The Deputy Secretary of Energy
Washington, DC 20585

January 23, 2002

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW
Washington, D.C. 20004

Dear Mr. Chairman:

Thank you for your November 5, 2001, letter regarding design requirements related to Emergency Operations Centers (EOCs).

As you noted, Los Alamos National Laboratory (LANL) designed the EOC for Performance Category 2 seismic design requirements. LANL addressed the possibility of more severe earthquakes, such as that defined as the design basis for the Plutonium Facility (Performance Category 3 Design Basis Earthquake), by enhancing the structural reinforcement for the EOC and by supplementing EOC capability via a mobile command center. This system of EOCs is intended to handle all credible seismic emergencies at LANL.

As you requested, we have evaluated the adequacy of our directives regarding the design of EOCs and the adequacy of associated functional and operational requirements. Specifically, we have reviewed DOE Orders, Guides, and Standards related to seismic design of facilities and Emergency Management Systems. Our Emergency Management Systems directives discuss the need for alternate EOCs if the primary EOC is not available. Alternate operating locations provide a means to continue emergency critical functions should the primary location suffer damage, become inaccessible, or require evacuation. The DOE seismic design directives give guidance to our contractors to apply more stringent seismic design if the safety function for the specific situation mandates.

Additionally, our seismic design directives point out that the design process shall consider the potential damage and failure of structures, systems, and components due to both direct and indirect effects, including common cause effects and interactions. To strengthen this concept, we will revise DOE Standard 1021, Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components reinforcing the concept that system interaction may be between one facility and another facility.

Your letter and the enclosed trip report also discuss some additional work needed to ensure that the LANL TA-18 flood retention structure performs as intended in the event of significant flooding. Specifically, this additional work is related to erosion control and testing of the concrete strength of the dam. Our Los Alamos Area Office and LANL are in the final stages of executing this additional site work, and results of this work will be provided to your staff upon completion.

Sincerely,

Francis S. Blake

Enclosure

Enclosure

Department of Energy
Emergency Operations Center (EOC) Seismic Design Adequacy

Background

In a letter to the Department of Energy (DOE) dated November 5, 2001, the Defense Nuclear Facilities Safety Board (DNFSB) raised an issue related to the design of DOE Emergency Operations Centers (EOCs). The letter stated that DNFSB has recently reviewed the design and construction of two new facilities at Los Alamos National Laboratory (LANL), one of which is the new LANL EOC. The design of the LANL EOC includes seismic design, specifically seismic design to Performance Category (PC)-2 Natural Phenomena design requirements (see DOE Standard 1021). The DNFSB points out that other facilities at LANL are designed to more stringent seismic requirements (PC-3) and states that in the event of an earthquake at or near the most severe magnitude addressed by PC-3 requirements, it is unlikely the new LANL EOC would remain functional. While DNFSB acknowledges that LANL is addressing the possible lack of functionality of the new EOC under severe seismic conditions, they question whether DOE directives provide adequate guidance regarding EOC design against earthquakes.

Issue: The Board requested that DOE evaluate the adequacy of its directives regarding the design of EOCs and inform the Board of any changes it plans to make.

Documents Reviewed

The following documents have been reviewed to address the DNFSB Issue:

1. DOE Order 151.1A, Comprehensive Emergency Management System
2. DOE Guide 151.1-1, Emergency Management Guide (Volume I, Volume II, Volume IV section 5)
3. DOE Order 420.1, Facility Safety
4. DOE Guide 420.1-2, Guide for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Nonnuclear Facilities
5. DOE Standard 1021, Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components (SSCs).
6. DOE Standard 1020, Natural Phenomena Hazards Design and Evaluation Criteria for DOE Facilities.

Directives Language Pertaining to EOC Design

The following material relevant to the Issue has been identified in the documents reviewed. Note this does not summarize offsite interface and communication mechanisms, which include response to severe Natural Phenomena including earthquakes:

DOE Order 151.1A, Comprehensive Emergency Management System:

Chapter I, Section 8 (p) - Operations/Field Office Managers establish and maintain an EOC to respond to emergency events. Every DOE EOC shall be equipped with compatible communication, photo/video, and automatic data processing support specified by the Director of Emergency Operations.

Chapter III, Section 3 (b) - Operational Emergency Base Program, Existing Plans. Existing plans, such as catastrophic earthquake plans or mass casualty plans detailing compliance with Federal, State, and local standards, may be incorporated directly into the Operational Emergency Base Program or invoked by reference.

Chapter IV, Section 3 (b)(9) - Operational Emergency Hazardous Material Program, Planning Requirements, Emergency Facilities and Equipment. Facilities and equipment adequate to support emergency response shall be available and maintained as follows: (a) a facility shall be available for use as a command center; (b) provisions shall be established for use of an alternate location if the primary command center is not available; and (c) adequate personal protective equipment and other equipment and supplies shall be available and operable to meet the needs determined by the results of the hazards assessment.

DOE Guide 151.1-1, Emergency Management Guide:

Vol. II, Section 2, Hazards Surveys. The identification of generic emergency conditions includes Natural Phenomena impacts (earthquakes).

Vol II, Section 6.2, Emergency Facilities and Equipment. The nature and potential for release of the hazards analyzed in the Hazards Assessment should dictate many of the specifications for facilities and equipment.

