DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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October 6, 1999

The Honorable T. J. Glauthier
Deputy Secretary of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Mr. Glauthier:

The staff of the Defense Nuclear Facilities Safety Board (Board) conducted a review of the status of safety analyses and safety analysis documentation that support nuclear operations at the Oak Ridge Y-12 Plant during the period June 28–July 1, 1999. In that review a number of deficiencies were noted. To date these deficiencies have not been adequately addressed and the report of the staff observations is provided for your consideration.

The systematic analysis of the potential dangers of activities involving hazardous materials and operations and the subsequent identification of controls to protect the public, workers and environment are required for the implementation of the Integrated Safety Management program to which the Department of Energy (DOE) is committed. DOE and its contractor at the Y-12 Plant have made progress in improving the safety management of those operations that have been the focus of recent attention. However, other activities have been less thoroughly examined or are being managed to outdated authorization bases.

The program planned by DOE for upgrades to the safety analyses for operations and their authorization bases appears to have faltered and merits re-invigoration. The Board understands that this issue will require vigorous staff effort, and wishes to be advised of the path forward that DOE and its contractor at the Y-12 Plant are developing to address this matter.

If you have any questions on this matter, please feel free to call.

Sincerely,

John T. Conway
Chairman

c: Brigadier General Gioconda
Ms. Gertrude Leah Dever
Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

July 12, 1999

MEMORANDUM FOR: G. W. Cunningham, Technical Director
J. K. Fortenberry, Deputy Technical Director

COPIES: Board Members

FROM: M. Helfrich

SUBJECT: Safety Basis for Defense Nuclear Facilities at Y-12 Plant

This report documents a review of recent upgrades to the safety basis for defense nuclear facilities at the Y-12 Plant in Oak Ridge, Tennessee. The review was conducted on June 28–July 1, 1999, by members of the staff of the Defense Nuclear Facilities Safety Board (Board) W. Andrews, F. Bamdad, and M. Helfrich, with assistance from outside expert R. West.

The history of the preparation, review, and approval of safety documentation for nuclear facilities at the Y-12 Plant indicates a pattern of missed commitments to develop comprehensive safety bases that define controls to protect the public, the workers, and the environment from undue risk. In addition, the slippage of the schedule for the development of Safety Analysis Reports (SARs) has led to an overreliance on the use of inadequate Bases for Interim Operations (BIOs) at the Y-12 Plant. Some of these BIOs do not appear to be an adequate authorization basis for long term operations, due to their limited scope and lack of consideration of worker safety.

Background. The SARs for nuclear facilities at the Y-12 Plant were prepared in the mid-1980s. These SARs did not adequately identify and control the hazards of Y-12 facilities. In mid-1989, the operating contractor initiated an effort to upgrade the authorization bases for 29 nuclear facilities during the next decade. This upgrade effort preceded the issuance in 1992 of Department of Energy (DOE) Orders 5480.23, *Nuclear Safety Analysis Reports,* and 5480.22, *Technical Safety Requirements*, which were followed in 1994 by the issuance of DOE Standard DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*. Thus the SAR Upgrade (SARUP) program at the Y-12 Plant was viewed as a pioneering effort in the DOE complex. The objective of the SARUP program was to systematically evaluate the hazards associated with the operation of Y-12 facilities using a four-phased approach. Production of updated SARs for Hazard Category 2 facilities (SARUP Phase III) was scheduled to be completed in 1998.

In 1997, a review by the Board's staff revealed that the original SARUP schedule had not been met. No new SARs had been produced. Lockheed Martin Energy Systems, Inc. (LMES) had proposed a schedule for completion of all SARs by 2002, but the DOE Oak Ridge Operations Office (DOE-OR) had requested a more ambitious schedule. In 1997, upgraded SARs were being developed for the on-site transportation vehicle and the enriched uranium warehouse, Building 9720-5. The warehouse was selected to be the first facility with an upgraded authorization basis because of its simple mission and structure.

LMES submitted the fifth revision of the SARUP schedule to DOE in February 1999, and it appears that this new schedule has already been overtaken by events. In the revised schedule, the estimated date for completion of the SARUP was extended to September 2002; additional funding of about $15 million for the effort was requested. In addition, the scope was reduced to nine new safety basis upgrades, with continued use of existing summary analysis and documentation as the authorization bases for the remaining facilities. A program for production of these upgraded documents has not been defined.

Quality and Consistency of Safety Basis Documentation. The hazard analyses supporting the BIOs for nuclear facilities at the Y-12 Plant are generally based on a review of the bounding scenarios identified for event categories. For example, events are categorized as fires, spills, and explosions, and the bounding scenarios are assessed qualitatively for identification of facility-level, and in a few cases, activity-level, controls for protection of the public. Given their intended short-term function and consistent with DOE directives, the BIOs generally do not contain detailed process hazard analyses that enable the identification of activity-level controls needed for worker protection. Discussions with safety analysis personnel indicated that many of the BIOs for nuclear facilities at the Y-12 Plant do not include analysis of the consequences of an accident to workers and collocated workers and the development of associated controls. This limitation of their BIOs, combined with delays in developing comprehensive authorization basis documents that include such analyses and resultant controls, suggests that workers may be unknowingly at increased risk.

