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## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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January 15, 1999

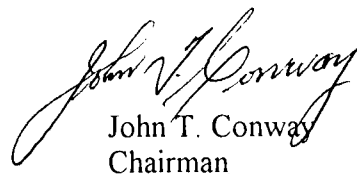
The Honorable Victor H. Reis  
Assistant Secretary for Defense Programs  
Department of Energy  
1000 Independence Avenue, SW  
Washington, D.C. 20585-0104

Dear Dr. Reis:

In a letter dated December 5, 1997, the Defense Nuclear Facilities Safety Board (Board) highlighted the need for more effective project management of construction projects by both the Department of Energy (DOE) and Los Alamos National Laboratory (LANL) to ensure that health and safety risks are identified early and effective controls are developed during the design stage. In the past, the deficiencies identified have also resulted in unsatisfactory definition and control of technical scope, leading to cost and schedule overruns. The Board's letter requested that DOE prepare a report addressing project management issues for the Capability Maintenance and Improvement Project (CMIP). Since CMIP underwent fundamental scope change, and DOE concluded that changes were necessary for all stockpile management construction projects, DOE and LANL addressed all such projects involving nuclear facilities at LANL in their response to the Board. DOE responded by a letter dated June 2, 1998, and the Board has been informed further on progress by DOE and LANL through briefings and exchanges with the Board's staff.

Significant positive initial steps have been taken to improve the technical project management of stockpile management projects at LANL. However, opportunities remain for further improvement as listed in the second paragraph of the summary section of the enclosed staff issue report. The report is provided for consideration as this upgrade effort continues. As DOE and LANL further evolve and implement plans to improve their focus on health and safety, the Board's staff will continue its working interface with DOE and LANL.

Sincerely,

  
John T. Conway  
Chairman

c: Dr. John C. Browne  
Dr. David Michaels  
Mr. G. Thomas Todd  
Mr. Bruce Twining  
Mr. Mark B. Whitaker, Jr.

Enclosure

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

## Staff Issue Report

November 12, 1998

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

**COPIES:** Board Members

**FROM:** A. G. Jordan

**SUBJECT:** Technical Project Management of Upgrades to Nuclear Facilities at Los Alamos National Laboratory (LANL)

This report documents observations of the staff of the Defense Nuclear Facilities Safety Board (Board) on project management of design and construction projects involving upgrades to nuclear facilities associated with stockpile management at Los Alamos National Laboratory (LANL). These observations are based on discussion with representatives of the Department of Energy (DOE) and LANL, review of documents, and on-site reviews conducted during October 19–22, 1998, by members of the Board's staff A. G. Jordan, R. W. Barton, J. Blackman, and A. Hadjian and outside experts W. Hall, P. Rizzo, and J. Stevenson.

**Summary.** Both DOE and LANL have made high-level commitments to improving project management and have structured their organizations so as to address project management issues with potential impact on the health and safety of the worker and the public. The DOE Nuclear Construction Projects Office (NCPO) in Albuquerque is improving its technical project management of the stockpile management projects at LANL. The emphasis on project management on the part of the director of LANL, including the formation of an external Project Management Advisory Panel, is proving effective in that there is now a clear understanding among all management levels involved in stockpile management projects of the importance of sound technical project management to the future viability of the laboratory. In addition, there are indications of improvement in key projects, such as the Nuclear Materials Storage Facility Renovation (NMSFR) and the Chemistry and Metallurgy Research (CMR) Building upgrades.

However, much work remains to be completed. DOE and LANL need to finalize agreements on incorporating DOE Order 430.1A, *Life Cycle Asset Management*, and its Good Practice Guides in the DOE/University of California contract for the management of LANL, and on the implementation of such requirements and guidance. Moreover, DOE and LANL have not finalized agreement on their respective roles, responsibilities, and authorities, or fully elaborated the contents typically expected in key documents such as Program Requirements Documents, Design Criteria, Project Execution Plans, Baseline Documents, and Design Reports. In addition, it is clear that LANL needs to improve its site-level infrastructure, including Laboratory Implementation Requirements and training of personnel in project management.

