DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004-2901
(202) 694-7000

November 5, 2001

The Honorable Francis S. Blake
Deputy Secretary of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Mr. Blake:

The Defense Nuclear Facilities Safety Board (Board) has been following with interest progress on the design and construction of two facilities needed to support and protect defense nuclear facilities at Los Alamos National Laboratory (LANL) during certain emergencies. These facilities—the planned Emergency Operations Center (EOC) and the recently constructed flood retention structure upstream from the nuclear facilities at Technical Area (TA)-18—were recently reviewed by the Board's staff.

As discussed in the enclosed report prepared by the Board's staff, based on Department of Energy (DOE) guidance for designing to protect against natural phenomena hazards such as earthquakes, the new EOC is being designed to Performance Category (PC)-2 requirements. LANL, however, has facilities, such as the TA-55 Plutonium Facility, that meet more stringent PC-3 requirements designed to provide protection against lower-probability, higher-consequence events. In addition, the new EOC is to be located in the deformation zone associated with the seismically active Pajarito fault. In the event of an earthquake at or near the most severe magnitude addressed by PC-3 requirements, it is unlikely the new EOC would remain functional.

LANL is addressing the possible lack of functionality of the new EOC under severe seismic conditions by considering it to be part of a system of EOCs that includes two older EOCs farther away from the Pajarito fault, supplemented by a communications van and mobile command center. This approach appears to provide the flexibility needed to handle all credible emergencies.

It is noteworthy, however, that DOE's design requirements for addressing natural phenomena hazards do not require consideration of a *system* of EOCs, nor do they require that the most severe credible emergency be addressed as part of functional and operational requirements for such a system. Therefore, the Board requests that DOE evaluate the adequacy of its directives regarding the design of EOCs and inform the Board of any changes it plans to make.

Finally, with regard to the TA-18 flood retention structure, although construction of the facility is considered to be complete, several details remain unfinished. These details could affect the ability of the structure to perform as intended in the event of significant flooding. The enclosed staff report addresses this issue as well.

Sincerely,

John T. Conway
Chairman

c: General John A. Gordon
The Honorable Robert Gordon Card
Mr. Richard E. Glass
Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

October 10, 2001

MEMORANDUM FOR: J. K. Fortenberry, Technical Director

COPIES: Board Members

FROM: A. Jordan and A. Hadjian

SUBJECT: Support Facilities Needed During Emergencies at Los Alamos National Laboratory

This report addresses the Department of Energy's (DOE) design criteria for a new Emergency Operations Center (EOC) at Los Alamos National Laboratory (LANL). It also presents comments on a flood retention structure built at Technical Area (TA)-18 to mitigate the potential effects of flooding. Both structures are intended to support defense nuclear facilities during certain emergencies. Staff members J. Blackman, A. Hadjian, A. Jordan, C. Keilers, and D. Kupferer, as well as outside experts P. Rizzo and J. Stevenson, participated in various aspects of these reviews.

New Emergency Operations Center Project. As a result of the Cerro Grande Fire in summer 2000, the DOE National Nuclear Security Administration (NNSA) and LANL became aware of serious inadequacies of the laboratory's primary EOC at TA-59: the EOC's size and layout cannot properly accommodate the staff needed during a prolonged emergency; access roads to the facility are limited, making it potentially inaccessible during certain types of emergencies; and its location in a basement could lead to the potential accumulation of heavier-than-air toxic gases, which would render the facility unusable.

Congress approved funding for a new EOC as a fiscal year 2001 line item project under the Cerro Grande Emergency Appropriations. LANL has proposed a site for the new facility in TA-69. This site is located in the deformation zone associated with the seismically active Pajarito fault, although it does have the advantage of being upwind of the prevailing west winds.

Observations on LANL's Planned EOC—During the first of two briefings to the Board's staff on this project, the staff noted that, based solely on seismic considerations, this site is undesirable. LANL stated that with regard to seismic robustness, the EOC is to be designed to Performance Category (PC)-2 requirements, which are identified by DOE as being appropriate for EOCs. Some additional requirements, such as ductile detailing, will enhance structural reliability. However, the staff considers that the proposed facility by itself could not be relied upon to remain functional during an earthquake of the magnitude that must be addressed in the design and operation of Hazard Category 2 facilities such as the LANL Plutonium Facility. Such facilities are designed to the requirements of PC-3 natural phenomena hazards to address lower-probability, higher-consequence events.

The staff noted further that, instead of considering the new EOC in isolation, it would be better to regard it as one element in a system or network of existing and new EOCs that would encompass the older EOC at TA-49 and a proposed mobile command center. The requirement for this network of EOCs would be that it have the capability to handle any credible emergency. In the relatively unlikely event of a severe earthquake that would render the new EOC unusable at least temporarily, another EOC, such as the mobile command center parked elsewhere, could be used.

