DOE F 1325.8
(8-89)
EFG (07-90)

United States Government **Department of Energy**

Memorandum

DATE: MAY 3 0 2007

REPLY TO ATTN OF: EM-60 (Chung, 202-586-5151)

SUBJECT: Request for Concurrence with Recommendation of the Defense Nuclear Facilities Safety Board (DNFSB) 2004-2 Plutonium Disposition Project Ventilation System Evaluation Report

TO: Jeffrey M. Allison, Manager, Savannah River Operations Office

Based on review of the information included in the subject report, evaluation by the Office of Environmental Management (EM) representative on the DNFSB 2004-2 Independent Review Panel, and input from the Office of the Chief of Nuclear Safety, the attached Independent Review Report is approved with the following considerations.

1) Savannah River Operations Office commits to meeting Safety Class and Safety Significant design and evaluation criteria contained in the DNFSB 2004-2 Evaluation Guidelines for the stated systems.

2) Design will continue to be evaluated and safety demonstrated as part of the continuing critical decision and safety basis activities associated with the project.

3) For the purpose of safety classification validation during preliminary design, the Savannah River Operations Office shall use the EM Interim Guidance or DOE-STD-1189 if published in time for use during preliminary design by the Plutonium Disposition Project.

If you have any further questions, please call me at (202) 586-5151.

Dae Y. Chung
Deputy Assistant Secretary for
Safety Management and Operations

Attachment

cc:
I. Triay, EM-3
P. McGuire, SR
R. Lagdon, CNS-ESE

INDEPENDENT REVIEW REPORT

PLUTONIUM DISPOSITION PROJECT

May 2007

BACKGROUND

On December 7, 2004, the Defense Nuclear Facilities Safety Board (DNFSB) issued Recommendation 2004-2, *Active Confinement Systems*. Recommendation 2004-2 noted concerns with the safety system (safety-class or safety-significant) designation strategy utilized in or planned for several facilities to confine radioactive materials during or following accidents. The Board's main issue is that for the purpose of confining radioactive materials through a facility-level ventilation system, safety system designation should be based on the active safety function (forced air through a high efficiency particulate air (HEPA) filter system). The DNFSB is concerned that a passive confinement safety function may not be as effective as the active safety function in a few postulated accident scenarios.

On March 18, 2005, the Secretary accepted DNFSB Recommendation 2004-2. On August 22, 2005, the Department of Energy (DOE) forwarded its Implementation Plan (IP) for this recommendation to the DNFSB. The DNFSB accepted the Department's IP on September 19, 2005. On July 12, 2006, the DOE forwarded a revised IP to the DNFSB which was accepted by the DNFSB on March 13, 2007. The DOE IP contains the methodology for systematically reviewing current or proposed ventilation systems at each of the sites. That methodology was established as the *Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related Systems* and was further amplified by issuance of an addendum on March 6, 2007. The evaluation process was first piloted at several facilities prior to DOE-wide implementation. This review is subsequent to the pilot reviews and is for a project in the conceptual design phase. This facility review was added to the Environmental Management (EM) high priority reviews in order to meet early project timeline requirements.

FACILITY OVERVIEW

The Plutonium Vitrification (PUV) Facility will be located in the existing K-Area Complex (KAC) primarily in what was previously the reactor process areas of -20' and -40' levels. The purpose of the PUV project will be to vitrify surplus EM-owned plutonium residues for eventual disposal. The EM feed represents approximately 13 MT of surplus plutonium metal and oxide, along with 8 MT of other impurities (includes actinides such as Am, EU, DU, NU, Np, etc.). The incoming materials are in the form of pure and impure oxide, metal and alloys packaged into 3013 interim storage containers and intact Green Fuel (sintered Pu pellets).

PUV will be designed for a planned 6-year operation. PUV operations are compartmentalized into rooms so that batch operations for that module can proceed without impacting adjacent modules. Rooms are arranged to provide for efficient and logical movement of material that is to be unpackaged, processed, vitrified, canned, and loaded into canisters. The PUV process will produce moderate quantities of LLW and TRU waste (material containers and job waste) from the processes, which will be processed for transfer to the onsite Waste facilities where it is either dispositioned on site or shipped to an offsite disposal location.

The PUV project is currently in the "conceptual" phase (CD-1) and therefore design is not complete. The existing KAC main building will be modified to accept the new PUV facility. Extensive D&R of existing reactor components, primarily on the -20' and -40' levels of the reactor building, will occur to make room for the new process. The present DSA classifies the building as SC and it meets NPH PC-3 criteria. All modifications will be analyzed to maintain conformance to this and any other project driven safety basis constraints as they apply to the existing structure.

The system design involved with this project is only at the conceptual level with no accident analysis initiated. Initially, the ACVS (sand filter, main exhaust fans, diesel generators and exhaust ductwork from building to stack) for the PUV is functionally classified as SC and is PC-3 qualified for protection of the public. The ACVS is also initially credited to protect the co-located worker outside the facility. The PCVS (glovebox exhaust fans, diesel generator, HEPA filters and exhaust ductwork from glovebox to main exhaust duct) is functionally classified as SS and is PC-2 qualified to protect the facility worker for the conceptual effort. Process ductwork within the building is functionally classified SS. Tornado dampers are functionally classified SC.

