Defense Nuclear Facilities Safety Board

24th Annual Report to Congress March 2014

Required by Section 2286e of the Atomic Energy Act of 1954, as amended

"The mission of the Board shall be to provide independent analysis, advice, and recommendations to the Secretary of Energy to inform the Secretary, in the role of the Secretary as operator and regulator of the defense nuclear facilities of the Department of Energy, in providing adequate protection of public health and safety at such defense nuclear facilities." 42 U.S.C. § 2286a(a)

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Washington, DC 20004-2901

March 6, 2014

To the Congress of the United States:

The Defense Nuclear Facilities Safety Board is pleased to submit to Congress its Twenty-Fourth Annual Report for Calendar Year 2013. The Board is an independent executive branch agency responsible for making recommendations to the Secretary of Energy, and in certain cases to the President, necessary to ensure adequate protection of public health and safety at the Department of Energy's defense nuclear facilities.

As required by 42 U.S.C. § 2286e(a), this report describes the Board's current safety initiatives and assesses improvements in the safety of defense nuclear facilities, as well as safety problems yet to be resolved.

Board member Joseph Bader did not participate in the consideration or approval of this report.

Respectfully submitted,

Peter S. Winokur, Ph.D.
Chairman

Jessie H. Roberson
Vice Chairman

Joseph. F. Bader
Member

Sean Sullivan
Member

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IN MEMORIAM

The Honorable Dr. Kenneth L. Mossman, Ph.D.
Defense Nuclear Facilities Safety Board
Member of the Board

April 1946 - January 2014

On July 31, 2013, Dr. Kenneth L. Mossman was nominated by President Barack H. Obama to serve as a member of the Defense Nuclear Facilities Safety Board. He was confirmed by the United States Senate on November 14, 2013, and sworn into office by Dr. Peter Winokur, the Board's Chairman, on November 26, 2013. Immediately upon taking office, Dr. Mossman immersed himself in the Board's efforts to enhance safety at the Department of Energy's defense nuclear facilities. In the short time span of six weeks, he met with members of Congress, the Secretary of Energy, and numerous federal, state, and local officials. Drawing on the experience gained in a long and prestigious academic career, Dr. Mossman brought fresh and valuable perspectives to the Board. He integrated himself quickly and effortlessly into the daily routine of the office and made many friends among his new colleagues. He engaged the Board's staff at all levels, listening to concerns and providing invaluable advice.

Though his time with the Board was brief, Dr. Mossman made a permanent positive contribution. He will be missed by all who interacted with him and will be remembered for his grand sense of humor and fierce dedication to his work. For those wishing to know more about Dr. Mossman's professional career, please visit the Board's website at www.dnfsb.gov.

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Los Alamos Main Gate, Manhattan Project

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I. The Board's Statutory Mission

History and Legislation

The 1970s and 1980s were turbulent decades for the nuclear industry worldwide. In 1975, a serious fire at the Browns Ferry nuclear power station nearly led to a core melt accident. Such an accident did take place four years later at the Three Mile Island power reactor site in Pennsylvania. These two watershed events caused the Nuclear Regulatory Commission to spend much of the 1980s seeking to impose new safety requirements on both operating reactors and reactors under construction. By 1986, much progress had been made, and the nuclear industry was "settling down." In April of that year, however, the Soviet-built Chernobyl nuclear reactor in Ukraine exploded, causing the largest accidental release of radioactive material in history. While safety experts agreed that U.S.-built power reactors did not share the flawed Chernobyl design, there was some concern with graphite-moderated reactors operated by the U.S. Department of Energy (DOE). Broader studies of DOE's defense reactors revealed that safety improvements lagged far behind those being made in the commercial nuclear industry. Congress was also concerned about the slow pace of cleaning up the waste generated by decades of nuclear weapons production.

Beginning in 1987, Congress began to consider legislation imposing some kind of external oversight or regulation of DOE's nuclear operations. Following two years of work by House and Senate committees, a compromise bill emerged based largely on Senator John Glenn's original bill, S. 1085, *Nuclear Protections and Safety Act of 1987*. On September 28, 1988, President Reagan signed a modified bill into law as part of the National Defense Authorization Act for Fiscal Year 1989. The provisions relating to the Defense Nuclear Facilities Safety Board (Board) were later codified in the Atomic Energy Act of 1954, as amended, at 42 U.S.C. § 2286 et seq.

Mission, Jurisdiction, and Powers

The Board is an independent federal agency within the executive branch of government, answerable to the President and subject to congressional oversight and direction. The five Board members, appointed by the President subject to confirmation by the Senate, are required by law to be "respected experts in the field of nuclear safety with a demonstrated competence and knowledge relevant to the independent investigative and oversight functions of the Board."[1] The Board is a collegial agency, meaning that its actions are determined by the Board as a whole. The Board's chairman is chief executive officer.

The Board's essential mission is to advise the Secretary of Energy on measures needed to ensure the safety of DOE's "defense nuclear facilities," a term defined in the Atomic Energy Act of 1954. This advice generally relates to preventing accidents affecting the public, workers,

[1] The Board had its full complement of five members throughout 2013. As of the date of this report, the Board has one vacancy.

or both. Advice may be offered in a variety of ways, from informal exchanges between technical professionals to formal recommendations made on the public record to the Secretary of Energy. Safety measures may pertain to specific DOE facilities and activities or may be directed at the safety requirements and guides employed to regulate nuclear activities. The Board's mission was further defined in a recent amendment of the Board's enabling legislation: "The mission of the Board shall be to provide independent analysis, advice, and recommendations to the Secretary of Energy to inform the Secretary, in the role of the Secretary as operator and regulator of the defense nuclear facilities of the Department of Energy, in providing adequate protection of public health and safety at such defense nuclear facilities." [2]

As noted above, the Board's jurisdiction covers DOE's "defense nuclear facilities." The Atomic Energy Act's definition of this term is somewhat complex, but it can be understood in plain language. The Board is only concerned with facilities operated by DOE that are (1) covered by the Atomic Energy Act and (2) have a function related to national defense. The phrase "defense nuclear facilities" thus excludes two major classes of government-regulated nuclear facilities: DOE's nuclear projects that are civilian in purpose, and commercial nuclear facilities regulated by the Nuclear Regulatory Commission. The Board's oversight jurisdiction does not extend to the U.S. Navy's nuclear propulsion program or to environmental hazards regulated by other federal and state agencies. (The table on page 4 lists the major sites that the Board oversees.)

The Board's oversight mission covers all phases in the life of a defense nuclear facility: design, construction, operation, and decommissioning. During the Board's more than two decades of work, some major sites have closed (such as Rocky Flats in Colorado), while other major facilities have been or are being built (such as the Waste Treatment and Immobilization Plant at Hanford in Washington State).

To carry out the mission outlined above, Congress granted the Board an effective suite of statutory tools. Principal among these is the Board recommendation issued to the Secretary. The statute requires the Secretary to either accept or reject the Board's recommendation, and in the case of an acceptance, to write and execute an implementation plan. This process all takes place on the public record. In cases involving an "imminent or severe threat to public health and safety," the statute requires the Board to also send its recommendation to the President, who makes the final decision on actions to be taken. In addition to recommendations, the Board is empowered to hold public hearings (and subpoena witnesses, if necessary), conduct investigations, demand information and documents needed for the Board's work from DOE and its contractors, and review and comment on DOE requirements and standards affecting safety at defense nuclear facilities. DOE is required by law to grant the Board "ready access to such facilities, personnel, and information as the Board considers necessary to carry out its responsibilities." Finally, the statute authorizes the Board to seek assistance from other federal agencies (such as the Nuclear Regulatory Commission) and from

[2] National Defense Authorization Act for Fiscal Year 2013, inserting 42 U.S.C. § 2286a(a).

organizations outside the government (such as the National Academy of Sciences) on matters relating to the Board's statutory responsibilities.

The National Defense Authorization Act for Fiscal Year 2013 made several changes to the Board's enabling legislation. These changes (a) clarify the relationship between the Board's Chairman and other the Board members; (b) provide a mission statement; (c) require that the Board, in making its recommendations, specifically assess risk whenever sufficient data exists; (d) require that the Board provide the Secretary with drafts of its recommendations and any related findings, supporting data, and analysis for comment prior to final issuance; and (e) mandate that the Board procure inspector general services from a federal agency having expertise in the Board's mission by October 1, 2013.[3]

[3] This inspector general requirement has been superseded by a provision in the Consolidated Appropriations Act for Fiscal Year 2014. See discussion below in Section XI.

Major Sites Subject to Board Jurisdiction

Site	Location	Operations	DOE Website
Hanford Site	Richland, Washington	Cleanup and decommissioning	http://www.hanford.gov
Idaho National Laboratory	45 miles west of Idaho Falls, Idaho	Storage and processing of radioactive waste	http://www.inl.gov
Lawrence Livermore National Laboratory	Livermore, California	Research to support the nuclear weapons arsenal	https://www.llnl.gov
Los Alamos National Laboratory	Los Alamos, New Mexico	Research to support the nuclear weapons arsenal; manufacturing of nuclear weapon components	http://www.lanl.gov
Nevada National Security Site	Northwest of Las Vegas, Nevada	Disposition of damaged nuclear weapons; nuclear fission and subcritical experiments; waste management	http://www.nv.energy.gov
Oak Ridge National Laboratory	Oak Ridge, Tennessee	Energy research; treatment and disposal of radioactive wastes	http://www.ornl.gov
Pantex Plant	Near Amarillo, Texas	Maintenance of the U.S. nuclear stockpile	http://nnsa.energy.gov/fieldoffices/npo
Sandia National Laboratories	Albuquerque, New Mexico	Nuclear research; support for weapons stockpile maintenance program	http://www.sandia.gov
Savannah River Site	Aiken, South Carolina	Tritium extraction, recycling and storage; management and treatment of radioactive wastes; nuclear materials storage and disposition; research and development	http://www.srs.gov
Waste Isolation Pilot Plant	26 miles east of Carlsbad, New Mexico	Disposal of transuranic waste in underground repository	http://www.wipp.energy.gov
Y-12 National Security Complex	Oak Ridge, Tennessee	Manufacturing/surveillance of nuclear weapons components; processing weapons-grade uranium	http://nnsa.energy.gov/npo

II. Highest-Priority Safety Problems

Earthquake Hazard at Los Alamos National Laboratory

The risk posed by the Plutonium Facility (PF-4) at the Los Alamos National Laboratory remains among the Board's greatest safety concerns. PF-4 was designed and constructed in the 1970s, and its structure lacks the ductility and redundancy required by today's building codes and standards. A 2007 reanalysis of potential earthquakes at Los Alamos indicated a greater than fourfold increase in the predicted earthquake ground motion. PF-4 contains significant amounts of plutonium, much of it in dispersible forms such as powders and liquids stored in containers not certified to survive facility collapse. The facility's safety documentation, approved by the National Nuclear Security Administration (NNSA) in December 2008, indicated that the radiation dose consequence to the public following an earthquake and resulting fire could exceed DOE's allowed levels by several orders of magnitude.

