



Defense Nuclear Facilities Safety Board

30th Annual Report to Congress March 2020

**Required by Section 2286e(a) 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, including with respect to the health and safety of employees and contractors at such facilities”

42 U.S.C. § 2286a(a)

Bruce Hamilton, Chairman
Jessie H. Roberson
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DEFENSE NUCLEAR FACILITIES
SAFETY BOARD

Washington, DC 20004-2901



March 17, 2020

To the Congress of the United States:

The Defense Nuclear Facilities Safety Board (Board) is pleased to submit to Congress its 30th Annual Report for Calendar Year 2019. The Board is an independent executive branch agency responsible for making recommendations to the Secretary of Energy, and in certain cases, to the President, to provide adequate protection of public health and safety at Department of Energy (DOE) defense nuclear facilities. The Board's ability to provide effective oversight relies on cooperation between the Board and DOE.

During 2019, the Board experienced challenges and delays in accessing information necessary to perform its responsibilities. In 2018, DOE's issuance of Order 140.1, *Interface with the Defense Nuclear Facilities Safety Board*, codified a major policy shift, and introduced significant changes to DOE's interface with the Board. It included restrictions placed on the Board's access to information that diminished the Board's ability to perform its statutory mandate effectively under the Atomic Energy Act of 1954, as amended. Congress recognized the importance of maintaining strong independent external oversight, and introduced a number of provisions into the Fiscal Year 2020 National Defense Authorization Act (NDAA), which clarified the Board's jurisdiction and DOE's responsibilities. Accordingly, the Board has requested to meet with the Secretary of Energy to discuss mechanisms and opportunities to improve the agencies' cooperation.

During 2019, the Board issued two safety recommendations:

Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*, which identified deficiencies at the Pantex Plant, including inadequately controlled, high consequence hazard scenarios associated with nuclear explosive operations.

Recommendation 2019-2, *Safety of the Savannah River Tritium Facilities*, which identified an issue of adequate protection of worker and public health and safety in the event of an energetic accident at the tritium facilities located at the Savannah River Site (SRS).

DOE formally accepted Recommendation 2019-1, and is currently revising its initial implementation plan in cooperation with the Board to ensure that the plan satisfactorily addresses the Board's concerns.

DOE rejected Recommendation 2019-2, stating that the Board's recommendation is "unnecessarily duplicative" of DOE's ongoing and planned actions. The Board initially raised the concerns put forward in the recommendation in August 19, 2011, correspondence to DOE; the recommendation was necessitated by DOE's inaction in addressing these concerns. By rejecting the recommendation, DOE's ongoing and planned actions for the tritium facilities will not be subject to an implementation plan and therefore not accountable and transparent to Congress and the public. The Board remains concerned with the current control set used to protect the workers at the SRS tritium facilities. The Board will continue its oversight mission, and plans to hold a public hearing at SRS in 2020 to further discuss with DOE actions to improve the safety of the tritium facilities.

The Board continues to perform its mission, and appreciates the changes Congress made to the NDAA. The Board is also taking action in response to several new provisions introduced into the NDAA. Specifically, the Board is actively hiring new technical employees and is proceeding expeditiously with a hiring process for an Executive Director of Operations. Further, in December 2019, the Board approved a comprehensive revision to its 2018-2022 strategic plan that will help improve its operations and mission effectiveness.

As required by 42 U.S.C. § 2286e(a), this report describes the Board's accomplishments, current safety initiatives, assessments regarding improvements in the safety of defense nuclear facilities, unresolved safety issues, and more detail regarding the impact of DOE Order 140.1 on the Board's ability to execute its mission.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Bruce Hamilton". The signature is fluid and cursive, with the first name "Bruce" and the last name "Hamilton" clearly distinguishable.

Bruce Hamilton
Chairman

c: The Honorable Dan Brouillette

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Pantex Plant, Amarillo, Texas

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EX. Executive Summary

Under the Atomic Energy Act of 1954, as amended, the Defense Nuclear Facilities Safety Board (Board) is charged with providing independent safety oversight of the Department of Energy's (DOE) defense nuclear facilities complex—a complex with the mission to design, manufacture, test, maintain, and decommission nuclear weapons, as well as other national security priorities. The Act mandates that the Board reviews the content and implementation of DOE standards, facility and system designs, and events and practices at DOE defense nuclear facilities to provide independent analysis, advice, and recommendations to inform the Secretary of Energy regarding issues of adequate protection of public health and safety at DOE defense nuclear facilities.

The Board prioritizes its safety oversight activities 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. This annual report summarizes the Board's significant safety oversight initiatives and some high-priority safety issues at defense nuclear facilities subject to the Board's oversight during 2019. The Board noted some of these issues in its January 16, 2020, letter to the Secretary of Energy following his confirmation. Foremost among these initiatives and issues were:

- *DOE Directive on Interface with the Board*—In May 2018, DOE issued DOE Order 140.1, *Interface with the Defense Nuclear Facilities Safety Board*, which incorporated new restrictions regarding the Board's access to information, facilities, and personnel that could diminish the Board's ability to effectively perform its statutory mandate under the Atomic Energy Act of 1954, as amended. In 2018 and 2019, the Board communicated its concerns regarding DOE Order 140.1 to the Secretary of Energy and held public hearings to gather information on its implementation. The National Defense Authorization Act (NDAA) for Fiscal Year 2020 amended the Atomic Energy Act of 1954 to clarify the Board's jurisdiction and DOE's responsibilities for granting the Board access to information, facilities, and personnel. Among provisions in the NDAA were requirements for the Board and for DOE to provide biannual reports to Congress on instances of DOE denial of access to the Board. The Board is hopeful that this revision to the Atomic Energy Act will resolve the impact that complex-wide implementation of DOE Order 140.1 has had on the ability of the Board to perform its statutory mission.

- *Safety Control Strategies for Nuclear Explosive Facilities at Pantex*—In early 2019, the Board completed its review of the safety basis and control strategy for nuclear explosive operations at the Pantex Plant, including the control of high consequence hazards. The Board concluded that portions of the safety basis for nuclear explosive operations do not meet Title 10, Code of Federal Regulations, Part 830, *Nuclear Safety Management* (10 CFR 830), that components of the process for maintaining and verifying implementation of the safety basis are deficient, and that DOE and the Pantex contractor have been unable to resolve the deficiencies. In order to ensure that the workers and surrounding public at Pantex are adequately protected, on February 20, 2019, the Board issued Recommendation 2019-1, *Uncontrolled Hazard*

Scenarios and 10 CFR 830 Implementation at the Pantex Plant. Following DOE's acceptance of the recommendation and initial development of an implementation plan, the Board has been working with DOE to revise the implementation plan to be fully responsive to the recommendation.

- *Safety of the Tritium Facilities at the Savannah River Site (SRS)*—The safety bases for SRS tritium facilities have several credible accidents that could result in very high radiological doses to individuals in the vicinity of those facilities. On June 11, 2019, the Board transmitted Recommendation 2019-2, *Safety of the Savannah River Tritium Facilities*, to the Secretary of Energy. The Board recommended that DOE (1) identify and implement near-term compensatory measures and long-term controls to prevent or mitigate the potential high radiological dose consequences, and (2) evaluate the adequacy of emergency preparedness programs and upgrade them as necessary. The Board initially raised its concerns regarding safety of SRS tritium facilities in August 19, 2011, correspondence to DOE; however, numerous DOE commitments to resolve these concerns have not been fulfilled. DOE rejected the recommendation, both in its initial response in September 2019 and following the Board's reaffirmation in December 2019; although, DOE's response and a subsequent briefing to the Board identified potential actions and plans that DOE intended to implement. By rejecting the Recommendation, DOE's ongoing and planned actions for the tritium facilities will not be subject to an implementation plan and lack accountability and transparency to Congress and the public. Overall, the Board remains concerned with the current control set used to protect the workers at the SRS tritium facilities, and that DOE's decisions regarding the tritium facilities are not consistent with its nuclear safety framework or its decisions across the rest of the defense nuclear complex. The Board plans to hold a public hearing at SRS in 2020 to further discuss actions to improve safety of the tritium facilities with DOE, among other topics.

- *DOE Rule on Nuclear Safety Management*—DOE is in the process of revising 10 CFR 830, *Nuclear Safety Management*, which has served as the cornerstone of its regulatory framework to ensure adequate protection of public health and safety. The Board communicated some initial concerns to DOE in its October 5, 2018, letter, and continued discussion with DOE in 2019. The Board is concerned that some of the proposed revisions to the nuclear safety management rule would erode DOE's regulatory framework that ensures adequate protection of workers and the public, especially in light of aging facilities and infrastructure in the complex. In addition to the concerns with the proposed revisions, the Board also noted deficiencies in the current rule in its October 5, 2018, letter. The Board will continue its review into 2020. (The Board subsequently issued Recommendation 2020-1, *Nuclear Safety Requirements*, on February 21, 2020.)

- *Safety of Waste Processing and Storage*—DOE has experienced two notable events in which drums containing solid nuclear waste were breached due to unexpected chemical reactions that occurred within the wastes: one event in 2014 at the Waste Isolation Pilot Plant and the other in 2018 at the Idaho National Laboratory. In 2019, the Board conducted a public hearing to discuss safety management of waste processing and storage with DOE. The Board has been evaluating how DOE is learning from these events and whether DOE has been

appropriately strengthening its safety posture, including updating applicable DOE directives to reflect lessons learned from the events.

The Board continued to implement recommendations from a November 2018 report of the National Academy of Public Administration (NAPA) to improve agency operations and mission effectiveness. In December 2019, the Board approved a comprehensive revision to its 2018–2022 strategic plan as recommended by NAPA. The revised plan is designed to maintain the Board’s technical excellence, foster continuous improvement, and enable nimble response to a challenging environment. The plan establishes goals and objectives aimed at providing high quality advice on the safety of the DOE defense nuclear complex efficiently, effectively, and transparently. Additionally, the plan will help cultivate a multitalented, dynamic staff that embodies the Board’s core values, focuses on the mission, and continuously hones its skills through training and development. The Board engaged NAPA to develop a Communication and Change Management Implementation Strategy, delivered in November 2019, to inform its approach for engaging the Board’s staff in implementing the revised plan.

This annual report organizes the Board’s oversight activities into four strategic areas: nuclear weapon operations; defense nuclear waste operations; design and construction of new defense nuclear facilities and major modifications to existing facilities; and safety standards and programs. The table on the following pages summarizes substantive Board communications to DOE in 2019. Appendix A summarizes the status of all Board recommendations open in 2019. Appendix B summarizes safety items that the Board identified in 2019.

