranium Disposition Program Office (HDPO) will determine which materials, if any, will be prepared and transferred to an off-site facility for processing and eventual fabrication of fuel for nuclear reactors.

These surplus HEU materials include approximately 7200 kg unirradiated sodium-bonded EBR-II driver fuel elements, and nearly 800 kg of HEU casting scrap from the process which formed various sodium-bonded fuels (including the EBR-II driver elements). Before the driver fuel can be packaged for shipment, the fuel elements will require removal of the sodium bond. The HEU scrap will also require repackaging in preparation for off-site transport.

Preliminary work on this task was authorized by BWXT Y-12 on Nov 6, 2006 and performed in three areas:

- Facility Modifications
- Safety Documentation
- Project Management

Facility Modifications

The facility modification effort focused on planning the dismantling and removal of equipment in the Fuel Manufacturing Facility (FMF). Once this equipment is removed, a new glovebox (where the sodium bond removal work will be done) will be installed in FMF. An Engineering Task Evaluation (ETA) is required by the INL work management system to obtain engineering services. The ETA for this work (FM-2006-17) was issued Nov 14, 2006. Task assignments of task manager, lead engineer, mechanical engineer, electrical engineer, and designer were made. A kickoff meeting was held with pertinent personnel from facility management, maintenance, radiological safety, occupational safety, nuclear safety, environmental compliance, project management, waste services, materials handling, and the assigned engineers. Input from the meeting was used to increase the level of detail of the work scope. A task evaluation documented the scope, required resources, proposed schedule, estimated cost, and an implementation plan. The evaluation was reviewed by all impacted organizations and approved Dec 21, 2006. The environmental checklist, hazards analysis, and request for a Davis-Bacon determination were initiated at this time. Tours were conducted so photographs and measurements could be taken before any detailed instructions were drafted. An Installation and Test Instruction (ITI) was prepared to perform a radiological survey and obtain samples from equipment and ducting. A determination was made on the level of radiological control required for the dismantling and removal of equipment. Samples of paint were analyzed for heavy metal contamination. The ITI for the actual dismantling and removal was routed for review. Comments were discussed on Mar 7, 2007, and the ITI was finalized and approved on Mar 29, 2007. An Unreviewed Safety Question (USQ) review was also completed at that time.

Material requisitions were initiated for the acquisition of some preliminary equipment and additional requisitions will be ongoing.

Documentation of the FMF Sodium Recovery Glovebox requirements is ongoing. This documentation along with the process description of the Melt-Drain-Evaporate (MEDE) system will provide nuclear safety with a starting point for developing a DSA Addendum.

Project Management

Project management activities associated with this task have included: scope definition, development of a work breakdown structure (WBS), and initial identification of potential project risks. A cost control account was established along with supporting detailed activities. The resource requirements and anticipated durations for the activities were estimated forming the projects baseline schedule. Costs were assigned to the activities resulting in the development of the projects budget. Project performance with respect to schedule and budget have been analyzed and reported on a monthly basis. Project roles and responsibilities were developed and assigned.

The project's work scope has been submitted to the MFC planning group for integration with other facility-specific activities. The coordination between project requirements and the facility management along with other affected organizations, has been, and will continue to be monitored on a daily basis to ensure the projects success.

Safety Documentation

The safety documentation effort was an evaluation performed by Nuclear Safety Engineering (NSE) against the 10CFR830 "Major Modification Evaluation Criteria." The principal hazard to be introduced with the proposed project is associated with the MEDE process: recovering sodium in greater quantities than what is currently allowed in other FMF argon atmosphere gloveboxes (batch quantities up to 433 grams of sodium versus 100 grams currently permitted in AFCI glovebox).

NSE personnel reviewed DOE G STD-1189-2006, "Integration of Safety into the Design Process" and 10 CFR 830.206 "Preliminary Documented Safety Analysis" (PDSA). The NSE dealt with the question of would the treatment and packaging of unirradiated sodium-bonded HEU fuel and miscellaneous casting scrap require FMF to substantially change its safety basis to support the work? This question required a document with an introduction, project description, hazards analysis, and completion of the PDSA evaluation criteria. (The evaluation criteria is six questions covering adding a new building, changing the footprint of the facility, impacting the credited safety function, adding a new process resulting in the need for a safety basis change, utilizing new technology not approved by DOE for FMF, creating the need for a revised safety basis controls, and involving a hazard not previously evaluated in the DSA.)

The determination document was drafted, but it didn't include the hazards analysis. Review comments were received, and comments were incorporated to include the hazards

analysis. This will require updating the FMF Fire Hazards Analysis and the FMF Combustible Loading Program, and revising the DSA to add a process description and hazards analysis to explicitly discuss the hazard associated with sodium recovery. The hazard and accident analysis may require the addition of controls for the sodium packaging containers and/or limits on the allowable recovered sodium inventory. These changes do not indicate a need for high cost upgrades to existing structures, systems, or components (SSCs) or high cost new SSCs to properly mitigate the hazards associated with this project. Thus it is concluded that treatment and packaging of unirradiated EBR-II driver fuel and miscellaneous casting scrap does not constitute a "major modification" per 10 CFR 830. The changes to the existing DSAITSR to reflect this project will be made following the normal USQ/DSAITSR change processes. The final draft required considerable effort and resulted in a determination document that was reviewed, comments incorporated, and approved. During this time frame discussions were held to determine the desire to transmit the document to DOE-ID for their information prior to the BWXT Y-12 project major modification deliverable. The final work for this task required a March 23, 2007 letter to inform the project manager that the subject work was completed and documented in report number INL/INT-07-12513.