On October 26, 2009, the Board issued Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety*, to focus the attention of DOE and NNSA leadership on the need to address the danger posed by an earthquake and subsequent fire at PF-4. In response, the laboratory undertook a series of actions to improve the safety posture of this facility. These actions included efforts to strengthen the structure of the building and to reduce the likelihood and severity of a post-seismic fire.

Plutonium Facility (PF-4, in foreground)

In 2011, the laboratory contractor discovered that the increase in the seismic ground motion postulated in the updated probabilistic seismic hazard analysis for the site could lead to collapse of PF-4, amplifying the Board's concerns regarding a seismic event at PF-4. NNSA's initial modeling of this accident identified structural vulnerabilities that could fail and result in loss of confinement capability or collapse. Subsequently, the laboratory contractor initiated upgrades to address the vulnerabilities. NNSA also sponsored a more detailed seismic analysis to further refine PF-4's response to a major earthquake. The analysis, completed in September 2012, identified two additional weaknesses that could result in collapse. The laboratory has begun physical modifications to the facility to address these weaknesses, with an initial completion target date of March 2016.

The Board expressed concern to the Deputy Secretary of Energy in a letter dated July 18, 2012, that this latest analysis was proceeding without adequate definition and technical justification. Subsequently, the Deputy Secretary of Energy directed NNSA to evaluate PF-4

using a second modeling approach. This alternate analysis is currently being performed by an independent engineering firm. Results are expected in early 2014.

On January 3, 2013, the Board issued a letter to the Secretary of Energy urging implementation of additional near-term measures to protect the public while analyses are under way. In a letter to the Board dated March 27, 2013, the Secretary identified near-term actions being taken. The Secretary asserted that, notwithstanding its known vulnerabilities, PF-4 is safe because it meets DOE's standard for providing confinement of radioactive materials. The Board responded by letter on July 17, 2013, challenging the validity of the methodology supporting the Secretary's conclusions. However, the Board decided to await the results of the alternative analysis before taking further action.

Criticality Safety at the Los Alamos Plutonium Facility

Since 2005, NNSA has recognized that the Los Alamos National Laboratory's criticality safety program does not fully comply with applicable requirements. Recently, a severe staffing shortage in the laboratory's criticality safety group has inhibited progress in correcting the deficiencies in this program. In May 2013, the Board's staff conducted a review of the criticality safety program at PF-4. The staff review team identified several new criticality safety concerns, including widespread weaknesses in conduct of operations. Specifically, the Board staff's concerns included the following: (a) many procedures did not include criticality safety controls, (b) operators typically did not utilize written procedures when performing fissile material operations, (c) packages containing fissile material were not labeled with parameters relevant to criticality safety, and (d) some credible abnormal conditions were not properly analyzed in criticality safety evaluations.

Subsequent to this review, the laboratory performed an extent-of-condition assessment that found additional deficiencies in criticality safety and conduct of operations, including several instances where operating procedures could not be executed as written. On June 27, 2013, the laboratory director paused all programmatic activities in PF-4. The pause remains in effect as of the date of this report.

On July 15, 2013, the Board issued a letter and report to the Secretary of Energy to assist NNSA in improving criticality safety and conduct of operations at Los Alamos. The Board's letter requested that NNSA provide a report and briefing on root causes and planned corrective actions, including actions to improve federal oversight of criticality safety and conduct of operations.

Manufacturing Operations at PF-4

On December 6, 2013, NNSA provided a report from the laboratory contractor to the Board that described the root causes of recent criticality safety infractions and detailed actions to be taken prior to resuming operations. These actions include (a) ensuring that operating procedures can be performed as written, (b) incorporating criticality safety controls into operating procedures, (c) designating important operating procedures as "Use Every Time" procedures, (d) reducing the plutonium mass limits to the minimum needed for specific operations, and (e) delivering refresher training on criticality safety and conduct of operations to all fissile material handlers.

The laboratory contractor plans to resume programmatic operations in PF-4 methodically, beginning with operations involving the lowest criticality safety risk. NNSA assigned a senior criticality safety expert as a technical advisor to the laboratory director during resumption activities. Meanwhile, NNSA is pursuing a causal analysis to evaluate why the contractor's problems at Los Alamos persisted for so long without federal action. NNSA believes this analysis can be used to strengthen federal oversight and ensure sustained resolution of criticality safety issues.

Early Integration of Safety in Design

During 2013, DOE made progress in resolving certain safety issues affecting complex design and construction projects. On other issues, however, DOE encountered problems with closure and integration of safety into the design process. In one instance, the Board's review of revised safety basis documentation for the Uranium Processing Facility (Y-12 National Security Complex) revealed that while NNSA had made progress in resolving prior safety issues, new issues concerning the effectiveness of safety controls required additional action. In an August 26, 2013, letter to NNSA, the Board questioned whether safety controls such as the facility's fire suppression system would function as intended to protect workers and the public from accidents involving the release of radioactive and toxic materials. In response, NNSA committed to ensure the effectiveness of such controls before beginning construction.

DOE continued to struggle with open safety issues at the Waste Treatment and Immobilization Plant at the Hanford Site. Beginning in 2012, DOE slowed the construction of two of the plant's key facilities—Pretreatment and High-Level Waste—to resolve safety issues and to reevaluate the project's design. Many of these issues have been outstanding for years.

The Board supports DOE's efforts to integrate safety concepts at an early stage in design and construction projects. To this end, the Board uses "project letters" to provide timely notification of safety issues to DOE. Project letters are often issued prior to major project milestones (known as "Critical Decisions") to ensure that DOE is aware of unresolved safety issues and to assist DOE in evaluating the readiness of a project to move forward. During 2013, the Board completed a review of the conceptual design and safety documentation for the Transuranic Waste Processing Center Sludge Processing Facility Buildouts Project at Oak Ridge National Laboratory. In anticipation of DOE's approval of Critical Decision-1, the Board sent DOE

a project letter on November 8, 2013, identifying safety risks that the project will need to address in the future.

Revision of DOE Standard 3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*

One of the major actions in DOE's implementation plan for the Board's Recommendation 2010-1, *Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers*, is to revise and improve DOE Standard 3009 so that it clearly identifies safety requirements. The revision is significantly behind the original implementation plan schedule, and the latest draft fails to meet a number of commitments made by the Secretary when he partially accepted the recommendation. On July 24, 2013, the Board issued a letter to the Secretary of Energy requesting an updated schedule and a report on how DOE would meet the commitments of its implementation plan. Based on DOE's response dated September 20, 2013, the Board expects to receive a final version of the revised standard for review in early 2014. Completing a revised standard with a clear and comprehensive set of safety requirements and implementing it across the defense nuclear facilities complex should improve the overall safety posture significantly.

Integrated Safety Management at the Activity Level

From 2008 to 2012, the Board's staff conducted reviews at all of DOE's defense nuclear facility sites to evaluate the implementation of Integrated Safety Management at the activity/worker level. Integrated Safety Management is the process by which DOE and its contractors integrate safety into management and work practices at all levels so that missions are accomplished while protecting the public and the workers. Effective planning of work at the activity level is based on the development of effective procedures to perform work safely and the ability of workers to follow those procedures as written. This planning involves implementing the five core functions of Integrated Safety Management: (1) defining the scope of work, (2) analyzing the hazards, (3) developing and implementing hazard controls, (4) performing work within those controls, and (5) providing feedback and continuous improvement.

As the final product of these reviews, the Board transmitted DNFSB/TECH-37, *Integrated Safety Management at the Activity Level: Work Planning and Control,* to DOE in August 2012. DNFSB/TECH-37 concluded that DOE had not achieved sustained improvement in implementing Integrated Safety Management at the activity level. In the Board letter accompanying the report, the Board stated that it believes "this is in large part due to a lack of formalized requirements and guidance within DOE's directives system and the resulting lack of DOE and contractor oversight in this area."

DOE provided its written response to the Board's letter and technical report in December 2012 and briefed the Board in January 2013 on an action plan for improvements. DOE's action plan included (a) development of a new DOE directive providing comprehensive

guidance for contractors, (b) revision of DOE's directive on oversight to explicitly address this area, (c) evaluation of operating experience, (d) holding of a complex-wide workshop, and (e) emphasis by DOE senior management on increasing the rigor of oversight. The Board's staff closely followed these efforts, providing comments to assist and enhance the resulting products. By December 2013, DOE was completing final review of the new and revised directives and had completed the other planned actions. At year's end, DOE submitted a report to the Board on the effectiveness of the actions taken in response to DNFSB/TECH-37. This report is under review.

Longevity of High-Level Waste Storage Systems

Stabilization and final disposition of the remnants of nuclear weapons production are essential tasks to protect the public. DOE stores more than 50 million gallons of high-level radioactive waste in 177 underground tanks at the Hanford Site. Many of the old single-shell tanks have been known to leak. As a result, DOE transferred most of the liquid waste in those tanks to newer double-shell tanks. The Board has been following DOE's plans for leaking tanks and the impact these tanks have on DOE's overall waste retrieval, treatment, and disposition strategy. In August 2012, DOE discovered that waste in double-shell tank AY-102 was leaking into the tank's secondary containment. This situation reinforces the need to retrieve and treat the tank waste and for vigilance in maintenance and safe operations in the Hanford Tank Farms for the foreseeable future, including maintaining ventilation as a safety-significant system to prevent flammable gas from accumulating in the tanks. The Board believes that prolonged storage of waste in the Hanford Tank Farms represents a potential threat to public health and safety.

Aerial View of F-Tank Farm, Savannah River Site

At the Savannah River Site, DOE stores about 37 million gallons of high-level waste in tanks. DOE is processing and stabilizing this waste, but will need to continue safely storing it for years to come because of the sheer volume. During 2013, the Board's staff reviewed how DOE is managing and maintaining ventilation systems in the Tank Farms. As at Hanford, ventilation is a key safety system that prevents flammable gas from accumulating in the tanks and also provides containment and filtration of airborne radioactive contamination. In the recent past, however, cracked ductwork, failed reheaters, and a release of contamination through the stack have indicated that this system is not entirely reliable. DOE and its contractor are facing challenges in maintaining these aging systems, but so far they have been able to handle failures by replacing vulnerable components.

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III. Recommendations Open in 2013

Recommendation 2000-1, *Prioritization for Stabilizing Nuclear Materials*

The Board closed this recommendation on December 19, 2013.

DOE has adequately addressed the safety-related concerns that warranted issuing this recommendation. Forty-seven of the 50 commitments contained in DOE's implementation plan are complete, and the three remaining commitments are either part of an established project or part of a formal consent agreement with a state government. The Board will continue to follow implementation using its normal safety oversight processes.

Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*

The Board closed this recommendation on October 17, 2013.

In Recommendation 2002-3, the Board sought to strengthen administrative controls used to assure safety at defense nuclear facilities. In response to the recommendation, DOE developed new requirements, standards, and training to ensure that administrative controls are reliable and effective. DOE has completed all of the commitments identified in the implementation plan for the recommendation and verified implementation of the new requirements across the defense nuclear complex.

Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*

The Board issued Recommendation 2004-1 in May of 2004 to address concerns with changes in DOE's organizational structure and safety practices. The recommendation covered these matters: delegation of authority for nuclear safety matters; technical capability of federal officials with safety responsibilities; Central Technical Authorities for decisions affecting safety; nuclear safety research; application of lessons learned from significant accidents; and application of the principles of Integrated Safety Management. While DOE has met most of the commitments in its implementation plan, all remaining commitments are overdue. These remaining commitments concern research and development for nuclear safety, guidance on safety oversight, and verification of DOE's federal safety assurance capability. In 2012, DOE established a committee on nuclear safety research and development. DOE is working on a process to identify department-wide needs for nuclear safety research and development and to assess the extent to which those needs are being addressed. During 2013, DOE continued to implement the commitment associated with nuclear safety research and development and began the process of revising its guide for federal oversight of nuclear facilities.

Recommendation 2004-2, *Active Confinement Systems*

DOE has completed its evaluation of confinement systems for all pertinent defense nuclear facilities in accordance with its implementation plan. As a result of this evaluation, deficiencies and weaknesses in confinement safety of many facilities were identified. The necessary physical modifications for some facilities have been completed, but others are either ongoing or scheduled for the future, pending availability of funding. Some modification schedules extend to 2018. DOE also revised safety directives to ensure future defense nuclear facilities will be designed to confine potential accidental releases adequately. The remaining deliverable from DOE's implementation plan is a final report that captures physical modifications and upgrades resulting from Recommendation 2004-2, including plans for funding and schedule. The Board will evaluate the final report and will then consider closing the recommendation.

Recommendation 2005-1, *Nuclear Material Packaging*

The Board issued Recommendation 2005-1 to improve protection for workers involved in the storage and handling of nuclear materials. In September 2009, DOE provided the final implementation plan deliverable—a DOE-wide plan and schedule for implementing DOE Manual 441.1-1, *Nuclear Material Packaging Manual.* In 2013, the Board continued to provide oversight of DOE's efforts to qualify containers to the requirements of the Packaging Manual. In April, safety analysts at Los Alamos National Laboratory submitted a second revised safety analysis for a new plutonium storage container to NNSA's Office of Packaging and Transportation for review and comment. At the end of 2013, the Office of Packaging and Transportation was working to resolve comments on the revised safety analysis.

Several other sites also plan to use this new container once it is approved. For this reason, the Office of Packaging and Transportation developed a safety guide for sites other than Los Alamos National Laboratory that are planning on packaging nuclear material into the new containers. This safety guide, released in August 2013, will help other sites by providing a checklist of requirements addressing those aspects of site-specific materials and container hazards not covered by the safety analysis developed for container use at Los Alamos National Laboratory.

DOE personnel have been developing an update to the September 2009 DOE-wide plan and schedule for implementing the Manual.

New Plutonium Storage Container

Recommendation 2007-1, *Safety-Related In Situ Nondestructive Assay of Radioactive Materials*

The Board closed this recommendation on March 19, 2013.

The recommendation was issued in response to unexpected accumulations of fissile material in processing equipment at Hanford and the Y-12 National Security Complex. The Board recommended that DOE develop standardized requirements for performing nondestructive assay measurements and place a higher priority on research and development for nondestructive assay instrumentation and measurement techniques. In response, DOE performed complex-wide reviews to identify and disseminate best practices and weaknesses in its nondestructive assay programs. DOE is now developing a standard that provides requirements and guidance for improving its nondestructive assay program in the areas of training and qualification, equipment capabilities, quality assurance, and oversight. In October 2012, DOE communicated to the Board that it had completed the actions identified in its implementation plan.

Recommendation 2008-1, *Safety Classification of Fire Protection Systems*

The Board closed this recommendation on April 22, 2013.

Recommendation 2008-1 identified the need for standards governing the design and operation of fire protection systems relied upon to protect the public and workers from radiological hazards at defense nuclear facilities. DOE completed the required deliverables in the implementation plan for the recommendation and issued DOE Standard 1066-2012, *Fire Protection*, in late 2012. This standard presents a comprehensive set of safety-related attributes for wet-pipe fire sprinklers, fire water supplies, and fire barriers. DOE also issued DOE Order 420.1C, *Facility Safety,* with appropriate references to Standard 1066-2012 for guidance on meeting DOE's fire protection requirements.

Recommendation 2009-1, *Risk Assessment Methodologies at Defense Nuclear Facilities*

The Board closed this recommendation on January 28, 2014.

In Recommendation 2009-1, the Board pointed out that DOE needed policies, standards, and guidance to govern use of quantitative risk assessment methodologies at defense nuclear facilities. In response, DOE issued in 2010 a complex-wide information notice discussing allowable uses of risk assessment. In April 2011, DOE issued a new departmental policy on nuclear safety that explained the appropriate use of quantitative and probabilistic risk assessment. In November 2013, DOE issued DOE Standard 1628-2013, *Development of Probabilistic Risk Assessments for Nuclear Safety Applications*. On December 23, 2013, DOE reported that it had completed all commitments in the implementation plan.

Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety*

The Board issued Recommendation 2009-2 on October 26, 2009, to focus DOE and NNSA management's attention on the risk posed by an earthquake and subsequent fire at the Los Alamos Plutonium Facility. The Secretary of Energy provided an implementation plan for the recommendation on July 13, 2010. NNSA took several actions to reduce risk, including reduction of the quantity of nuclear materials in the facility, implementation of new controls on combustible material loading and operation of furnaces, installation of robust storage safes, and installation of other seismic upgrades. NNSA continued to work on analyses and upgrades during 2013. The recommendation remains open because of the extended timeframe for upgrade of the active confinement ventilation system and because additional controls or structural upgrades may be required to address seismic vulnerabilities identified by the ongoing analyses of the structure.

Recommendation 2010-1, *Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers*

The Board and DOE worked together in 2013 to better implement Recommendation 2010-1. DOE prepared a draft revision to DOE Standard 3009, *Criteria and Guidance for Preparation of U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, one of its most important technical standards for compliance with 10 CFR Part 830, *Nuclear Safety Management*. However, in its review of the final draft revision of the standard, the Board found technical flaws and deviations from the commitments made by DOE in its implementation plan for this recommendation. The Board communicated these observations to the Secretary of Energy in a letter dated July 24, 2013. The Board also noted that DOE had not met many elements of the implementation plan for the recommendation. In a response dated September 20, 2013, the Deputy Secretary of Energy provided a revised implementation plan schedule that extended completion of some actions by more than two years (to early 2016). The technical issues and deviations from the commitments in the implementation plan have not been resolved and require further dialogue with DOE.

Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*

On December 17, 2010, the Board issued Recommendation 2010-2 to resolve potential nuclear safety hazards at the Hanford Waste Treatment and Immobilization Plant. The recommendation focused on the need for large-scale testing, representative simulants, and representative sampling to demonstrate the performance of mixing and transfer systems. DOE submitted its implementation plan on November 10, 2011, and the Board accepted it on January 19, 2012. Subsequently, DOE's testing program obtained results that were inconsistent with an important assumption in the implementation plan. In a November 8, 2012, letter, the Secretary of Energy informed the Board that a full-scale testing program would become the new technical basis for implementing the recommendation. This change in strategy requires a major revision of DOE's implementation plan. On July 15, 2013, the Board transmitted a letter to the Secretary of Energy requesting a schedule for completing the implementation plan

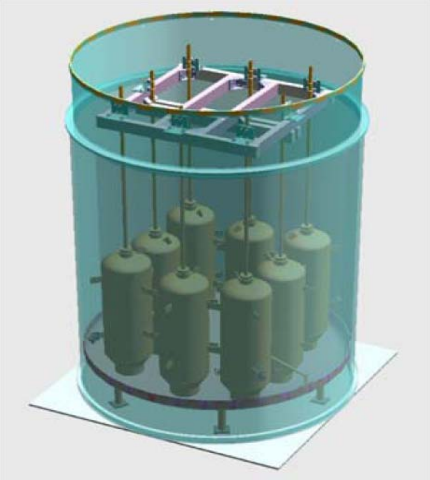


Illustration Showing Pulse Jet Mixers in Process Vessel

revision and additional details on the new strategy for demonstrating reliable operation of the mixing systems. The Deputy Secretary of Energy responded on September 11, 2013, with a letter containing a schedule for Secretarial approval of a revised implementation plan by the end of February 2014.

The Board closed this recommendation on January 28, 2014, based on its determination that DOE's new technical approach rendered the individual sub-recommendations of Recommendation 2010-2 no longer relevant. The Board is continuing to monitor and evaluate data on DOE's new technical approach to resolve the safety-related issues with pulse jet mixing.

Recommendation 2011-1, *Safety Culture at the Waste Treatment and Immobilization Plant*

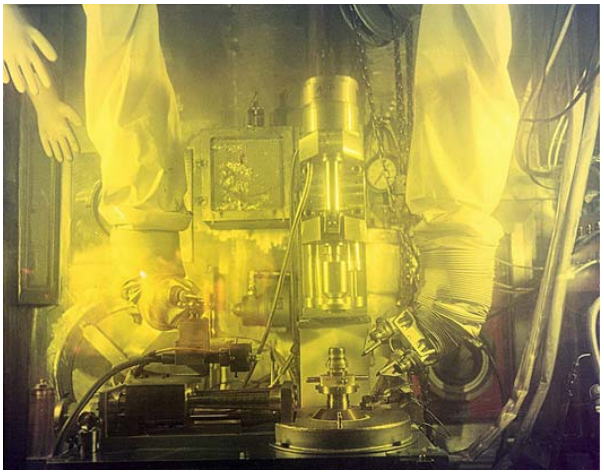
The Board issued Recommendation 2011-1 following an investigation into the safety culture of the Waste Treatment and Immobilization Plant project at the Hanford Site. DOE submitted its implementation plan for the recommendation to the Board in December 2011 and provided an addendum describing additional actions in September 2012. DOE completed a number of actions from the implementation plan during 2013, many of which focused on working to achieve and reinforce a safety-conscious work environment at Hanford and across DOE's defense nuclear complex. On November 25, 2013, DOE reported to the Board that it had completed the commitment to develop and deliver training to personnel across the complex on the safety-conscious work environment. Between August 2012 and August 2013, the course was delivered 70 times to approximately 1,700 DOE and contractor managers and leaders at DOE headquarters and sites across DOE's complex. Approximately 1,400 of the attendees were associated with leadership and management of defense nuclear facilities.

DOE's site offices and contractors, using guidance issued by DOE headquarters and with the support of DOE's Office of Health, Safety and Security, undertook self-assessments of the safety-conscious work environment across the complex. These assessments identified numerous areas needing attention. DOE is analyzing the results and determining follow-on actions. Members of the Board's staff are reviewing the self-assessments to determine if they were performed consistently across the complex.

Recommendation 2012-1, *Savannah River Site Building 235-F Safety*

In May 2012, the Board issued Recommendation 2012-1, which identified the need for DOE to remove or immobilize the residual plutonium-238 contamination located within Building 235-F. The purpose of this task is to mitigate the hazard posed by the material's physical form and significant quantity, thus protecting more than 1,000 site workers located

nearby. This recommendation also identified the need for near-term actions and compensatory measures to improve the safety posture of Building 235-F while cleanout work is being planned. The Secretary of Energy provided DOE's implementation plan to the Board on December 5, 2012. Actions completed per the plan in 2013 included further reducing combustible materials in the building and conduct of emergency response drills for workers in the area. In addition, DOE developed a plan for deactivating (i.e., cleaning out) the building and approved a safety basis to support initiation of deactivation activities and the removal of residual contamination. It is not clear, however, that DOE will be able to maintain the schedule outlined in the implementation plan because of budgetary constraints.



