

TESTIMONY OF
DR. PETER S. WINOKUR, CHAIRMAN
DEFENSE NUCLEAR FACILITIES SAFETY BOARD

SAFETY OVERSIGHT OF DEPARTMENT OF ENERGY
DEFENSE NUCLEAR FACILITIES

SUBCOMMITTEE ON STRATEGIC FORCES
HOUSE ARMED SERVICES COMMITTEE
UNITED STATES HOUSE OF REPRESENTATIVES

APRIL 5, 2011

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE:

Thank you for the opportunity to testify on nuclear safety issues at defense nuclear facilities operated by the Department of Energy (DOE) and the National Nuclear Security Administration (NNSA). Clearly, this is a period of significant transition for DOE, which includes billions of dollars in construction projects and a huge portfolio of site cleanup work. The Board believes it is prudent to proactively address safety issues at DOE's defense nuclear facilities to ward off threats to public health and safety and to resolve safety concerns early in the design process. The Board continues to champion the early integration of safety in design and efforts to strengthen DOE's safety culture. Today I will provide some background on the Defense Nuclear Facilities Safety Board (Board) and how we operate, and then I will provide the Board's assessment of safety issues related to DOE and NNSA defense nuclear facilities.

Legislative History and Statutory Mission of the Board

The Board was created by Congress in 1988. Congress tasked the Board to conduct safety oversight of defense nuclear facilities under the control or jurisdiction of DOE. The Atomic Energy Act of 1954, as amended, currently establishes two categories of facilities subject to Board jurisdiction: (1) those facilities under the Secretary of Energy's control or jurisdiction, operated for national security purposes that produce or utilize special nuclear materials, and (2) nuclear waste storage facilities under the control or jurisdiction of the Secretary of Energy. The Board's jurisdiction does not extend to facilities or activities associated with the Naval Nuclear Propulsion Program, transportation of nuclear explosives or materials, the U.S. Enrichment Corporation, facilities developed pursuant to the Nuclear Waste Policy Act of 1982 and licensed by the Nuclear Regulatory Commission, or any facility not conducting atomic energy defense activities.

Under its enabling statute, 42 U.S.C. § 2286 *et seq.*, the Board is responsible for independent oversight of all programs and activities impacting public health and safety within DOE's defense nuclear facility complex, which has served to design, manufacture, test, maintain,

and decommission nuclear weapons. The Board is authorized to review and analyze facility and system designs, operations, practices, and events, and to make recommendations to the Secretary of Energy that the Board believes are necessary to ensure adequate protection of public health and safety, including worker safety. In this regard, the Board's actions are distinguishable from a regulator in that the Secretary may accept or reject the recommendations in whole or in part. The Board must consider the technical and economic feasibility of implementing the recommended measures, and the Secretary must report to the President and Congress if the implementation of a recommendation is impracticable because of budgetary considerations or if the implementation would affect the Secretary's ability to meet the annual nuclear weapons stockpile requirements. If the Board determines that an imminent or severe threat to public health or safety exists, the Board is required to transmit its recommendations to the President, as well as to the Secretaries of Energy and Defense. After receipt by the President, the Board is required to make such recommendations public and transmit them to the Committees on Armed Services and Appropriations of the Senate and to the Speaker of the House.

The Board's enabling statute also requires the Board to review and evaluate the content and implementation of health and safety standards, including DOE's orders, rules, and other safety requirements, relating to the full life cycle of defense nuclear facilities, including design, construction, operation, and decommissioning. The Board must then recommend to the Secretary of Energy any specific measures, such as changes in the content and implementation of those standards that the Board believes should be adopted to ensure that public health and safety are adequately protected. The Board is also required to review the design of new defense nuclear facilities before construction begins, as well as modifications to older facilities, and to recommend changes necessary to protect health and safety. The Board periodically reviews and monitors construction at these defense nuclear facilities to evaluate whether construction practices and quality assurance ensure design requirements related to nuclear safety are met.

