December 31, 2003

The Honorable Everet H. Beckner
Deputy Administrator for Defense Programs
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0104

Dear Dr. Beckner:

The Y-12 National Security Complex is in the final stages of starting up the Oxide Conversion Facility in Building 9212. The current schedule indicates that this facility will be started up in summer 2004. The Defense Nuclear Facilities Safety Board (Board) has been overseeing the safety enhancement activities for this operation for several years, and is pleased to observe some significant improvements.

However, the Board's staff observed that there are several areas in which additional focus is warranted to ensure adequate protection of the public and workers. The potential for errors in the functional classification of safety controls is of particular concern to the Board because many sites show weaknesses performing this function. Other issues include uncertainties regarding weld quality and an unanalyzed criticality safety scenario. The enclosed report provides staff observations in these and other areas.

The Board requests to be kept informed of the progress made to address the issues identified in the enclosed report.

Sincerely,

John T. Conway
Chairman

c: Mr. William J. Brumley
Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

November 18, 2003

MEMORANDUM FOR: J. K. Fortenberry, Technical Director

COPIES: Board Members

FROM: F. Bamdad
T. Hunt

SUBJECT: Safety Review of Oxide Conversion Facility at Y-12 National Security Complex

The Y-12 National Security Complex is preparing to start up the Oxide Conversion Facility (OCF), formerly known as the hydrogen fluoride (HF) supply system in Building 9212; the facility is expected to be fully operational by the third quarter of fiscal year 2005, to fulfill its national security mission. The current schedule calls for an Operational Readiness Review (ORR) to be performed by the National Nuclear Security Administration (NNSA) in the summer 2004. The startup of OCF operations will have as its safety basis the Basis for Interim Operation (BIO) document that has been reviewed and approved by NNSA. Members of the staff of the Defense Nuclear Facilities Safety Board (Board) T. Hunt, D. Owen, M. Duncan, D. Gutowski, and F. Bamdad reviewed the authorization basis for the OCF activities, walked down the processes involved, and held discussions at the site on October 28 and 29, 2003. During this review, the staff made the following observations:

Design. The contractor, BWXT Y-12, has satisfactorily resolved the confinement issues identified in the Board's letter of May 30, 2000. The HF confinement enclosures on the loading dock are qualified to Performance Category 3 seismic requirements, and seismically qualified isolation valves have been installed to confine hazardous material to these enclosures during an earthquake. A safety-significant seismic detection and control system has been installed to perform the necessary safety functions.

Weld Quality Assurance. The Board's staff reviewed the status of reexamination and verification of vendor-supplied welds in cases in which radiography records were incomplete. Specifically, radiographic films for 47 welds had been lost by the vendor. Of these, 30 welds were reradiographed, and these films are available. Another 17 welds were accepted with missing radiographic films; 10 of these welds are in a hydrogen piping manifold located in the reduction fluid bed enclosure. The justification for not reradiographing these welds included cost, difficulty of obtaining portable radiography equipment, and lack of observed problems with other welds. Although this radiography approach may be acceptable for non-hazardous systems, it does not seem appropriate for

the Department of Energy (DOE) to accept missing radiography records for convenience.

Safety Basis. As noted, the current Building 9212 BIO will be used to support OCF startup. The contractor is preparing a documented safety analysis (DSA) that will meet the safe harbor requirements of DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analysis* and all its change notices. This effort, however, will not be completed in time to support the ORR for OCF operations (the DSA is scheduled for completion in September 2004).

The approved BIO is based on a thorough process hazards analysis that identified more than 500 operational events for OCF operations. The events with significant consequences to the public or workers were further analyzed quantitatively for identification of safety-class or safety-significant structures, systems, and components (SSCs). The radiological consequences of these events did not exceed the DOE Evaluation Guideline of 25 rem, which requires identification of safety-class SSCs. The toxicological consequences to the public, however, exceed the site criterion for identification of safety-significant SSCs.

