DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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March 23, 2009

The Honorable Steven Chu
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Chu:

The Defense Nuclear Facilities Safety Board (Board) would like to take this opportunity to congratulate you on your appointment as Secretary of Energy. As you assume your duties, the Board would like to present our views on the state of nuclear safety at the Department of Energy's (DOE) defense nuclear facilities, in accord with the Board's statutory mandate to identify the nature and consequences of potential threats to public health and safety at these facilities, elevate such issues to the highest levels of authority, and inform the public. A summary of these views is provided in the enclosure for your use in the management of nuclear safety at DOE's defense nuclear facilities.

We look forward to working with you on these matters and would welcome the opportunity to discuss these with you at your earliest convenience.

Sincerely,

A.J. Eggenberger

A.J. Eggenberger
Chairman

Enclosure

c: Mr. Mark B. Whitaker, Jr.

Enclosure

Views of the Defense Nuclear Facilities Safety Board on the State of Nuclear Safety at the Department of Energy's Defense Nuclear Facilities

Priority Safety Issues Affecting Multiple Department of Energy Sites

Integrating Nuclear Safety Early in the Design of Defense Nuclear Facilities: *Continue implementation of the safety-in-design initiative as a high priority.*

The Defense Nuclear Facilities Safety Board (Board) is required by law to make such recommendations to the Secretary during design and construction that would ensure that new defense nuclear facilities provide adequate protection of the health and safety of workers and the public. For the past several years, the Board has driven an initiative to ensure that Department of Energy (DOE) design project teams focus on early recognition and rapid resolution of safety issues. The Board and DOE prepared a joint report to Congress, dated July 19, 2007, describing in detail many of the actions being taken to accelerate identification and resolution of safety issues. Performing thorough reviews of safety issues earlier in the design process allows these issues to be resolved in an efficient and timely manner, while minimizing adverse impacts on project costs and schedules. Taking this approach is essential to the success of major design and construction projects, which include facilities such as:

- Waste Treatment and Immobilization Plant, Hanford Site
- Integrated Waste Treatment Unit, Idaho National Laboratory
- Chemistry and Metallurgy Research Replacement Project, Los Alamos National Laboratory (LANL)
- Radioactive Liquid Waste Treatment Facility Replacement Project, LANL
- New Solid Transuranic Waste Facility, LANL
- Uranium-233 Downblending and Disposition Project, Oak Ridge National Laboratory
- Pit Disassembly and Conversion Facility, Savannah River Site (SRS)
- Salt Waste Processing Facility, SRS
- Highly Enriched Uranium Materials Facility, Y-12 National Security Complex
- Uranium Processing Facility, Y-12 National Security Complex

The Integrated Waste Treatment Unit and the Uranium Processing Facility have been serving as examples of how projects can be designed to identify and resolve safety issues early in design and in the most cost-effective manner.

The importance of this initiative, especially in light of the current federal budget environment, cannot be overstated. This approach is the best way to avoid costly late resolution of major design issues or surprises late in the development of a new facility.

Ending Reliance on Unsound Facilities: *Address the fact that Manhattan Project era facilities are no longer suitable for prolonged use.*

The National Nuclear Security Administration (NNSA) continues to rely on aging facilities to carry out hazardous production missions in support of the nation's nuclear deterrent while planned replacement facilities suffer extended design and construction delays. Examples include the 9212 Complex at Y-12 (portions of which are more than 60 years old), to be replaced by the planned Uranium Processing Facility; and the Chemistry and Metallurgy Research building at LANL (55 years old), to be replaced by the Chemistry and Metallurgy Research Replacement Project. The 9212 Complex cannot meet existing nuclear safety requirements for Hazard Category 2 nuclear facilities, and the Chemistry and Metallurgy Research building's seismic fragility poses a continuing risk to the public and workers. Other facilities in similar situations include the Radioactive Liquid Waste Treatment Facility at LANL and the scattered facilities that constitute LANL's capability to repackage, characterize, and ship transuranic wastes offsite for disposal.

NNSA is taking interim actions to improve the safety posture of the existing facilities. NNSA has reduced the inventory of uranium solutions in plastic bottles at the 9212 Complex and plans to relocate some activities from the Chemistry and Metallurgy Research building to a more robust facility at LANL. NNSA also is executing a line-item project to upgrade certain facility systems in the 9212 Complex based on a facility risk review and is consolidating operations in the Chemistry and Metallurgy Research building into wings of the structure that do not lie directly above a seismic fault. However, these are stop-gap measures. These facilities are structurally unsound, are unsuitable for use any longer than is absolutely necessary, and will have to be shut down, perhaps before the replacement facilities are ready.

Unfortunately, completion of planned replacement facilities has been delayed beyond original projections, and scrutiny continues regarding their cost, scope, and programmatic need. NNSA must continue to drive safety improvements at the existing facilities while at the same time building the replacement facilities quickly or finding alternative, safer means of accomplishing mission-related work.