In support of its mission, the Board may conduct investigations, issue subpoenas, hold public hearings, gather information, conduct studies, establish reporting requirements for DOE, and take other actions in furtherance of its review of health and safety issues at defense nuclear

facilities. These powers facilitate accomplishment of the Board's primary function, which is to assist DOE in identifying and correcting health and safety problems at defense nuclear facilities. The Secretary of Energy is required to cooperate fully with the Board and provide the Board with ready access to such facilities, personnel, and information the Board considers necessary to carry out these responsibilities.

The Board does not impose requirements on DOE's capital projects or other activities. The Board operates by ensuring that DOE identifies a satisfactory set of safety requirements for a project or operation, and then evaluating DOE's application of those requirements. The safety requirements are embodied in DOE's directives and/or invoked in national consensus standards. For example, the requirement that facilities withstand seismic events and other natural phenomenon hazards is a DOE requirement that is implemented in a graded fashion as a function of the hazard associated with the facility. The requirement to update the probabilistic seismic hazard analysis for DOE facilities built in seismically active areas every decade is likewise a DOE requirement.

Resource Needs and Cost-Awareness of the Defense Nuclear Facilities Safety Board

I would like to take the opportunity to say a few words about the Board's 2012 Budget Request. The President's budget request for Fiscal Year 2012 includes \$29.13 million in new budget authority for the Board. This is a \$3 million increase compared to Fiscal Year 2010 and will support a personnel strength of 120, which is the target that the Board has been growing toward for the past several years. Given the current pace and scope of activities in the DOE defense nuclear complex, the Board believes this level of staffing is necessary to provide oversight to ensure that public and worker health and safety are adequately protected. A consideration for this level of resources is to provide oversight of health and safety without interfering with DOE activities' timelines. For the Board, oversight requires the resources necessary to prevent a serious nuclear accident, which must be prevented to protect public and worker health and safety.

The 2012 Budget requests \$16 billion for NNSA and Environmental Management activities that involve defense nuclear facilities under the Board's purview. We believe that continuous improvements in safety serve as enablers to DOE's mission. In the area of new design and construction, the failure to identify design flaws that could impact public and worker health and safety early in the design process can significantly increase project costs due to the cost of re-engineering and the need to make post-construction modifications to complex DOE defense nuclear facilities. Such flaws have in the past typically increased costs and delayed operations while corrections were made. With DOE's design and construction costs exceeding \$20 billion, each increase in project cost of one percent equates to an increase of more than \$200 million. Consequently, we believe the Board's Fiscal Year 2012 Budget Request provides cost-effective oversight while protecting public and worker health and safety.

The Board's budget is essentially devoted to maintaining and supporting an expert staff of engineers and scientists (nearly all of whom have technical master's degrees or doctorates) required to accomplish our highly specialized work. Seventy-one percent of our budget request for Fiscal Year 2012 is for salaries and benefits, 5 percent is for travel and transportation (essential because of the need to physically visit defense nuclear facilities), and 3 percent is for technical expert contracts. The remainder is for rent, information technology and communication expenses, security, administrative support, training, and supplies, which are largely fixed costs. As you will see in my assessment of safety issues in this testimony, the workload of providing health and safety oversight is growing as the defense nuclear complex evolves, and will continue for decades as DOE and NNSA continue cleanup activities and weapons operations to support DOE's national security mission.

The Board is very mindful of the need for cost-effective solutions to safety problems at defense nuclear facilities, and always seeks the simplest practical remedy. The Board considers factors such as the remaining useful life of facilities, schedules and plans for replacing them, and means to mitigate disruptions to ongoing operations that may result from recommended safety

improvements. In a joint report to Congress on July 19, 2007, the Board and DOE agreed that early integration of safety in design is both crucial and cost-effective, as it avoids schedule delays as compared to the case when safety issues are recognized late in the design process (or worse, after construction has commenced). In most cases, the types of safety measures needed to meet DOE's safety requirements are a small fraction of the cost of the project. The same principle applies to oversight of operations—in an effective Integrated Safety Management system, hazards are recognized while the procedure for an operation is being developed, safety controls are built into the process, and the operation is then conducted safely and efficiently. Finally, the Board works with DOE to ensure that new technology important to safety is fully mature and capable of performing its intended safety function.

