DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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June 1, 1998

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 Defense Nuclear Facilities Safety Board (Board) and its staff have been following the development of an Integrated Safety Management System for subcritical experiments at the Nevada Test Site. The Board expects that the final release and full implementation of the Nevada Orders that define this system will occur in the near future. In addition, if actions are taken to capture lessons learned from each experiment, continuing improvement of the Orders and the safety analyses they require should enhance the safety of the subcritical experiment program.

The reviews conducted by the Board and its staff for the first three subcritical experiments indicated that potential hazards for those specific operations would be adequately controlled. However, improvements are still advisable in the documentation of the specific controls being relied upon for prevention and mitigation of hazards. The national laboratories should also update expeditiously the bounding hazard analysis for the U1a Complex to adequately address the hazards during subcritical experiments. The Board's staff will evaluate progress in addressing these issues during a follow-up review in July for BAGPIPE and CLARINET and will be available for further discussions at that time.

A staff report discussing these and other observations for the BAGPIPE and CLARINET subcritical experiments is enclosed for your information and use. The Board and its staff will continue to follow closely the safety management of the subcritical experiments.

Sincerely,

John T. Conway
Chairman

c: Mr. Gerald Johnson
Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

DNFSB Staff Issue Report

June 1, 1998

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: W. White

SUBJECT: Safety Evaluation Panel Review of the BAGPIPE and CLARINET Subcritical Experiments at the Nevada Test Site

This memorandum documents a review by the staff of the Defense Nuclear Facilities Safety Board (Board). During the week of April 27, 1998, staff members T. Davis and W. White observed the Safety Evaluation Panel (SEP) review of the BAGPIPE and CLARINET Subcritical Experiments (SCEs). These two experiments, scheduled by Lawrence Livermore National Laboratory (LLNL) for the third and fourth quarters, respectively, of CY 1998, are intended to collect data on shocked plutonium surfaces. Each experiment will involve less than 2500 g of high explosives and less than 200 g of special nuclear material.

Background. During the past 2 years, the Board and its staff have encouraged the Department of Energy's Nevada Operations Office (DOE-NV) to develop an Integrated Safety Management System for SCE operations at the Nevada Test Site. The DOE-NV Orders written to define this Integrated Safety Management System require an SEP review for each SCE. During this review, the SEP members evaluate the proposed operations to determine whether those operations satisfy the two SCE safety standards.

Before this review is performed, the laboratory conducting the SCE is required to submit a hazard analysis for the experiment. Because many of the hazards involved with SCE operations will be common to most of the planned experiments, LLNL and Los Alamos National Laboratory (LANL) have written a bounding hazard analysis for generic SCE operations. For each experiment, the responsible laboratory writes an experiment-specific hazard analysis that addresses the activities, operations, and diagnostics associated with that experiment by referencing the bounding analysis and analyzing any new hazards not covered therein.

Scope of Work. The scope of work associated with these experiments is clearly defined in the hazard analysis. This scope involves all operations associated with the SCE from receipt and inspection of materials to reentry of the U1a Complex after experiment execution.

Hazard Analysis. Hazards for the BAGPIPE and CLARINET SCEs are identified in the experiment-specific hazard analyses, the bounding hazard analysis, and the authorization basis

documents for the Device Assembly Facility (DAF) and the U1a Complex. Review of the SCE hazard analyses revealed several areas that could be improved as the Integrated Safety Management System process evolves:

- The information in the U1a hazard analysis and the SCE hazard analyses does not adequately address the hazards associated with U1a activities that may impact the SCE. Examples of these hazards include fire hazards, high-pressure air lines, and high-voltage electrical lines.

- The interfaces and relationships between the SCE hazard analyses and the U1a authorization basis documents are not well defined. The SEP noted these weaknesses and explored several potential U1a hazards. However, a bounding hazard analysis for the U1a Complex that adequately addresses SCEs will not be completed prior to BAGPIPE and CLARINET.

- The experiment-specific hazard analyses submitted to the SEP do not clearly identify how the various generic hazard scenarios from the bounding hazard analysis apply to BAGPIPE and CLARINET or why certain hazard scenarios were deemed not to be applicable to these two experiments. This makes it difficult to verify that the appropriate scenarios were analyzed for hazards specific to BAGPIPE and CLARINET.

- The experiment-specific hazard analysis for BAGPIPE presents a methodology for using consequence and probability to determine risk ranking and the need for controls. The tables that summarize the consequence and risk analysis data are inconsistent and offer little useful information. There is little justification provided for the various frequencies assigned to different hazard scenarios.

Identification of Controls. The controls required for SCE operations are identified in the hazard analyses for the SCEs and in the U1a and DAF authorization basis documents. The following are staff observations on the controls identified in the SCE hazard analyses;

- The controls are often described in very general terms, with little detail on how they are implemented at the Nevada Test Site. The progression from a particular hazard to specific controls that would clearly mitigate or prevent that hazard is not adequately described.

- All the controls necessary for SCE operations are not identified. As previously noted, the authorization basis documents for the DAF and the U1a Complex will provide additional controls; however, the link to these controls is not adequately discussed in the SCE hazard analyses. Although the SEP attempted to identify additional information on these controls in their report, the total set of all controls necessary for SCE operations is not well defined.

The above problems with the hazard analyses and the identification of controls may make the application of an appropriately tailored change control process difficult. The SEP requested that LLNL provide a description of their change control process for SCEs to the SEP chairman before conducting the BAGPIPE experiment.

Verification of Readiness to Perform Work. The SEP meeting was held several months before the scheduled execution of these SCEs. As a result, many of the procedures, plans, and equipment for BAGPIPE and CLARINET were not ready for SEP evaluation. The SEP plans to reconvene closer to the experiment dates to review closure of panel recommendations and any changes to the experiments. The SEP acknowledged problems with the timing of its initial review and will work with DOE Headquarters to arrange a more appropriate schedule for reviews of future experiments.

Despite the timing of the review, panel members were able to conclude that the hazards for these two experiments will be adequately controlled. This was due in large part to the significant experience many members of the Panel have with Nevada Test Site operations. Unfortunately, this wealth of experience will not always be available to the Department of Energy. It is important that the Nevada Operations Office continue to train and develop new personnel for nuclear explosive operations at the Nevada Test Site.

Feedback and Improvement. The Integrated Safety Management System for SCEs continues to evolve and improve for each SCE. As previously noted, however, the hazard analyses for the SCEs have several potential areas for improvement. The staff will follow the feedback and improvement processes in place for both DOE and the laboratories to observe whether this issue is adequately addressed.

Future Staff Actions. The staff will continue to follow the Integrated Safety Management System for SCEs as it evolves during the next few experiments. The staff will conduct a detailed technical review of several systems and processes associated with the BAGPIPE SCE, such as the diagnostic control systems, the timing and firing system, and the on-site transportation equipment.