Substantive Board Communications to DOE in 2019

RECOMMENDATIONS	
February 20	Recommendation 2019-1, <i>Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant</i>
June 11	Recommendation 2019-2, <i>Safety of the Savannah River Site Tritium Facilities</i>
TECHNICAL REPORT	
November 12	Los Alamos National Laboratory Plutonium Facility Leak Path Factor Methodology (DNFSB/TECH-44)
LETTERS	
February 6	Nuclear Criticality Safety Program at the Y-12 National Security Complex
February 6	Closing Recommendation 2015-1, <i>Emergency Preparedness and Response at the Pantex Plant</i>
February 27	Integrated Waste Treatment Unit at Idaho National Laboratory
March 12	Waste Drums Over-pressurization at Idaho National Laboratory
March 21	Seismic Hazards for the Device Assembly Facility at the Nevada National Security Site
May 9	High Level Waste Facility at the Hanford Waste Treatment and Immobilization Plant
May 22	Radioassay and Nondestructive Testing Facility at Los Alamos National Laboratory
June 5	Nuclear Criticality Safety Program at the Y-12 National Security Complex
June 5	DOE Standard for Assessment of DOE Contractor Criticality Safety Programs
June 12	Board Access to the DOE Nuclear Explosive Safety Study Process
July 2	Electrical Infrastructure and Systems at the Hanford Site
July 25	Nuclear Criticality Safety Program at the Y-12 National Security Complex
July 30	Closing Recommendation 2011-1, <i>Safety Culture at the Waste Treatment and Immobilization Plant</i>
August 22	DOE Implementation Plan for Board Recommendation 2019-1 and Reaffirming the Recommendation
August 23	Federal Oversight of Nuclear Criticality Safety at the Y-12 National Security Complex
August 27	Safety Significant Confinement Ventilation System at the Waste Isolation Pilot Plant
October 7	Safety Analysis for Building 2026 at Oak Ridge National Laboratory
October 7	Electrical Distribution System at the Hanford Waste Treatment and Immobilization Plant
October 10	Response to DOE Rejection of Recommendation 2019-2
October 11	Board Access to the DOE Nuclear Explosive Safety Study Process
October 18	Flammable Gas Hazards Associated with Solid Wastes

LETTERS (continued)	
October 28	DOE Implementation Plan for Board Recommendation 2019-1
November 6	DOE Standard for Accident Analysis of Aircraft Crash into Hazardous Facilities
November 15	Safety Systems and Safety Analysis at the Plutonium Facility at Los Alamos National Laboratory
November 18	Pulse Jet Mixer Control System in the Waste Treatment and Immobilization Plant at Hanford
December 4	Safety Basis and Criticality Safety in Building 2026 at Oak Ridge National Laboratory
December 4	Seismic Design and Qualification of Emergency Lighting Systems at Defense Nuclear Facilities
December 5	Reaffirmation of Recommendation 2019-2, <i>Safety of the Savannah River Site Tritium Facilities</i>
December 27	Design Basis Earthquake Impact on Facilities and Appurtenances at the Pantex Plant
PUBLIC HEARINGS OR MEETINGS	
February 21	Department of Energy's Interface with the Defense Nuclear Facilities Safety Board
June 20	Safety Management of Waste Storage and Processing in the Defense Nuclear Facilities Complex
October 28	DOE Response to Recommendation 2019-2, <i>Safety of the Savannah River Tritium Facilities</i>
December 12	Implementation Plan for Recommendation 2019-1, <i>Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant</i>

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I. The Board's Statutory Mission

Congress established the Defense Nuclear Facilities Safety Board (Board) in 1988 as an independent federal agency within the executive branch of government, subject to congressional oversight and direction. Five Board members, appointed by the President subject to confirmation by the Senate, are required 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.” The Board is a collegial agency, meaning that its actions are determined by the Board as a whole. The Board’s chairman serves as the chief executive officer and performs this function subject to Board policies.

The Board’s essential mission is to provide independent analysis, advice, and recommendations to the Secretary of Energy to inform the Secretary, in his or her role as operator and regulator of Department of Energy (DOE) defense nuclear facilities, in providing adequate protection of public health and safety, which includes the health and safety of workers. As noted above, the Board’s jurisdiction covers DOE’s “defense nuclear facilities”—a term defined in the Atomic Energy Act of 1954, as amended. The Board only is concerned with facilities operated by DOE that: (1) have a function related to national defense; or (2) store nuclear waste (excluding Yucca Mountain and other facilities operated pursuant to the Nuclear Waste Policy Act). 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 (NRC). The Board’s oversight jurisdiction also 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 3 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. Congress granted the Board a suite of statutory tools to carry out its mission. Principal among these is the formal 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. In the case of a rejection, the Secretary must report to the relevant congressional committees the reasoning for the rejection. This process all takes place on the public record. In cases involving an “imminent or severe threat” to the public health and safety, the statute also requires the Board to 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, obtain 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 prompt and unfettered 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 NRC) and

from organizations outside the government (such as the National Academy of Sciences), as needed.

As discussed further in Section II, the Board has been concerned that DOE Order 140.1, *Interface with the Defense Nuclear Facilities Safety Board*, issued in May 2018, undermines the Board's ability to execute its statutory mission under the Atomic Energy Act. The National Defense Authorization Act for Fiscal Year 2020 (NDAA) addressed opportunities to improve the Board's operations identified in the recent organizational assessment issued by the National Academy of Public Administration. One of the most important changes is the creation of an Executive Director of Operations. The Board will work to expeditiously implement these changes in 2020.

Major Sites Subject to the Board's Jurisdiction

Site	Location	Operations	Website
Hanford Site	Richland, Washington	Management and treatment of radioactive wastes; facility 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; disposition of legacy transuranic waste	http://www.lanl.gov
Nevada National Security Site	65 miles northwest of Las Vegas, Nevada	Disposition of damaged nuclear weapons; critical and subcritical experiments; waste management	http://www.nnss.gov
Oak Ridge National Laboratory	Oak Ridge, Tennessee	Energy research; treatment and disposal of radioactive wastes	http://www.ornl.gov
Pantex Plant	17 miles northeast of Amarillo, Texas	Maintenance of the nuclear weapons stockpile	https://pantex.energy.gov
Sandia National Laboratories	Albuquerque, New Mexico	Nuclear research; support for the 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 and surveillance of nuclear weapons components; processing of weapons-grade uranium	http://www.y12.doe.gov/

II. The Board's Relationship with the Department of Energy

Over the past 30 years, the Board has had a strong and constructive relationship with DOE. However, during the last two years, cooperation with the Board and its staff has deteriorated and impacted the Board's execution of its duties. This decline is attributed to DOE's publication of DOE Order 140.1, *Interface with the Defense Nuclear Facilities Safety Board*, which was issued in May 2018 without formal input from the Board. The Order codified a major policy shift and introduced significant changes to DOE's interface with the Board, including restrictions placed on the Board's access to information that diminished the Board's ability to effectively perform its statutory mandate under the Atomic Energy Act of 1954, as amended.

In December 2019, the President of the United States signed into law the National Defense Authorization Act (NDAA) for Fiscal Year 2020, which specified the Congress's expectations for the cooperation between the Board and DOE. The Board is committed to working with DOE to clarify and resolve any issues that negatively impact cooperation between the agencies. The Board has requested to meet with the Secretary of Energy to discuss mechanisms to improve interface and communications. The discussion herein lays out the challenges that the Board experienced with DOE following the implementation of DOE Order 140.1.

Under the Order's provision to deny access to deliberative meetings, DOE began denying the Board's staff access to deliberations conducted as part of nuclear explosive safety studies. On June 12, 2019, the Board sent a letter to the Secretary of Energy that documented DOE's denial of Board's staff access to nuclear explosive safety study deliberations. The Board's letter stated that access to all phases of these meetings was necessary in order to fully evaluate the implementation of DOE directives governing safe nuclear explosive operations and to understand the study group's rationale for categorizing or dismissing potential nuclear explosive safety concerns in its final report.

DOE responded in an August 9, 2019, letter offering to brief the Board's staff in lieu of attending the nuclear explosive safety study deliberations. In a final letter on this topic, dated October 11, 2019, the Board concluded that access to all phases of the nuclear explosive safety study process was needed in order to independently assess the safety of nuclear explosive operations. This letter noted the Board's direction to its staff to attend all phases of the process, and requested the Secretary of Energy to inform the Board if DOE planned to prohibit access to a specific study. The Board has not received a response to this letter.

In addition to denying access to nuclear explosive safety study deliberations, DOE prevented the Board's staff from receiving ready access to certain information, personnel, and facilities needed to perform independent oversight effectively. Specifically, the Board's resident inspectors stationed at Los Alamos National Laboratory have not received timely access to routine correspondence between DOE's Environmental Management field office and its contractor in functional areas related to defense nuclear facilities. Further, personnel at the National Nuclear Security Administration (NNSA) Los Alamos National Laboratory field office,

and the NNSA Savannah River field office have denied or delayed access to information, facilities, or personnel meetings that were necessary for the Board to perform its mission. In most instances, DOE eventually provided access; however, the delays required every level of the Board's organization to spend significant amounts of time and effort to ameliorate. As a result, DOE's actions have caused delays in the Board's ability to provide timely oversight, and siphoned away resources from safety oversight activities.

The Board believes that DOE's strained relationship with the Board and the issuance of DOE Order 140.1 is having a negative impact on evaluating questions of the adequate protection of public health and safety. As discussed further in Section III, the Board issued two formal recommendations to the Secretary of Energy: Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*, which identified deficiencies at the Pantex Plant, including high consequence hazard scenarios associated with nuclear explosive operations that are not adequately controlled; and Recommendation 2019-2, *Safety of the Savannah River Tritium Facilities*, which concluded that there is an issue of adequate protection of worker and public health and safety in the event of an energetic accident at the Tritium Facilities at the Savannah River Site. The implementation plan in response to Recommendation 2019-1 was issued without the traditional practice of seeking Board consultation. Recommendation 2019-2 was the first full rejection of a safety recommendation in the Board's history. During the December 12, 2019, public meeting on Board Recommendation 2019-1, however, DOE senior leadership testified that DOE plans to improve the implementation plan for Recommendation 2019-1 and will work with the Board to adequately address the recommendation. The Board recognizes this commitment as a positive development. Regarding 2019-2, the Board remains concerned with the current control set used to protect the workers at the SRS tritium facilities, and that DOE's decisions regarding the tritium facilities are not consistent with its nuclear safety framework or its decisions across the rest of the defense nuclear complex.