The National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling concluded that the Macondo well blowout revealed such systematic failures in risk management that they place in doubt the safety culture of the entire industry. A key finding in the commission's January 2011 report is that fundamental reform will be needed in both the structure of those in charge of regulatory oversight and their internal decision-making process to ensure their political autonomy, technical expertise, and their full consideration of environmental protection concerns. Likewise, the Board seeks to ensure that oversight and decision-making processes in the DOE defense nuclear complex remain strong and technically defensible. The bottom line is that a nuclear accident is unacceptable to the public and the Administration.

Although not a regulatory body, the Board is the only agency that provides independent scientific and technical safety oversight of DOE's defense nuclear facilities. The Board remains the last line of defense to ensure DOE line management implements the safety requirements needed to ensure accidents do not happen within the defense nuclear weapons complex. DOE is undertaking initiatives to create and test new governance models that rely more heavily on the objectivity of its line organizations for safety oversight, eliminate or streamline its directives, and eliminate or streamline contractor requirements to achieve more efficient operations. This increases the overall reliance on the Board to provide independent oversight. The DOE-Board

independent safety oversight model has yielded a positive safety performance record in DOE's defense nuclear complex since the Congress established the Board.

Nuclear Safety Issues at DOE and NNSA Defense Nuclear Facilities

The Board evaluates all of DOE's and NNSA's activities in the context of Integrated Safety Management. The core functions of Integrated Safety Management are straightforward and have been institutionalized in policy by DOE and NNSA in response to the Board's recommendations. They are:

- Define the scope of work
- Analyze the hazards
- Develop and implement hazard controls
- Perform work within controls, and
- Provide feedback and continuous improvement

Integrated Safety Management also institutionalizes guiding principles that form the basis for a safety-conscious and efficient organization, including:

- Balanced mission and safety priorities
- Line management responsibility for safety
- Competence commensurate with responsibility, and
- Identification of safety standards and requirements appropriate to the task at hand

When properly implemented at all levels, Integrated Safety Management results in facility designs that efficiently address hazards, operating procedures that are safe and productive, and feedback that drives continuous improvement in both safety and efficiency. Shortcomings in safety and efficiency in the operation of DOE and NNSA defense nuclear facilities can almost always be related to a failure to apply Integrated Safety Management.

I would like to highlight the following safety issues as particularly important to ensuring that the defense nuclear complex can safely accomplish its missions:

- The need to preserve and continuously improve safety directives
- The need to consider safety early in the design of new defense nuclear facilities
- The need to replace unsound facilities and invest in infrastructure for the future
- The need to safely store and disposition DOE's and NNSA's large inventories of nuclear materials
- The need to develop and maintain a technically qualified federal workforce dedicated to the effective oversight of safety
- The need to resolve safety issues at the Hanford Waste Treatment and Immobilization Plant
- The need to learn appropriate lessons from the March 11 earthquake that caused such devastation in Japan

Preserving an Effective Nuclear Safety Directives System:

Preserve the Departmental requirements and guidance essential to ensuring safety within the DOE defense nuclear complex.

DOE and NNSA are self-regulated, and to facilitate self-regulation have 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. Many of these directives came about in the late 1980s when DOE needed a safety framework to reliably perform its mission. The Board was created by Congress in this same time period. The Board evaluates these safety directives, provides comments on gaps or weaknesses, and uses the directives as fundamental yardsticks for evaluating safety of facilities and activities. The Board views the directives system as the primary means by which DOE enables the safe accomplishment of work at defense nuclear facilities.

