DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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November 6, 1996

The Honorable Alvin L. Alm
Assistant Secretary for Environmental Management
Department of Energy
Washington, DC 20585-0113

Dear Mr. Alm:

Since accepting Defense Nuclear Facilities Safety Board (Board) Recommendation 94-1, the Department of Energy has decided to transfer and stabilize defense spent nuclear fuel. The Board is interested in seeing these processes proceed in a safe and expeditious manner.

Members of the Board staff recently reviewed the plans of both the Savannah River Site and Idaho National Engineering Laboratory to transfer spent fuel. These operations require moving massive casks now in spent fuel storage basins, where a cask drop might cause structural damage and significant water inventory loss. The reviews indicate that several basic measures that could prevent a drop and mitigate its damage have not been considered. This and other handling issues are described in the enclosed reports. Addressing these issues in a timely manner could reduce the possibility of a cask drop and its adverse consequences.

These reports are provided for your review and use. If you need any additional information on this matter, please let me know.

Sincerely,

John T. Conway
Chairman

c: Mr. Mark B. Whitaker, Jr.

Enclosures (2)

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

August 28, 1996

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Dominic S. Napolitano

SUBJECT: Handling of Spent Nuclear Fuel at the Idaho National Engineering Laboratory (INEL), Trip Report for August 19-23, 1996.

1. Purpose

This report discusses handling and processing of spent nuclear fuel at INEL's Idaho Chemical Processing Plant (ICPP). Observations are the result of an August 20-22, 1996, site visit by Defense Nuclear Facilities Safety Board (Board) staff members Russell Green, Dominic Napolitano, and Donald Wille and outside expert David Boyd.

2. Summary

INEL is consolidating its spent fuel inventory to fulfill a state agreement. This activity involves extensive spent fuel cask movements that raise possible nuclear safety concerns. A cask drop is a high-probability and often a high-consequence event. As an example, based on NUREG-0612 statistics, Board staff estimate the probability of a drop during the entire 603 south basin retrieval operation to be between 0.6 and 9 percent. Such an accident can cause a massive quantity of water to be lost from the basin. Board staff are concerned about two general issues:

- INEL engineers did not know whether cask operations meet basin design limits. They were unaware of the location of basin pipes. A pipe struck by a cask could drain the basin. In addition, the engineers did not know whether the casks are bounded by design calculations or could cause structural damage to the pool.

- Special lifting devices, such as the cask yokes used for operations, may not meet industry standards. Those standards specify different design safety factors for critical and noncritical lifts. INEL devices are designed to the lesser noncritical factors. However, no analysis was provided to Board staff showing that a cask drop is safe and thus noncritical. If drops are considered unsafe, INEL's special lifting devices cannot meet industry standards unless redesigned.

3. Background

The Department of Energy (DOE) intends to remove all spent fuel from INEL by 2035. Presently, INEL is consolidating its spent fuel inventory in the 666 Basin and two dry storage facilities—the Irradiated Fuel Storage Facility and the 749 vaults.

4. Discussion

The following text highlights observations made by Board staff.

Fuel Cask Handling at the ICPP. Many spent fuel transfers occur at the ICPP. Board staff are concerned that INEL and DOE staff are unaware of important design and operational details needed to ensure safe cask handling.

Basin Design: INEL personnel did not know whether cask operations are within basin design limits. This is illustrated by three areas of knowledge deficiency.

First, cask engineers could not say whether pipes are located under the cask path in the 666 basin. However, system engineers not involved in cask operations told the Board staff that a recirculation return line is under the path. A break in this line could cause total Basin drainage. The DOE Idaho Field Office stated they believe siphon holes were added to the line during construction; these holes would prevent drainage. However, no evidence was provided to confirm the existence of the holes, which can be validated by field observation.

Second, cask engineers stated that the 666 Basin floor is designed for a 65-ton cask drop. Cask drop analysis is dependent on both weight and cask geometry. The engineers did not know what geometry was assumed in the calculations. Thus, they could not know whether operations are within design limits. Additionally, they did not know whether the design calculations examined structural pool damage or only local floor damage. If structural damage was neglected, one cannot know whether a drop near the pool corner can induce leakage.

Third, there is no cask drop analysis for the 603 Basin. Consequently, INEL does not know whether its make-up water capacity is sufficient for accident conditions. Additionally, engineers expressed concerned that a cask drop on a particular wall could result in 2-ft drop in pool level. Yet no one has corrected this simple problem by limiting the cask lift height. Board staff observed a lift in which there were no procedural limits on how high the operator could raise the cask.

Lifting Equipment: INEL personnel did not know essential information on certain critical lifting equipment. This information is needed to estimate the fatigue life of cranes. Old cranes not built to a design code might have limited service lives. The quality of cranes and yokes varies between the two ICPP basins. The 666 Basin is a new facility that came on line in 1984. Its cranes meet industry standards, including *The Crane Manufacturers Association of America*

Specification No. 70 , and its cask equipment meets American National Standards Institute (ANSI) N14.6. In contrast, the 603 Basin is much older (1954). INEL engineers did not know the design standards or the safety factors on the 603 cranes which will be used frequently until December 2000. A detailed inspection by a crane manufacturer could give important safety information regarding the cranes' fatigue life.

Additionally, the design of special lifting devices for cask may be inadequate relative to industry standards. INEL uses the *DOE Hoisting and Rigging Manual*, which requires that cask yokes be designed to ANSI N14.6. This standard requires two different safety factors for critical and noncritical lifts. INEL contractors use the lesser, noncritical requirements. They justify this interpretation by stating that any basin drainage resulting from a cask drop is not a safety concern because no off-site release should result. The DOE Idaho Field Office has disagreed, stating that a drop that causes gross basin water loss is unsafe. No analysis was presented showing the occurrence is safe. Consequently, if a cask drop is viewed as unsafe, special lifting devices must be designed with higher safety factors to meet ANSI N14.6.

Operations: INEL does not require a qualified rigger to be present at pre-engineered critical lifts. A crane operator is expected to complete the rigging by following an engineered drawing. However, crane operators are not necessarily trained in rigging. The presence of a rigger increases the safety margin. Errors in rigging specifications do occur, and sometimes rigging equipment is in poor condition. Board staff observed a 603 lift in which crane operators were given a very simplistic rigging drawing that was outdated and inconsistent. In this case, the operators found the problem. Other lifts are more demanding, and a qualified rigger has a significantly greater chance of finding problems.

In addition, transfer routes for cask shipments are not specified in a procedure. Current practice for fuel shipments entering the ICPP is to drive a truck over the shortest route to the 666 Basin. The traditional route takes the casks past chemical tanks and oxygen dewars and over utilities and chemical trenches. INEL has not considered using another route that would avoid these hazards.

Operations at the Irradiated Fuel Storage Facility. Canning operations at the dry storage facility are planned to begin soon. Yet there is no solid technical basis for these activities. Before storage, fuel must be treated to eliminate pyrophoric hydrides. However, the treatment process has not been formally designed. It relies on diffusion rates for uranium oxide rather than the compound of concern, uranium hydride. Additionally, the calculations used have never been independently reviewed or approved.

Seismic Concerns at the Irradiated Fuel Storage Facility. The facility racks and canisters meet the seismic requirements of DOE Order 5480.28 and DOE-STD-1020, but the facility structure does not. INEL will strengthen the structure to eliminate critical seismic overstresses. The project is targeted for completion in fiscal year 1997.

5. Future Staff Actions

These issues have been brought to the attention of the DOE Idaho Field Office. Documentation is being requested for further staff review.