Glovebox Cell in Building 235-F, Savannah River Site

Recommendation 2012-2, *Hanford Tank Farms Flammable Gas Strategy*

Recommendation 2012-2 identified the need for safety-related ventilation systems to aid in preventing and mitigating flammable gas events for the double-shell tanks at the Hanford Tank Farms. The recommendation also identified the need to upgrade a number of other systems that are necessary to provide accurate and reliable indications of abnormal conditions associated with flammable gas events. DOE accepted the recommendation and developed an implementation plan to address the Board's concerns. On July 17, 2013, the Board accepted DOE's implementation plan.

IV. Emergency Preparedness, Response, and Recovery

The Board continues to stress the importance of emergency preparedness and response. Especially critical is the capability of defense nuclear facilities to prepare for and respond to severe events and "beyond design basis" events such as the earthquake and tsunami that caused great damage to the Fukushima Daiichi Nuclear Power Plant. The Board has made a practice of including emergency preparedness and response as a panel session topic at its public hearings on the safety of operations at defense nuclear facilities.

At the Board's public hearing in Amarillo, Texas, held on March 14, 2013, the Board questioned a panel of NNSA and contractor witnesses about the Pantex Plant's preparedness for responding to severe operational or natural phenomena events. The discussion covered the types of severe events that Pantex has identified and analyzed, as well as the scope of emergency drills and exercises. As part of their response to Board questions, contractor personnel committed to conducting an exercise that would assess the termination and recovery phases of emergency response. The Board also examined the effectiveness of drills and exercises conducted at Pantex and the evaluation and implementation of corrective actions found to be necessary. NNSA and contractor personnel, acknowledging that the strategy used to evaluate past exercises was flawed, committed to upgrade the strategy and re-evaluate past exercises. After the public hearing, the Board sent additional questions to NNSA regarding emergency preparedness and response at Pantex. In a June 12, 2013, response to these questions, the NNSA Production Office manager clarified responses and reiterated commitments made during the public hearing.

Emergency Services, Pantex Plant

Preparation for severe events at the Y-12 National Security Complex was the major focus of one of the panel sessions at the Board's public hearing in Knoxville, Tennessee, on December 10, 2013. Questions from the Board members addressed planning for severe events such as cascading or multiple facility events and exercises to evaluate the effectiveness of preparations. The Board focused on analysis of the consequences of events that affect multiple facilities, actions developed to address these events, and how emergency response personnel have been prepared to take the necessary actions and prioritize resources when cascading events overwhelm emergency response resources. The Board also focused on the condition of emergency response facilities and their survivability and habitability after a severe event and coordination of emergency response by multiple stakeholders.

Throughout the year, the Board's site representatives and other members of the Board's staff conducted reviews to improve emergency preparedness and response capabilities at DOE sites. These reviews included observations of exercises and drills at various DOE sites, as well as programmatic reviews of emergency preparedness and response programs at DOE sites. The scope of these programmatic reviews was not limited to a site's preparation for severe events, but extended to the site's overall emergency preparedness and response program and associated facilities and equipment. The Board's staff also provided input directly to DOE's staff assigned to regulate emergency preparedness and response at DOE sites. This input included feedback on proposed DOE guidance on severe events and observation of independent assessments conducted by DOE's Office of Health, Safety and Security at Lawrence Livermore National Laboratory, the Hanford Site, and the Nevada National Security Site.

Emergency Operations Center, Los Alamos National Laboratory

V. Nuclear Weapon Operations

The Board and DOE share a common goal of ensuring the safety of DOE's nuclear weapon operations. These operations include making nuclear weapon components, disassembling active weapons for surveillance and maintenance, reassembling weapons for deployment by the armed forces, and taking apart retired weapons. The Board also provides safety oversight of the handling and storage of special nuclear material and tritium, and of DOE's nuclear weapon research and development work.

Nuclear Explosive Operations, Pantex Plant

The Pantex Plant's primary mission is to assemble, disassemble, examine, and dismantle nuclear weapons. These activities must be given the highest level of safety oversight because an accident could result in a nuclear detonation or detonation of high explosives that disperses special nuclear material. Personnel in NNSA's nuclear explosive safety program are responsible for ensuring all operations meet the required standard of safety for these high-hazard operations.

Hazard Analyses for Nuclear Weapon Operations. In a letter dated April 5, 2011, the Board identified a concern that NNSA design agencies were not adequately documenting the analyses used to develop safety controls for nuclear weapon operations at Pantex, as required by DOE-NA-STD-3016, *Hazard Analysis Reports for Nuclear Explosive Operations*. NNSA replied to the Board on August 3, 2011, stating that it would review the design agencies' processes for implementing DOE-NA-STD-3016 to ensure their effectiveness and adequacy. This review remains incomplete. During 2013, the Board's staff evaluated an updated analysis for operations on the W76 weapon program and found technical inconsistencies leading to disparate controls for similar nuclear explosive hazards. The Board was briefed on the matter by senior NNSA leaders, who are reinvigorating NNSA's review of the implementation of DOE-NA-STD-3016.

Safety Controls for "Falling Man" Scenarios. In 2013, consistent with its own standards, NNSA led an expert panel known as a Nuclear Explosive Safety Study ("NESS") Group to review conditions at Pantex. The Study Group called for immediate action to address deficiencies in the hazard analyses of potential consequences caused by a falling worker during nuclear explosive operations. On August 14, 2013, NNSA management downgraded the majority of the findings related to "falling man" deficiencies such that no immediate actions were required. NNSA did not provide a technical justification for the downgrade, despite the fact that the Board specifically addressed the need for technical justification of NESS Group downgrades at a public hearing held in Amarillo on March 14, 2013. On November 25, 2013, the Board received a briefing by NNSA representatives, who described an effort to update the directives controlling the nuclear explosive safety process and stated that the Board's concerns would be considered.

Operations and Infrastructure, Y-12 Nuclear Security Complex

Work Planning and Control and Conduct of Operations. On December 29, 2011, the Board sent a letter to NNSA identifying safety concerns regarding deficiencies in activity-level work planning and control at Y-12. NNSA and the Y-12 contractor have been working to address the deficiencies noted by the Board. This year, the Y-12 contractor led an independent assessment of work planning and control and conduct of operations. The contractor's assessment concluded that conduct of operations had improved to the desired level of performance, but that progress to address deficiencies in work planning and control was slower than desired. The Board followed up on this issue during its December 10, 2013, public hearing in Knoxville, Tennessee.

Aging Infrastructure. Since 2005, the Board has been following DOE's efforts to address known vulnerabilities related to the age of existing defense nuclear facilities at Y-12. Of particular concern is the seismic vulnerability of certain enriched uranium production facilities. In August 2013, DOE fulfilled an annual reporting requirement on the safety of continued operations and briefed the Board regarding the condition of Buildings 9212, 9215, and 9204-2E. Members of the Board's staff conducted two reviews in 2013 to evaluate the confinement ventilation systems and electrical distribution systems in Buildings 9215 and 9204-2E. During the December 10 public hearing, the Board received testimony on safety risks of existing facilities and NNSA's plans for a modern replacement facility.

Safety Analysis and Controls, Lawrence Livermore National Laboratory

On August 30, 2012, the Board issued a letter to NNSA identifying systemic deficiencies in nuclear safety control strategies at the Tritium Facility and the Plutonium Facility at Lawrence Livermore National Laboratory. In response to the Board's letter, NNSA committed to review the processes for development, review, and approval of safety basis documents at both the laboratory and the NNSA field office. The reviews, completed in 2013, identified recommendations that should result in an improved safety basis for nuclear operations.

In 2013, the Board's staff began to evaluate NNSA's work to develop an update of the probabilistic analysis of earthquake hazards for Lawrence Livermore. The existing analysis dates back to 2002; DOE requirements specify updates every 10 years. The update effort includes reviewing seismic source characterization, equations that predict ground motion, site characterization, and final hazard calculations.

Earthquake Hazard and Waste Disposition, Los Alamos National Laboratory

Earthquake Hazard at the Plutonium Facility. As the location for plutonium processing, purification, and component fabrication, PF-4 at Los Alamos National Laboratory plays a unique role in supporting NNSA's mission. The Board remains very concerned about the risk posed by PF-4's seismic vulnerability and intends to work closely with NNSA to ensure the adequate

protection of workers and the public in Los Alamos. (See Section II above for a detailed discussion.)

Transuranic Waste Disposition. Subsequent to the 2011 Las Conchas wildfire, DOE reached a "Framework Agreement" with the State of New Mexico. The Agreement would accelerate removal of 3,706 cubic meters of above-ground transuranic waste located at Los Alamos National Laboratory's Area G by June 30, 2014. This effort, known as the 3706 Campaign, required a significant increase in the rate of waste processing while implementing new waste remediation processes. Due to the heightened risk associated with increased waste throughput and the startup of new waste processing activities, the Board's staff placed priority on observing Area G waste activities in 2013.

Members of the Board's staff observed the contractor's readiness assessment and conduct of operations for waste sorting, size reduction, and repackaging operations in Dome 375 of Area G. The staff team identified deficiencies in supervisory oversight and communication with workers. The Board's staff then conducted a second review, focused on conduct of operations at Area G. The review team noted numerous deficiencies and opportunities for improvement in the conduct of operations. The staff team communicated the issues from both reviews to NNSA, which took corrective actions in response.

Aerial View of Area G, Los Alamos National Laboratory

On November 19, 2012, the Board issued a letter to NNSA regarding the safety basis for Area G. In this letter, the Board noted inconsistencies between the safety basis and the objectives described in DOE standards. These inconsistencies caused an underestimation of the radiological dose consequence of potential accidents, leading to an inadequate control set to protect the public and the workers. In its January 16, 2013, response, NNSA committed to resolving the majority of the Board's issues during the next safety basis update, while deferring certain issues to future updates. The updated safety basis resolves the Board's most important concerns; the Board's staff is working with laboratory personnel to resolve the remaining issues.

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VI. Design and Construction

New Facilities

The Atomic Energy Act requires that the Board review the design and construction of new defense nuclear facilities to ensure the adequate protection of the public health and safety during eventual operation. The Board uses a variety of methods to carry out this function, including detailed reviews by the Board's technical staff, public hearings, requests for information, and visits by Board members to construction sites. Currently, the Board is actively overseeing the design and construction of 10 new defense nuclear facilities with a projected total cost of approximately $25 billion dollars. The Board is waiting to see what action DOE takes on several other projects that are on hold or have been deferred. The table below lists DOE's design and construction projects, the status of each project, and the status of the Board's review.