Last year, DOE and NNSA pursued several initiatives to rapidly reduce the scope and impact of the directives system:

- DOE commenced a *2010 Safety and Security Reform Plan* that sought to revise, cancel, or consolidate 107 safety and security directives maintained by DOE's Office of Health, Safety and Security on an extremely aggressive schedule. The plan and its associated End-State Vision contemplated reducing health and safety directives by 50 percent in about 6 months.
- Under its Governance Reform Initiative, NNSA bypassed DOE's established directives review system to conduct its own line-by-line evaluation of the contractor requirements of selected directives, including directives related to nuclear safety. NNSA sought to identify duplicative, overly prescriptive, inconsistent, and unclear requirements and authorized its site offices to delete them (in some cases, deleting the entire Contractor Requirements Document) from site contracts, starting at the Nevada National Security Site and Sandia National Laboratories.
- At the end of 2010, DOE adopted an "expedited" process for changing directives, beginning with seven health and safety directives that had been targeted in the NNSA Governance Reform Initiative, to "achieve the Department's management excellence goals."

The Board cannot ascertain a need for the extremely compressed schedules for the revision of health and safety directives. DOE was unable to articulate any specific problem in the field, and the Board was unable to find problems caused by the existing safety directives or significant deficiencies in their requirements. In May 2010, DOE responded to the Board's concerns which were enumerated at the Board's public meeting earlier in the month by instituting a rigorous and disciplined process for its *2010 Safety and Security Reform Plan* that

would carefully assess the content of each directive, the value of each requirement, and the consequences of each requirement's removal or modification. This approach yielded positive results. However, the NNSA Governance Reform Initiative circumvented the newly adopted systematic approach. DOE responded to the Board's concerns about the NNSA initiative in November 2010 by committing to review NNSA's modified contractual approaches through the DOE directives review system consistent with its *2010 Safety and Security Reform Plan*. However, DOE's end-of-year announcement of the expedited processing of seven key directives essentially countermanded its systematic approach even as it superseded the NNSA initiative.

The Board is maintaining an intense level of oversight of 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. It is not apparent that accelerated directives reform efforts yield benefits commensurate with the demands they place upon the finite resources at DOE, NNSA, and the Board, nor is it clear how this initiative will improve and strengthen safety.

Integrating Nuclear Safety Early in the Design of Defense Nuclear Facilities:

Continue implementation of the safety-in-design initiative as a high priority.

DOE and NNSA defense nuclear facilities currently under design and construction have a total project cost of more than \$20 billion. The 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 the workers and the public. For the past several years, the Board has driven an initiative to ensure that DOE and NNSA 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, that describes 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 issues to be resolved efficiently and in a timely manner, and minimizes adverse impacts to project cost and schedule. 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
- Chemistry and Metallurgy Research Replacement Project, Los Alamos National Laboratory (LANL)
- Uranium Processing Facility, Y-12 National Security Complex
- Pit Disassembly and Conversion Project, Savannah River Site
- Salt Waste Processing Facility, Savannah River Site
- Integrated Waste Treatment Unit, Idaho National Laboratory
- Radioactive Liquid Waste Treatment Facility Upgrade Project, LANL

The importance of early integration of safety into the design 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 as is the current situation with the Waste Treatment and Immobilization Plant.

The Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417, enacted a limitation on funding for the Chemistry and Metallurgy Research Replacement Project at LANL until the Board and NNSA each certified that certain design issues reported by the Board had been resolved. The Board submitted its certification report to Congress on September 4, 2009. The Board applied significant resources toward accomplishing this certification, consuming about 6,500 hours of Board and staff effort. Working with NNSA, the Board identified specific concerns and the actions necessary to resolve them prior to certification. As discussed in detail in the Board's certification report, NNSA revised or agreed to revise the preliminary design, design requirements, and design processes to address the Board's concerns. NNSA also committed to implement the design requirements agreed upon in

the certification process during final design. The Board has continued to review the facility design as it has developed to ensure that it remained consistent with the commitments made by NNSA. For example, earlier this year, the Board requested that NNSA provide the technical basis for changes in the safety strategy being proposed by the LANL contractor that would reduce the allowable material-at-risk, downgrade the classification of several safety systems, and reduce seismic design requirements for the safety-related ventilation system.