The NDAA for Fiscal Year 2020 amended the Atomic Energy Act of 1954 to clarify the Board's jurisdiction and DOE's responsibilities for granting the Board access to information, facilities, and personnel. Specifically, the revised law: (1) clarifies that the Board's jurisdiction includes onsite workers; (2) specifies that the Secretary of Energy shall provide the Board "prompt and unfettered access" to facilities, personnel, and information as the Board considers necessary to carry out its responsibilities, regardless of hazard or risk category of such facilities; (3) requires the Secretary of Energy to provide the Board written notice when he or she seeks to deny the Board information; (4) requires the Board to submit a biannual report to Congress listing each instance DOE denies the Board access to information; and (5) requires the Secretary of Energy to submit a biannual report to Congress listing each instance he or she denies the Board access to information and the reason for the denial.

Overall, the Board believes that DOE's implementation of DOE Order 140.1 has impacted the long-standing productive relationship between the Board and DOE, as evidenced by the examples provided above. The Board is encouraged by the changes made to the Atomic Energy Act and will continue to pursue renewed dialogue with DOE. Moving forward in 2020, the Board will attempt to meet with the Secretary of Energy to discuss mechanisms and

opportunities to improve the agencies' cooperation, while continuing its focus on ensuring that adequate protection of public health and safety is maintained at defense nuclear facilities.

III. Nuclear Weapon Operations

In 2019, the Board performed nuclear safety oversight of high priority operations within the nuclear weapon complex. The Board's oversight priorities were based on the nuclear safety risk of proposed and ongoing activities. For the Los Alamos National Laboratory, the Pantex Plant, the Savannah River Tritium Enterprise, and the Y-12 National Security Complex, the Board maintained full-time resident inspectors to monitor operations. The Board identified two issues of adequate protection related to the safety of operations at the Pantex Plant and the Savannah River Tritium Enterprise that are discussed below.

Pantex Plant

Recommendation 2019-1

Based on an evaluation conducted throughout 2018 of the adequacy of safety controls for Pantex nuclear explosive operations and the processes that ensure those operations have an adequate safety basis, the Board found the following:

- Portions of the safety basis for Pantex nuclear explosive operations do not meet 10 CFR 830, *Nuclear Safety Management*. For example, there are high consequence hazards that are not adequately controlled, or have controls that are not sufficiently robust or that lack sufficient pedigree to reliably prevent or mitigate the event.
- Multiple components of the process for maintaining and verifying implementation of the Pantex safety basis are deficient, including completion of annual updates as required by 10 CFR 830.
- To date, the NNSA Production Office and the Pantex management and operating contractor have been unable to resolve known safety basis deficiencies.

On February 20, 2019, the Board transmitted Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*, to the Secretary of Energy. The Board recommended that the Secretary of Energy perform the following five actions: (1) implement compensatory measures to address all deficiencies described within the recommendation appendices; (2) perform an extent-of-condition evaluation of the Pantex safety basis and implement subsequent corrective actions to ensure compliance with DOE regulations and directives; (3) implement actions to ensure process design and engineered controls eliminate or protect the nuclear explosives from impact and falling technician scenarios, including those identified in the recommendation enclosure; (4) ensure the design, procurement, manufacturing, and maintenance of special tooling is commensurate with its safety function; and (5) train safety basis personnel to ensure future revisions to the safety basis comply with 10 CFR 830 requirements.

NNSA accepted the recommendation on April 16, 2019. On July 16, 2019, NNSA transmitted its implementation plan for Recommendation 2019-1. Upon review, the Board found the language and terms of the implementation plan in fact reject significant parts of the

recommendation, and reaffirmed Recommendation 2019-1 in a letter to the Secretary of Energy dated August 22, 2019.

NNSA responded on September 23, 2019, acknowledging its previous acceptance of the recommendation, noting the implementation plan included detailed commitments to address the Board's safety concerns, and offering a briefing on the implementation plan and suite of other improvement actions. The Board accepted NNSA's offer for a briefing in its letter of October 28, 2019, but maintained its position that NNSA's implementation plan constituted rejection of the recommendation. In its letter, the Board provided detailed concerns with the implementation plan, including the following areas: (1) federal ownership, (2) unaddressed sub-recommendations, (3) insufficient scope in implementation plan actions, (4) responsiveness to root causes, and (5) future action plans as implementation plan deliverables. The Board held a public meeting on the implementation plan on December 12, 2019. NNSA personnel briefed the Board on the implementation plan and planned improvement activities. During the public meeting, NNSA personnel committed to revise the implementation plan to address the Board's concerns.



Weapons Manufacturing Operations at the Pantex Plant

Nuclear Explosive Safety

During 2019, the Board and its staff provided oversight of nuclear explosive operations at the Pantex Plant. Specifically, the Board's staff assessed the evaluations of nuclear explosive safety for W88 alteration 370 and B61-12 life extension operations, as well as the programmatic evaluations of Pantex bays, cells, and special purpose facilities in which nuclear explosive operations are performed. Additionally, the Board's staff evaluated process changes to address electrical hazards during B83 disassembly operations.

Design Agency Weapon Response Technical Bases

During 2019, the Board and its staff provided oversight of the design agency technical basis information used in the generation of weapon response summary documents provided to the Pantex Plant for incorporation into its safety basis. Specific weapon response technical bases reviewed included the W88 at Los Alamos National Laboratory; the B61, W80, and W88 at Sandia National Laboratories; and weapon response changes at Lawrence Livermore National Laboratory associated with B83 process changes addressing electrical hazards during Pantex disassembly operations.

During these reviews, the Board and its staff evaluated the adequacy of the design agency documentation and processes used to generate and review the documents. The reviews also addressed federal oversight of the process, and implementation of the revised DOE Standard 3016, *Hazard Analysis Reports for Nuclear Explosive Operations*, that included a revised definition of what constitutes a high explosive violent reaction. Observations from these reviews included opportunities to improve the weapon response development process and the underlying data. The Board and its staff plan to continue these reviews in 2020.

Design Basis Earthquake Impact on Certain Facilities and Appurtenances

On December 27, 2019, the Board communicated to the Secretary of Energy regarding inadequately controlled scenarios involving the failure of certain enclosed corridors (referred to as “ramps”), loading docks, and appurtenances during a design basis seismic event at Pantex. Although the Board concluded that NNSA’s actions to expeditiously upgrade the affected structures are appropriate, the technical basis used to accept the risk for continuing operations in those facilities was not complete. NNSA plans to complete facility upgrades that address this issue in 2020.

Savannah River Tritium Enterprise

Recommendation 2019-2, Safety of the Savannah River Tritium Facilities

Throughout 2018, the Board evaluated the safety bases for the Savannah River Site (SRS) tritium facilities and noted that several credible accidents could result in very high radiological doses, creating the potential for significant consequences to individuals in the vicinity of the those facilities. Notably, the Board experienced significant delays in obtaining information required for this evaluation. On February 11, 2019, the Board sent a draft recommendation to the Secretary of Energy on the safety of the SRS tritium facilities. The NNSA Administrator responded to the draft recommendation noting that ongoing actions adequately address the Board’s concerns, making the need for additional actions unnecessary.

On June 11, 2019, the Board transmitted Recommendation 2019-2, *Safety of the Savannah River Tritium Facilities*, to the Secretary of Energy. The Board recommended that DOE take action to identify and implement near-term compensatory measures and long-term controls to prevent or mitigate the potential for high radiological dose consequences. Additionally, the Board recommended that DOE evaluate the adequacy of emergency

preparedness programs and upgrade them as necessary to ensure the site can quickly identify and properly treat a large number of individuals in the event of an energetic accident at the tritium facilities.

In its September 10, 2019, letter responding to Recommendation 2019-2, NNSA noted certain ongoing and planned actions related to control of high radiological dose scenarios but rejected Recommendation 2019-2. NNSA offered to brief the Board on its actions related to Recommendation 2019-2. On October 10, 2019, the Board responded to the Secretary of Energy and accepted the offer of a briefing. The Board determined that a public meeting would be held at the Board's headquarters on October 28, 2019, to receive the briefing. The Board's response requested that DOE address several topics during the public meeting, including DOE's basis for rejecting Recommendation 2019-2.



Savannah River Tritium Enterprise

At the Board's October 28, 2019, public meeting, DOE's representatives reiterated information from DOE's original response, including several actions and plans, but did not dispute the Board's technical analysis. DOE provided no new substantive information in the briefing; therefore, the briefing did not diminish the Board's concerns.

The Board is concerned that the actions and plans presented by DOE will not fully address the accident scenarios with high dose consequences to individuals in the vicinity of the tritium facilities, and the Board does not agree that ongoing actions and plans obviate the need for Recommendation 2019-2. In addition, by rejecting the Recommendation, DOE's ongoing and planned actions for the tritium facilities will not be subject to an implementation plan and therefore will not be accountable and transparent to the public. As a result, the Board reaffirmed Recommendation 2019-2 in its December 5, 2019, letter to the Secretary of Energy. The NNSA Administrator responded to the Board's reaffirmation on January 3, 2020, reiterating that DOE does not accept Recommendation 2019-2. The Board plans to conduct a public

hearing in 2020 at a location adjacent to SRS. This hearing will include discussion with DOE on the significant safety risk to workers due to high consequence accident scenarios at the Savannah River Tritium Facilities.

Los Alamos National Laboratory (LANL)

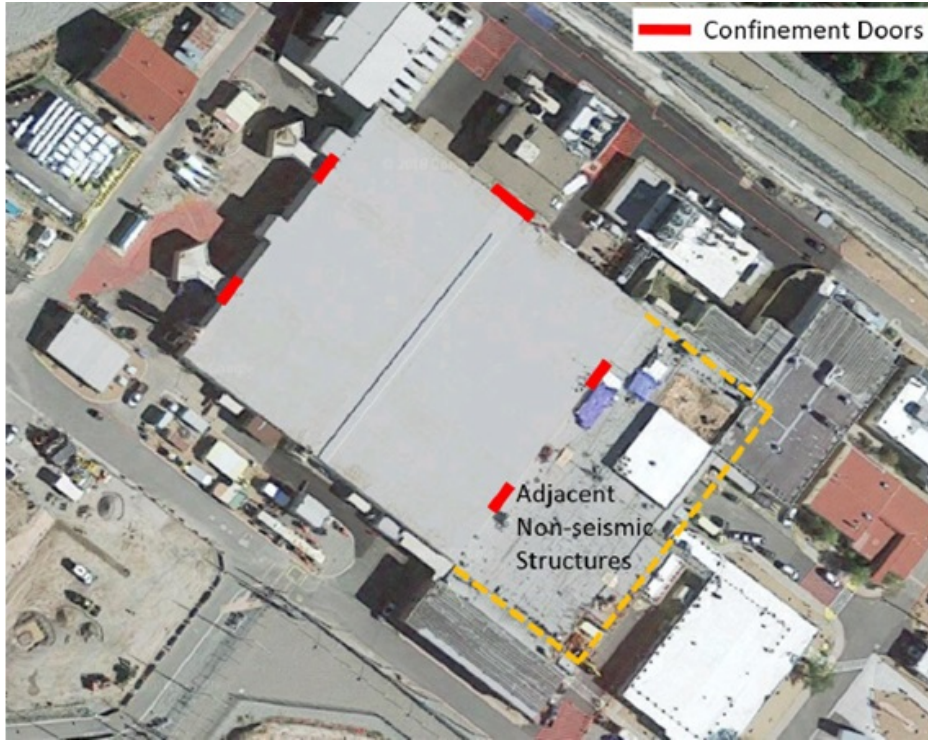
Plutonium Facility Safety Basis

The Board's staff completed a review of the safety basis and supporting documents for the Plutonium Facility (PF-4) at LANL. In a November 15, 2019, letter, the Board communicated to the Secretary of Energy its concerns with the PF-4 safety basis. These concerns relate to:

- Non-conservative assumptions made in the accident analysis that underestimate the dose consequences due to a post-seismic fire,
- Non-conservative inputs and assumptions used to calculate the leak path factor, which is used to quantify the building's ability to passively confine radioactive materials during an accident,
- Inappropriate dose conversion factors used to calculate the dose consequences from accidents involving heat source plutonium oxides,
- Non-conservative assumptions related to the time the building's confinement doors are open following an earthquake, and
- Deficient safety systems with compensatory measures that do not ensure the system will be able to perform its intended safety function.