During its review of safety basis documentation, the Board's staff found that while BIOs have been generated and approved for most facilities, they vary from a detailed review of the hazards for Building 9212 Enriched Uranium Operations, to an abbreviated analysis and report for Building 9720-18, to a very cursory review of the hazards in a characterization plan for Building 9720-12:

- In 1993, the contractor submitted a safety study to be used as a graded SAR for Building 9720-18, a warehouse-type facility. By the end of 1998, following several exchanges of comments, LMES stated that no further effort would be expended on this document, and a SAR would be prepared in the near term. DOE agreed with this approach on the condition that an abbreviated BIO be submitted in accordance with

the guidance of DOE Standard 3011-94. Section 4.2.4.2 of that standard describes the use of an abbreviated BIO in the case of a facility whose submittal of an upgraded SAR and Technical Safety Requirements (TSRs) is imminent (e.g., 6 months). An abbreviated BIO was approved in April 1999, and in the approval letter DOE requested a detailed schedule for the development of the SAR. Subsequently, LMES reported that funding was not available for preparing a SAR for this facility, and no schedule for upgrading the BIO has been provided.

It should be noted that this facility is an old wooden structure with thousands of tons of depleted uranium stored mostly in wooden boxes. A more detailed hazards analysis of this facility may indicate a need for identification of additional controls or repackaging of the uranium in nonflammable containers to reduce the risk of fire to the collocated workers and the public.

- The authorization basis document for another warehouse-type facility, Building 9720-12, is a characterization plan that was approved in August 1998. This document provides a plan for characterizing the material in the facility, as well as some safety hazard controls. There is no analysis to indicate the basis for the selected controls.

- A significant amount of uranium solutions and powder are stored in Building 9720-6. The processing activities in this facility have been shut down; however, a significant amount of transient combustibles are stored in the office spaces directly below the storage areas. The BIO justifies storage of hazardous material in this facility using the argument that the material at risk is less than what would result in a 25 rem site boundary dose (evaluation guidelines) in case of fire.

- In 1995, it was decided that no upgraded safety basis was needed for Building 9204-4 because all nuclear activities would cease within 2 years. In 1999, DOE proposed that no additional safety analysis was needed for this building because it will be deactivated in fiscal year (FY) 2005. Discussions with management personnel indicate that no funding request has been submitted for the replacement facilities for the activity in this building; deactivation in FY 2005 is therefore unlikely. As a result, nuclear activities will continue in this building for more than 10 years beyond the point at which it was decided that insufficient operational time remained to justify development of an upgraded authorization basis.

Time Required To Approve Safety Basis Documentation. During the staff's review of the safety basis documents for defense nuclear facilities at the Y-12 Plant, numerous issues were identified with respect to the time required for submittal and approval of SARs and TSRs.

- According to the original SARUP program schedule, the first upgraded SAR was to be issued by mid-1995 for the on-site transportation vehicle, known as the Blue Goose. This SAR was submitted in January 1998 and approved by DOE-OR in April 1998. The corresponding TSRs were submitted in July 1998; as of July 1999, however, they had not yet been approved by DOE.

- The SAR and TSRs for Building 9720-5 (enriched uranium warehouse) provide another example of slow development, review, and approval of safety documentation. The SAR was approved in March 1998, and the TSRs were submitted in June 1998. After 13 months this document has not been approved, apparently because of problems with communications, document quality, turnaround time for responses to comments, and submission separate from its SAR.

- The SAR for Building 9204-2E was submitted in August 1998 and is still in the comment resolution phase.

Current DOE and Contractor Efforts To Address Safety Basis Issues. DOE has indicated that it recognizes the need for more technical staff to review safety basis documents, and that it is trying to obtain these additional resources. LMES is attempting to address issues related to problems with safety basis documentation through a reorganization aimed at centralizing responsibility for preparation and maintenance of this material. The new organization will include the functions of facility safety, criticality safety, issues management, and implementation of requirements.

Concurrently with this reorganization, DOE and LMES are conducting workshops to improve the interrelationships among the functions involved in developing safety bases and to establish guidelines for the preparation, review, and approval of safety documentation. The Board's staff was informed that discussions had been held concerning evaluation guidelines, functional classification of controls, implementation of controls, review of safety documentation, and the SARUP schedule. Currently, working groups are preparing positions for specific issues to be addressed in another workshop, which will be held about 3 weeks after the first. Initial indications are that agreement has been reached concerning evaluation guidelines to be used for selecting safety systems, structures, and components; a revised SARUP schedule (the two SARs that have already been prepared); an improved BIO process; and concurrent submission of the SAR and TSRs for a facility.

Modular Storage Vaults. During a review of the hazardous materials at Y-12 conducted in 1992, the Board's staff identified potential vulnerabilities with regard to storage of special nuclear materials (SNM) in buildings that were neither seismically qualified nor protected from fire hazards. DOE and the contractor proposed construction of modular storage vaults (MSVs) that would help resolve both issues. The MSVs are reinforced concrete blocks that can house 20 containers. These concrete blocks would protect the SNM from collapse of the

building in a seismic event and provide protection from fires. They would also improve conditions with respect to nuclear criticality and safeguards and security.

Because of their low production cost and the significant safety enhancements offered for storage of a large amount of readily dispersible material, more than 300 of these MSVs were ordered. To date, however, only 60 MSVs have been used, primarily as a result of safeguards and security concerns regarding the need to be able to verify the location and amount of the SNM. These concerns led to modifying the MSVs to equip them with weight and location sensors. These modifications involved drilling holes, which damaged some of the MSVs; moreover a significant number of MSVs were damaged by the outside weather while awaiting funding for the necessary modifications. In addition, a new Fire Hazard Analysis of the MSVs is needed to verify that the SNM is not susceptible to a fire as a result of the small holes made in the concrete for instrumentation wiring. Consequently, hazardous materials are stored in metallic cans on shelves inside buildings (such as Building 9720-6) that are vulnerable to seismic events and fire, instead of using the MSVs.