Preserving an Effective Nuclear Safety Directives System: *Preserve the DOE requirements and guidance essential to ensuring safety within the DOE defense nuclear complex.*

DOE has developed a system of nuclear safety directives enumerating a comprehensive set of nuclear safety requirements, garnered from 60 years of operating experience in both the commercial and defense-related arenas. However, DOE is reviewing a significant subset of the directives to ensure that objectives are "accomplished without being unclear, overly prescriptive, duplicative, or contradictory" per the direction of the Secretary of Energy in a memorandum dated September 10, 2007. Furthermore, in January 2009, DOE issued a sweeping revision to the directive that governs the structure of this system and the processes used to develop and revise directives, returning to an approach last employed 15 years ago. This revision is a fundamental paradigm shift that will result in DOE and NNSA reworking many existing directives.

In all, more than 60 nuclear safety-related directives were redrafted during 2008, and more will be redrafted in 2009. This is a large and costly effort, and care must be taken to avoid weakening the directives that underpin safety throughout the defense nuclear complex. The Board is maintaining an intense level of oversight over the revision to the directives system and the vitality of the directives being revised to ensure that the margin of safety embodied in DOE's directives is maintained or increased. It is essential that the senior leadership of DOE and NNSA do the same, or many years of progress in development and refinement of the directives system could be undone.

Preserving and Enhancing the Central Technical Authority Function: *Ensure that the Central Technical Authorities remain effective through the transition of the Administration.*

On July 21, 2004, the Secretary of Energy accepted the Board's formal Recommendation that DOE empower a central and technically competent authority responsible for operational and nuclear safety goals, expectations, requirements, standards, directives, and waivers. Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*, was issued in May 2004 in response to adverse developments within the DOE defense nuclear complex, including the loss of technical competence and understanding at high levels of DOE's organizational structure and reduced central oversight of safety. The findings of the Columbia Accident Investigation Board were a major factor leading to the recognition that senior management required strong, independent technical safety advice to balance the mission-oriented focus of senior program directors.

In response to the Board's Recommendation, the Secretary of Energy created two Central Technical Authority positions—one for NNSA and one for Energy, Science and Environment—described in a memorandum dated April 26, 2005. Each Central Technical Authority is supported by a small technical staff under a Chief of Nuclear Safety (known as the Chief of Defense Nuclear Safety in NNSA). Their roles and responsibilities related to nuclear safety oversight are described in DOE Order 226.1A, *Implementation of Department of Energy Oversight Policy*, and DOE Order 410.1, *Central Technical Authority Responsibilities Regarding Nuclear Safety Requirements*. One of the primary roles of the Chiefs of Nuclear Safety is to provide independent safety oversight of the line organizations. This promotes the appropriate balance between mission and safety, which is a guiding principle of the DOE's primary safety program, Integrated Safety Management.

Despite the Secretary's acceptance of the Board's Recommendation, a reorganization within NNSA late in the previous Administration moved a large portion of the Chief of Defense Nuclear Safety's supporting staff to the NNSA line organization, and a hiring freeze within NNSA has inhibited the rebuilding of this function. Similarly, personnel moves during the transition have eliminated the Chief of Nuclear Safety office for Energy, Science and Environment. While it is the Secretary's prerogative to determine how DOE's offices are staffed, it is imperative that the Central Technical Authorities be reconstituted, remain independent and effective, and have sufficient support from dedicated technical staffs.

Improving Federal Technical Staff Capability: *Ensure that technical project managers, facility representatives, and safety system oversight personnel have appropriate backgrounds, training, and qualifications.*

Safe and efficient execution of DOE's mission requires an adequate complement of qualified technical staff at its headquarters and site offices. Therefore, DOE has committed to developing and maintaining a technically competent federal workforce. However, across the complex, the number of qualified individuals on DOE staffs is well below desired levels, as evidenced by the quarterly reports issued by the DOE Federal Technical Capability Panel. In particular, DOE needs to rectify shortages of qualified federal staff in the Technical Qualification Program, Facility Representative Program, and Safety System Oversight Program, each of which is critical to providing technically competent personnel for the oversight of defense nuclear facilities.

NNSA and the DOE Office of Environmental Management have used incentives such as increasing the grade level of fully qualified Facility Representatives and awarding retention bonuses to attract and retain qualified personnel. However, such group incentives are being reconsidered or discontinued at some sites. As noted, hiring by NNSA was severely curtailed under this year's Continuing Resolution, and its competent staffing level has drifted backward. DOE as a whole does not have an aggressive and proactive staffing plan that integrates anticipated losses with recruitment and the time required to complete training. The need for competent staffing continues to grow as some facilities age and as new facilities are procured, designed, and built.

Implementing Cross-Cutting Recommendations: *Provide leadership at the Headquarters level for cross-cutting safety improvements recommended by the Board.*

Nuclear Safety Research and Development. The Board's Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*, identifies the need for a nuclear safety research and development function. As stated in DOE's Implementation Plan for this Recommendation, "DOE nuclear operations demand a high level of safety and attention to detail, particularly for operations involving high consequence, low probability accidents. These operations also demand rigorous research and development. An integrated nuclear safety research program will identify key gaps between research needs and program plans and highlight those needs to DOE/NNSA senior leaders at an appropriate point in the planning and budgeting cycle to allow the gaps to be addressed." NNSA is the lead for this activity, but has made exceptionally limited progress in establishing a nuclear safety research and development function. The involvement of DOE's senior leadership is needed to invigorate this effort.

