

A.J. Eggenberger, Chairman
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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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May 10, 2006

The Honorable Linton Brooks
Administrator
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0701

Dear Ambassador Brooks:

The Defense Nuclear Facilities Safety Board (Board) and its staff have been closely following the development of authorization basis documentation for the Plutonium Facility at Lawrence Livermore National Laboratory (LLNL) to comply with the requirements of Title 10 of the Code of Federal Regulations, Part 830, *Nuclear Safety Management* (Rule). The National Nuclear Security Administration's Livermore Site Office recently approved a new Rule-compliant Documented Safety Analysis (DSA) and Technical Safety Requirements (TSR) for the Plutonium Facility that collectively represent a significant improvement over the facility's currently implemented safety basis. The recently approved DSA and TSRs also adequately address deficiencies identified in previous versions of the documents which were communicated in the Board's letter of April 12, 2004. In this regard, the Board is particularly pleased that LLNL has renewed its commitment to a control strategy that includes robust, safety-class active confinement ventilation.

Although significant strides have been made in improving the technical content and overall defensibility of the DSA and TSRs for the Plutonium Facility, the Board's staff did note several isolated weaknesses that warrant consideration in the preparation of future annual updates to the DSA. Areas that could benefit from additional examination are detailed in the enclosed staff issue report, which is provided for your information and use, as appropriate.

Finally, the Board will continue to follow LLNL's progress closely as the focus of activities turns toward verifiably implementing the new safety basis for the Plutonium Facility. Although timely implementation of the Rule-compliant safety basis is critically important and resource intensive, LLNL must exercise care to ensure that existing commitments to correct deficiencies in fundamental safety management programs continue to garner an appropriate level

of resources and management attention. In particular, the Board understands LLNL is in the process of rebaselining the project schedule for implementation of configuration management for vital safety systems with the intention of integrating this project with the DSA implementation effort. This action appears prudent and necessary to ensure effective and durable implementation of the new safety basis. The Board looks forward to receiving the new schedule and supporting documentation for the project, including the Risk Management Plan and Project Execution Plan.

Sincerely,

A handwritten signature in black ink, appearing to read "A. J. Eggenberger". The signature is written in a cursive style with a prominent loop at the end.

A. J. Eggenberger
Chairman

c: Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

April 12, 2006

MEMORANDUM FOR: J. K. Fortenberry, Technical Director

COPIES: Board Members

FROM: B. Broderick

SUBJECT: Authorization Basis Documentation for the Plutonium Facility,
Lawrence Livermore National Laboratory

On February 21–23, 2006, staff members of the Defense Nuclear Facilities Safety Board (Board) conducted a review of the proposed Documented Safety Analysis (DSA) and Technical Safety Requirements (TSR) for the Plutonium Facility at Lawrence Livermore National Laboratory (LLNL). The purpose of this review was to assess the technical content of the proposed documents and the adequacy of revisions made to address significant deficiencies identified in earlier versions. Facility walkdowns and discussions with site office and LLNL personnel were conducted in support of this review. Subsequent to the LLNL site visit, the Board's staff reviewed the Safety Evaluation Report (SER) issued by the National Nuclear Security Administration's Livermore Site Office (LSO) on April 7, 2006, to formally approve the DSA and TSRs. Staff members F. Bamdad, B. Broderick, M. Merritt, J. Plaue, and R. Raabe participated in these reviews.

Background. In October 2003, LLNL formally submitted a DSA and TSRs for LSO review and approval that would establish a new authorization basis for the Plutonium Facility to comply with the requirements of Title 10 of the Code of Federal Regulations (CFR), Part 830, *Nuclear Safety Management* (Rule). Upon reviewing these documents, both the Board's staff and LSO personnel identified significant deficiencies. The Board issued a letter dated April 12, 2004, detailing a number of these fundamental issues, and LSO transmitted more than 270 formal comments to LLNL that were to be tracked and addressed prior to resubmission of the documents. On December 19, 2005, having made significant and pervasive changes to address the issues raised during the initial review, LLNL formally submitted revised DSA and TSR documents for the Plutonium Facility to LSO, requesting final review and approval. LSO issued an SER approving the Rule-compliant DSA and TSRs with eight conditions of approval on April 7, 2006.