The PUV HVAC System will be designed with confinement zones 1, 2 & 3 (Primary, Secondary, and Tertiary). Zone 1 includes the areas of highest potential for contamination (e.g., gloveboxes & hoods); Zone 2 includes surrounding areas of the Zone 1 in the process rooms; and Zone 3 includes the clean areas (e.g., clean corridors, office spaces, control rooms, etc.). To maintain confinement of hazardous materials, airflow within the building will be from clean areas to areas of successively higher potential for contamination. Air Locks will be provided between clean areas and potentially contaminated areas for contamination control. All material transports between zones 1, 2 & 3 will be by sealed containers (3013s or vit cans) with the following exception – Green Fuel sintered pellets will be bagged out in a convenience can and transported to Feed Prep through the -40' Zone 3 clean area. The sintered pellet material form (high-fired ceramic) makes it very difficult to aerosolize, even in a room fire.

The HVAC system includes:

- Primary Confinement Air Supply (Air Handling Units)
- Primary Confinement Ventilation Glovebox/Hood Exhaust System (Primary Exhaust)
- Secondary and Tertiary Confinement Ventilation Supply (Air Handling Units)
- Secondary and Tertiary Confinement Ventilation Exhaust (Main Exhaust System)

The process areas and potentially contaminated areas will be provided with a once through system and no recirculation. The HVAC system for support and non-contaminated/non-process areas will be re-circulating with some make-up air to compensate for the exhaust. The active component HVAC design will incorporate redundance for Supply Air Handling Units and Primary, Secondary, and Tertiary Exhaust Systems for the reliability, availability and maintainability of the HVAC system. The

HVAC system design must select components and materials of construction suitable for the corrosive environment to ensure high levels of system performance and reliability.

The Pu processing area secondary/tertiary confinement ventilation will be provided by three exhaust fans (EF) and three air-handling units (AHU) with two of each normally operating and one each in standby mode. The building static pressure will be controlled automatically by varying one SF's speed thru a variable frequency drive (VFD) and/or the inlet vane damper on one exhaust fan. The exhaust fans are SC and powered by dedicated SC emergency diesel generators.

The primary exhaust system (gloveboxes/hoods) will consist of SS redundant exhaust fans, a dedicated SS standby diesel generator and redundant bag-in/bag-out, two-stage, testable HEPA filter housings. Each inert glovebox has a re-circulating system purification/cooling loop venting to the exhaust system when required to adjust the differential pressure.

The main supply air system for the process areas will utilize AHUs consisting of filters, electric heating coils, chilled water cooling coils, and supply fan. Outside air will be conditioned in the AHUs to meet temperature and humidity requirements. The AHUs will utilize chilled water for cooling and humidity control, electric heat for pre-heating outdoor air and for zone temperature control in the space. Some of the PUV process gloveboxes will be inerted with Argon or Helium. When air is supplied to Zone 1 air gloveboxes from Zone 2 (process module rooms), the inlet will be provided with HEPA filter to prevent the backflow of potentially contaminated air into the uncontaminated area.

The primary exhaust system for gloveboxes, hoods, and maintenance air flow for inert gloveboxes will consist of pre-filters, two-stage in-place testable HEPA filter housing and a fan. This subsystem will be SS with 100% redundancy. Air from the process gloveboxes (non-inert) and hoods will be exhausted first through gloveboxes and hoods HEPA filters, and then through the main exhaust system.

The main exhaust system will consist of a sand filter located outside the PIDAS with an inlet/outlet tunnel, exhaust fans, and an exhaust stack. All exhaust streams will be filtered in the sand filter as a final stage and exhausted through the fan house to an elevated exhaust stack. The exhaust air will be sampled and continually monitored within the stack exhaust. The sand filter structure will be of reinforced concrete design that complies with the requirements of Performance Category PC-3 for NPH events. The sand filter, exhaust fans, diesel generators and inlet/outlet exhaust tunnel functional classification will be SC.

INDEPENDENT EVALUATION

An independent review of the evaluation conducted by the Savannah River Site (SRS) Site Evaluation Team (SET) was conducted for the Office of Environmental Management. This review concentrated on assuring compliance with the requirements of the DNFSB 2004-2 Evaluation Guidelines and Supplemental Guidance. As a new construction project in conceptual design, PUV has committed to meeting the DNFSB 2004-2 ACVS Evaluation Guidelines. Therefore, due to the non controversial status of the PUV review, the involvement of the complete IRP as designated in DNFSB 2004-2 was considered not to be necessary. The SRS SET fully documented the intended compliance with DNFSB 2004-2 in their facility evaluation and the current compliant status of the preliminary design.

INDEPENDENT RECOMMENDATION

It is recommended that the PSO and CTA accept the PUV ACVS evaluation and commitment to meet the provisions of the DNFSB 2004-2 Evaluation Guidelines. The PUV project is in conceptual design and can continue to undergo changes in programmatic assumptions and design. As a new project, compliance with DNFSB 2004-2 Evaluation Guidelines will be finalized through formal design reviews and review and acceptance of project safety basis documentation. Verification of continued compliance with the provisions of DNFSB 2004-2 must continue to be emphasized during subsequent project reviews and critical decisions.