The Board noted that while DOE has made physical improvements to PF-4 over the past decade, significant portions of DOE's strategy to upgrade the safety controls have been delayed and the upgrades remain incomplete. The timely completion of safety control improvements is particularly important given that DOE is extending its reliance on PF-4 to execute key national security missions. The Board requested a briefing on (1) NNSA's strategy for ensuring the deficient safety systems at PF-4 will be upgraded on a schedule commensurate with future national security missions, and (2) the approach for addressing the weaknesses in the analyses that support the PF-4 safety basis, which occurred in February 2020.

In support of this letter, on November 12, 2019, the Board issued Technical Report, DNFSB/TECH-44, *Los Alamos National Laboratory Plutonium Facility Leak Path Factor Methodology*, which presents the Board's staff's independent analysis and concerns with the statistical methodology used to calculate the PF-4 leak path factor.



LANL Plutonium Facility Showing Confinement Doors



Transuranic Waste Storage Outside of the Plutonium Facility

Radioassay and Nondestructive Testing Shipping Facility

In a December 9, 2014, letter to the NNSA Administrator, the Board identified several issues with the safety controls for the Radioassay and Nondestructive Testing (RANT) shipping facility. In a response letter dated March 25, 2015, the NNSA Administrator committed to resolving these issues and providing quarterly status briefings to the Board. In a May 22, 2019, letter, the Board concluded that the recently revised RANT safety basis resolved the issues identified in 2014 and that the quarterly briefings were no longer needed. In April 2019, LANL resumed shipping operations of transuranic waste to the Waste Isolation Pilot Plant using RANT, which is important for reducing the risk of above ground storage of transuranic waste.

Y-12 National Security Complex (Y-12)

Y-12 Nuclear Criticality Safety

In May 2017, engineers in the Y-12 nuclear criticality safety (NCS) organization identified unexpected quantities of accumulated uranium in the sand recycling system that supports the Building 9212 reduction system. The Y-12 contractor conducted an extent-of-condition review to evaluate the root causes of the event and continued to find unexpected uranium accumulation in various process areas and pieces of equipment through 2018. In a letter to the Secretary of Energy on February 6, 2019, the Board requested a briefing on the Y-12 NCS program, including the program's overall performance and the unexpected uranium accumulation discoveries. The Board subsequently requested additional information regarding the program in a June 5, 2019, letter to the Secretary of Energy.

The Board's staff completed a review of the Y-12 NCS program. The Board issued a letter with an enclosed report on July 25, 2019, to the Secretary of Energy that concluded there were several deficiencies and systemic issues in the Y-12 NCS program and inadequate federal oversight by the NNSA Production Office. The letter and report identified the following deficiencies:

- *Inability of the Y-12 NCS organization to adequately maintain the Y-12 NCS program:* The Y-12 NCS organization lacks sufficient qualified staff to perform both continuous improvement activities and operations-directed work. The site struggles to retain qualified engineers in the Y-12 NCS organization.
- *Lack of Y-12 operations personnel responsibility for criticality safety:* There is an inherent lack of ownership of criticality safety throughout the operations organization at Y-12 that leads to inadequate criticality safety implementation in Y-12 processes.
- *Inadequate interface of the Y-12 NCS program with other Y-12 support programs:* The uranium accumulation events exposed an inadequacy in the interface between the Y-12 NCS program and other Y-12 support programs that impact criticality safety. Y-12 support programs, such as the inadvertent accumulation prevention

and nuclear materials control and accountability programs, lack adequate understanding of the NCS organization's expectations and the NCS organization lacks an understanding of other programs' limitations.

The Board encouraged the Secretary of Energy to use the information from the staff's review to address the deficiencies and make improvements to the Y-12 NCS program. On August 23, 2019, the Board sent a letter to the Secretary of Energy requesting a detailed briefing on actions taken to address feedback from reviews conducted of the Y-12 NCS program; roles and responsibilities of the federal staff in conducting oversight of nuclear criticality safety; and expectations of its field office personnel in ensuring the safety of its federal and contractor workforce. In October 2019, because of the Board's concerns, the full Board conducted its first trip in several years to receive this briefing on-site and to conduct field observations of Building 9212. The Board remains concerned with the criticality safety program, particularly the operators' understanding of and compliance with the program, and will continue to review the Y-12 NCS program in 2020.



Y-12 National Security Complex

Nevada National Security Site (NNSS)

Device Assembly Facility Seismic Hazard Assessment

The Board's staff completed an evaluation regarding the seismic hazard for the Device Assembly Facility (DAF) at NNSS. In a letter dated March 21, 2019, the Board communicated to the Secretary of Energy its concern with the seismic hazard at DAF. In 2007, NNSS completed the update for the DAF probabilistic seismic hazard analysis, which identified a significant seismic hazard increase. However, NNSS continues to operate DAF without accounting for the increase in seismic hazard and without evaluating whether the structures, systems, and components credited in the safety basis can perform their safety function during and after a

seismic event. The Board communicated that it was concerned with the situation and informed DOE of its intent to review the planned revision of the DAF safety basis. This review is underway.

IV. Defense Nuclear Waste Operations

In 2019, the Board performed nuclear safety oversight of high priority Office of Environmental Management operations within the nuclear weapon complex. The Board based its oversight priorities on the nuclear safety risk of proposed and ongoing activities. For the Hanford and Savannah River Sites, the Board maintained full-time resident inspectors to monitor operations. For selected sites at which Environmental Management operations are not the primary activity, such as Los Alamos and Oak Ridge National Laboratories, the Board maintained coverage using resident inspectors assigned nearby and dedicated members of the Board's headquarters staff. Dedicated members of the Board's headquarters staff monitor Idaho National Laboratory and the Waste Isolation Pilot Plant.

Safety of Waste Processing and Storage

DOE has experienced two notable events in which drums containing solid nuclear waste were breached due to unexpected chemical reactions that occurred within the wastes. One event occurred in February 2014 at the Waste Isolation Pilot Plant (WIPP), and the other occurred in April 2018 at the Idaho National Laboratory (INL). Both events involved the release of radioactive wastes from the drums.

On June 20, 2019, the Board conducted a public hearing on safety management of waste storage and processing in the defense nuclear facilities complex. The public hearing included a range of topics, such as the corrective actions DOE took after the two events, deficiencies in DOE standards related to chemical reaction hazards, controls in place at DOE sites for preventing similar accidents, and federal oversight.

The Board has been evaluating how DOE is learning from these events, the circumstances surrounding them, and whether DOE has been appropriately strengthening its safety posture. As part of this effort, the Board sent the Secretary of Energy a letter on March 12, 2019, regarding flammable gas hazards (such as methane) in waste containers. The April 2018 event at INL highlighted the fact that some wastes at INL generate substantial amounts of methane, and the Board found that DOE did not have effective controls to prevent or mitigate certain types of accidents related to flammable gases. On October 18, 2019, the Board sent a follow-up letter to the Secretary requesting information on the prevalence of flammable gas drums at sites beyond INL. The Board is currently analyzing DOE's response, which arrived January 6, 2020.

In the interim, the Board has observed that controls associated with drums on location at generator sites vary widely in number, quantity, and rigor. Further, recognizing that a potential gap exists, DOE established a working group to revise DOE Standard 5506, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities* in June 2019. The Board transmitted advice to the Secretary in early January 2020 regarding specific areas of concern to address while developing the revision.

Savannah River Site

The Board continued to work closely with DOE personnel as they continued actions identified in response to Recommendation 2012-1, *Savannah River Site Building 235-F Safety*. Recommendation 2012-1 identified the need for DOE to take actions to reduce the risk to collocated workers near Building 235-F, and progress is discussed more fully in Appendix A. The Board also continued to provide oversight of the Salt Waste Processing Facility design and construction project. Details can be found in Section V. The Board plans to conduct a public hearing in 2020 at a location adjacent to SRS. This hearing will include discussion with DOE on Building 235-F and other significant safety topics.

H-Canyon Facility

In a December 16, 2015, letter to DOE, the Board identified concerns regarding the structural integrity and degraded state of the H-Canyon Exhaust (HCAEX) Tunnel. As a result, DOE directed its contractor to perform a non-linear fragility analysis of the HCAEX Tunnel to determine the tunnel's adequacy. The analysis determined that the tunnel currently meets the acceptance criteria for the probability of surviving a seismic event, but also notes that there is limited margin under gravity loads for additional degradation beyond the concrete loss considered in the analysis. Consequently, DOE is pursuing an alternative control strategy that would not require the HCAEX Tunnel to survive a seismic event while still assuring adequate protection of the public.



HCAEX Tunnel Concrete Surface Degradation as of 2018

In a letter to the Secretary of Energy dated December 7, 2018, the Board identified its interest in the alternative strategy evaluation that DOE is conducting, and established a reporting requirement for DOE to brief the Board on the status of the evaluation within 180 days, and to provide quarterly updates thereafter until the evaluation is completed. Briefings were conducted on June 6, 2019, and September 30, 2019. DOE now plans to credit other process equipment with providing adequate containment during a seismic event along with radiological material limits. Thus there will no longer be a need to credit the HCAEX Tunnel as a safety-related control during or after a design basis earthquake. The evaluation is captured in a revision to the H-Canyon Documented Safety Analysis, which DOE approved in December 2019. In January 2020, the Board received a briefing from DOE on its revised safety strategy and the Board's staff will review the revised analysis later in 2020.