The BIO identified about 17 design features and 10 active engineered systems that are classified as safety-significant, mainly to protect the public and workers from the toxicological consequences of HF. Although the hazards appear to have been thoroughly identified in the BIO, the Board's staff noted the following weaknesses in the set of controls chosen to prevent or mitigate the consequences of the operational events:

- The criteria used to select and classify controls for the protection of facility workers appear to be less stringent than those used for collocated workers. Safety-significant SSCs are identified to protect facility workers only from prompt fatality, whereas collocated workers are protected by safety-significant SSCs if the potential consequences of identified scenarios exceed the Emergency Response Protective Guideline (ERPG)-3 level. According to current DOE directives, all workers should be equally protected from significant hazardous conditions. The staff was informed that this concern will be addressed during the preparation of the DSA.

- The Y-12 Site Office has informally identified an issue related to potential worker exposure to HF during connection of the HF cylinder to the pigtail assembly used to transfer HF to the vaporizer. During the subject operation, a worker must access the valves on the end of the cylinder through a door in the cylinder enclosure. The enclosure is normally kept at a slightly negative pressure to ensure that any gas leaks are drawn to the loading dock scrubber system, which removes HF before exhausting air to the environment. This negative pressure is assumed to provide worker protection during connection of the HF cylinder to the pigtail assembly. However, with the access door open during pigtail installation, the face velocity at the opening has not been shown to be sufficient to protect the worker in the case of an HF release during this operation.

The Y-12 Site Office communication of this issue was informal and no mechanism was being applied to ensure proper resolution. The Board's staff believes this issue needs to be communicated formally to the contractor for resolution and tracked to acceptable closure.

- One system relied upon to prevent or mitigate potential accident conditions did not appear to have been properly identified as safety-significant. The dock enclosures and the scrubber system are relied upon as secondary confinement to prevent release of HF to the environment in the event of a leak in the primary confinement. Even though this secondary confinement function is classified as safety-significant, not all of the supporting systems are similarly classified. The water flow system of the scrubber is the motive force for HF to be drawn out of the enclosure and treated. Although the primary confinement is automatically isolated upon failure of the scrubber water flow system, leaks from primary confinement could still result in significant consequences. This scrubber water flow system should be identified as safety-significant to ensure that the safety function identified in the BIO will be performed reliably.

- A review of the criticality safety evaluation for the fluid beds indicated that a potential accident scenario had not been analyzed. Discussions with contractor personnel identified that no analysis had included the complete discharge of the uranium tetrafluoride (UF_4) from the uranium receiver onto the floor of the UF_4 transfer glovebox, especially with introduction of a moderator. Many kilograms of uranium are available for transfer into the glovebox, which is located directly below a fire suppression header and within a few feet of some sprinkler heads. There is a potential pathway on the top of the glovebox for water intrusion in the event of sprinkler activation or a pipe break, and there is no drain in the glovebox floor to minimize the accumulation of water.

Emergency Management Hazards Analysis. The Emergency Management Hazards Analysis (EMHA) and its associated Emergency Action Levels (EALs) for Building 9212 and OCF were recently revised to portray more accurately some of the improvements made in the facility and its operations. The hazard analyses that support these documents were performed by the Emergency Management group using a computer program different from that used to prepare the BIO. Some of the assumptions also appear to be different from those made during preparation of the BIO. As a result, the potential consequences of similar events may require dissimilar levels of protection.

For example, a break in the HF transport pipe is identified in the EMHA as resulting in locally high consequences and thus being declared an Alert, whereas the BIO estimates the consequences of the same event at the site boundary to exceed the ERPG-2 levels (which would require declaration of a General Emergency if used for identification of the EAL). The contractor's representatives stated that such discrepancies are due to the overly conservative assumptions used in the BIO, and will be resolved during the preparation of the DSA.

EALs are used mainly for early response to an accident, and as such, they should be based on adequately conservative analyses. This is of particular importance for a highly hazardous material such as HF. It would be prudent to integrate the hazard analyses used for preparation of the DSA and the EALs to ensure adequate conservatism in the estimated consequences and protection of the public and workers. DOE provides some guidance in DOE-HDBK-1163-2003, *Integration of Multiple Hazard Analysis Requirements and Activities*, that may be helpful in integrating these hazard analyses.