The House Conference Report 109-702 on the National Defense Authorization Act for Fiscal Year 2007 (H.R. 5122) directed the Board to provide quarterly reports on the status of significant unresolved technical differences between the Board and DOE on issues concerning the design and construction of DOE's defense nuclear facilities. While Congressional direction no longer requires the Board to continue providing quarterly reports, the Board continues to provide these reports to keep all parties informed of the Board's concerns with design of new DOE defense nuclear facilities. The Board has also been encouraged by the feedback received from the Congressional committees to continue providing these reports to Congress and DOE. The twelve reports issued thus far are available to the public on the Board's web site.

Ending Reliance on Unsound Facilities and Investing in Infrastructure for the Future:

Parallel investments are needed to safely operate existing facilities and develop replacements.

Last fall, the Board issued its first report to Congress on aging and degrading facilities in the DOE defense nuclear complex. This report will be updated periodically to highlight the greatest infrastructure needs affecting safety of defense nuclear facilities at DOE and NNSA sites. NNSA's production infrastructure includes aging facilities overdue for replacement as well as newer facilities that require upgrades to provide safe and reliable support for the nation's enduring nuclear deterrent. Examples of aging facilities 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 (CMR) building at LANL (nearly 60 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 CMR 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 repack, characterize, and ship transuranic wastes offsite for disposal.

To its credit, NNSA has taken actions to reduce the radioactive material-at-risk in aging facilities. NNSA has reduced the inventory of uranium solutions in polymer bottles at the 9212 Complex and committed to relocate some activities from the CMR building to a more robust facility at Los Alamos. In addition, NNSA initiated a line item project to upgrade certain systems in the 9212 Complex based on a facility risk review and is consolidating operations in the CMR building into wings of the structure that do not lie directly above a seismic fault. These are, however, stop-gap measures. These facilities are structurally unsound and are unsuitable for use any longer than absolutely necessary. They may need to be shut down before the replacement facilities are ready.

The planned replacement facilities have been delayed beyond original projections, but the need to proceed with them appears to be broadly recognized and supported. This is a positive development, but the new facilities are at least a decade away. NNSA must continue to drive safety improvements at the existing facilities while the replacement facilities are developed. Unsafe conditions would rapidly develop if NNSA were to turn away from maintaining and upgrading facilities such as the 9212 Complex and CMR in anticipation of their eventual replacement.

NNSA also needs to invest in safety upgrades at newer facilities with enduring missions. The Plutonium Facility at LANL is a compelling example. NNSA planned to rely on that facility as its sole manufacturing capability for nuclear weapon pits for decades to come, but had not made commensurate investments in the building's safety systems. The Board issued an urgent formal recommendation in 2009 on the need to implement reliable safety systems in the facility

to reduce the consequences of severe accident scenarios. In response, NNSA has taken a number of interim actions to quickly improve the safety posture of the Plutonium Facility and is developing longer-term upgrades to the facility's safety systems. The Board believes a seismically qualified active confinement ventilation system provides the best solution to ensure adequate protection of public and worker safety for this essential facility.

A similar situation exists at the Device Assembly Facility at the Nevada National Security Site, but the path forward is less clear. That facility is the permanent home to the Critical Experiments Facility relocated from LANL. It also performs assembly work for subcritical experiments and is a potential location for nuclear explosive assembly and disassembly operations. Despite these important, enduring missions, the facility's fire suppression system has numerous, long-standing deficiencies that need to be corrected.

The most pressing concerns for DOE's Environmental Management program are the aging tank farms at the Savannah River Site and Hanford. DOE is building several facilities to process and vitrify waste in these tanks for eventual disposition. Some tanks may be 80 to 100 years old when they are finally emptied. DOE is actively engaged in tank integrity programs to provide the correct chemical environment to prevent corrosion and ensure no new leaks occur in the interim.