Transuranic Waste Shipment Departing from LANL to WIPP

Los Alamos National Laboratory

Safety of Transuranic Waste Operations

During 2019, the Board's staff began a review of transuranic waste generation, processing, and storage operations at LANL, including NNSA facilities (the Plutonium Facility, the Chemistry and Metallurgy Research Facility, and the Transuranic Waste Facility) and Area G, which is the responsibility of the DOE Office of Environmental Management. The staff's review is focused on topics related to the Board's June 20, 2019, public hearing discussed above on safety management of waste storage and processing in the defense nuclear facilities complex, including:

- Hazards associated with undesired chemical reactions in transuranic wastes at LANL and the technical basis for accident analysis assumptions (e.g., the Area G safety basis analyzes energetic chemical reactions using a release fraction about 130 times

lower than the value used in the Plutonium Facility safety basis for waste involving nitric acid and polyols); and

- Safety control strategy for preventing and mitigating releases due to energetic chemical reactions (e.g., preventing the creation of waste with incompatible materials, safety of waste stored inside and outside of confinement, and controls for detecting releases).

The Board's staff will continue its review into 2020.

Hanford Site

The Board continued to provide oversight of several design and construction projects intended to support the disposition of radioactive waste stored in 177 underground tanks, including the Waste Treatment and Immobilization Plant and the Tank Side Cesium Removal System. Discussion of these design and construction projects can be found in Section V.

Deactivation and Decommissioning of the Plutonium Finishing Plant (PFP)

In December 2017, DOE suspended demolition activities at PFP following a spread of contamination beyond radiologically controlled areas. In conjunction with the State of Washington and the Environmental Protection Agency (both of which have jurisdiction over aspects of the activity), DOE lifted the work suspension in September 2018, after completing the corrective actions, and resumed lower-risk PFP demolition work. In 2019, the Board's oversight of the demolition activities focused on DOE's control of the contamination and the corrective actions DOE established to avoid recurrence of the conditions resulting in the contamination spread event. In April 2019, the Board's staff observed and evaluated the management assessment for the resumption of higher-risk PFP demolition work. The Board and its staff continue to monitor ongoing demolition and debris removal activities as the project enters the final phase of demolition.



Demolition Operations at the Hanford Plutonium Finishing Plant

Hanford 324 Building Remote Soil Excavation

The Waste Technology Engineering Laboratory (324 Building) at the Hanford site operated from 1965 to 1996 in support of radioactive materials and chemical process research and development. During its operational period, an unidentified breach in the protective metal barrier associated with the facility's B-Cell floor allowed spills of liquid highly radioactive materials to leak into the soil beneath the B-Cell. DOE has designed a project to remediate the highly contaminated soil underneath the B-Cell to mitigate the environmental hazard.



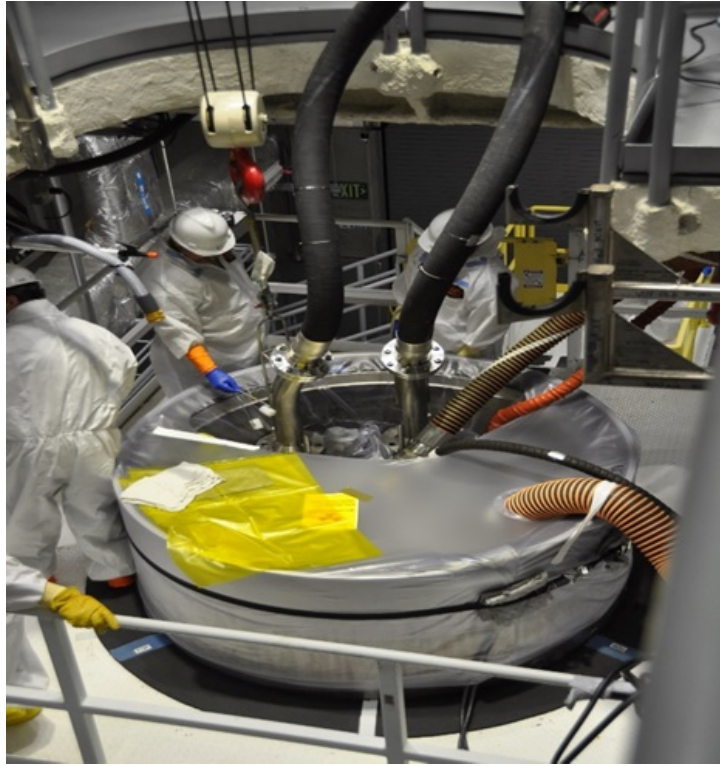
Airlock Operations in the 324 Building at Hanford

In 2019, the Board's staff reviewed the structural design aspects of the contaminated soil remediation project, including the design of micropiles that will be used to support the facility during removal of contaminated soil. In March 2019, DOE's contractor began drilling pilot holes to gather information related to the installation of the micropiles. During the work, the contractor's workforce identified higher than expected radiological contamination, resulting in a need to improve its contamination controls. However, because of continuing instances of personnel contamination, work was subsequently stopped by the contractor in November 2019. The Board's staff is closely monitoring DOE and contractor efforts to improve work and radiological controls at the 324 Building, as well as the actions to address the contamination events and implement proposed corrective actions.

Sludge Removal Project

In 2019, the Board's staff maintained oversight of sludge retrieval and transfer operations from the 105-K West Basin to the sludge transport and storage containers (STSCs) staged in the 105-K West Annex, transport of STSCs to T-Plant, and T-Plant receipt and processing activities for storage. The primary objective was to verify that project personnel

maintained adequate formality and discipline of operations in the 105-K West Area and T-Plant, ensuring sludge transfer and transport operations could be completed safely.



Final Sludge Transfer in 105-K West Annex



Final Transport of Sludge Container from 105 K-West Basin/Annex

DOE successfully completed this significant project to move the highly radioactive sludge away from the Columbia River at the 105-K West Basin/Annex and into safer storage on the Central Plateau at T-Plant on September 9, 2019. 105-K West personnel expect to ship approximately four more STSCs bearing contaminated sand and garnet filter media in the next

year for long-term storage at T-Plant pending development of a permanent disposal strategy. 105-K West Basin water will eventually be shipped to the Liquid Effluent Retention Facility basins for processing at the Effluent Treatment Facility.

Review of Hanford Site Electrical Distribution System

In 2019, the Board's staff completed a review of the electrical infrastructure for a number of Hanford's operating nuclear facilities. The Board communicated results of this review in a July 2, 2019, letter to the Secretary of Energy. The Board noted that, while significant progress has been made toward improving the site-wide electrical infrastructure, there are still some concerns that merit DOE's attention. In particular, the letter noted that a significant portion of the T-Plant electrical distribution system is original to the facility construction (completed in 1944) and is well past its design life. The distribution system's age, combined with the lack of an alternate power supply, could impact the reliability of the plant's safety-significant confinement ventilation system. T-Plant is expected to remain operational in support of site missions, such as storage of 105-K West Basin sludge, for the foreseeable future.

Oak Ridge National Laboratory (ORNL)

Building 2026 Initial Uranium-233 Processing Campaign

The Board reviewed the preliminary documented safety analysis (PDSA) for the Initial Processing Campaign in Building 2026. The Initial Processing Campaign would be the first of several planned campaigns to down-blend uranium-233 stored at ORNL Building 3019 for ultimate disposal as low-level waste. This campaign is considered a major modification because the materials/processes involved require DOE to upgrade Building 2026 from a Hazard Category 3 facility to a Hazard Category 2 facility.

The Board communicated the results of this review to the Secretary of Energy in an October 7, 2019, letter. In particular, the Board noted its concerns with the facility's accident analysis and its use of potentially non-conservative airborne release fraction and respirable fraction values in the event of a pressurized release of radiological material. In addition, the enclosure to the letter contained the following observations: (1) the contractor did not fully evaluate the need for a criticality accident alarm system, (2) the emergency lights in the building are not seismically qualified and alternative lighting was not identified to allow workers to evacuate after a seismic event, and (3) the PDSA focused on identification of safety significant controls but did not clearly describe the protection of facility workers from high radiation levels during normal operations. The Board will continue following DOE's efforts in preparation for the uranium-233 down-blending campaigns.

Criticality Safety for the Building 2026 Oak Ridge Oxide Processing Campaign

The Oak Ridge Oxide Processing (OROP) campaign is a separate project in Building 2026 that is designed to extract thorium-229 from selected uranium-233 materials for medical application. The campaign is one of DOE's projects for treating and transforming the stored inventory of uranium-233 material into a low-level waste form suitable for disposal.

Based on review of the OROP campaign, on December 4, 2019, the Board sent a letter to the Secretary of Energy regarding nuclear criticality safety. The Board identified an inconsistency with the implementation of the safety basis and criticality safety evaluation requirements from DOE Order 420.1C, *Facility Safety*, which cites American National Standard Institute/American Nuclear Society (ANSI/ANS) 8.1, *Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors*.

As discussed in the Board's letter, the OROP campaign did not initially include an adequate safety margin between the operational fissile mass limit and the specified subcritical fissile mass limit for processing the uranium-233 material. While the contractor had subsequently developed additional analyses to establish a new subcritical fissile mass limit, the Board determined that the analysis was incomplete. Though the Board did not identify a safety concern with the new limit, the Board's letter advised that DOE should consider improving the technical documentation to meet DOE Order 420.1 and ANSI/ANS 8.1. The Board will continue to provide oversight of the OROP campaign.

Waste Isolation Pilot Plant

In addition to providing operational oversight, the Board provided oversight of the design for the new safety significant confinement ventilation system at WIPP. Details can be found in Section V. Overall, the Board has observed that WIPP continues to struggle in areas such as maintenance, work control, conduct of operations, and safety-related instrumentation and control.

Idaho National Laboratory

The Integrated Waste Treatment Unit (IWTU) is designed to process approximately 900,000 gallons of liquid radioactive sodium-bearing waste, which is now stored at INL's Idaho Nuclear Technology and Engineering Center (INTEC) tank farm, as well as newly generated liquid waste from INTEC. In 2019, IWTU has continued efforts addressing problems during operations with non-radioactive simulant. The Board transmitted a letter to the Secretary of Energy on February 27, 2019, requesting a briefing on the status of the project. Representatives from the DOE Idaho Operations Office and the operating contractor briefed the Board on March 26, 2019, regarding the current status of the facility, issues and accomplishments, and remaining schedule to start radiological operations and complete the facility's mission.