Design and Construction Projects Under Review

Project Name	Location	Projected Cost	Status of Project	Status of Board Review
Waste Treatment and Immobilization Plant	Hanford Site, Richland, WA	$12.3 billion	Concurrent design and construction	Multiple open safety issues
K-Basin Closure Sludge Treatment Project	Hanford Site, Richland, WA	$280 million	Phase 1: Final design Phase 2: Conceptual design	Ongoing – one open safety issue
Integrated Waste Treatment Unit	Idaho National Laboratory, ID	$571 million	Construction complete, conducting performance testing	Ongoing – no current safety issues
Chemistry and Metallurgy Research Replacement Project	Los Alamos National Laboratory, NM	$3.7–5.8 billion (under DOE review)	Final design	Project suspended by DOE during 2012
Radioactive Liquid Waste Treatment Facility Upgrade Project– Transuranic Liquid Waste Facility	Los Alamos National Laboratory, NM	$62–96 million	Preliminary design	Ongoing – no current safety issues

Design and Construction Projects Under Review (cont.)

Project Name	Location	Projected Cost	Status of Project	Status of Board Review
Transuranic Waste Facility Project	Los Alamos National Laboratory, NM	$107 million	Final design	Ongoing – one open safety issue
Transuranic Waste Processing Center Sludge Processing Facility Buildouts Project	Oak Ridge National Laboratory, TN	> $100 million	Preliminary Design	Ongoing – no current safety issues
Salt Waste Processing Facility	Savannah River Site, Aiken, SC	$1.34 billion	Construction	Ongoing – no current safety issues
Waste Solidification Building	Savannah River Site, Aiken, SC	$414 million	Construction	Ongoing – no current safety issues
Uranium Processing Facility	Y-12 National Security Complex, Oak Ridge, TN	$4.2–6.5 billion	Preliminary Design	Multiple open safety issues

Hanford Site, Waste Treatment and Immobilization Plant

The Waste Treatment and Immobilization Plant (sometimes referred to as the Waste Treatment Plant) is a $12 billion radiochemical processing facility. DOE began work on this project in the late 1990s. Its purpose is to treat 56 million gallons of radioactive and toxic waste stored in 177 underground tanks at the Hanford Site near Richland, Washington. As currently designed, the plant will chemically separate waste retrieved from the tanks into two streams of differing radioactive hazard—low-activity waste and high-level waste—and solidify them into glass in stainless steel canisters. DOE will dispose of the low-radioactivity glass onsite and will ship the high-level waste glass offsite for permanent disposal once a repository is available. The plant will use three primary nuclear facilities known as the Pretreatment, Low-Activity Waste, and High-Level Waste facilities to meet these objectives.

For more than a decade, the Board has devoted time and resources to oversight of this critical facility with two main safety objectives. First, operation of the plant must not expose the public or workers to undue risk. Second, the plant must achieve its design objectives to eliminate the safety and environmental risks posed by continued storage of this waste in aging

underground tanks. Although this is a one-of-a-kind project with novel technology requiring significant research and development, it is being designed concurrent with construction. As a result, timely identification and resolution of technical issues are paramount to meeting the objectives of the Hanford cleanup effort.

During 2013, the Board's staff focused its reviews on ensuring that important safety systems can meet the functional and performance requirements in the project's safety basis documents. This project continues to undergo significant design and safety changes, although it is more than fifty percent constructed. The Board's staff conducted reviews of:

- the technical approach for integration of criticality safety into the design of the plant,
- safety basis documentation and supporting calculations for the High-Level Waste Facility,
- hazard analyses to support the documented safety analysis for the Low-Level Waste Facility,
- an authorization basis amendment to designate structural components at the Pretreatment Facility as safety significant design features,
- the technical bases for re-categorizing the Low-Activity Waste Facility as a higher hazard category,
- corrective actions to address deficiencies in installed fire protection systems in the Low-Activity Waste Facility, Analytical Laboratory, and Balance of Facilities, and
- DOE's initiative to develop an alternative approach for addressing the risks and challenges associated with immobilization of the Hanford tank waste.

The Board continues to work closely with DOE to resolve the following nine previously-identified safety issues: (1) mixing in process vessels, (2) controls for hydrogen gas, (3) modelling of spray leak accidents, (4) heat transfer analyses for process vessels, (5) design of the instrumentation and control system, (6) safety controls for ammonia hazards, (7) erosion and corrosion of process systems, (8) design and construction of the electrical distribution system, and (9) the potential for sliding beds of solids that erode process piping. In 2013, DOE resolved one safety issue concerning the validation of a computer model for mixing radioactive waste, but otherwise made little progress in addressing outstanding safety issues.

On September 24, 2013, DOE released the Hanford Tank Waste Retrieval, Treatment, and Disposition Framework, which describes an alternative approach for addressing the risks and challenges associated with completing the Hanford tank waste clean-up. In this document, DOE stated that safety issues associated with the Waste Treatment and Immobilization Plant

caused construction of the Pretreatment Facility to be suspended and construction of the High-Level Waste Facility to be slowed. DOE assembled a design completion team to resolve safety issues and enable completion of design and construction, startup, and operations of these facilities. The Board will follow the team's progress in resolving open safety issues.

Additional information on these safety issues can be found in the Board's reports to Congress dated July 15, 2013, and December 26, 2013, available on the Board's website.

Waste Treatment and Immobilization Plant, Hanford Site

Los Alamos National Laboratory, Transuranic Waste Facility

Aging facilities at Los Alamos National Laboratory's Area G are used to store, process, characterize, and ship transuranic waste to the Waste Isolation Pilot Plant for disposal. DOE committed to the State of New Mexico to close Area G no later than December 2015. In order to support the enduring mission of PF-4 beyond 2015, NNSA is designing a new Transuranic Waste Facility to replace the waste storage and characterization functions currently carried out in Area G.

The new facility will be capable of staging and storing up to 1,240 drums of transuranic waste. Its characterization function will be capable of certifying that waste containers meet the acceptance requirements for shipment to and disposal at the Waste Isolation Pilot Plant. The new facility will be a Hazard Category 2 nuclear facility due to the quantity of radioactive waste planned to be stored there. Based on the hazards associated with the facility, the Board is following the development of safety controls that ensure the safety of the public and workers.

The final design is nearing completion. The Board is awaiting release of the project's Preliminary Documented Safety Analysis to verify that safety concerns identified by the Board in its June 11, 2012, letter to NNSA have been adequately addressed.

Oak Ridge National Laboratory, Transuranic Waste Processing Center Sludge Processing Facility Buildouts Project

The Transuranic Waste Processing Center Sludge Processing Facility Buildouts Project is a major modification to the existing Transuranic Waste Processing Center, a Hazard Category 2 nuclear facility located at Oak Ridge National Laboratory. The Sludge Processing Facility Buildouts Project will transfer 2,000 cubic meters of sludge and supernate from the Melton Valley Storage Tanks to a new annex of the Transuranic Waste Processing Center for characterization and solidification. DOE will dispose of the solidified sludge as low-level waste at the Nevada National Security Site.

During 2013, the Board reviewed the project's conceptual design and "Safety Design Strategy" document and determined that there were no significant safety issues that would preclude the project from advancing to the preliminary design stage. However, the Board's staff did identify three concerns that the project team agreed to address during preliminary design. The Board relayed the results of its review to DOE in a project letter dated November 8, 2013. In parallel with the Board's reviews, the design contractor's project team identified several nuclear safety risks relating to accident analysis parameters/assumptions and safety classification and seismic design of equipment required for protection of the public and workers.

The Board will continue to review DOE's efforts to address these issues as the project proceeds to preliminary design.

Y-12 National Security Complex, Uranium Processing Facility

Enriched uranium processing and fabrication are vital to maintaining the nation's nuclear weapons stockpile and supplying fuel for the United States Navy's nuclear-powered submarines and aircraft carriers. The Uranium Processing Facility[4] is the centerpiece of NNSA's plan to consolidate enriched uranium operations at the Y-12 National Security Complex into a safe, modern, and secure facility that replaces Y-12's aging infrastructure.

The Board's oversight during the past year focused on ensuring integration of safety into the facility's design and in reviewing updated design and safety analysis documentation developed by NNSA to address prior Board safety issues. In an April 2, 2012, letter to NNSA, the Board identified a number of deficiencies with the preliminary safety analysis and design requirements that led the Board to conclude that the project team had not adequately

[4] This facility is also referred to as the Uranium Capabilities Replacement Project. See Section 3123 of the National Defense Authorization Act for Fiscal Year 2013.

Artist's Rendering of the Uranium Processing Facility

integrated safety into the preliminary design. NNSA independently identified many similar issues during its review of the preliminary safety analysis. The project team revised the preliminary safety analysis and design documentation to address these issues. In 2013, the Board reviewed the revised documentation and concluded that while NNSA had made progress in resolving the safety issues identified in the April 2012 letter, new safety issues concerning the effectiveness of safety controls required additional action by NNSA to ensure the integration of safety into the design. In an August 26, 2013, letter to NNSA, the Board requested that NNSA provide a plan and schedule for addressing these new safety issues. NNSA briefed the Board on its plans on November 21, 2013. The Board is reviewing these plans.

Also during 2013, NNSA modified the project's execution strategy by combining major milestones for establishing the project's cost and schedule baseline and for authorizing the start of construction. As part of this strategy, NNSA committed to developing interim safety reports to document the evolution of the design and safety analysis in advance of the combined milestone. The Board will review these interim safety reports as they are developed. The Board discussed the project with DOE and NNSA personnel at its December 10, 2013, public hearing in Knoxville. (see Section X below).

During the public hearing, the acting NNSA Administrator testified regarding the potential for rethinking the strategy for replacing Y-12's aging infrastructure. The acting NNSA Administrator stated that NNSA intended to develop the Uranium Processing Facility to 90 percent of the final design to support making detailed budgetary projections with confidence. He further stated that if, at that point, the cost appears to be beyond any reasonable budgetary projection, NNSA would have to decide whether or not to re-scope the project. However, he also stated that any rethinking would have to include a very firm position that the modernization project cannot be delayed indefinitely.

Closure of Safety Issues for DOE Design and Construction Projects

During 2013, the Board worked closely with DOE to resolve safety issues on several of its large, complex design and construction projects. Several examples are highlighted below.

- DOE is constructing the Salt Waste Processing Facility at the Savannah River Site to treat salt waste from high-level waste tanks for further processing and disposal. In a letter to DOE dated February 10, 2009, the Board identified problems in the control of flammable gas in the facility's vessels and piping systems. Inadequate controls could lead to explosions and a loss of confinement of highly hazardous radioactive material during plant operation. In 2013, the Board completed its review of DOE's corrective actions and concluded that DOE had developed an appropriate control strategy to protect the primary confinement boundary for radioactive materials from flammable gas hazards.

- DOE is pursuing the K-Basin Closure Sludge Treatment Project to remove radioactive sludge from the K West Basin at the Hanford Site. The sludge was generated by deteriorating spent nuclear fuel during decades of storage. In a letter to DOE dated July 31, 2012, the Board identified flaws in the preliminary accident analysis supporting the selection of safety controls for the project. These flaws included failure to perform an unmitigated analysis of accident consequences and the failure to use bounding parameters in calculating radiological dose consequences to the public during postulated accidents. In 2013, the Board reviewed updated documentation prepared by the project team and concluded that the new analysis identified an appropriate set of safety controls to protect workers and the public.