In a second briefing, LANL expressed agreement with this concept by describing the proposed Emergency Management System as consisting of the following:

- The new, primary EOC at TA-69, which will be available for the vast majority of emergencies; have the most extensive capabilities; and be most accessible to DOE, LANL, and Los Alamos County emergency management.

- An older EOC at TA-49, along with a communications van, so that voice and data communications similar to those provided by the primary EOC will be available.

- A third EOC located in White Rock, New Mexico, and serviced by the same communications van.

- A mobile command center (not yet procured, but included in the budget)—a vehicle that would satisfy requirements of the Federal Emergency Management Agency.

The Board's staff agrees that the proposed Emergency Management System, if implemented properly, can be expected to handle all credible emergencies, including the low-probability, high-consequence earthquakes addressed by PC-3 functionality requirements for ground motion. NNSA expects to approve a combined Critical Decision 2 (performance baseline) and 3 (construction) in fall 2001, and complete construction by September 30, 2003.

Observations on DOE's Requirements for EOCs—DOE's guidance for protecting against natural phenomena hazards in designing EOCs is given in DOE G 420.1-2, *Guide for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Nonnuclear Facilities,* which is associated with DOE Order 420.1, *Facility Safety.* The Order states that "guidance associated with this Document are not mandatory requirements. The guidance provided in the implementation guides and standards referenced therein are acceptable methods to satisfy the requirements of the Document . . . ." In addition, DOE G 151.1-1, *Introduction to the Emergency Management Guide,* provides some design guidance.

The staff has the following comments on DOE's guidance:

- These DOE documents do not distinguish between design guidance for EOCs supporting nuclear facilities with significant hazards and those supporting commercial facilities.

- In discussing natural phenomena hazards, DOE G 420.1-2 does not address the need to have a *system* of EOCs capable of continuing to support defense nuclear facilities should one or more emergency facilities or elements in the EOC system become inoperable. (On the other hand, DOE G 151.1, while not addressing natural phenomena hazards, provides guidance that an alternate EOC is to be available if the primary EOC should become uninhabitable.)

- DOE G 420.1-2 states that "PC-2 SSCs [structures, systems, and components] are meant to ensure the [degraded] operability of essential facilities (e.g., fire house, *emergency response centers*, hospitals) . . . ." [Emphasis added.] The implication is that EOCs are to be designed to PC-2 requirements. However, at locations having nuclear facilities for which PC-3 is appropriate, at least some elements of the EOC system must function adequately to manage any emergency at these facilities. Whether a given EOC must meet PC-2 or PC-3 functionality requirements for ground motion depends on the particular emergency management system.

Revision of DOE directives to address the above points appears appropriate. Elements of the EOC system must be as robust as the highest-hazard facilities the system is meant to support in an emergency.

TA-18 Flood Retention Structure. In summer 2000, the Cerro Grande wildfire burned 7,500 acres at LANL, as well as thousands of acres in the hillsides above the laboratory. In severely burned areas, infiltration and interception of precipitation have been reduced because of increased soil hydrophobicity and decreased vegetative cover, increasing the likelihood of greater runoff and flooding than normal. The greatest risk of flood damage to defense nuclear facilities is at TA-18. To control the flow of water through TA-18, a flood retention structure (FRS) was designed by the Army Corps of Engineers, which also had construction management responsibility. The FRS is a dam-like structure designed to release flood water over a period of time, reducing peak flow.

Two members of the Board's staff, as well as an outside expert, toured the essentially completed FRS. This review revealed that, although construction of the FRS is considered complete, several details remain unfinished that could affect the ability of the structure to perform as intended in the event of significant flooding:

- On both the upstream and downstream sides of the FRS, at the juncture of the structure with the canyon walls, erosion has been occurring. Erosion control measures are needed to prevent further erosion that could impair the structural performance of the FRS.

- In addition, erosion controls are needed along the canyon walls above the storage reservoir upstream of the FRS to prevent substantial quantities of soil from being washed into the reservoir, thus reducing its holding capacity.

- The roller-compacted concrete mix used for the construction of the FRS was changed from the original design, with flyash being replaced by cement. While this change has the effect of improving strength, it also has the negative effect of increasing the heat of hydration. No special measures, such as aggregate cooling, ice water, or night placement, were identified as having been taken. Consequently, the issues arise of the possibility of cracking or the existence of weak horizontal planes. It is our understanding that DOE plans to core sample the flood retention structure. The staff noted that coring at an incline, as well as shear and tensile testing of the core samples, would help address these issues. Coring at an incline would ensure that viable test specimens would be obtained.