

John T. Conway, Chairman  
A.J. Eggenberger, Vice Chairman  
Joseph J. DiNunno  
Herbert John Cecil Kouts  
John E. Mansfield

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004  
(202) 208-6400

97-0004037



December 5, 1997

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 staff of the Defense Nuclear Facilities Safety Board (Board) and outside experts recently completed an on-site review at the Los Alamos National Laboratory (LANL) following submittal of the Enhanced Conceptual Design Report (ECCR) for the Capability Maintenance and Improvement Project (CMIP). Their observations, discussed in the enclosure to this letter, indicate a need for more effective project management by both the Department of Energy (DOE) and LANL to ensure that all hazards are identified early, and effective controls are developed during the design stage. Several deficiencies in safety engineering attributable to ineffective project management have been identified. An example is the lack of adequate safety design criteria, including standards, which ought to have been developed during the conceptual design phase. Neither DOE nor LANL had identified plans to develop these criteria. As another example, a plan for reviewing the ECCR had not been developed by DOE as of the end of September 1997. Again, appropriate project management processes have not been identified by DOE or LANL. DOE Order 430.1, *Life Cycle Asset Management (LCAM)*, including its project management guidance, has not been adopted.

The Board notes that these observations are symptomatic of the need at both DOE and LANL for technical personnel experienced in management of major, complex design and construction projects and for the implementation of relevant DOE safety-related guidance. In both Recommendation 93-3, *Improving DOE Technical Capability in Defense Nuclear Facilities Programs*, and its annual reports to Congress, the Board has emphasized the need for a greater level of technical expertise at DOE. In addition, in a letter dated November 25, 1994, the Board highlighted the need to clarify the processes LANL follows in design, construction, and preparation for operation of new and upgraded defense nuclear facilities.

The Board understands that DOE and LANL have taken some positive steps to improve project management. For example, DOE has identified the need for high-level, experienced project management personnel on its staff, although these personnel have not yet been hired. In addition, LANL is forming an advisory board on project management, although this step in itself will not add project management experience to the day-to-day design and construction efforts at LANL.

Subsequent to its review, the Board's staff was informed that the decision to utilize Wing 5 of the Chemistry and Metallurgy Research building for CMIP is being reconsidered, and CMIP objectives may be modified, leading to a possible need to revise the ECDR. However, it is not clear that the decisions being taken adequately consider safety or that improved project management will result.

Therefore, the Board requests that DOE submit a report within 90 days of receipt of this letter evaluating the capability of the current CMIP program management at both DOE and LANL:

- 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.

As DOE develops this information, we will be pleased to work with you and your staff to provide any clarification that may be needed.

Sincerely,

Signed by  
John T. Conway

John T. Conway  
Chairman

c: Dr. John C. Browne  
Mr. Bruce Twining  
Mr. Mark B. Whitaker, Jr.

Enclosure

**Enclosure**  
**Observations on the Capabilities Maintenance and Improvement Project**  
**at the Los Alamos National Laboratory,**  
**October 22, 1997**

Members of the staff of the Defense Nuclear Facilities Safety Board (Board) J. Blackman, A. Hadjian, A. Jordan, and C. Keilers, along with outside experts W. Hall, P. Rizzo, and J. Stevenson, reviewed the Capabilities Maintenance and Improvement Project (CMIP) on September 28-29, 1997. The observations below are based on that review and on additional reviews of the Preliminary Hazards Analysis (PHA) performed by the Board's staff member M. Helfrich and outside expert J. Leary.

**DOE and LANL Project Management.** A number of the observations of the Board's staff and outside experts indicate the need for better and more focused project management. First, the Department of Energy (DOE) and Los Alamos National Laboratory (LANL) have not agreed on the fundamental project management steps needed to ensure that all safety concerns are identified early as a result of safety analysis and fully addressed in design criteria. For example, the Enhanced Conceptual Design Report (ECCR) delivered by LANL is not what the DOE staff expected and does not adequately address the results of the PHA. Second, a decision to use a portion of the Chemistry and Metallurgy Research (CMR) facility in a critical manner for CMIP was not based on a sound systems engineering approach and appears to be inappropriate. Third, the steps that need to be taken before Title I preliminary design begins in October 1998 are not well defined. Finally, DOE is still developing a review plan for the ECCR, which was issued in August 1997.

