DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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October 17, 2005

The Honorable Linton Brooks
Administrator
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0701

Dear Ambassador Brooks:

The Defense Nuclear Facilities Safety Board (Board) has been closely following various safety aspects of the National Nuclear Security Administration's design project for the Pit Disassembly and Conversion Facility (PDCF), including ventilation, safety analysis, criticality safety, seismic criteria, process safety, and fire protection. The PDCF design project is nearing completion of the final design stage, and the Board will continue its safety reviews as the project progresses. The electrical design aspect of the project is anticipated to achieve 90 percent of final design within the next several months. The Board's staff conducted a review of the electrical system at the 60–70 percent completion stage of the final design. The concerns identified during this review are provided as an enclosure to this letter.

Subsequent to the review, discussions with your staff and the Board's staff have continued and the issues discussed appear to be headed toward resolution. The enclosure is provided for your information and use, as appropriate.

Sincerely,

A. J. Eggenberger
Chairman

c: Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

September 19, 2005

MEMORANDUM FOR: J. K. Fortenberry, Technical Director

COPIES: Board Members

FROM: A. Matteucci

SUBJECT: Review of Electrical System of the Pit Disassembly and Conversion Facility

The purpose of this report is to document a review of the electrical system of the Pit Disassembly and Conversion Facility (PDCF). The review was conducted at the National Nuclear Security Administration's (NNSA) design contractor's (Washington Group, International [WGI]) facilities in Denver, Colorado on August 24, 2005, by the Defense Nuclear Facilities Safety Board (Board) staff A. Gwal, H. Massie, and A. Matteucci.

Background. The primary mission of the PDCF is to (1) receive surplus weapons plutonium in the form of pits and other plutonium metals, (2) convert the plutonium metal to plutonium oxide, and (3) remove any residual classified attributes through blending of the converted plutonium oxide. The PDCF design project, being lead by WGI, is in the final design stage. Although the design stage of the overall project is near the 90 percent final design stage, the electrical aspect of the project is at about 60–70 percent final design. The electrical design aspect of the project is anticipated to achieve 90 percent of final design in late 2005.

Safety Analysis. The preliminary documented safety analysis (PDSA) for the PDCF has been submitted. The PDCF was determined to be a Hazard Category 2 facility, and based on hazard analysis and associated unmitigated accident analysis results, there is a potential for significant onsite consequences. An assessment of safety controls has been completed and documented in the PDSA.

The scope of the electrical design addresses normal, standby, uninterruptible, and emergency power systems. Within this scope, the electrical design for the PDCF incorporates controls which are designated both safety-class and safety-significant. Presently, the portion of the electrical system designated as safety-class includes the emergency generators and fuel system, automatic transfer switches, electrical distribution system, and the 125 volt battery system.

Electrical System. Overall, the design of the electrical system is progressing well. However, there were several concerns identified by the staff during the review.

Standby Diesel Generators—The staff believes that the present rating of the two standby diesel generators may not be adequate to handle the necessary loads during restart from a loss of off-site power, especially the restart of a 700 horsepower (hp) chiller motor. During restart of the PDCF after a loss of off-site power, the facility would be restarted in a limited operational mode. During normal operations with off-site power, two 700 hp chillers are operating. The limited mode would require operation of only one 700 hp chiller. To provide the necessary power to perform a successful restart of the facility in a limited mode, the standby generators may need to have an increased rating. The PDCF project team desires to maintain the current footprint of the facility. The staff is concerned that efforts to maintain the current footprint may drive a final electrical system that cannot support operation of the facility in a standby mode. The staff suggested the contractor perform the calculations for restarting the facility with all necessary loads, including a 700 hp chiller motor, to confirm the adequacy of the rating for the standby diesel generators.

Non-Safety Loads on the Safety-Class or Safety-Significant Busses—The PDCF electrical design criteria references the appropriate Institute of Electrical and Electronic Engineers (IEEE) standards (e.g., IEEE Standard 384, *Standard Criteria for Independency of Class 1E Equipment and Circuits*) related to the connection of non-safety-related loads to safety-class busses. However, the requirements regarding the connecting of non-safety-class loads on a safety-class bus are missing in design documents. The explicit inclusion of the requirements relating to connecting non-safety-class loads to the safety-class bus would ensure these requirements are adhered to during the electrical design process.

Fast Reclosing—Section 20.85 of the National Electrical Manufacturers Association (NEMA) M G-1-1993, Revision 2, states that "Induction machines are inherently capable of developing transient current and torque when exposed to an out-of-phase bus transfer or momentary voltage interruption and reclosing on the same power supply." The magnitude of the transient torque may range from 2–20 times the rated torque and is a function of machine parameters and switching time.

The staff suggested an evaluation of the transient torque for the 700 hp chiller motor during a fast reclosing after a loss of power for a very short duration and that suitable protective devices be provided, if required, for the protection of the chiller motor.

4160 Switch Gear—The current PDCF design makes partial use of fuses in lieu of circuit breakers in the electrical system. The design of typical switch gear systems do not employ both circuit breakers and fuses. Although fused switches may be used in lieu of circuit breakers, coordinating a line-side circuit breaker with a load-side fuse is difficult. The staff suggested that NNSA thoroughly evaluate the coordination of protective devices, specifically the fuses for the 700 hp chiller motor and upstream circuit breakers.

Procurement Specifications—Procurement specifications for safety-class electrical equipment do not include the seismic requirements. The contractor had planned to include the seismic requirements in the procurement specification by referencing a separate document, which might be confusing to the equipment bidder. As a result of discussion with the staff, the contractor has now decided to include the seismic requirements for electrical equipment directly in the procurement specifications.