**Background.** The Board has previously reviewed design and construction projects at LANL, with particular emphasis on (1) the NMSFR, (2) the CMR Building upgrades, (3) the Capability Maintenance and Improvement Project (CMIP), and (4) the Technical Area (TA)-55 fire-suppression water supply replacement.<sup>1</sup> In reviewing these projects, the Board noted deficiencies in safety engineering attributable to ineffective project management. One example was a lack of adequate design criteria, including safety standards, with no plans by either DOE or LANL to develop these criteria. Another example was DOE's lack of a plan for reviewing an Enhanced Conceptual Design Report for CMIP. In its memorandum of December 5, 1997, the Board identified a need for improved project management by both DOE and LANL to ensure that all hazards are identified early and that effective controls are developed during the design stage, and requested that DOE prepare a report within 90 days evaluating actions needed to:

- Provide more focused, structured organizations augmented with personnel well experienced in the design and construction of major, complex, hazardous projects.
- Develop a systematic life-cycle analysis fully considering health, safety, and environmental requirements, as well as mission needs.
- Develop safety design criteria before preliminary design begins.
- Develop appropriate project management controls for CMIP per DOE Order 430.1 or equivalent.

This request centered on CMIP, which at that time had as its objectives developing the capability to manufacture 50 pits per year and upgrading related facilities. Subsequently, CMIP began undergoing a redefinition, and the upgrades now being called CMIP are to be designed at some future time. However, the project management issues identified in the Board's December 5, 1997, memorandum are common to all four of the above projects, and in their responses to the Board's request, DOE and LANL are addressing all stockpile management construction projects involving nuclear facilities at LANL.

DOE's initial draft response was received by the Board's staff in early March 1998, and was found to be inadequate. After discussions concerning the intent of the Board's December 5, 1997, memorandum, DOE agreed to submit a revised response by June 5, 1998.<sup>2</sup>

During the week of May 11, 1998, the Board's staff reviewed progress on site with both DOE and LANL. DOE reported on a new organization structured to better oversee stockpile management projects at LANL and discussed improvements in project management controls for

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<sup>1</sup> See memoranda from the Board to the Honorable Victor H. Reis, Assistant Secretary for Defense Programs, dated September 4, 1996; August 15, 1997; and December 5, 1997.

<sup>2</sup> See memoranda from Gene Ives, Deputy Assistant Secretary for Military Application and Stockpile Management, to the Honorable John T. Conway, dated March 5 and 30, 1998.

interfacing with the LANL design process. The director and deputy director of LANL expressed a commitment to significant improvements in construction project management and described a new organizational structure intended to better manage design and construction projects. The director also discussed a Project Management Advisory Panel (PMAP) of outside experts he had appointed to assist him in identifying systemic performance issues and to recommend improvements and corrective actions. In addition, LANL and DOE discussed progress in improving project management for the various projects.

On June 2, 1998, DOE submitted a memorandum<sup>3</sup> providing a formal response to the Board's December 5, 1997, memorandum. DOE agreed that there were deficiencies in project management at both DOE and LANL, and presented its evaluations and a draft Action Plan. Subsequently, the Board's staff continued holding discussions with DOE and LANL representative concerning actions to improve project management.

On September 17, 1998, the findings and recommendations of the PMAP were described to the Board by the PMAP chairman, along with the director and deputy director of LANL, the LANL associate director for nuclear weapons, the DOE deputy assistant secretary for military application and stockpile management, the manager of the DOE-Albuquerque Operations Office, and others. In summary, the PMAP found serious deficiencies, similar to those identified by the Board, in two major categories: (1) contemporary business practices, including front-end project definition and project execution disciplines, and (2) leadership, including DOE/LANL roles and interface and senior management as culture change agent.

Briefings during the week of October 19, 1998, were intended to review progress by both DOE and LANL in improving project management to ensure that safety is appropriately addressed early on and throughout the design process.

**Discussion.** Observations of the Board's staff are summarized below.

*DOE Project Management*—The DOE Nuclear Construction Projects Office (NCPO) in Albuquerque is becoming effective in developing technical project management of the stockpile management projects it funds at LANL. However, DOE needs to reach agreement with LANL on incorporating project management requirements such as those in DOE Order 430.1A, *Life Cycle Asset Management*, along with selected Good Practice Guides, into the DOE/University of California (UC) contract for managing LANL, and on the implementation of such requirements and guidance. Agreements on LANL deliverables are also needed, including whether DOE will review the deliverables for approval, information, or action. To be successful, agreements need to clarify terminology such as "Program Requirements Document," "Design Criteria," "Project Execution Plan," "Baseline," and "Design Reports," and elaborate on the expected contents of key documents. In an attachment to a memorandum dated June 2, 1998, DOE submitted a draft Project Management Plan for NCPO that identifies which documents are required at the various

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<sup>3</sup> See memorandum from Victor H. Reis, Assistant Secretary for Defense Programs, to the Honorable John T. Conway, dated June 2, 1998.

stages of design and construction and what action DOE plans to take. However, the contents of the documents are not specified. In addition, agreement with LANL on the submittals and their content has not been formalized.