- In an April 3, 2012, letter to DOE, the Board found deficiencies in DOE's plans for validating a computer model of pulse jet mixing at the Waste Treatment and Immobilization Plant. DOE planned to use the model to confirm that mixing systems for radioactive wastes will meet safety requirements. The Secretary of Energy's letter to the Board dated November 8, 2012, stated that DOE intended to replace the computer models with a full-scale testing program for mixing systems. This change in approach, completed in 2013, addressed the Board's safety issue since DOE will no longer rely on computer models to confirm mixing system performance.

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VII. Hazardous Materials

The Board is responsible for ensuring that DOE safely processes, stabilizes, and disposes of hazardous nuclear materials. The Board's safety oversight focuses on DOE's management of defense-related high-level waste, processing of nuclear materials into stable forms for safe long-term storage or disposal, and deactivation and decommissioning of defense nuclear facilities that are no longer needed.

High-Level Waste Management

DOE manages high-level defense waste at the Hanford Site, Savannah River Site, and Idaho National Laboratory. The Board has focused operational oversight on the large tank farms at the Hanford and Savannah River sites, and on radioactive materials extracted from high-level waste and stored at Hanford's Waste Encapsulation and Storage Facility. The Board's staff has conducted reviews of the startup of the Integrated Waste Treatment Unit at Idaho. The primary safety issues evaluated by the Board during 2013 are summarized below.

Hanford Site

Integrity of High-Level Waste Tanks. DOE stores more than 50 million gallons of radioactive waste in high-level waste tanks at Hanford. Many of the old single-shell tanks have been known to leak. For this reason, most liquids in those tanks have been removed and transferred to newer double-shell tanks. After DOE announced in February 2013 that as many as six single-shell tanks were actively leaking (DOE later revised this assessment to indicate that only one single-shell tank, T-111, has an active leak), the Board's staff reviewed level trends for all of the single-shell tanks at Hanford. The staff found that complex and competing phenomena such as evaporation make confirming or denying the presence of a small leak difficult using existing information.

The double-shell tanks were expected to remain sound until the wastes were eventually retrieved and immobilized for disposal. However, in August of 2012 DOE detected a slow but continuing leak from the primary, or inner tank, of double-shell tank AY-102 into its secondary containment. The Board has been closely following DOE's plans for dealing with the leak, DOE's evaluations of other tanks containing similar waste, and the potential impact on the overall waste retrieval and treatment strategy. Given that the storage period may exceed the design life for some of the double-shell tanks, and has already exceeded the design life for all the single-shell tanks, the potential for new leaks is an ongoing concern.

DOE is considering retrieving a portion of the liquid radioactive waste in tank AY-102 prior to full retrieval of all liquids and solids from the tank. At DOE's request, the Board evaluated the potential for this partial waste retrieval to affect safety. In a letter dated November 1, 2013, the Board informed DOE that there were no clear safety benefits or threats from this proposed action. The Board also concluded that significant uncertainty remains regarding the condition of the tank, including the cause of the leak, the leak rate, the chemical

and physical conditions at the leak site, and the effect of a change in temperature, pressure or chemistry on the leak rate.

The Board advised DOE that if it chooses to retrieve some of the liquid from the tank, the tank should be closely monitored for signs of increased leakage or blockage of air channels distributing cooling air to the tank bottom. The Board also advised DOE to consider developing an improved thermal model of the tank to aid in understanding the safety significance of any changes observed after removal of liquids.

Leaked Waste in Secondary Containment of Tank AY-102

High-Level Waste Transfer System. DOE has addressed a number of the performance and maintenance issues related to the high-level waste transfer system identified by the Board in a letter to DOE dated April 26, 2011**.** The Board's staff is monitoring DOE's investigations of corrosion mechanisms for the high-level waste tanks. These efforts are important in determining whether the tanks and transfer systems will remain serviceable for the duration of the waste retrieval and stabilization mission.

Flammable Gas in Tanks with Deep Solids Layers. In January 2013, the contractor for the Tank Farms determined that the potential existed for deep layers of sludge in high-level waste tanks to retain and release hazardous amounts of flammable gas. The contractor developed a Justification for Continued Operation that allows for continued retrieval of waste from single-shell tanks into double-shell tanks with deep sludge layers. It includes requirements for monitoring the behavior of the deep sludge layers and developing a recovery plan should this behavior indicate unexpected flammable gas retention. The Board's staff is monitoring and assessing actions coordinated by the Tank Farms contractor to evaluate this phenomenon.

Waste Encapsulation and Storage Facility. The Waste Encapsulation and Storage Facility stores 1,936 cesium-137 and strontium-90 capsules in water-filled pool cells. In response to maintenance issues identified in a Board letter to DOE dated October 6, 2011, the facility contractor completed a formal causal analysis. The purpose of this analysis was to determine why internal assessments failed to uncover problems found by the Board's staff in work planning and control, conduct of operations, training, and oversight. The contractor then implemented a series of corrective actions to address issues identified in the causal analysis. In 2013, the Board's staff reviewed the actions associated with the plan and observed a contractor effectiveness review. The Board's staff noted improvement in the monitoring and surveillance of safety features, the quality and use of technical procedures, facility-specific system training, and the effectiveness of oversight.

Idaho National Laboratory

Integrated Waste Treatment Unit. The Integrated Waste Treatment Unit was built to solidify 900,000 gallons of radioactive liquid waste stored in underground tanks as part of DOE's Idaho Cleanup Project. An over-pressurization event occurred during non-radioactive testing of the facility's process systems in June 2012. Since then, DOE has developed a corrective action plan and made numerous changes to the facility. Members of the Board's staff reviewed the development and initial implementation of this plan and noted several weaknesses which DOE has corrected. The staff continues to monitor the project's progress as it prepares to resume startup test operations with non-nuclear simulant material.

Nuclear Materials Stabilization and Storage

Hanford Site

Treatment of Sludge from K West Basin. In a letter dated July 31, 2012, the Board identified several problems relating to DOE's preliminary design for systems to remove the remainder of radioactive fuel sludge from the K West basin. In particular, the Board's letter described concerns relating to spray leak accident scenarios analyzed in the safety analysis. In 2013, the Board's staff reviewed changes to the accident scenarios in the project's safety analysis. The staff concluded that the analysis is now technically sound and bounding.

Savannah River Site

Storage of Reactive Metal Fuels in L-Basin. In January 2013, the Board issued DNFSB/TECH-38, *Storage Conditions of Reactive Metal Fuel in L-Basin at the Savannah River Sit*e. This technical report found that the reactive metal fuels are vulnerable to degradation and that degradation is already occurring in L-Basin. As the fuel degrades, it becomes more difficult to handle, repackage, and process. The Board's letter transmitting the report to DOE noted that further attention to the disposition of these materials is warranted.

Degraded Fuel Can, Savannah River Site

HB-Line Facility. The Board's staff reviewed the documented safety analysis for HB-Line and identified potential safety vulnerabilities in the facility contractor's proposal to downgrade the classification of the diesel generator from safety-significant to general service. If normal power were lost and the generator failed to start, then both the normal purge air system and the emergency alternate purge method would become inoperable, along with the room and glovebox exhaust systems. In such a scenario, there would be no controls to prevent the accumulation of flammable gas in the tanks and dissolvers. DOE subsequently directed the contractor to maintain and operate the HB-Line diesel generator and vessel vent system piping as safety-significant systems and to formally upgrade them to safety-significant within six months. DOE also took action to revise calculations of flammable gas accumulation rates in the safety analysis to correct an error identified by the Board's staff. This resulted in changes to the Technical Safety Requirements to ensure that a loss of purge air flow would be corrected before flammable conditions could develop in a process vessel.

In 2013, the contractor and DOE conducted readiness assessments at the HB-Line facility that were intended to confirm readiness for implementing a new documented safety analysis and for performing an upcoming plutonium processing mission. The contractor assessment team identified a large number of findings, including several involving conduct of operations. The contractor declared its readiness to be reviewed by DOE, but DOE's team suspended its assessment after two weeks because of continued deficiencies in conduct of operations, and cited several instances of non-conservative decision-making by the contractor. The Board's staff monitored these events closely and will continue to monitor DOE's corrective actions.

Site Safety Infrastructure. The Board issued a letter to DOE on March 27, 2012, identifying deficiencies in the fire water supply systems at K-Area and A-Area at the Savannah River Site. The responsible contractor at the site subsequently undertook a review of the Savannah River National Laboratory's fire suppression system that resulted in the system being declared inoperable. During 2013, the Board's staff evaluated the site's plans for addressing the many code noncompliances in the fire water supply systems and in the laboratory's fire suppression system. In K-Area, the deficient diesel fire pump has been repaired, but the deficient electric fire pump has not. The laboratory contractor has identified a funding source for some of the additional evaluations which will be required and to correct minor deficiencies in the fire water supply for the laboratory, but not for updating the documented safety analysis or to start correcting the 152 deficiencies in the laboratory's automatic fire sprinkler system. DOE's August 10, 2012, reply to the Board stated that replacement of the A-Area fire protection water supply system with a code compliant fire water supply tank and fire water pumps is warranted, but that replacement was contingent upon securing sufficient funding. Funding has not yet been identified. The Board's staff is continuing to monitor DOE's efforts to complete the needed upgrades.

Oak Ridge National Laboratory

Uranium-233 Disposition Project. Members of the Board's staff raised several safety and design-related questions to DOE associated with the project's Phase II, in which uranium-233 materials not suitable for shipment offsite as-is will be processed for disposal. DOE indicated willingness to work toward addressing the questions as it develops Phase II plans.

Transuranic Waste Remediation and Disposal

In recent years, DOE has transported most of the legacy transuranic waste stored at the Idaho and Savannah River Sites to the Waste Isolation Pilot Plant. The remaining work involves some of the more challenging waste. Cleanup is becoming increasingly hazardous and difficult as the effort progresses. Many of the remaining containers are in poor condition and contain much higher quantities of radioactive and hazardous materials than containers previously processed. Incidents that resulted in plutonium uptakes by workers at Idaho and Savannah River serve as important warnings that greater worker protection is now required during cleanup.

Members of the Board's staff observed DOE's verification of the Integrated Safety Management system for the Advanced Mixed Waste Treatment Project at Idaho. The staff found that all elements of an Integrated Safety Management system are present, but that greater depth and rigor in implementation will be needed to ensure the project can safely carry out the more challenging tasks remaining. Challenges experienced this year included two fires in hot cells that occurred while handling components containing flammable vapors. No workers were injured, but affected work has been delayed.

On June 27, 2012, the Board issued a letter identifying safety deficiencies in the formality and rigor of work planning and control for the maintenance program at the Waste Isolation Pilot Plant. During 2013, DOE and the contractor worked to address the identified deficiencies. This effort was monitored by the Board's staff.

Deactivation and Decommissioning

Part of the Board's statutory task is to ensure that defense nuclear facilities are safely deactivated and decommissioned. Key Board efforts in this area include evaluating activity-level hazard analyses and work planning and control programs that are central to the safe performance of this type of work. In 2013, the Board's staff focused attention on deactivation of the Plutonium Finishing Plant at Hanford.