Discussion. In its letter of April 12, 2004 (and the enclosed staff issue report dated March 17, 2004), the Board raised issues regarding the adequacy and technical basis of a proposed passive confinement strategy whereby structural boundaries of the Plutonium Facility would be credited to mitigate potential dose consequences to the public in the event of an accident. This proposed passive approach diverged sharply from the existing strategy employed

at the facility in which safety-class active ventilation was provided to ensure that radioactive material would be forced through a series of high-efficiency particulate air (HEPA) filters before being released from the facility under accident conditions. Weaknesses were also noted in the clarity and specificity of a number of controls credited in the hazard analysis. In some cases, these weaknesses made it difficult to identify the preventative or mitigative safety function being performed by a credited control or to ensure adequate flowdown of important attributes of credited controls into TSRs.

The revised DSA and TSRs contain a number of fundamental changes made in response to the issues discussed above. The revised analysis conservatively assumes leak path factors of 1.0 for unfiltered releases. Modification of this important analytical parameter prompted the return to reliance on an active confinement strategy. In support of this strategy, the functional classifications of the room ventilation system and the emergency power system were upgraded to safety-class. Additionally, controls credited in the hazard analysis tables were described in greater detail, which clarified specific safety functions and improved traceability to the TSRs. These and other changes contained in the revised DSA and TSRs have adequately resolved the fundamental issues identified in the Board's April 12, 2004 letter.

The set of Rule-compliant documents consisting of the revised DSA, TSR, and SER with its associated conditions of approval, constitute a material improvement in the safety basis of LLNL's Plutonium Facility. Once fully and effectively implemented, the hazard controls identified and protected in these documents should further enhance the facility's safety posture. Although significant strides have clearly been made, the Board's staff did identify several isolated areas in which potential weaknesses remain. While a number of concerns identified by the staff were captured by LSO and ultimately deemed appropriate for inclusion in the SER, the following areas may warrant additional consideration and potential corrective action during the preparation of future annual updates to the DSA.

Pedigree of DSA References—LLNL procedure AB-006, *Safety Basis Calculation Procedure for Category 2 and 3 Nuclear Facilities*, establishes formal expectations for the pedigree of calculations and analyses used to support assumptions and conclusions contained in the DSA of the Plutonium Facility. One attribute governed by AB-006 is the appropriate level of review for a given type of calculation. For example, a Type 1 calculation (i.e., one intended to be a stand-alone reference to support safety basis documentation) requires an independent review by a technically qualified individual, approval by the responsible manager, and acceptance by the facility manager. Criteria for selection of independent reviewers and the review methods to be followed are specified. A number of calculations and analyses that were referenced in the DSA for the Plutonium Facility but prepared before the formal LLNL guidance was issued did not demonstrably satisfy this level of review. For example, the staff noted that there had been no independent review of calculations supporting DSA assumptions that certain equipment and structures would survive a hypothetical hydrogen explosion event. While AB-006 became a requirement only after its issuance in August 2001, it specifically states, "calculations approved prior to this procedure becoming effective will be appropriately reviewed and approved." It is unclear how several older DSA references meet this requirement.

Given that they underpin important analytical assumptions in the DSA, calculations that predate current requirements related to the pedigree of reference documents should be subjected to some form of independent review or verification to ensure that their methodology and conclusions are valid.

Ion Exchange Resin Controls—The hazard analysis contains a postulated scenario in which ion exchange resin is contacted by a strong oxidizing agent, resulting in an explosive exothermic reaction. The unmitigated consequences of this event are identified as “low” for both workers and the public. This consequence determination places the resin explosion scenario in worker and public risk bins that do not require controls to be credited and protected as TSRs. For this scenario, the energy available to create hazardous conditions or initiate an accident sequence is highly dependent on the quantity of ion exchange resin available to produce and propagate the exothermic reaction. Determining that unmitigated consequences will be low (particularly for workers) requires the assumption that an insufficient quantity of resin will be present to drive more serious consequences. Given that assumptions about resin quantity must be preserved to ensure that unmitigated consequences remain low enough such that additional controls need not be credited, it is not clear that this important initial condition is adequately captured and appropriately protected.

Conclusion. The technical content and overall defensibility of safety basis documentation for the Plutonium Facility have been improved significantly by the recently approved Rule-compliant DSA and TSRs. The Board’s staff will continue to follow LLNL’s progress closely as the focus of activities turns toward verifiably implementing the new safety basis. Although timely implementation of the Rule-compliant safety basis is critically important and resource intensive, LLNL must exercise care to ensure that existing commitments to correct deficiencies in fundamental safety management programs continue to garner an appropriate level of resources and management attention. Successful execution of some of these standing commitments, such as the Configuration Management Plan, is crucial for ensuring effective and durable implementation of the new safety basis.