Nuclear Material Packaging. The Board issued Recommendation 2005-1, *Nuclear Material Packaging*, to increase protection for workers involved in the storage and handling of nuclear materials. In March 2008, after making improvements suggested by the Board, DOE issued Manual 441.1-1, *Nuclear Material Packaging Manual*, to codify the attributes required for safe packaging of nuclear materials. Since then, DOE has fallen behind schedule.

Responsibility for the successful implementation of Recommendation 2005-1 was assigned to the DOE Office of Health, Safety and Security (HSS), but it does not appear that HSS is in a position to obtain satisfactory plans for implementing the improved packaging requirements at the site level, or to integrate the site-level plans into an overall strategy for implementing the Manual. Leadership at the Headquarters level is needed to drive this effort to a successful completion.

Priority Safety Issues at Specific Sites

Hanford Site:

- Waste Treatment and Immobilization Plant—Preservation of the safety margin and operational flexibility as DOE seeks to reduce cost and complexity

- K-Basin sludge treatment—Safe interim storage and selection of a safe and effective process for stabilizing spent fuel sludge retrieved from the K-Basins

- High-level waste tank integrity—Tank waste chemistry controls, inspection programs, and laboratory experiments to preserve the integrity of decades-old high-level waste tanks until the waste can be retrieved and processed

- Key new facilities under design and construction:
  - Waste Treatment and Immobilization Plant
  - K-Basin Closure Sludge Treatment Project

Idaho National Laboratory:

- Key new facility under design and construction: Integrated Waste Treatment Unit

Oak Ridge National Laboratory:

- Key new facility under design and construction: Uranium-233 Downblending and Disposition Project

Savannah River Site:

- H-Canyon facility—Life extension and safety analysis upgrades for continued capability to process plutonium, uranium, spent nuclear fuel, and other radioactive materials for recovery or disposition

- Critical role in materials consolidation and disposition—Need for coordination between Office of Environmental Management and NNSA to execute nuclear materials consolidation and disposition missions underway and planned at Savannah River Site

- High-level waste tank integrity—Tank waste chemistry controls, inspection programs, and laboratory experiments to preserve the integrity of decades-old high-level waste tanks until the waste can be retrieved and processed

- Oversight staffing—Need for sufficient qualified staff for safety oversight by DOE Savannah River Operations Office

- Key new facilities under design and construction:
  - Salt Waste Processing Facility
  - Waste Solidification Building
  - Pit Disassembly and Conversion Facility and/or Plutonium Preparation Project
  - Tank 48 Treatment Project

Lawrence Livermore National Laboratory:

- Safety of enduring nuclear facilities—Continuation of ongoing nuclear safety improvements during and after removal of security category I/II special nuclear materials from defense nuclear facilities

Los Alamos National Laboratory:

- Nuclear facility safety bases—Development and implementation of high-quality safety bases to provide assurance that defense nuclear facilities can operate in a manner that protects workers, the public, and the environment

- Institutional safety programs– Significant improvement in institutional safety programs, such as formality of operations, training and qualification, integrated work management, fire protection, and nuclear criticality safety

- Infrastructure replacement and upgrades—Interim upgrades and near-term replacement for the Chemistry and Metallurgy Research building and Radioactive Liquid Waste Treatment Facility; and safety system upgrades for the Plutonium Facility

- Disposition of legacy transuranic wastes—De-inventory of Area G and the safety basis of supporting facilities

- Key new facilities under design and construction:
  - Chemistry and Metallurgy Research Replacement Project
  - Radioactive Liquid Waste Treatment Facility Replacement Project
  - New Solid Transuranic Waste Facility

Nevada Test Site:

- Device Assembly Facility—Repair of the impaired fire suppression system and implementation of new controls to support startup of the Criticality Experiments Facility

- Key new facility under design and construction: Criticality Experiments Facility

Pantex Plant:

- Technical support by design agencies—Implementation of NNSA requirements governing the development, documentation, and peer review of technical analyses of postulated events and environments during nuclear explosive operations at Pantex

- Lightning and electrostatic discharge—Characterization and control of the effects of lightning strikes and electrostatic discharge in nuclear explosive facilities

- Nuclear explosive safety process—Effectiveness and management support of the expert Nuclear Explosive Safety Study Groups that independently evaluate the safety of nuclear explosive operations at Pantex

Y-12 National Security Complex:

- Aging infrastructure, 9212 Complex—Risk reduction and facility safety improvements to allow interim operations to continue safely in the short term

- Nuclear criticality safety program—Continued improvement in the nuclear criticality safety program to ensure that applicable standards are properly implemented

- Nuclear materials storage—Continued and, where possible, accelerated efforts to reduce the inventory of excess and legacy nuclear materials stored indefinitely in aging facilities

- Key new facilities under design and construction:
  - Highly Enriched Uranium Materials Facility
  - Uranium Processing Facility