DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004
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December 22, 1998

Mr. James M. Owendoff
Acting Assistant Secretary for
Environmental Management
Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-1000

Dear Mr. Owendoff:

In accordance with its enabling statute, the Defense Nuclear Facilities Safety Board (Board) continues to review the design and construction of new Department of Energy (DOE) defense nuclear facilities. Enclosed for your consideration is an issue report prepared by the Board's staff on the design of the Advanced Mixed Waste Treatment Project at the Idaho National Engineering and Environmental Laboratory.

The Advanced Mixed Waste Treatment Project is a privatization effort to retrieve, characterize, treat, and package a large inventory of transuranic and low-level mixed waste that originated from defense nuclear facilities elsewhere in the DOE complex. The design is in the early stages. Construction is scheduled to be completed and operations begun by 2003. The Board's staff observed that much of the design to date appears sound, but that more effort is required in developing an adequate preliminary safety analyses and on applying sufficient conservatism in the identification of those structures and systems being relied on to perform a safety function. This identification is a key step in the design process since it determines which codes and standards ought to be invoked for safety-related structures, systems, and components. Inadequate identification of safety systems early in the design can cause significant delay later in the design as a result of the need to correct deficiencies.

Please feel free to contact me or have your staff contact Mr. Todd Davis of the Board's staff if there are questions on this matter.

Sincerely,

John T. Conway
Chairman

c: Mr. Mark B. Whitaker, Jr.
Mr. John M. Wilcynski

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

December 1, 1998

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: T. Davis

SUBJECT: Advanced Mixed Waste Treatment Project at Idaho National Engineering and Environmental Laboratory

This memorandum documents issues reviewed by the staff of the Defense Nuclear Facilities Safety Board (Board) concerning the Advanced Mixed Waste Treatment Project (AMWTP) at the Idaho National Engineering and Environmental Laboratory (INEEL). The staff reviewed the project's status during the week of November 16, 1998. Staff participants included T. Davis, A. Gwal, C. Keilers, and R. Zavadoski.

The AMWTP is a privatization project to retrieve, characterize, treat, and package 65,000 cubic meters of transuranic and low-level mixed waste during the next 20 years. The fixed-price contract was awarded to British Nuclear Fuels Limited (BNFL) in December 1996. BNFL expects to secure the necessary environmental and safety approvals by September 1999 and then to complete construction and begin operation by 2003. The current design, which is approximately 20 to 30 percent complete, includes supercompaction, encapsulation, and incineration. Although much of the design to date appears sound, the staff identified several issues with regard to the facility safety analysis and facility design.

Safety Analysis. The draft Preliminary Safety Analysis Report (PSAR) identifies few systems as important to safety (i.e., safety-significant and safety-critical) as compared with safety analyses for other Department of Energy (DOE) facilities with comparable accidents, source terms, and distances to the public and workers. Also, the predicted releases from the design basis accidents do not appear appropriately bounding with regard to material quantity and type and for each type of dose receptor (i.e., the public, collocated workers, and facility workers). The staff notes that DOE-Idaho made similar comments concerning the PSAR and has requested further review of this issue.

Because the material that will be processed is not well characterized and to allow operational flexibility to process additional waste, the staff believes that it may be appropriate to conservatively simplify the safety analyses (e.g., source term assumptions). This change will increase confidence that the facility is adequate throughout its service life for accidents involving all conceivable input waste streams. While the current design criteria for many potential safety systems appear close to those at other DOE sites for safety-related equipment, this type of conservative safety analysis would likely identify any remaining improvements that need to be made.

Criticality Controls. BNFL has not determined how it will implement double contingency for criticality scenarios. It would be prudent to determine what controls will be used because of potential impacts to facility design. The one criticality control that has been identified, mass limits, is expected to rely on a software-based database system and software interlocks.

Electrical Systems. Single-point failures exist in the electrical distribution system even though the Project Design Criteria states that the distribution system should not have single-point failures. Additionally, the safety-significant radiation monitoring system does not have a safety-significant power supply.

Fire-Protection System. The fire-protection system was designed to 1994 codes, which have since been revised. It would be prudent to compare these requirements with the latest codes to ensure that safety requirements are not missed. The project used the Uniform Building Code in lieu of National Fire Protection Association (NFPA) requirements in NFPA 101. The NFPA 101 provisions ought to be reviewed to ensure that life safety code requirements are met.

Seismic/Structural Design. The contractor appears to be considering the less-stringent Performance Category (PC)-2 seismic and extreme wind criteria for all or portions of the building structural design. The staff believes it would be more appropriate to use the PC-3 requirements for structures, systems, and components that provide confinement of hazardous material or that need to function through an earthquake or other extreme loading event.

While most of the treatment processes with dispersible material are located in bays with thick concrete walls, the incinerator is located in a bay with three less-robust masonry walls. It may be appropriate to reevaluate the incinerator bay design to ensure that the walls provide appropriate confinement to protect the public and workers during both normal and accident conditions.

The staff believes it would also be timely for the architect-engineer, with assistance from INEEL, to update the seismic analysis approach document and better define how these analyses will be conducted. In particular, it would be worthwhile to incorporate information from other recent INEEL projects, such as site-specific design load combinations, snow mass for seismic analysis, seismic response spectra, and bedrock time histories for PC-3 seismic events. To improve load-carrying capacity during accidents, it may also be beneficial to incorporate into the design portions of the Seismic Zone 3 and 4 ductile detailing provisions from the Uniform Building Code.