DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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March 30, 2007

The Honorable Thomas P. D'Agostino
Acting Administrator
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0701

Dear Mr. D'Agostino:

Ensuring the safety of nuclear explosive operations at the Pantex Plant is a key priority of the Defense Nuclear Facilities Safety Board (Board). One essential aspect of providing a safe environment for such operations is lightning protection. The Board has documented issues related to the adequacy of lightning protection at Pantex since the late 1990s. Through the efforts of the National Nuclear Security Administration (NNSA) and the Board, significant safety improvements have been made at Pantex to address the potential lightning threat to nuclear explosive operations. Several issues remain, including work to characterize and control the hazard posed by the *indirect* effects of a lightning strike on a nuclear explosive facility. Work on these issues has progressed too slowly and should be addressed in the near future.

In a letter to the Department of Energy (DOE) dated June 22, 2001, the Board first raised issues related to possible indirect energy transfer mechanisms, such as concentrated currents in large-diameter ductwork that generate large magnetic fields. These fields can potentially induce electrical currents in components of nearby nuclear explosives. Considerable uncertainty existed regarding the magnitude of this potential indirect lightning threat and the ability of current lightning protection controls to adequately mitigate this potential threat. Despite this uncertainty, lightning subject-matter experts associated with NNSA, the design laboratories, and the Board agreed that the *direct* lightning effects remained the most pressing lightning-related threat to safety at Pantex.

Accordingly, resources were initially applied toward understanding and mitigating the potential threat from direct lightning effects. In an August 6, 2002, letter, the Board reminded NNSA of the continuing need to address potentially important indirect mechanisms. In response to this letter, NNSA and its contractors developed a project plan for the *Investigation of Lightning-Initiated Indirect Effects at Pantex.*

In 2004, Sandia National Laboratories (SNL) completed an analysis of the worst-case threat that could be posed by indirect coupling mechanisms. This analysis indicated that the potential threat was marginal for main charge detonators, but might be problematic for other

explosive initiators that pose hazards to worker safety. In accordance with the indirect lightning effects project plan noted above, BWXT-Pantex in 2004 submitted the SNL analysis to Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL) and requested response information for weapon components that could be affected by such insults.

LLNL provided an initial response to BWXT's request in a January 2007 Information Engineering Release (IER). Although the IER identifies excessive conservatism in the analysis, the report that accompanies the IER contains preliminary results that call into question the existing lightning protection scheme at Pantex. These results raise the possibility that additional controls may be required to mitigate the threat from indirect lightning effects. LANL has not provided its response to BWXT.

Two other previously identified safety issues involving direct lightning effects have also not been resolved. The first issue concerns a potential hazard from lightning-induced spalling of concrete, while the second issue concerns whether the inductance of wires used to bond facility electrical penetrations is adequately accounted for in calculations of maximum voltages resulting from a lightning strike. These issues were first identified by an NNSA Nuclear Explosive Safety Master Study conducted in 2000. A recent NNSA briefing to the Board on safety-related research to support nuclear explosive operations at Pantex indicated that some work was currently ongoing to address these two safety issues.

While the Board's staff continues to have discussions with NNSA, BWXT, and the design agencies on the issues identified in this letter, the Board is concerned that these direct and indirect lightning-related issues have remained unresolved for a long time. The Board believes there has been adequate time to resolve these issues and the associated uncertainties in the threat posed by *direct and indirect* lightning effects. Therefore, pursuant to 42 U.S.C. § 2286b(d), the Board requests that NNSA brief the Board within 30 days of receipt of this letter on NNSA's assessment of the risk posed by these issues and its plan and schedule for completing actions to resolve them.

Sincerely,

A. J. Eggenberger
Chairman

c: Mr. Mark B. Whitaker, Jr.