LANL's organization for CMIP is a complex matrix structure divided into three technical areas (plutonium manufacturing, system engineering, and facilities modifications), and supported by staff from one program office and five divisions. It is not clear how this nontraditional organization would operate functionally to prepare follow-on design documents and be integrated with the recently selected architect/engineer organization, Fluor-Daniel, Inc. Moreover, the interrelationships and, more important, the integration among tasks are not clearly established. A simplified, traditional project management organization ought to be considered for managing this project. In addition, DOE has not fully formed its team for CMIP; for example, a key project management position has not yet been posted.

It would be useful for DOE and LANL to (1) have personnel on their respective staffs who are experienced in managing the design and construction of major complex projects; (2) clearly define the project management steps they intend to carry out; (3) reconsider, as soon as possible, the decision to use part of the CMR building before its selection becomes irrevocable; and (4) prepare design criteria, prior to the start of Title I preliminary design, along the lines of those listed in the table provided at the end of this enclosure.

**Work Smart Standards.** LANL has completed the Work Smart Standards (WSS) process for environment, safety, and health standards, and DOE has agreed to a contract modification that would replace existing DOE standards requirements with WSS.

DOE Order 430.1, *Life Cycle Asset Management (LCAM)*, is not referenced in the WSS. The LCAM Order was developed by DOE as the mechanism for invoking appropriate program/project management, and in particular, guidance for implementation of a systems engineering process for projects like CMIP. The Board's staff believes the Good Practice Guides developed for LCAM contain generally adequate treatments of the subject and ought to be considered by LANL. Without such guidance, CMIP is left to develop its own approach for performing a systems engineering analysis. Furthermore, it is not clear how DOE will judge the adequacy of the project performance without more definitive requirements.

During the review by the Board's staff, a comparison of the content of WSS with current DOE standards was discussed. A number of discrepancies became obvious. The American Society of Mechanical Engineers Boiler and Pressure Vessel Code is included in the WSS standards list. However, no guidance is presented to indicate when various sections of the code (e.g., Section III, "Nuclear Power Plant Components," versus Section VIII, "Pressure Vessels") ought to be applied. Chemical process piping is usually designed to Chemical Plant and Petroleum Refinery Piping requirements (B31.3), but since this standard is not included in the WSS standards, it is not obvious what standard will be invoked for the design of chemical process piping. Finally, a comparison of the WSS standards with the Standards/Requirements Identification Documents (S/RIDs) referenced in the ECDR would appear to invalidate some of the bases for the upgrades presented in the ECDR. The S/RIDs, for the most part, appear to reference appropriate standards that are not included in the WSS.

**Enhanced Conceptual Design Report and Preliminary Hazards Analysis for the Capabilities Maintenance and Improvement Project.** The safety basis for many of the system upgrades contained in the ECDR was reviewed. Worker safety control requirements were not considered adequately in developing the ECDR. For example, while the layout of the processes has been studied extensively, as-low-as-reasonably-achievable principles for radiation protection have not been directly addressed.

As discussed in the PHA, the scope of the analysis was focused on the facility, not individual processes, based on the assumption that it is the overall amount of material at risk evaluated for derived design basis accidents that has the potential to affect the facility. Therefore, the analysis focused on hazards at the facility level, and while it did apply a hazards checklist approach to the processes, it was not a true process hazards assessment of individual processes using a detailed "what-if" walkdown approach. In addition, the stated purpose of the analysis was to serve as a design tool, to ensure that fundamental safety design requirements and safety features would be developed based on the level of hazards present, and to ensure that all safety design features would be accounted for in the early design stage so that safety requirements could then be integrated cost-effectively into the facility and process designs. However, while some

design requirements would be developed as part of the analysis, a random sampling of these requirements revealed that few, if any, of them had been carried over into the ECDR. In fact, many of the proposed modifications outlined in the ECDR were attributed to equipment replacement due to maintenance requirements or upgrades to meet code requirements.