Investments such as these are a continuing need in the defense nuclear complex. Failing to devote sufficient resources to these improvements has long-term negative effects on DOE's ability to safely accomplish its objectives.

Safe Storage and Disposition of Nuclear Materials

Safely package, store, and disposition excess nuclear materials to eliminate the risk they may pose to facility workers and the public.

DOE faces several challenges related to nuclear materials that have been declared surplus to national security needs or are otherwise no longer needed. These materials exist in many

chemical and physical forms and include large inventories of used nuclear fuel, plutonium, uranium, and other highly radioactive isotopes. More materials are being added to these inventories as DOE ends Cold War era programs, decommissions old nuclear facilities, and uncovers or produces additional wastes during site cleanup work.

Three main challenges exist: (1) DOE must provide safe interim storage for the large inventory of nuclear materials, (2) DOE must develop timely disposition plans for the materials to limit the risks to workers and the public, and (3) DOE must identify the facility and infrastructure requirements that will support safe completion of the disposition mission.

The Board believes premature shutdown of the H-Canyon facility could have significant unintended safety consequences. For many nuclear materials, DOE's preferred method of disposition has been chemical processing through the H-Canyon facility. DOE needs to define its long-term processing needs clearly, based on options supported by a sound technical basis, before taking actions that would impact the future operability of H-Canyon.

Effectively Performing Federal Safety Oversight:

Ensure federal personnel have appropriate backgrounds, training, and qualifications, and are dedicated to the oversight of safety of defense nuclear facilities.

Safe and efficient execution of DOE's and NNSA's missions requires an adequate complement of qualified technical staff at its headquarters and site offices. DOE and NNSA have committed to developing and maintaining a technically competent federal workforce. Both DOE and NNSA have made good progress in assigning qualified federal staff to the Technical Qualification Program, Facility Representative Program, and Safety System Oversight Program, each of which is critical for providing technically competent personnel for the oversight of defense nuclear facilities.

Safe and efficient execution of DOE's and NNSA's missions also requires commitment by senior federal management to dedicate sufficient resources to safety oversight of the

contractors who design, build, operate, maintain, and decommission DOE's and NNSA's facilities. DOE and NNSA are reevaluating their roles in overseeing the work of their contractors, which includes increasing reliance by DOE on contractors' assurance systems. The Board believes DOE must meet its inherently governmental statutory responsibility to protect public and worker health and the environment. In the end, contractors are responsible to DOE for the safety of their operations, and DOE is responsible to the President, Congress, and the public.

Last year, NNSA declared a 6-month moratorium on NNSA-initiated functional assessments, reviews, evaluations, and inspections of its contractors. NNSA stated the purpose of the moratorium was to "1) free up resources to be redirected to higher mission direct work; and, 2) to allow NNSA to use available resources to develop an integrated, comprehensive, interdisciplinary oversight approach with an implementing plan consistent with the Secretarial objective to rely more on contractor assurance systems, reduce or eliminate requirements for transactional oversight where not required by law or regulations and rely on rigorous peer reviews." The outcome of this effort was a policy letter issued by NNSA in February of this year, titled *Transformational Governance and Oversight*.

The NNSA policy letter defines an approach to self-regulation that has many positive attributes aimed at focusing federal oversight where it is most needed. The NNSA Administrator's opening message, repeated in Chapter 1 of the policy, commits that, "Rigor and implementation of independent oversight for nuclear and high hazard activities will continue to be maintained and enhanced" under the transformed system of oversight. However, the policy also states the operating principle that "We constantly strive to reduce or eliminate requirements for transactional oversight where not required by statute or the Federal Acquisition Regulation [FAR]..." This principle could be applied in a manner that undercuts the federal role as defined in DOE's current safety directives, because many requirements for federal oversight defined in DOE's directives are not driven by statute or the FAR. The policy later states that as contractors demonstrate the effectiveness of their self-assurance systems, NNSA will "reduce duplicative or transactional oversight in favor of system oversight" but subsequently states that transactional

oversight of nuclear and high-hazard activities would continue.