DOE and LANL indicated that they planned to include DOE Order 430.1A in the DOE/UC contract. A thorough evaluation and implementation of this Order and its guidance by key DOE and LANL management and project personnel will provide the opportunity to address and resolve many of the open institutional and project-level issues related to DOE/LANL stockpile management projects. Experience gained from current projects can provide useful feedback for contractual changes. It would appear appropriate at this time to form a focus group to develop such an agreement, as part of the LANL Integrated Safety Management Change Control Board process; this group would include key personnel from NCPO, LANL project leaders, and individuals from the newly formed Project Management Division. Contractual changes for project management can be considered subject to future revision through a feedback and improvement mechanism common in Integrated Safety Management.

*LANL Senior Management*—The emphasis on project management on the part of the director of LANL, including the formation of the PMAP, is proving effective in that there is now a clear understanding among all management levels involved in stockpile management projects of the importance of sound technical project management to the future viability of the laboratory. In addition, project and line management roles, responsibilities, and authorities are being better defined, and personnel in management positions, including the recently appointed director of the new Project Management Division, appear to be capable of fulfilling their responsibilities. However, a key position—project director reporting to the Nuclear Materials Technology division director—remains to be filled.

The PMAP has correctly identified deficiencies in baseline definition and change control as fundamental issues. In the past, these deficiencies have resulted in the unsatisfactory definition and control of technical scope noted in the attachment to the Board's December 5, 1997, memorandum, and could lead to safety issues due to discounting the safety impact of changes as a result of schedule pressures.

*Specific Projects*—Project management tools with the potential to be effective are beginning to be used for the NMSFR and the CMR Building upgrades projects. The NMSFR is approaching 90 percent completion of Title I (preliminary design), and a review cycle is planned at that point. Following Title I, Title II design, an effort of the same magnitude as Title I, is expected to be authorized.

System Design Descriptions (SDDs) are being used as focal points for safety and other requirements for the NMSFR. LANL stated that the SDDs are being written in conformance with DOE-STD-3024-98, *Content of System Design Descriptions*, which is close to being released. A draft Preliminary Safety Analysis Report is due to be released on November 30, 1998. The Board's staff intends to review the NMSFR further after completion of 90 percent of Title I,

focusing on key issues such as thermal margin and structural adequacy, as well as DOE's design review process.

DOE and LANL are taking a pragmatic, rational approach to analyzing hazards at CMR and developing and implementing controls through administrative actions and upgrades. At DOE's direction, LANL submitted a Basis for Interim Operations (BIO), with the purpose of promptly developing defensible hazard analyses for CMR and shifting from the use of substandard Operational Safety Requirements to more formal controls similar to Technical Safety Requirements (TSRs). The BIO identifies six safety-class structures, systems, and components (building structure, fire suppression, hot cells, flammable gas control system, main vault, and Wing 9 floor storage wells) and five safety-significant structures, systems, and components (fire alarm system; heating, ventilation, and air conditioning for Wings 2, 3, 4, 5, 7, and 9; alpha box, an enclosure within hot cells for use with high-contamination activities; hood washdown system; and continuous air monitors). DOE conditionally approved the BIO on August 31, 1998. Approval conditions require that a number of actions be taken within 3 months to control combustible loading (which had been significantly reduced by recent actions), and to institute programs to control material-at-risk (MAR) and define a containerization program for better protecting MAR during seismic events. Other actions are required to test the fire-suppression system and evaluate its pedigree.

The CMR upgrades project addresses actions needed as a result of the BIO, including its designation of safety-class and safety-significant structures, systems, and components, as well as upgrades to improve operability and reliability at least through 2010. A total of 18 subprojects have been identified for the BIO/TSR upgrades and 24 for operability and reliability.