Vol. IV, Section 5.1 and 5.4.1, Emergency Facilities and Equipment. Facilities and equipment necessary to support the Operational Emergency Hazardous Material Program build upon those required for Base Program. Additional requirements include a facility to serve as a command center, an alternate command center in the event the primary is not available, and adequate equipment and supplies to meet the needs determined by the results of the Hazards Assessment. To be considered habitable, the EOC should remain operational and life-supporting for an extended period of time, under accident conditions (as derived from the facility Hazards Assessment) and maintain its structural integrity under various design bases events, including natural phenomena.

DOE Order 420.1, Facility Safety:

> Section 4.4.2, The design process shall consider potential damage and failure of systems, structures, and components due to both direct and indirect natural phenomena effects, including common cause effects and interactions from failures of others systems, structures, and components.

DOE Guide 420.1-2, Guide for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Nonnuclear Facilities:

> Section 5, Policy. Some structures perform an essential function that is important to preserve during and/or after an earthquake or other natural disturbance. Hospitals and emergency response centers are good examples.
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> Section 6.1, Guidelines, Graded Approach. PC-2 SSCs are meant to ensure the operability of essential facilities (e.g., emergency response centers) or to prevent physical injury to in-facility workers. PC-2 performance is analogous to the design criteria for essential facilities (e.g., center for emergency operations) in the model building codes. In discussing DOE Standard 1021, the guide states that "Engineers with knowledge of systems, safety requirements, and facility operations should select performance categories in a manner to ensure that DOE safety policies are met. Economic or programmatic considerations may require use of more stringent goals for specific SSCs (i.e., they may be placed in a higher performance category)."
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> Section 6.2.1 NPH Design, Interaction and Common Cause Effects. The design and evaluation process must consider potential damage and failure of SSCs due to both direct natural phenomena effects (common cause) and indirect natural phenomena effects due to the response of other SSCs (interaction). The occurrence of a natural phenomena event, especially earthquake, affects many of all SSCs in a facility or across an entire site. These common cause effects must be considered in design or evaluation.

DOE Standard 1021, Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components:

> Section 2.4(d) Basic Categorization Guidelines, Performance Category 2. An SSC shall be placed in preliminary PC-2 if the SSC's failure by itself or in combination with one or more SSCs may result in loss of function of any emergency handling or emergency preparedness that may be needed to preserve the health and safety of workers and visitors.
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> Section 2.5 System Interaction Effects. An SSC that has been placed in a preliminary performance category in accordance with the basic categorization guidelines shall have appropriate additional NPH mitigation requirements if its behavior by itself, or the multiple common cause behavior of it with other SSCs may adversely affect the

performance of another SSC. While this is classically applied to SSCs within an individual facility, the overall intent can be applied to one facility as a whole with another facility.

Section 3.6 Determination of Preliminary Performance Category for Non-Safety Components. SSCs that must be safe and usable for emergency purposes after an NPH event in order to preserve the health and safety of the workers and co-located workers, as well as members of the general public, should also be placed in PC-2. Examples of such SSCs are those that are essential for the operation and functioning of emergency communication centers.

Evaluation of DOE Directives Related to Seismic Design of EOCs

The Emergency Management Guide states that EOCs should remain operational for an extended period of time under accident conditions, which would suggest under conditions beyond those normally associated with events considered for PC-2 seismic design. In contrast, the DOE Guide for NPH Mitigation (and DOE Standard 1021) states that emergency response facilities should be categorized as PC-2 facilities, which implies that these facilities do not need to be operational under accident conditions.

The term 'accident condition' itself is subject to some interpretation in that DOE nuclear facilities complete accident analysis when results from hazards analysis warrant, particularly those situations where there may be a need to designate some SSCs as safety class to prevent or mitigate unacceptably high consequences to the public. If accident analysis indicates that a given seismic accident results in public radiological doses beyond DOE established evaluation guidelines, then safety class SSCs are selected. These safety class SSCs are typically designed for PC-3 seismic design requirements.

Without a full understanding of all requirements and guidance provided in DOE Natural Phenomena directives one could reach the conclusion that there are apparent conflicts in guidance. This is not the case when one considers the following:

1. The assignment of performance categories to SSCs per DOE Guide 420.1-2 and DOE Standard 1021, are minimum requirements. For EOCs the minimum performance category would be PC-2. Sites can choose, depending on the site specific situation, to design an EOC to PC-3 seismic design requirements (see quotation from guide listed above).

2. The Emergency Management Guide discusses the need for an alternate command center in the event that the primary EOC is not available.

3. An earthquake of sufficient size to both damage a PC-2 seismically designed EOC, and PC-2 and PC-3 SSCs within hazardous facilities, is likely to cause widespread damage to other facilities on-site, and to the general public. In these cases, the role of the local EOC

is likely to be diminished given the severity of the event.

Conclusion

The overall conclusion from the above assessment is that DOE Directives provide sufficient flexibility regarding seismic design of EOCs, and should result in some EOCs being designed to PC-2 seismic requirements, while others to PC-3 seismic requirements. The above assessment was discussed between NA-53 and EH-53 staff to assist in developing the response letter to the DNFSB.