Highly Contaminated Equipment at the Hanford Plutonium Finishing Plant

In January 2013, a spread of radioactive contamination in the Plutonium Finishing Plant exposed workers who were removing highly contaminated portions of a high-efficiency particulate air filter attached to a glovebox. The Board's staff closely followed the investigation of this event and the subsequent implementation of corrective actions. Interim corrective actions included focused training and requiring immediate responders to have respirators available. The remaining corrective actions include installing an airlock-like tent for workers exiting the room that contains this glovebox, as well as further training for both workers and supervisors. In July 2013, workers inadvertently spread contamination again during work to replace a port cover on the same glovebox. Workers responded to this event in a manner consistent with lessons learned from the January event.

VIII. Safety Standards and Programs

Department of Energy Directives

The Atomic Energy Act requires the Board to evaluate the content and implementation of standards relating to the design, construction, operation, and decommissioning of DOE's defense nuclear facilities. "Standards" in this context includes DOE orders, regulations, and guidance documents. In 2013, the Board completed its review and comments on DOE Standard 1628-2013, *Development of Probabilistic Risk Assessments for Nuclear Safety Applications*, and continued its review of draft DOE Standard 3009, *Criteria and Guidance for Preparation of U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*. The Board's staff formally reviewed 35 DOE directives in 2013. These standards govern vital elements of safety in design, operations, and oversight of DOE's defense nuclear facilities, and it is essential to keep them updated to reflect operating experience, lessons learned, and other advancements in understanding. Although DOE has made progress, many standards of interest to the Board are overdue for revision or recertification. The Board expects to continue to review a number of DOE technical standards during 2014, including a revision to DOE Standard 1189-2008, *Integration of Safety into the Design Process*.

Review of Nuclear Safety Programs

In conducting oversight of DOE's nuclear safety programs, the Board applies a complex-wide perspective that builds on data collected at the field level, integrating the results to identify opportunities for broad safety program improvements. The Board dedicates significant resources to reviewing (a) safety analyses and controls at defense nuclear facilities, (b) key supporting programs such as quality assurance, nuclear criticality safety, and training and qualification of personnel, (c) the technical competence of DOE's federal workforce, (d) DOE's safety oversight of its contractors, and (e) other attributes important to nuclear safety. These efforts led to significant improvements in nuclear safety at defense nuclear facilities. Highlights not already discussed in previous sections of this report are summarized below.

Conduct of Operations and Maintenance. In 2013, members of the Board's staff continued to conduct assessments of conduct of operations and maintenance programs at defense nuclear facilities. Follow-up maintenance assessments were conducted (after implementation of corrective actions in response to letters from the Board) at Hanford's Waste Encapsulation and Storage Facility and the Waste Isolation Pilot Plant. Noteworthy progress has been realized in most of the areas identified in the Board's letters.

Transuranic Waste Operations at Radioassay and Nondestructive Testing Facility, Los Alamos National Laboratory

Members of the Board's staff also performed conduct of operations assessments at Los Alamos National Laboratory's transuranic waste operations and the Nevada National Security Site. The Board's staff identified weaknesses in the implementation of numerous elements of DOE Order 422.1, *Conduct of Operations*. The Board's staff provided feedback and suggestions for program improvement to site personnel. Members of the Board's staff continue to monitor the safe implementation and effectiveness of the operations and maintenance programs.

Health Physics Programs. In 2013, the Board's staff completed reviews of radiation protection programs at the Idaho Cleanup Project and Advanced Mixed Waste Treatment Plant at the Idaho National Laboratory. The Board's staff identified deficiencies in contractual agreements for subcontracted services, program staffing, and implementing procedures. In response, the Idaho National Laboratory's contractors took actions to strengthen their radiation protection programs. In January 2013, DOE's Idaho Operations Office experienced a personnel shortfall that resulted in the office having no staff dedicated to full-time oversight of the radiation protection programs at the Idaho Cleanup Project and Advanced Mixed Waste Treatment Plant. Members of the Board's staff remained engaged with DOE's Idaho Operations Office until DOE filled the position with a qualified individual in September 2013.

IX. Administration

Budget Levels and Staffing

Response to Changes in the Board's Enabling Legislation. The National Defense Authorization Act for Fiscal Year 2013 made several modifications to the Board's enabling legislation. One modification requires the Board to "specifically assess risk" when issuing recommendations. In response to this direction, the Board developed the necessary guidance to implement the change. The guidance includes a publicly visible Policy Statement defining how the Board will assess risk. As a corollary effort, the Board's staff developed supporting internal directives that define the methods to be used in implementing the Policy Statement. The new internal directives also address a second change to the Board's enabling legislation by establishing procedures for implementing the "draft recommendation" process. Under the new procedures, the Board transmits a draft recommendation, along with relevant information and analyses, to the Secretary of Energy at least 30 days before finalizing the recommendation. Per the revised legislation, the Board will evaluate any comments provided by the Secretary of Energy prior to finalizing the recommendation.

Board's Strategic Plan. The Board reviewed and revised its Strategic Plan in 2013. The revised plan was advertised for public comment and is being finalized pending review by the Office of Management and Budget. When approved, the new Strategic Plan will fulfill requirements contained in the Government Performance and Results Modernization Act of 2010. It also addresses recommendations from recent external reviews of the Board's operations and implements the recent changes to the Board's enabling legislation. The new Strategic Plan and associated Annual Performance Plan place significant emphasis on accomplishing safety oversight, continually improving the agency's operations, and communicating with external stakeholders. The plan moves the agency toward a clearer, performance-based approach in accomplishing the Board's mission by requiring the development of improved internal controls and use of performance measures. The Board will review and modify the performance measures annually to ensure effectiveness and achievement of intended results.

Internal Controls. The Board is making a concerted effort to improve both the efficiency and effectiveness of its safety oversight activities. To support this effort, the Board initiated two external reviews of its operations in 2012 and, after analyzing the results, is implementing many of the recommendations resulting from the reviews. As part of the implementation effort, the Board's staff is documenting a set of formal instructions and operating procedures for its safety oversight activities. The effort is extensive and will take approximately three years to complete using a phased approach. The first phase will implement a consistent method for doing oversight work. This will allow continuous process improvement and enable more transparent and more effective interaction between the Board's staff and its DOE counterparts. The second phase will formalize a process for identifying, prioritizing, scheduling, and resourcing work. The effort includes the development of project tools and methods to provide visibility of ongoing and planned oversight efforts to senior staff managers and the Board. These internal controls will ensure that the Board's staff works on oversight activities that are consistent with the

Board's Strategic Plan and that will best accomplish the Board's mission to provide independent analysis, advice, and recommendations to the Secretary of Energy. The improved visibility will also allow the Board to rapidly and effectively shift staff efforts when priorities change as the result of emerging problems or other oversight needs. The third and final phase focuses on staff development. The goal of this phase is to establish procedures to ensure that the Board's staff maintains a high level of expertise in the areas that are critical to oversight work at defense nuclear facilities. This effort is especially important since many key technical personnel are eligible to retire.

Prioritization of Work

The Board's safety oversight activities are prioritized predominantly on the basis of risk to the public and workers, types and quantities of nuclear and hazardous material at hand, and hazards of the operations involved. The Board considers the following main factors:

- Proximity to collocated workers and the offsite public,
- Quantity, chemical composition, physical form, and radiological characteristics of the nuclear material stored or handled in the facility,
- Potential for accidents involving energetic release of materials (e.g., earthquakes, tornados, runaway chemical reactions, fires, or explosions), criticality accidents, or nuclear detonations,
- Complexity of safety controls and the degree of reliance on active safety systems or administrative controls instead of passive design features,
- Novelty of materials, facilities, or operations, and
- The significance of changes in (a) facility configuration, (b) the condition of aging systems and equipment, and (c) operations, personnel, or management.

The Board uses multiple avenues to obtain the information needed for this risk-based prioritization. Continuous in-field observations by the Board's Site Representatives provide real-time information regarding safety issues and potential risks to the workers and the public at five major DOE defense nuclear sites. Site Representatives provide weekly activity reports to the Board and are in constant communication with the Board's headquarters staff. This information is invaluable in allowing the Board to assess the priority of work and assign resources appropriately. Similarly, the Board's headquarters staff interacts frequently with DOE's headquarters and field offices to inform the Board of the status and future plans for facilities and activities at defense nuclear sites. The Board's staff also monitors DOE's various reporting mechanisms for off-normal events (e.g., the Occurrence Reporting and Processing System) to identify individual occurrences or trends that indicate a need for safety oversight.

Board members directly obtain information needed to prioritize oversight by a variety of means. Board members (as a group and individually) visit selected DOE defense nuclear facilities each year to review activities and safety issues. Board members are briefed regularly by senior DOE officials on the status of activities and safety initiatives. Finally, the Board members interact informally with personnel at DOE's headquarters and field offices.

Subject to this prioritization, four types of safety oversight are underway at all times:

- Evaluation of DOE's organizational policies and processes. These reviews evaluate topics such as technical competence of DOE and contractor personnel, adequacy of safety requirements and guidance, and the presence of a strong safety culture.

- Evaluation of actual hazardous activities and facilities in the field. These reviews focus on identifying the hazards and evaluating preventive and mitigative controls.

- Expert-level reviews of the safety implications of DOE's actions, decisions, and analyses. When significant safety issues are at stake, these reviews further consider the technical quality of the action, decision, or analysis, including the validity of information relied on by DOE's approval authorities.

- Identification of new safety issues otherwise unknown in the DOE complex. Since, by definition, these safety issues would not have been addressed but for the Board's efforts, this may be the area in which the Board has the largest impact on the safety of DOE's highly hazardous operations.

In regard to the last item above, new safety issues identified by the Board in recent years have included site-specific issues, such as safety issues in the design of Hanford's Waste Treatment and Immobilization Plant, and cross-cutting issues, such as deficiencies in activity-level work planning and control at multiple defense nuclear facilities.

To ensure that safety is integrated into the design of new defense nuclear facilities, the Board tracks every project, and schedules reviews to match each project's design maturity. The Board prioritizes these reviews based on its Strategic Plan and Annual Performance Plan. This approach gives the Board confidence that its staff and budget are dedicated to the highest risk activities under the Board's jurisdiction. These specific factors are always weighed:

- Design basis accidents that include natural phenomena and operational accidents,

- Nuclear and chemical hazards in the facility and potential for energetic release of such materials,

- Importance of safety controls at the facility level and process level—controls for higher hazard and more likely accidents are reviewed in greater detail,

- Maturity of safety documentation at key stages in the project's life—prior to DOE's approval of the conceptual safety design report, preliminary safety design report, preliminary documented safety analysis, and the final documented safety analysis, and

- Oversight capability of DOE's project management organization.

X. Informing the Public

Public Hearings

The Board's enabling legislation vests it with a comprehensive suite of statutory tools to execute its oversight mission. One of the Board's more potent powers includes the ability to hold public hearings. Public hearings play an essential role in the Board's mission of ensuring adequate protection because they assist the Board in obtaining vital safety information from DOE, NNSA, expert sources, and the public at large. In 2013, the Board held two public hearings. The Federal Register notice and agenda for each hearing were posted on the Board's website, and the Board also advertised the hearings in local newspapers. The Board received testimony from the public during these hearings, and such testimony was included in the public record. Transcripts of both hearings will be posted on the Board's website; a DVD copy may be obtained free of charge upon request.