In parallel with this effort, DOE's Office of Health, Safety and Security (HSS) changed its operational model from the traditional role of performing independent oversight to one that emphasizes assisting line organizations in addressing problem areas in safety and security. DOE's 2010 *Safety and Security Reform Plan* stated that HSS had suspended independent oversight of low-hazard operations except where site performance warranted increased attention, but that rigorous and informed oversight would continue for high-hazard operations. The reform plan stated that DOE's directive on independent oversight—DOE Order 470.2B, *Independent Oversight and Performance Assurance Program*—would be revised to redefine the independent oversight and regulatory enforcement functions of HSS. This revision is still in progress, so the final role of HSS is still being determined. The Board is actively providing input to DOE on this important directive.

The Board believes that there are noteworthy elements in DOE's and NNSA's oversight reform efforts. For example, the Board agrees that DOE should cultivate and maintain the technical expertise within its headquarters organizations to advise line organizations and field elements on safety issues. The Board also agrees that DOE and NNSA should require their contractors to implement and continuously improve assurance systems that drive the safe execution of work. However, contractor assurance systems at defense nuclear facilities have not achieved a degree of effectiveness that would warrant a reduction in federal safety oversight, nor are they expected to in the foreseeable future. It would not be prudent to reduce federal safety oversight of defense nuclear facilities in expectation of future improved assurance by the contractors. Similarly, it is important that DOE and NNSA continue to recognize requirements pertaining to quality assurance, integrated safety management, operating experience/lessons learned, and other such safety programs as essential to ensuring the safety of nuclear and high-hazard activities, and not treat them as "non-nuclear" requirements.

Hanford Waste Treatment and Immobilization Plant:

Ensure the design and construction of the Waste Treatment and Immobilization Plant will enable DOE to stabilize and dispose of Hanford's high-level wastes safely.

The Hanford Waste Treatment and Immobilization Plant (WTP), under design and construction at an estimated cost of more than \$12 billion, is essential to the safe stabilization and disposal of 53 million gallons of high-level waste stored in 177 underground tanks, some of which date back to World War II. DOE began a significant redesign of the facility in 2009, when the design was already more than two-thirds complete and construction of the WTP facilities ranged from about one-quarter to halfway done. The Board is expending a significant portion of its resources evaluating the safety of the revised design, some aspects of which are continuing to evolve. The Board is concerned that some changes are being implemented before outstanding technical issues are resolved.

The Board set forth its concerns in a public hearing held near the Hanford Site on October 7 and 8, 2010. The Board is continuing to evaluate all aspects of the WTP design as it develops; three key safety issues that require prompt resolution are summarized below:

- The unproven effectiveness of the mixing and transfer systems, which are essential to the operation of WTP and are needed to prevent flammable gas from accumulating in process vessels and to prevent accumulations of solids, which could pose a nuclear criticality hazard
- Questions regarding the new control strategy for flammable gas in process systems, which implements a novel application of quantitative risk analysis as a design tool
- The uncertain ability of the Tank Farms to characterize, control, and transfer waste to WTP in compliance with the waste acceptance criteria that need to be met to allow the safe and successful operation of the WTP Pretreatment Facility

After the public hearing, the Board issued Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*, to address unresolved technical concerns related to the mixing and transfer systems in WTP. The Board believes that testing and analysis completed to date has been insufficient to establish with confidence that the pulse jet mixing and transfer systems will perform adequately at full scale, given the solids content and other characteristics of the wastes to be processed. During the Board's public hearing, DOE committed to conduct large-scale testing to better assess the performance of the mixing system before installing the affected vessels in the facility. The Board's recommendation will guide DOE in developing a test plan that resolves all technical issues and should help minimize future delays. DOE is developing a plan to implement the recommendation now, but it is not yet clear whether the plan will be fully responsive to the Board's concerns.

