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# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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98-0003155



October 8, 1998

The Honorable Victor H. Reis  
Assistant Secretary for Defense Programs  
Department of Energy  
1000 Independence Avenue, SW  
Washington, D.C. 20585-0104

Dear Dr. Reis:

The Defense Nuclear Facilities Safety Board (Board) has been following the actions of the Department of Energy (DOE) and Lockheed Martin Energy Systems (LMES) toward restart of certain operations, designated Phase A2, for Enriched Uranium Operations (EUO) in Building 9212 at the Y-12 Plant. Phase A2 includes various furnace/burner, solution processing, and wet chemistry operations used to process residues and waste, including that from Phase A1 metallurgical operations. The Board's staff has been reviewing the identification and implementation of safety controls for Phase A2 operations. A report presenting the staff's observations during recent reviews at Y-12 is enclosed for your information and appropriate action.

In connection with use of the Holden Gas Furnace, the Board's staff reviewed adherence to two key industry standards on design and operation of furnaces and on gas piping systems. The staff's report notes that these standards are included in the Standards/Requirements Identification Document for Y-12, and conformance to such standards for the Holden Gas Furnace is credited in the safety basis for Building 9212. Numerous design and operational issues and other open questions were identified during the review; it appears that detailed knowledge and assessment of conformance to these standards were lacking for this application. As noted in the enclosed report, DOE and LMES personnel at Y-12 are addressing these Holden Gas Furnace issues. The Board wishes to be informed of the results of further actions to ensure the safety of operations with the Holden Gas Furnace.

The Board will continue to follow DOE's actions toward restart of additional operations with enriched uranium at the Y-12 Plant.

Sincerely,

A handwritten signature in black ink, appearing to read "John T. Conway".

John T. Conway  
Chairman

c: Mr. Mark B. Whitaker, Jr.  
Mr. Gene Ives  
Mr. James Hall

Enclosure

## Staff Issue Report

September 24, 1998

**MEMORANDUM FOR:** G. W. Cunningham, Technical Director

**COPIES:** Board Members

**FROM:** D. Owen

**SUBJECT:** Y-12 Enriched Uranium Operations, Phase A2 Restart Preparations

This report documents a review by the staff of the Defense Nuclear Facilities Safety Board (Board) of restart preparations for certain Y-12 Enriched Uranium Operations (EUO) Phase A2 processes in Building 9212. This review was conducted during the weeks of September 6 and September 14, 1998.

**Background.** EUO Phase A2 operations being prepared for restart consist of various furnace/burner, solution processing, and wet chemistry processes. The Phase A2 processes are used to prepare residues and waste from the Phase A1 casting, rolling, forming, and machining operations for storage or disposal. Lockheed Martin Energy Systems (LMES) resumed Phase A1 operations in June 1998. The Board's letter of June 19, 1998, noted problems with identification and implementation of safety controls and issue closure during Phase A1 restart preparations. In response, the Department of Energy (DOE) and LMES have identified actions intended to improve their approaches in these areas.

**Review Approach.** The staff reviewed the ongoing LMES Phase A2 restart efforts, with emphasis on identification and implementation of safety basis controls for the Phase A2 furnace/burner operations and the Westfalia Centrifuge, Jaw Crusher/Shear, and dry vacuum systems. While progress is being made in some areas, the review revealed continuing problems with the identification and implementation of safety basis controls and issue closure, as noted below.

**Holden Gas Furnace Safety Controls.** The Holden Gas Furnace uses natural gas. The Building 9212 Basis for Interim Operation (BIO) relies on the proper construction and testing of gas system components and the proper operation and surveillance of a flame management system to prevent a gas explosion in the furnace area. The BIO credits conformance with industry standards to ensure this protection. LMES personnel identified National Fire Protection Association (NFPA) Standard 86, *Ovens and Furnaces*, and NFPA 54, *National Fuel Gas Code*, as applicable (these standards are also listed in the Y-12 Standards/Requirements Identification Document [S/RID]). The review identified many issues and open questions in the application of detailed requirements in these two standards to the Holden Gas Furnace. These issues and questions ranged from improper design of control circuit components to improper testing

procedures. DOE and LMES personnel stated that they would conduct an in-depth review of these issues/questions and develop a course of action to correct identified problems.

**Isolation of Hydrogen from Room 1010 Tube Furnace.** The BIO discusses a recent decision to discontinue use of hydrogen to the tube furnace equipment. However, no direct removal of hydrogen supply to room 1010 via removal and capping of piping was planned. This does not appear prudent as future plans for the use of hydrogen in other parts of Building 9212 may allow for inadvertent introduction of hydrogen to room 1010. Additionally, the Tube Furnace procedure was not changed to delete a section of the procedure that allows operation with hydrogen.

