

July 20, 2001

The Honorable Jessie Hill Roberson  
Assistant Secretary for  
Environmental Management  
Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-0113

Dear Ms. Roberson:

The Defense Nuclear Facilities Safety Board (Board) has been evaluating preparations at the Savannah River Site (SRS) to start up the HB-Line neptunium/plutonium oxide process, known as HB-Line Phase II. Safe and successful operation of HB-Line Phase II is an important step toward stabilizing actinide solutions at SRS, as committed to by the Secretary of Energy in the Department of Energy's Implementation Plan for the Board's Recommendation 94-1, *Improved Schedule for Remediation in the Defense Nuclear Facilities Complex*. The Board believes thorough and timely analysis of hazards and identification of controls are essential to the success of this project and to the avoidance of further delays in stabilizing these hazardous materials.

The Board's staff has identified several potential safety issues associated with this activity. Some of these issues appear to be the result of insufficient hazard analysis. In general, the hazard identification process used for this project does not appear to be as comprehensive as the Process Hazard Analysis methodology recommended in DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*. The limitations of the methodology used at HB-Line Phase II may have contributed to some accident scenarios not being evaluated effectively in the contractor's hazard analysis.

The Board is aware that additional hazard analysis is being performed, and anticipates receipt of the findings of this analysis, as well as the identification and implementation of additional controls that may be warranted. The Board was pleased to see that a safety system failure mode evaluation has been performed to identify potentially unsafe failure modes for some existing HB-Line systems that provide active safety controls. A similar evaluation may be appropriate for other HB-Line safety systems, including those that perform alarm functions.

During a recent visit to SRS, the Board was briefed on HB-Line Phase II startup preparations. The Board is aware that there are continuing discussions between the Board's staff and SRS personnel, and that work to address staff questions and issues is ongoing.

The enclosed reports prepared by the Board's staff identify several issues that warrant further consideration by project personnel.

Sincerely,

John T. Conway  
Chairman

c: Mr. Greg Rudy  
Mr. Mark B. Whitaker, Jr.

Enclosures

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

## Staff Issue Report

July 6, 2001

**MEMORANDUM FOR:** J. K. Fortenberry, Technical Director

**COPIES:** Board Members

**FROM:** C. Coones

**SUBJECT:** Fire Protection Review, HB-Line Phase II

This report documents observations made by the staff of the Defense Nuclear Facilities Safety Board (Board) during meetings held from March through June 2001 concerning fire protection for HB-Line Phase II activities. Staff members C. Coones, F. Bamdad, and J. Troan reviewed the facility, as well as the process and hazard analysis documentation, to evaluate whether the facility was adequately protected from postulated fire events.

**Hazard Identification.** The staff's review of the HB-Line Basis for Interim Operation (BIO) indicated that not all hazards were analyzed in the BIO, the Hazard Analysis, or the HB-Line Fire Hazards Analysis (FHA). Table 8.1-8 of the BIO indicates that up to 4,500 pounds of acetone, 900 pounds of hydrogen peroxide, and 110 gallons of hydrazine mononitrate may be stored in the facility. A similar table, identified in S-CLC-H-00230, *HB-Line Facility Hazards Analysis*, as the maximum facility chemical inventory, lists the same quantities of acetone and hydrogen peroxide, but 28,000 pounds of hydrazine mononitrate. Westinghouse Savannah River Company (WSRC) personnel have indicated that these chemical quantities are not required for HB-Line operations and that this table indicates permitted quantities of chemicals under environmental regulation. However, aside from these tables, there is no determination of bounding quantities of process chemicals that may be found inside HB-Line. The potential hazard presented by these chemicals in these quantities has not been evaluated; although the FHA addresses a small quantity of hydrazine mononitrate, there is no analysis of any quantity of acetone or hydrogen peroxide in the facility. To properly ascertain the chemical hazard, a consistent bounding quantity of process chemicals needs to be determined and properly analyzed in the BIO.

**Functional Classification of Fire Protection Systems.** The BIO indicates the need for a safety-class fire suppression system on the third and fourth floors of HB-Line. The safety-class fire suppression system is fed from the H-Area fire protection water supply system and routed through the H-Canyon suppression system, both of which are functionally classified as production support systems. Loss or impairment of the H-Area fire water supply system or part of the system in H-Canyon could result in a loss of the HB-Line sprinkler system without the knowledge of HB-Line operations personnel.

The current HB-Line Technical Safety Requirements (TSR) document requires only annual flow testing of the sprinkler system and monthly pressure readings, and contains no controls over the source of fire water. Procedure 2.25, "Functional Classifications," in the WSRC conduct of engineering manual, states that systems supporting safety-class functions are required to be safety-class as well. DOE G 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria Guide for use with DOE O 420.1, Facility Safety*, states that support systems must be classified as safety-class if their failures can prevent a safety-class system, structure, or component from performing its safety functions. The functions of the H-Area fire water system and the H-Canyon suppression system support the safety-class fire suppression system in HB-Line. To provide safety-class fire suppression in HB-Line, the operation of the fire water supply system must be controlled to the same level. One method would be to functionally classify the H-Area fire water system as safety-class, with attendant TSR controls.

**Tornado Dampers.** The tornado dampers in the HB-Line supply ducts are credited in the BIO with eliminating the flow of combustion products from HB-Line during intermediate and full facility fires that involve the fifth and sixth levels of HB-Line. Typically, tornado dampers are installed to prevent rapid building depressurization during tornados outside the facility. Depending on its design, the damper may not function properly when triggered by a pressure increase inside the facility, particularly the gradual pressure increase that would accompany a fire in the facility. The TSR operability specifications for the tornado dampers contain only the requirement that the dampers be operable; they include no operating pressure or leak rates. Because of these issues, there is insufficient evidence that these tornado dampers can serve to isolate the facility during a fire. In addition, review of the TSR indicates that if the dampers are determined to be inoperable, a period of 7 days is allowed to restore operability. If operability has not been restored after 7 days, 72 hours is allowed to produce a response plan, and an unlimited time is allowed to repair the equipment. Therefore, although this equipment is required by the accident analysis, it may be out of service for an unlimited period. It may be appropriate for DOE to consider a change to the TSR to require that the facility be placed in a safe condition if this equipment is not restored to service within a limited time.

**Combustible Control.** The current safety analysis contains requirements for strict control of combustibles in rooms 410N and 410S to protect the JT-71 and JT-72 tanks in the area. The controls limit the total quantity of combustibles to 400 pounds wood equivalent and specify separation distances between combustibles and tank supports. The existing transient combustible control procedure, NOP-221-HB-6903, does not include the third and fourth floors of HB-Line, indicating that this administrative control is not complete. Furthermore, a recent review by WSRC indicated that the quantity of combustibles in the area may actually be as high as 5,670 pounds wood equivalent, providing sufficient fuel to produce a high-temperature (1200<sup>N</sup>C) flashover fire in the area and boil off the tank contents. Combustible control is no longer a viable administrative control for this area. Instead, WSRC has proposed to limit the concentration of plutonium in these tanks to 5.5 grams per liter to prevent unacceptable consequences due to a fire in this area. This type of control needs to be instituted as a TSR control. WSRC is working to provide the revised safety analysis to the Department of Energy in early July 2001. The Board's staff plans to review the revised analysis once it is complete.