The latest DOE schedule calls for the start of a contractor readiness assessment in July 2020, followed by a federal readiness assessment in August 2020. A confirmatory run to demonstrate full plant controllability will follow. The Board will continue to observe activities to start IWTU radiological operations closely.



Integrated Waste Treatment Unit

V. Design and Construction

The Board’s Policy Statement-6, *Policy Statement on Oversight of Design and Construction of Defense Nuclear Facilities*, established in July 2017, provides the current approach the Board takes to review the design and construction of DOE defense nuclear facilities. The Board evaluates staff analyses, along with other sources of data such as input from resident inspectors, Board member field visits, DOE project status briefings, and Board hearings, to form the basis for identifying any nuclear safety deficiencies to DOE. Commensurate with the degree a deficiency challenges adequate protection of public health and safety, the Board uses its statutory tools to inform DOE and the public. Design and construction projects under review in 2019 by the Board and its staff are listed in the following table.

Design and Construction Projects Under Review in 2019

Project Name	Location	Status of Project	Status of Board Review
Waste Treatment and Immobilization Plant	Hanford Site, Richland, WA	Concurrent design and construction	Ongoing - project letter issued on 10/12/2017
Low Activity Waste Pretreatment System	Hanford Site, Richland, WA	Preliminary design	Project on hold - project letter issued on 5/14/2015
Tank Side Cesium Removal System	Hanford Site, Richland, WA	Preliminary design	Ongoing
Tank Waste Characterization and Staging Capability	Hanford Site, Richland, WA	Conceptual design	No ongoing design activities
Idaho Calcine Disposition Project	Idaho National Laboratory, Idaho Falls, ID	Conceptual design	Project on hold
Plutonium Equipment Installation Subproject Phase 1	Los Alamos National Laboratory, Los Alamos, NM	Construction	Ongoing - project letter issued on 11/18/2016
Transuranic Waste Processing Center Sludge Processing Facility Buildouts Project	Oak Ridge National Laboratory, Oak Ridge, TN	Preliminary design	Ongoing

Project Name	Location	Status of Project	Status of Board Review
Material Staging Facility	Pantex Plant, Amarillo, TX	Conceptual design	Ongoing
Salt Waste Processing Facility	Savannah River Site, Aiken, SC	Construction complete, preparing for startup	Ongoing
Safety Significant Confinement Ventilation System	Waste Isolation Pilot Plant, Carlsbad, NM	Final design	Ongoing - project letters issued on 3/26/18 and 8/27/19
Uranium Processing Facility	Y-12 National Security Complex, Oak Ridge, TN	Construction	Ongoing - project letter issued on 6/26/2017
Electrorefining Project	Y-12 National Security Complex, Oak Ridge, TN	Final design	Ongoing

Hanford Site, Waste Treatment and Immobilization Plant and Tank Side Cesium Removal System

The tank farms at the Hanford Site near Richland, Washington, contain 56 million gallons of radioactive and toxic waste stored in 177 underground tanks. In the late 1990s, DOE began work on the Waste Treatment and Immobilization Plant (WTP), which is intended to immobilize the Hanford tank waste. WTP is a radiochemical processing plant consisting of four primary facilities: Pretreatment, Low-Activity Waste (LAW), High-Level Waste (HLW), and the Analytical Laboratory facilities. As initially designed, all waste first would be processed through the Pretreatment facility, where it would be separated into two streams: low-activity waste and high-level waste. These two waste streams then would be solidified into glass in stainless steel containers at the LAW and HLW facilities, respectively. DOE will dispose of the low-activity waste glass onsite and will ship the high-level waste glass offsite for permanent disposal once a national repository is available.

Since initial design efforts, numerous technical issues have arisen at WTP, primarily related to the Pretreatment and HLW facilities, which are now considered by DOE to be resolved. In a letter to the Board dated October 24, 2018, DOE had declared resolution of three technical issues related to the design of the HLW facility: unanalyzed melter accidents, seismic categorization of safety controls, and hydrogen control strategy. As documented in its May 19, 2019, letter to the Secretary of Energy, the Board agrees that DOE has identified acceptable strategies for resolving these issues. However, the Board's letter also provided further technical information for DOE's consideration.

In a separate letter dated May 15, 2019, DOE declared resolution of issues related to control of pulse-jet mixers in the Pretreatment and HLW facilities. DOE initially opened the technical issue, in part, because of concerns raised in Board Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*. In its letter, DOE described significant testing, design changes, and structural analysis to support resolution of the original technical issues. The Board acknowledged this effort in its November 18, 2019, response letter to the Secretary of Energy. The Board agrees that these DOE's efforts responding to Recommendation 2010-2 have strengthened the technical foundation for use of pulse-jet mixer systems in the WTP facilities.

The technical issues, in conjunction with funding constraints, have significantly impacted the timeline for waste treatment. Consequently, DOE developed a strategy to feed the low-activity waste to the LAW facility without first processing it in the Pretreatment facility. The current approach involves a new project—the Tank Side Cesium Removal (TSCR) system—that will pretreat and deliver waste to the LAW facility. This approach would enable the LAW facility to vitrify waste prior to completion of the Pretreatment facility; however, high-level waste would still be pretreated and delivered via the Pretreatment facility.

In May 2018, DOE approved the documented safety analysis for the LAW facility. In June 2018, Bechtel National, Incorporated, declared completion of LAW facility construction activities. DOE approved the preliminary documented safety analysis for TSCR in January 2020. DOE is beginning commissioning activities, with the intent to begin LAW facility operation ahead of a legally mandated 2023 deadline. Due to the complexity and hazards of the LAW facility as well as the precedent such commissioning activities will set for HLW and Pretreatment facilities, the Board will maintain significant oversight of the LAW facility safety analysis and startup preparations.

Regarding the electrical distribution system at WTP, DOE declared resolution of 10 issues in its letter to the Board dated December 10, 2018. The Board had initially raised these issues in April 2012. Given DOE's planned safety strategy for the LAW facility, the Board does not have any significant concerns related to its electrical infrastructure. However, as the Board noted in its response letter of October 7, 2019, to the Secretary of Energy, two issues—equipment qualification and the battery charging control set—remain a concern given the differences in the operating environments between the LAW facility and the Pretreatment and HLW facilities.

In its August 30, 2019, letter to the Board, DOE declared resolution of concerns related to erosion wear allowances for piping, vessels, and pulse-jet mixers, applicable to the Pretreatment facility, and, to a lesser extent, the HLW facility. The Board's review of DOE's technical analyses related to erosion and corrosion wear allowances continues into 2020.

In its October 23, 2014, letter, the Board requested that DOE address increased volcanic ashfall hazards identified in updated assessments by the United States Geological Survey and provide plans to incorporate that information into the WTP design and safety basis. In late 2018, reports of a multi-agency effort sponsored by DOE were completed in support of an

updated volcanic ashfall characterization for the Hanford site. However, DOE has determined that additional work is required before it can use the results of that study. Instead, DOE is using the results of a previously developed hazard assessment produced by the United States Geological Survey that provides significantly increased ashfall parameters. Given this approach, the Board does not have any safety issues related to the ashfall hazard and planned operations for the LAW facility.

In 2019, the Board's staff also reviewed the safety instrumented systems that will be used in the LAW facility. Based on the information reviewed, the Board did not identify any safety issues in this area. The Board will continue to follow DOE's effort to complete the development of these systems and their associated surveillance methodologies.



Control Room in the Low-Activity Waste Facility at Hanford

Savannah River Site, Salt Waste Processing Facility (SWPF)

SWPF will separate SRS tank farm radioactive waste into high-level and low-activity waste streams. The high-level waste stream will be vitrified at the Defense Waste Processing Facility and the low-activity waste stream will be immobilized into a grout mixture at the Saltstone Production Facility. In April 2016, DOE completed SWPF construction and began system and facility testing. The systems and facility testing continued into 2019. By year's end, the SWPF contractor was completing cold commissioning testing using a non-radioactive waste simulant and had conducted a contractor operational readiness review (ORR).

In 2019, the Board's staff completed reviews of the SWPF safety basis documents and functional testing of safety systems. The Board's staff also observed (1) testing of facility systems in response to plant upsets, (2) several drills and exercises to demonstrate emergency preparedness, and (3) various training sessions and oral qualification boards for operations personnel.

In November 2019, the Board's staff observed the conduct of the SWPF contractor ORR by which the contractor intended to confirm readiness for safe startup of radiological operations. The contractor ORR resulted in several findings requiring resolution. The DOE Savannah River Operations Office found, however, that the SWPF contractor ORR report identified numerous other deficiencies that were not captured by the ORR findings and that may not be addressed by explicit corrective actions. At year's end, DOE was working with the SWPF contractor on a path forward to address and correct the deficiencies identified by the contractor ORR, as well as other deficiencies identified by DOE. DOE plans to conduct a federal ORR in early 2020 to confirm readiness for SWPF startup. In 2020, the Board and its staff will closely follow the DOE and contractor efforts to make SWPF ready and to start radiological operations.



Salt Waste Processing Facility at the Savannah River Site

WIPP, Safety Significant Confinement Ventilation System (SSCVS)

The Board's staff completed a review of the final design of the SSCVS instrumentation and control system. In an August 27, 2019, letter to the Secretary of Energy, the Board noted its determination that the design of the SSCVS does not adequately consider design requirements for an important piece of its instrumentation and control system, the underground, safety-significant continuous air monitor (CAM) system. Inadequate performance of the CAM system can result in an atmospheric radiological release and contamination of the SSCVS salt reduction building. The Board's letter outlined three safety items related to (1) the time required to return the SSCVS to a safe configuration upon CAM detection of an underground radiological release, (2) interlocks between supply fans in a proposed utility shaft and SSCVS fans to avoid inadvertent up-casting of potentially

contaminated underground air, and (3) the use of CAM locations and set-points developed under the regulatory framework established by Title 10, Code of Federal Regulations (CFR) 835, *Occupational Radiation Protection*, as opposed to 10 CFR 830, *Nuclear Safety Management*.

In addition, the Board’s August 27, 2019, letter discussed the need for WIPP personnel to consider the long-term effect of the underground salt environment on CAM performance, as well as the effects of a smoke environment that may co-exist with a radiological release event. Further, the instrumentation and control systems that will effect actuation of safety systems have not been clearly described. WIPP does not completely specify and analyze design and performance criteria, which makes it difficult to ensure that the final SSCVS design can perform its intended safety function. In addition to releasing unfiltered radiological contamination, a release could contaminate the salt reduction system and impact operations of the WIPP facility as a whole. The Board requested that DOE provide a written response followed by a briefing from DOE outlining plans to address these concerns.

On December 20, 2019, DOE sent its written response to the Board’s letter; DOE intends to brief the Board early in 2020.