Pantex Plant. The Board's first public hearing of 2013 convened on March 14, 2013, in Amarillo, Texas. The Board received testimony from DOE and NNSA on the safety culture, emergency preparedness, and nuclear explosive operations at the Pantex Plant. The Board focused specifically on the identification of shortfalls in the Pantex safety culture, potential impacts that a flawed safety culture may have on nuclear explosives operations, and management approaches to improving safety culture. The Board also inquired as to the plant's plans and capabilities to respond to a site emergency; demonstrated performance in drills and exercises; and preparation for severe events resulting from natural phenomena, such as a major earthquake, flood, or tornado. Nine members of the public testified on the record before the hearing concluded. The Board offered a live webcast stream of this hearing on its website. A total of 110 viewers logged into video streaming during the live broadcast.

Y-12 National Security Complex. This hearing, held on December 10, 2013, in Knoxville, Tennessee, was devoted to exploring the risks to nuclear operations associated with Y-12's aging infrastructure, safety in design of the Uranium Processing Facility, conduct of nuclear operations, and emergency preparedness at Y-12. The Board received testimony from NNSA and its contractors regarding the near-term and long-term risk assessment and mitigation efforts currently being undertaken. Of primary interest was NNSA's progress since the Board's October 2, 2012, public hearing concerning safety in the design of the Uranium Processing Facility. The Board also discussed Y-12's emergency planning, response, and oversight capabilities for severe events, including the condition and survivability of emergency response facilities; key safety initiatives to improve conduct of operations and work planning; and the importance of effective oversight to sustain long-term improvements. Nineteen members of the public testified on the record before the hearing concluded. The Board also offered a live webcast stream of this hearing on its website. During the live broadcast, the peak number of viewers at any one time was 115.

**Y-12 Public Hearing in Knoxville, TN,
December 2013**

Response to FOIA Requests

The Board received 21 formal requests for Board records filed under the Freedom of Information Act (FOIA) in 2013. The table below outlines how the Board responded to each request.

Board Response to 2013 FOIA Requests

Board Response	Denial Based on Exemption	Partial Grant	Full Grant	No Records Located	Other
No. of Requests	2	3	3	10	3

Information Technology Activities

In 2013, the Board improved its information technology infrastructure to enhance staff productivity. As a result, the Board now possesses greater flexibility in responding to any unusual event that might affect access to the Board's headquarters. First, the Board completed a technology refresh program that replaced the desktop computers on all employees' desks with laptop computers and docking stations. This change has given staff members improved flexibility in choosing where and when to perform their work and hold meetings, both inside

and outside of the Board's headquarters. Next, the Board began issuing new smartphones running a modern mobile operating system to all staff, replacing older, less capable, and obsolete devices. The Board also began using a cloud-based management service for mobile devices to ensure that all agency-issued mobile devices are updated in a timely manner and that security controls are enforced on all devices. The combination of laptop computers, updated smartphones, and the Board's cloud-based e-mail system has created a more mobile workforce, allowing staff members to work just as easily outside of the office as in it. Consequently, the Board's telework program has seen vast improvement.

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XI. Funding and Human Resources

Budget Levels and Staffing

As a result of the Budget Control Act of 2011, the Board was subject to sequestration beginning in the second quarter of FY 2013. To account for the mandated spending cuts, the Board operated at a prorated level of $26.786 million—$2.344 million less than appropriated—beginning March 1, 2013. On March 26, 2013, Congress passed the Consolidated and Further Continuing Appropriations Act of 2013, which required the Board to maintain operations at the annualized sequestered levels for the remainder of FY 2013.

Due to the lack of a spending bill, the federal government entered FY 2014 in shutdown mode. Fortunately, the Board was able to continue operations during the shutdown by using OMB-approved carryover funds. On October 17, 2013, Congress enacted a continuing resolution to provide FY 2014 funding through January 15, 2014. Once again, funding was provided at the annualized FY 2013 sequestered levels ($26.786 million for the Board).

For the duration of 2013, the Board operated at its statutory capacity of five members. However, membership changed in the latter part of the year. On November 22, 2013, Dr. John Mansfield—a Board member since 1997—retired from the Board. Dr. Mansfield was replaced by Dr. Kenneth Mossman of Scottsdale, Arizona, who was confirmed by Congress on November 14, 2013, for a term expiring October 18, 2016.[5] Total federal employee strength at the end of 2013 was 110. This number includes the 80 scientists and engineers on board. Pending sufficient appropriations, the Board hopes to achieve its goal of reaching the 120 FTE level specified in its FY 2013 and FY 2014 budget requests in the near future.

In FY 2013, the Board achieved its eighth consecutive unqualified audit opinion on its financial statements from an independent auditor, as required by the Accountability of Tax Dollars Act of 2002. The auditor found that the Board complied with all applicable federal laws and regulations and had no material weaknesses in its internal controls.

To fulfill a requirement of the National Defense Authorization Act for FY 2004 that federal agencies conduct annual employee surveys, the Board participated in the Office of Personnel Management's 2013 Federal Employee Viewpoint Survey. In response to a decline in survey scores, the Board's Chairman created an Employee Committee consisting of representatives from across the organization to thoroughly analyze the survey results. Based on its findings, the committee will make recommendations to the Board on potential areas of improvement. As evidence of its commitment to sustaining a positive workplace, the Board plans to undertake corrective actions in the second quarter of FY 2014.

The National Defense Authorization Act for FY 2013 (Public Law 112–239) directed the Board to enter into an agreement with another federal agency to procure the services of the

[5] Dr. Mossman passed away on Wednesday, January 8, 2014.

Inspector General of such agency no later than October 1, 2013. Throughout FY 2013, the Board made significant efforts to enter into an agreement with the Nuclear Regulatory Commission's Office of the Inspector General. When those negotiations failed to yield an agreement, the Board sought assistance from the Council of the Inspectors General on Integrity and Efficiency. Using this assistance, the Board was able to enter into a Memorandum of Agreement for inspector general services with the United States Postal Service Office of Inspector General on December 16, 2013.

This Memorandum of Agreement was cancelled in January 2014 as a result of the passage of the Consolidated Appropriations Act for FY 2014. This Act superseded the Memorandum of Agreement because it "permanently authorize[s] the Inspector General of the Nuclear Regulatory Commission to execute the duties and responsibilities in the Inspector General Act of 1978 with respect to the [Board]."

Appendix A: Reporting Requirements in 2013

Date	Addressee	Topic
Jan. 3	Secretary of Energy Chu	Earthquake hazard, PF-4 facility, Los Alamos National Laboratory
Feb. 25	Acting Administrator, National Nuclear Security Administration	Fire protection program, Pantex Plant
July 15	Secretary of Energy Moniz	Implementation Plan for Recommendation 2010-2
July 15	Secretary of Energy Moniz	Criticality safety program, Los Alamos National Laboratory
July 17	Secretary of Energy Moniz	Earthquake hazard, PF-4 facility, Los Alamos National Laboratory
July 24	Secretary of Energy Moniz	Implementation Plan for Recommendation 2010-1
Aug. 26	Acting Administrator, National Nuclear Security Administration	Safety basis for the Uranium Processing Facility, Y-12 National Security Complex
Oct. 23	Deputy Secretary of Energy	Modification of annual reporting requirement, criticality safety, Recommendation 97-2

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Appendix B: Significant Board Correspondence in 2013
(letters available on the Board's website)

Hanford

April 1, 2013, letter to Senator Wyden on the state of nuclear safety at the Hanford Site.

July 15, 2013, letter to the Secretary of Energy imposing a reporting requirement regarding the implementation plan for Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*.

July 17, 2013, letter to the Secretary of Energy accepting the implementation plan for Recommendation 2012-2, *Hanford Tank Farms Flammable Gas Safety Strategy*.

November 1, 2013, letter to the Secretary of Energy enclosing a staff issue report on decanting liquid from Hanford Tank 241-AV-102.

Los Alamos National Laboratory

January 3, 2013, letter to the Secretary of Energy imposing a reporting requirement regarding earthquakes hazards at PF-4.

July 15, 2013, letter to the Secretary of Energy imposing a reporting requirement regarding criticality safety.

July 17, 2013, letter to the Secretary of Energy concerning earthquake hazards at PF-4.

Oak Ridge National Laboratory

November 8, 2013, letter to the Senior Advisor for Environmental Management transmitting a project letter on the Sludge Processing Facility Buildouts Project.

Pantex Plant

February 25, 2013, letter to the Acting Administrator, National Nuclear Security Administration, transmitting a reporting requirement regarding fire protection systems at Pantex.

Savannah River Site

January 3, 2013, letter to DOE's Senior Advisor for Environmental Management, transmitting DNFSB/TECH-38, *Storage Conditions of Reactive Metal Fuel in L-Basin at the Savannah River Site*.

April 16, 2013, letter to the Secretary of Energy regarding the implementation plan for Recommendation 2012-1, *Savannah River Site Building 235-F Safety*.

Y-12 National Security Complex

August 26, 2013, letter to the Acting Administrator, National Nuclear Security Administration, regarding the safety basis for the Uranium Processing Facility.

Other Correspondence

February 14, 2013, letter to House and Senate Armed Services Committees on assessing "technical and economic feasibility" pursuant to 42 U.S.C. § 2286a(b)(5).

February 28, 2013, letter to Congress transmitting the Board's Twenty-Third Annual Report.

March 19, 2013, letter to the Secretary of Energy closing Recommendation 2007-1, *Safety-Related In Situ Nondestructive Assay of Radioactive Materials*.

April 22, 2013, letter to the Secretary of Energy closing Recommendation 2008-1, *Safety Classification of Fire Protection Systems*.

June 20, 2013, letter congratulating Secretary of Energy Moniz on his appointment.

July 15, 2013, letter to Congress transmitting a report on the status of significant unresolved safety issues concerning the design and construction of DOE's defense nuclear facilities.

July 24, 2013, letter to the Secretary of Energy imposing a reporting requirement concerning commitments made in response to Recommendation 2010-1, *Safety Analysis Requirements for Defining Adequate Protection for the Public and the Workers*.

September 3, 2013, letters to the Secretary of Energy recognizing individuals given annual awards for Safety System Oversight and for Facility Representative.

October 17, 2013, letter to the Secretary of Energy closing Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*.

October 23, 2013, letter to the Deputy Secretary of Energy modifying the annual reporting requirement for criticality safety issues.

October 30, 2013, letter to the Secretary of Energy enclosing a report on infrastructure problems at operating defense nuclear facilities.

December 19, 2013, letter to the Secretary of Energy closing Recommendation 2000-1, *Prioritization for Stabilizing Nuclear Materials*.

December 19, 2013, letter to Congress transmitting the Board's FY 2013 Performance and Accountability Report.

December 26, 2013, letter to Congress transmitting a report on the status of significant unresolved safety issues concerning the design and construction of DOE's defense nuclear facilities.

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