The Board is particularly concerned that DOE's revised strategy for controlling flammable gas in piping and equipment does not credit the safety function of the primary confinement boundary consisting of piping, vessels, and related components to prevent release of radioactive material. The Board also remains concerned about the use of quantitative risk analysis as part of the flammable gas control strategy for WTP. The application of quantitative risk analysis as a risk assessment and design tool is a first use for DOE. DOE has no standards or requirements for the use of quantitative risk analysis, nor for controlling the assumptions that underpin the quantitative risk analysis in the safety basis. If DOE's current approach cannot be shown to be adequate, the design team will need to reestablish active safety controls to prevent flammable gas from accumulating in numerous systems.

Lastly, the Board is concerned regarding the ability of the Tank Farms to supply waste that is compatible with WTP. Because of the limited ability of WTP's pulse jet mixers to handle solids, the amount and size of solid particles in the waste feed need to be controlled to ensure that the mixing and transfer systems in WTP can operate safely and effectively. This will require that the Tank Farms prepare, control, and characterize the feed to ensure it meets the waste

acceptance criteria before it is transferred to WTP. Waste that does not comply with WTP's acceptance criteria will need to be preconditioned in some manner or dispositioned by alternate means.

Impacts of March 11 Earthquake in Japan on Safety at DOE's Defense Nuclear Facilities:
Ensure DOE learns appropriate lessons from the major earthquake that struck Japan.

The review of data from the March 11 earthquake in Japan, as well as other new earthquakes, plays an important role in updating the standards used by DOE and industry to characterize seismic hazards and establish conservative design requirements. DOE has a directive, Order 420.1B Change 1, *Facility Safety*, requiring its contractors to conduct a review of natural phenomena hazard assessments at least every 10 years to determine whether there have been significant changes in methods or data that would, for example, indicate an increase in seismic hazards and seismic design ground motions. Although changes in the assessment of natural phenomena hazards can impact the design requirements of structures, systems, and components for new facilities like the Uranium Processing Facility, the Chemistry and Metallurgy Research Replacement facility, and the Waste Treatment and Immobilization Plant, it is too early to fully understand the impacts of and lessons to be learned from the events in Japan. The Board's review of the design of new defense nuclear facilities focuses on ensuring that adequate safety margin exists to address residual uncertainties with earthquakes and ground motions that some might consider as beyond design basis. The events in Japan clearly validate the need for robust defense-in-depth and emergency response plans to ensure sufficient safety systems are available to address unexpected situations including the potential for release of radioactive material.

Twelve days after the earthquake, the Secretary of Energy issued Safety Bulletin 2011-01, *Events Beyond Design Safety Basis Analysis*, based on reports from the U.S. Nuclear Regulatory Commission that events at the Fukushima Daiichi nuclear power station in Japan appear to have been caused by factors that were outside the design basis for the facility. The

bulletin requires DOE sites with Hazard Category 1 and 2 nuclear facilities (with certain exclusions) to (1) review how beyond design basis events have been considered or analyzed and any controls that have been put in place that could prevent or mitigate them, (2) discuss the ability to safely manage a total loss of power including a loss of backup capabilities, (3) confirm that safety systems are being maintained in an operable condition in accordance with technical safety requirements, and (4) confirm that emergency plans, procedures, and equipment are current, functional, and have been appropriately tested. These reports are due to DOE Headquarters by April 14 for Hazard Category 1 facilities and by May 13 for Hazard Category 2 facilities. The Board will evaluate these reports carefully. The Board has been conducting a focused review of the emergency plans, practices, and drills, including recovery, at the Savannah River Site during the past year and will use DOE's reports in response to the Secretary's safety bulletin to help establish our priorities for reviewing other sites.

Conclusion

I anticipate that the issues I have described are familiar to NNSA and our Congressional oversight committees. They have been previously identified by the Board in public documents, such as letters to DOE and NNSA, reports to Congress that summarize unresolved safety issues concerning design and construction of defense nuclear facilities, the Board's report to Congress on aging facilities, and the Board's Annual Report to Congress. These reports and documents are available for review on the Board's public web site.