Y-12 National Security Complex, Uranium Processing Facility (UPF)

In March 2018, the UPF project achieved several crucial milestones by receiving NNSA’s approval for critical decision 2 and 3 for all major sub-projects under the larger UPF project portfolio. This authorized and initiated the official start of construction for all three nuclear building structures and the non-nuclear support building.



UPF Main Processing Building Construction

UPF construction activities have been focused on erecting structural steel for the Salvage and Accountability Building and placing concrete for the first floor walls of the Main Processing Building. The structural shell (steel framing and outer sheet metal skin) of the Mechanical and Electrical Building are complete, and construction activities have shifted to installation of equipment. For the past year, the UPF project also has focused on equipment fabrication and installation.

The Board's staff conducted a review of quality assurance of construction and equipment fabrication. This review included three visits to UPF vendors fabricating components to the nuclear quality assurance requirements of the American Society of Mechanical Engineers and an on-site review of quality assurance implementation by NNSA's primary construction contractor for UPF. The Board's staff assessed implementation of quality assurance procedures, instructions, and plans in accordance with UPF project requirements and assessed the oversight provided by the NNSA Uranium Project Office.

VI. Safety Standards and Programs

The Board evaluates the content and implementation of DOE directives relating to the design, construction, operation, and decommissioning of DOE's defense nuclear facilities. The Board is required to review these directives, termed as "standards" in the Atomic Energy Act, which include DOE orders, guides, regulations, standards, and handbooks.

Department of Energy Regulations and Directives

DOE Rule on Nuclear Safety Management

DOE has yet to complete its efforts, begun in 2018, to revise 10 CFR 830, *Nuclear Safety Management*. This rule serves as the cornerstone of DOE's regulatory framework to ensure adequate protection of public health and safety. The Board communicated its concerns and comments on DOE's notice of proposed rulemaking to DOE in an October 5, 2018, letter. To date, DOE has not communicated to the Board how it intends to address the Board's comments.

Overall, the Board is concerned that the proposed revision to 10 CFR 830 will make it more difficult for DOE to exercise consistent oversight across the complex and loosens requirements upon which DOE and the public rely to ensure adequate protection of public health and safety. The Board is concerned that, if DOE's proposed changes are implemented, there is a potential for the safety basis and facility operations to drift outside the envelope approved by DOE. The Board also identified concerns with the current version of 10 CFR 830 that should be addressed regardless of DOE's resolution of the Board's and the public's comments on the proposed revision. The Board's normal oversight activities frequently involve various aspects of 10 CFR 830 or its implementation, and through these activities the Board will continue to assess the effectiveness of the rule and its implementation at defense nuclear facilities. (The Board subsequently issued Recommendation 2020-1, *Nuclear Safety Requirements*, on February 21, 2020.)

DOE Standard 3014-2006, Accident Analysis for Aircraft Crash into Hazardous Facilities

DOE issued DOE Standard 3014 in 1996 so there would be consistent and comprehensive analyses of external hazards of aircraft crash accidents that affect nuclear facilities. In 2019, the Board and its staff completed a review of DOE Standard 3014, which has not been modified since 1996. The Board found that this standard is inconsistent with updated DOE directives, and the inputs used to screen the aircraft crash hazards are no longer adequate. The Board's review identified other technical weaknesses as well as areas where additional guidance by DOE is warranted to improve the standard's contents. In addition, this standard is implemented inconsistently across the complex. In its November 6, 2019, letter to the Secretary of Energy, the Board advised DOE to take action to revise this standard and address the identified safety issues so that pertinent hazard analyses are prepared in an adequate manner to support the documented safety analyses required by DOE. To date, DOE has taken no action, and the Board is not aware of any DOE plans to revise this standard.

DOE Standard 1158-2010, Self-Assessment Standard for DOE Contractor Criticality Safety Programs

DOE issued DOE Standard 1158 in 2010 to ensure consistent contractor implementation of applicable industry standards for criticality safety programs issued by the American National Standards Institute and the American Nuclear Society. The Board evaluated this DOE standard and issued a June 5, 2019, letter to the Secretary of Energy identifying two safety items. First, DOE independently decided to cancel DOE Standard 1158 in November 2018. Maintaining an active DOE self-assessment directive or technical standard for DOE contractors is important to ensuring healthy criticality safety programs and safe operations. Second, DOE Standard 1158 was not aligned with current revisions of relevant industry standards. For areas where there are new requirements, recommendations, or substantial changes to existing requirements, the contractors could develop the corresponding lines of inquiry without DOE guidance, which runs the risk of inconsistent and/or inaccurate application across the complex. The Board's letter advised that DOE consider incorporating updated information, consistent with current industry standards, into an active DOE directive or technical standard. DOE has recently begun work to address these concerns. The Board intends to follow this effort.

Planned Reviews in 2020

The Board is examining some DOE directives that have complex-wide effects and/or those that establish controls for high-hazard activities in fiscal year 2020. The Board plans to review revisions to DOE Standard 5506, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities*; DOE Handbook 3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*; new DOE Standard 1228-2019, *Preparation of Documented Safety Analysis for Hazard Category 3 DOE Nuclear Facilities*; and revised DOE Standard 1027-2018, *Hazard Categorization of DOE Nuclear Facilities*. The Board may elect to add reviews of DOE directives as it deems appropriate.

Federal Oversight

In 2019, the Board's staff began a review of DOE oversight implementation across the complex, specifically focused on how DOE ensures that its federal oversight is effective at ensuring safe operations at defense nuclear facilities. This includes gathering oversight information from multiple DOE headquarters organizations and field offices to better understand the current DOE oversight framework relative to DOE requirements bearing on federal oversight. The Board's staff will continue its review into 2020, comprising interactions with the various DOE entities to support the analysis of DOE oversight and providing results of the analysis.

Nuclear Criticality Safety

The Board's staff conducted criticality safety reviews in 2019 to ascertain the health of DOE contractor criticality safety programs. These included reviews at the Y-12 National Security Complex and the Lawrence Livermore National Laboratory of contractor criticality

safety program compliance with applicable industry standards as well as oversight by the DOE field offices.

Additionally, the Board's staff reviewed the DOE Fiscal Year 2018 Annual Metrics Report on nuclear criticality safety programs, which was transmitted to the Board on January 28, 2019. In response to a Board's letter to the Secretary of Energy on February 6, 2019, related to the annual metrics report, DOE provided a briefing to the Board on the Y-12 nuclear criticality safety program, including its overall performance and unexpected uranium accumulation discoveries. Further details on the Board's review of the Y-12 program are provided in Section III. While continuing to assess nuclear criticality safety programs across the complex, the Board intends to maintain a strong focus on the Y-12 program.

Technical Safety Requirement (TSR) Implementation

In 2019, the Board's staff began a cross-cutting review of TSR implementation at defense nuclear facilities located at the Hanford Site, Los Alamos National Laboratory, the Pantex Plant, the Savannah River Site, and the Y-12 National Security Complex. This review is focused on the site protocols and practices for declaration and reporting of violations of facility TSRs and analysis of applicable DOE directives in supporting safe operation of defense nuclear facilities. The Board staff's review will continue in 2020.

Electrical Systems

The Board evaluated facility emergency lighting systems across the DOE complex. Some form of emergency lighting is typically provided as a key life safety system to support facility egress and emergency response activities in defense nuclear facilities, but the majority of emergency lighting systems installed across the complex have not been designed to survive a design basis earthquake. Thus, it is possible that neither normal nor emergency lighting would be available during or after a design basis earthquake. The lack of lighting could affect workers' ability to evacuate a facility or hinder emergency response actions. In its December 4, 2019, letter to the Secretary of Energy, the Board noted that this situation indicates a weakness in the published guidance regarding the design and qualification of these critical systems. The Board will continue to evaluate facility emergency lighting and DOE's efforts to improve these systems across the complex.

Sharing of Operating Experience

In a January 4, 2018, letter to the Secretary of Energy regarding review of TSR implementation at SRS, the Board identified less than adequate rigor of TSR control implementation, training, work authorization, and corrective actions. By May 2018, DOE and NNSA had responded with a set of actions taken or planned at SRS to address the issues identified by the Board. In its August 14, 2018, letter to the Secretary of Energy, the Board noted that sharing the SRS operating experience for ensuring rigorous TSR implementation with the defense nuclear complex would be beneficial and help identify challenges in this area at

other sites. In June 2019, DOE issued an operating experience document to the complex highlighting the SRS actions.

Appendix A: Board Recommendations

Recommendations Open in 2019

Recommendation 2019-2, *Safety of the Savannah River Tritium Facilities (REJECTED)*

Recommendation 2019-2 identified the need for DOE to take actions to ensure adequate protection of public health and safety at the tritium facilities. In a September 10, 2019, letter, DOE rejected Recommendation 2019-2. Following the September letter and a public meeting on October 28, 2019, the Board transmitted a letter to the Secretary of Energy on December 5, 2019, reaffirming Recommendation 2019-2. For additional information on Recommendation 2019-2, see the Savannah River Tritium Enterprise entry in Section III of this report.

Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant (REMAINS OPEN)*

Recommendation 2019-1 identified the following: (1) portions of the safety basis for Pantex nuclear explosive operations do not meet 10 CFR 830, including high consequence hazard scenarios that are not adequately controlled; (2) multiple components of the process for maintaining and verifying implementation of the Pantex safety basis are deficient; and (3) the Pantex federal and contractor organizations have been unable to resolve known safety basis deficiencies. DOE accepted the Recommendation on April 16, 2019, and transmitted its implementation plan on July 16, 2019.

Upon review, the Board found the “language and terms of the Implementation Plan in fact reject significant parts of the Recommendation,” and reaffirmed Recommendation 2019-1 in a letter dated August 22, 2019. In a public meeting on December 12, 2019, NNSA personnel briefed the Board on its implementation plan and other improvement activities. Of note, during the public meeting, NNSA personnel committed to revise the Recommendation 2019-1 Implementation Plan to address Board concerns. For additional information on Recommendation 2019-1, see the Pantex Plant entry in Section III of this report.

Recommendation 2015-1, *Emergency Preparedness and Response at the Pantex Plant (CLOSED IN 2019)*

The Board issued Recommendation 2015-1 in November 2015 to address significant weaknesses in specific elements of emergency preparedness and response at Pantex. Through 2018 and early 2019, members of the Board’s staff observed multiple exercises and drills at Pantex that demonstrated various improvements to emergency preparedness and response following the Board’s Recommendation. The Board closed Recommendation 2015-1 in a February 6, 2019, letter to the Secretary of Energy.