**Seismicity.** Two studies related to ground motion are ongoing and have the potential to affect the CMIP design: (1) trenching at the Pajarito fault to improve the basis for seismic design and (2) surveys at Technical Area-55 (TA-55) to evaluate the existence of surface rupture.

The trenching study at the Pajarito fault was directed at providing a better constrained slip rate and a simplified logic tree, and obtaining a more realistic ground-motion characterization for the site. This study is now in the process of being completed.

The trenching was not intended to determine the capability of the fault. The Pajarito fault was always considered capable in the Woodward-Clyde Federal Systems, Inc. (W-C) studies, which provide the basis for seismic design criteria, and in fact is the dominant contributor to the seismic risk as regards ground motion. The fault was expected to have experienced Holocene (i.e., within the last 10,000 years) movements, but previous trenching by W-C failed to locate the actual fault and associated Holocene offsets. As a result, conservative assumptions were made to envelope the slip rate parameter and cover all the possible interrelated fault movements among the Pajarito, Rendija Canyon, and Guaje Mountain faults, resulting in a very complex logic tree. Although this led to seismic design criteria, it was not an elegant solution.

The primary objective of the survey of canyon walls near TA-55 was to determine whether the Rendija Canyon fault continues southward and crosses TA-55. Based on the results obtained to date and the 1972 Dames and Moore trenching at TA-55, the potential for significant surface rupture at TA-55 appears to have been eliminated. However, the study points to the fact that the Rendija Canyon fault splays to the southwest toward TA-3, where the CMR building is located. DOE subsequently requested that LANL review the implications of the results of the study for the use of CMR for CMIP.

**Future Staff Actions.** The Board's staff discussed its concerns with DOE personnel attending the meeting and will follow the resolution of the issues raised. In addition, the staff will review the effect of the WSS requirements on major LANL projects and activities.

### Examples of Design Criteria Needed Prior to Title I Preliminary Design

| Potential Design Criterion  | Comments  |
|---|---|
| Directly applicable codes and standards, supplementary requirements, and approved analysis methodologies                        | In addition to Work Smart Standards, Los Alamos National Laboratory and the Department of Energy need to agree on what other codes, standards, and requirements, as well as analysis and design methodologies, are appropriate. For example, Nuclear Regulatory Commission Regulatory Guides and staff technical positions provide a model of the scope and specificity appropriate for CMIP. |
| Natural phenomena hazards, including wind, earthquakes, floods, snow, and lightning   | The potential for surface rupture in the Chemistry and Metallurgy Research area needs to be evaluated as a result of recent field investigations. Standards relating to seismic design need to be specified.  |
| Man-induced hazards   | This would include identification of design requirements resulting from collateral effects associated with preventing and mitigating the impact of potential threat activities.   |
| Design basis accidents  | Design basis accidents need to be understood early since their prevention and mitigation may necessitate significant design redirection.  |
| Controls identified in the Preliminary Hazards Analysis to protect workers, collocated workers, the public, and the environment | The Preliminary Hazards Analysis does not contain a Process Hazards Analysis. An initial Process Hazards Analysis needs to be performed once the basic process arrangement has been finalized.  |
| Public, collocated worker, and worker dose acceptance criteria, and other safety and health considerations                      | An evaluation guideline or acceptance criteria need to be identified for protection of the public, collocated workers, and workers in order to conservatively identify safety structures, systems, and components at the initial design stage.  |
| System functional requirements  | This effort initiates development of system design descriptions for all systems to ensure that as system requirements are identified in safety analyses, resulting functional requirements are properly reflected in system design requirements.  |
| Emergency response considerations   | Close-in public access may require incorporation of controls not currently envisioned.  |
| Designation of safety-class and safety-significant systems  | Prediction of safety-class and safety-significant systems needs to be conservative so that impacts on the facility design can be determined. These predictions can be refined during the preliminary and final design of the facility.  |