**Restriction of Organics in the Muffle Furnace.** The BIO discusses a decision to prohibit processing of organics in the Muffle Furnace. Volatile organics have previously caused an explosion in the Muffle Furnace. The exclusion of organics is planned by EUO only via a precaution in the Muffle Furnace procedure; there is no specific safety basis control identified in the BIO to establish such a restriction.

**Drainage Features for Criticality Safety.** For several of the Phase A2 processes, one or more specific drainage features are required as safety controls to reduce the possibility of a criticality from the unplanned introduction or buildup of reflective/moderating liquids. Recently, during startup of Phase A1 operations, problems have occurred with the sizing of drain holes in the crucible for casting furnaces and in machine coolant trays. In view of these problems, the staff reviewed the way this issue was being addressed for Phase A2 processes that rely on such drainage features. For most of those processes that require drainage features, there was no evidence of a deliberate determination of credible flooding scenarios and evaluation of flow capacity of the drainage features. Additionally, programmatic guidance did not appear to call for such evaluation of drainage features for adequate flow capacity under credible scenarios when required for criticality safety.

The Criticality Safety Requirements (CSR) document for the Holden Gas Furnace requires that four separate system components be inspected "periodically" for drain hole obstructions. For two components, a quarterly inspection was established, and for the other two components an annual inspection was established (for one of these components the inspection was originally monthly, but was changed to yearly via a "pen-and-ink" change). LMES personnel could not explain the technical basis for the different inspection frequencies.

**Implementation of Other Criticality Safety Controls.** Several deficiencies with implementation of specific controls set forth in CSR documents were identified for the Tube Furnace, Carbon Burner, Head House Dry Vacuum, and D-1 Dry Vacuum processes. Among these deficiencies were instances of controls being included in the "precautions and limitations" section of procedures, but not in the appropriate performance section; failure to mark steps or precautions in the procedure that implement a CSR control as a safety control; and failure to list all drawings that control features important to criticality safety as noted in the CSR, and identify

certain CSR passive design components/features with an "N" designation in the Master Equipment Lists.

One action responding to the Board's letter of June 19, 1998, was LMES' performance of a comprehensive mapping of safety basis controls for each process to implementing documents. This effort was intended to ensure comprehensive capture of the extensive population of safety basis controls. The staff found that this mapping effort was performed inconsistently from process to process (with multiple approaches and formats being employed) and noted multiple errors in the various mapping documents used. These varied approaches to mapping of controls appear to have contributed to the implementation deficiencies noted above.

**Calibration Status of Safety Components.** The calibration status of safety control circuit pressure switches was questioned while the staff was reviewing the implementation of the Holden Gas Furnace flame management system. Actual calibration of these safety components to ensure proper actuation pressure is done under a recall program. In discussions with the shift manager, the staff found that there were no means for this person to know the calibration status of these or other such safety components in safety systems.

**Use of Administrative Control Tags for Safety Applications.** In reviewing the isolation of the hydrogen utility line to Building 9212, the staff found that two valves were tagged shut using an Administrative Control Tag. Administrative Control Tags are administered in accordance with LMES Procedure OP-151, *Equipment Tagging for Administrative Control*, which establishes a method for identifying components and systems that are operational, but for which some precaution or information is necessary prior to operation. Questioning of personnel revealed that the only system of tags for preventing the operation of equipment for personnel safety was a Do Not Operate (DNO) tag procedure, but that such tags were used only for maintenance activities. The exclusion of hydrogen from the building to prevent the potential for an explosion was not considered to meet the conditions for using a DNO tag. Discussions with LMES and DOE personnel revealed that this programmatic issue had been recently identified, and a team had been formed to address it.

**Evaluation of Programmatic Deficiencies During Issue Closure.** In response to the Board's letter of June 19, 1998, LMES is taking steps to ensure that programmatic deficiencies are evaluated as part of the development of corrective action plans for identified findings and other issues. Evaluation of programmatic deficiencies was not evident in the review of two EUO Management Self Assessment findings for the Muffle Furnace, where deficiencies in site guidance for developing abnormal response procedures were evident, but no corrective actions to improve the site guidance had been developed. Discussions with LMES personnel indicated that additional action was required to ensure the issue closure process would address evaluation of programmatic deficiencies.

**Future Staff Action.** The above issues were discussed with LMES and DOE Y-12 Site Office personnel, and actions to address these issues are in progress. The staff will continue to follow these issues and overall preparations for resumption of EUO Phase A2 operations.