To reestablish the design basis of safety-class and safety-significant structures, systems, and components and of the CMR electrical system, LANL is developing Design Information Summaries in accordance with DOE-STD-1073-93, *Guide for Operational Configuration Management Program*. The Design Information Summaries are to evolve into SDDs consistent with DOE-STD-3024-98 before the upgrades are fully operational. The Board's staff intends to review the details of selected planned upgrades at a future date.

LANL reported that the TA-55 Fire Protection Yard Main Replacement project has been halted because of inadequate quality assurance on the part of the architect/engineer. As a result, the replacement for the TA-55 fire-protection water supply will probably not be fully operational for about 2 years. The existing fire-protection water supply has leaked on a number of occasions and was leaking at the time of the staff's review. The leaks are due to corrosion of the underground steel water pipes, and LANL plans to replace the leaking section of piping. Since there are two independent water supplies for the piping, a single leak may not present a major safety concern. However, should several leaks occur at once, it might be difficult to provide adequate water flow for the entire system. Subsequent to the staff's review, DOE reported that it is working with LANL to develop contingency plans. The staff notes that if LANL and DOE had had a more comprehensive method, including the participation of engineering personnel, for

selecting and monitoring architect/engineers for design and construction projects, the safety issues and delays now being experienced probably would not have occurred.

The Transition Manufacturing and Safety Equipment project addresses near-term needs for a revised pit production strategy. The project is intended to include equipment and modifications to support pit production capability and facility infrastructure, and modifications to support continued safe, reliable, and compliant operations.

CMIP now has as its objective development of the capability to manufacture 20 pits per year. Conceptual design is to begin in late fiscal year 1999.

*Work Smart Standards*—Standards other than 430.1, *Life Cycle Asset Management*, are also required for the design and construction of nuclear facilities. For example, DOE Order 420.1, *Facility Safety*, and DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contract Employees*, address subjects such as nuclear and explosives safety design criteria and suspect and counterfeit item controls that are relevant to design; however, these sections are not incorporated in the DOE/UC contract. It is noteworthy that DOE and LANL have recently agreed to incorporate DOE Order 4330.4A, *Maintenance Management Program*, in the contract.

*LANL Institutional Infrastructure and Action Plan*—The LANL institution-level infrastructure for project management needs development. As stated above, LANL and DOE need to incorporate the requirements of DOE Order 430.1A, *Life Cycle Asset Management*, as well as a tailored selection of the Good Practice Guides, in the DOE/UC contract.

To communicate contractual requirements to LANL facility management and employees, LANL has decided to incorporate requirements and related guidance into three types of documents: Laboratory Performance Requirements (LPRs), Laboratory Implementation Requirements (LIRs), and Laboratory Implementation Guidance (LIG). LPRs are the highest level of internal requirements and directly reference contractual standards. LIRs specify how the performance requirements are to be met, and LIGs provide nonmandatory guidance. The LIRs and LIGs require further development to fully address project management of nuclear facilities. At present, site-wide laboratory requirements and guidance do not provide sufficient support to line management. In addition, they do not reflect contemporary project management practices for design and construction of hazardous facilities. The LPRs, LIRs, and LIGs will need to address changes still to be made to the DOE/UC contract. With the appointment of a director of the new Project Management Division, it is expected that appropriate LIRs and LIGs will be developed. Also, a clear identification of project management staffing needs is anticipated.

Following the staff's review, LANL completed a draft Action Plan addressing issues related to the institutional infrastructure and to interface with DOE, such as negotiating changes to the DOE/UC contract and modifying an LIR on construction project management. However, this plan requires further development to present a complete strategy and expedited plans for improving the LANL project management infrastructure. Also, it would be useful to align the

LANL Action Plan more closely with DOE plans and to adopt accepted practices from industry where possible. In addition, the incorporation of mentoring by personnel from industry would help ensure the plan's proper implementation.

**Future Action.** The staff plans to continue to monitor the development of project management practices at DOE and LANL and the evaluation and implementation of Order 430.1A and its Good Practice Guides. In addition, the staff plans to review specific technical aspects of key projects, such as thermal and structural aspects of the NMSFR design. The staff also plans to review the updated DOE Action Plan, which is expected to be issued in the near future, as well as the evolution of the LANL Work Smart Standards and contingency plans to assure an adequate water supply for fire protection in TA-55.