2012-2, Hanford Tank Farms Flammable Gas Safety Strategy (REMAINS OPEN)

Recommendation 2012-2 identified the need for safety-related ventilation systems to aid in preventing flammable gas events in the double-shell tanks at the Hanford Tank Farms. The recommendation also identified the need to upgrade a number of other systems necessary to provide accurate and reliable indications of abnormal conditions associated with flammable gas events.

DOE is now treating the double-shell tank primary ventilation system as a safety-significant control in the safety basis for the Hanford Tank Farms. In 2019, per DOE's implementation plan, DOE tested previously installed equipment and implemented the required safety basis changes to support the use of the new safety-significant flow detection equipment in the ventilation exhaust ducts. These monitors will allow DOE to ensure that airflow is sufficient to prevent hydrogen gas accumulation.

In a November 25, 2019, letter to the Board, DOE stated that, with the addition of two planned improvements to the tank farms documented safety analysis that address the remaining implementation action items, it considered Recommendation 2012-2 action items to be closed. The Board is evaluating DOE's approach for closing the remaining action items.

Recommendation 2012-1, Savannah River Site Building 235-F Safety (REMAINS OPEN)

Recommendation 2012-1 identified the need for DOE to take actions to reduce the risk to collocated workers near Building 235-F at SRS. One of the recommendations was to remove or immobilize the residual contamination within Building 235-F. The Secretary of Energy provided an implementation plan in response to Recommendation 2012-1 in December 2012 and an updated schedule to the implementation plan in March 2015.

From the fourth quarter of 2018 and into the beginning of 2019, DOE made progress in removing material from some of the plutonium fuel form cells and gloveboxes. In July 2019, the Savannah River Operations Office sent a letter of direction to the contractor to stop removal of material and proceed with placing the building in a condition in which most electrical equipment and power is secured and the building is generally unoccupied. DOE is planning on approving a revised fire scenario and accident analysis that would show a fire cannot affect the material at risk and the calculated dose consequences to the collocated worker would be less than 100 rem total effective dose. This direction deviates from the current DOE implementation plan. The Board and its staff have held discussions with personnel from DOE (both at headquarters and at SRS), and its contractor, regarding their path forward and potential revisions to the implementation plan and the facility safety basis. The Board will continue to assess the ongoing actions and plans at Building 235-F, to ensure that the ultimate goal—to reduce the risk to collocated workers near Building 235-F—is achieved.

In 2020, the Board plans to conduct a public hearing at a location adjacent to SRS. This hearing will include discussion with DOE on Building 235-F and other safety topics.

**Recommendation 2011-1, *Safety Culture at the Waste Treatment and Immobilization Plant*
(CLOSED IN 2019)**

The Board issued Recommendation 2011-1 following an investigation into whistleblower-identified safety concerns at the Waste Treatment and Immobilization Plant project at the Hanford Site. DOE subsequently developed an implementation plan to address the identified concerns, and has since completed all commitments in its implementation plan. In 2018 and 2019, the Board reviewed these implemented actions to assess their effectiveness in improving the safety culture at the Waste Treatment and Immobilization Plant. The Board determined that DOE's actions have improved safety culture, and therefore concluded that DOE has adequately addressed the underlying causes associated with the Board's concerns. The Board closed Recommendation 2011-1 in a letter to the Secretary of Energy on July 30, 2019.

Appendix B: Summary of All Safety Items Identified by the Board in 2019

The Board’s Policy Statement-7, *Communication and Disposition of Safety Items*, establishes certain aspects of the Board's communication and disposition of safety items to better enable the execution of the Board's functions consistent with its mission. The Board determines the identification of safety items for formal communication to DOE, and determines the disposition of each safety item. The disposition could be: a safety observation that is provided for DOE’s information and use; a safety issue for which the Board requires additional information from DOE; or, an issue of adequate protection for which the Board recommends corrective action to DOE. Per Policy Statement-7, this appendix provides a summary of all safety items identified during the reporting period, the Board’s disposition, and their status to be included in the Board’s annual report to Congress. The table below provides the summary of safety items the Board identified in 2019, organized by site or complex-wide as applicable.

Summary of All Safety Items Identified by the Board in 2019

Site	Board Disposition and Status	Title of Safety Item	Description of Safety Item
Hanford	Board Letter – 7/2/2019 Safety Observation	Electrical Distribution System – T-Plant Electrical Distribution System	T-Plant electrical distribution system is past its design life and lacks an alternate power supply, which could impact the reliability of the safety-significant confinement ventilation system.
Hanford	Board Letter – 7/30/2019 Safety Observation	WTP Safety Culture – Inconsistent Corrective Action Management Program Performance	There are weaknesses in the issues management structure that may affect the safety culture.
Hanford	Board Letter – 7/30/2019 Safety Observation	WTP Safety Culture – Contractor Management Engagement	WTP contractor has a downward trend of management engagement.
Hanford	Board Letter – 7/30/2019 Safety Observation	WTP Safety Culture – Survey Improvement	Safety culture surveys could be improved to better monitor the health of the WTP safety culture.
Hanford	Board Letter – 7/30/2019 Safety Observation	WTP Safety Culture – Use of External Assessments	There is not a sufficient number of external safety culture assessments to ensure sustainability of a healthy safety culture.
Hanford	Board Letter – 10/7/2019 Safety Observation	WTP Electrical Issues – Electrical Equipment Qualification	There is insufficient technical justification to exclude IEEE 323 requirements from WTP safety-significant equipment located in a mild environment.
Hanford	Board Letter – 10/7/2019 Safety Observation	WTP Electrical Issues – Charging System Safety Control Set	The credited charging technology relies on uncredited support systems to prevent a dangerous accumulation of hydrogen gas and does not adequately ensure the operation of the safety system.

Site	Board Disposition and Status	Title of Safety Item	Description of Safety Item
Idaho	<p>Board Letter – 3/12/2019 Safety Issue</p> <p>Partial DOE response and briefing provided in April and May 2019, respectively</p> <p>Board Letter – 10/18/2019 modifies reporting requirement and sets new deadline</p> <p>DOE Letter – 11/15/2019 requests 45-day extension that Board granted</p> <p>DOE response provided in January 2020</p>	Waste Containers with Elevated Methane Concentrations – Unidentified Flammable Drums	Waste containers could have concentrations of flammable gases that approach or exceed the lower flammability limit.

Site	Board Disposition and Status	Title of Safety Item	Description of Safety Item
Idaho	<p>Board Letter – 3/12/2019 Safety Issue</p> <p>Partial DOE response and briefing provided in April and May 2019, respectively</p> <p>Board Letter – 10/18/2019 modifies reporting requirement and sets new deadline</p> <p>DOE Letter – 11/15/2019 requests 45-day extension that Board granted</p> <p>DOE response provided in January 2020</p>	Waste Containers with Elevated Methane Concentrations – Lack of Effective Controls	Existing controls are ineffective to prevent or mitigate deflagrations in containers with wastes that generate flammable gases at a significant rate.
LANL	<p>Board Letter – 11/15/2019 Safety Issue</p> <p>Requested DOE response within 60 days</p>	PF-4 Safety Basis at LANL – Post-seismic Fire Accident Progression	The accident progression postulated for the post-seismic fire accident scenario is not conservative, which would result in higher dose consequences.
LANL	<p>Board Letter – 11/15/2019 Safety Issue</p> <p>Requested DOE response within 60 days</p>	PF-4 Safety Basis – Leak Path Factor	The statistical methodology for leak path factor is not conservative, which would result in higher dose consequences for the post-seismic fire scenario.
LANL	<p>Board Letter – 11/15/2019 Safety Issue</p> <p>Requested DOE response within 60 days</p>	PF-4 Safety Basis – Dose Conversion Factors for Heat Source Plutonium Oxides	The dose conversion factor is incorrectly applied to certain forms of heat source plutonium, and results in underestimated dose consequences to the public and workers.

Site	Board Disposition and Status	Title of Safety Item	Description of Safety Item
LANL	Board Letter – 11/15/2019 Safety Issue Requested DOE response within 60 days	PF-4 Safety Basis – Confinement Doors	Release phenomena from a non-conservative confinement doors assumption would increase the dose consequences to the public for postulated seismic events.
LANL	Board Letter – 11/15/2019 Safety Issue Requested DOE response within 60 days	PF-4 Safety Basis – Compensatory Measures for Deficient Systems	The compensatory measures do not always ensure that the systems would be able to perform their intended safety function or that the hazards they are credited to protect would be prevented or mitigated.
NNSS	Board Letter – 3/21/2019 Safety Observation	Device Assembly Facility Seismic Hazard	DOE has not adequately evaluated credited safety-related structures, systems, and components to ensure that they can perform their safety function during and after a seismic event.
ORNL	Board Letter – 10/7/2019 Safety Observation	Building 2026 Preliminary Documented Safety Analysis	The accident analysis uses lower airborne release fraction and respirable fraction values for the release of pressurized oxides than the bounding values given in DOE Handbook 3010, which would result in higher dose consequences to the co-located worker.
ORNL	Board Letter – 12/4/2019 Safety Observation	Oak Ridge Oxide Processing (OROP) Building 2026 Campaign	OROP campaign analyses used to establish a subcritical mass limit for uranium-233 are incomplete.
Pantex	Board Recommendation – 2/20/2019 Issue of Adequate Protection Received Implementation Plan on 7/16/2019 Requested DOE briefing provided in December 2019	Recommendation 2019-1, <i>Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant</i>	Portions of the safety basis for nuclear explosive operations at Pantex do not meet 10 CFR 830. There are high consequence hazards that (1) are not adequately controlled; (2) may have controls, but lack documentation linking the controls to the hazards; or (3) have controls that are not sufficiently robust or that lack sufficient pedigree to reliably prevent or mitigate the event. Multiple components of the process for maintaining and verifying implementation of the safety basis at Pantex are deficient. NNSA and Pantex contractor have been unable to resolve known safety basis deficiencies.

Site	Board Disposition and Status	Title of Safety Item	Description of Safety Item
Pantex	Board Letter – 12/27/2019 Safety Observation	Design Basis Earthquake Impact on Facilities and Appurtenances	Inadequately controlled scenarios involving the failure of certain ramps, loading docks, and appurtenances could result in high consequences to the public during a design basis seismic event at Pantex. The technical basis NNSA used to accept the risk for continuing operations in those facilities is not complete.
SRS	Board Recommendation – 6/11/2019 Issue of Adequate Protection DOE letter on 9/10/2019 rejecting Recommendation DOE briefing on 10/28/2019 Board reaffirmed Recommendation on 12/5/2019	Recommendation 2019-2, <i>Safety of the Savannah River Tritium Facilities</i>	Adequate protection of the public health and safety is not assured in the event of an energetic accident at the Tritium Facilities. There are several credible accidents that could result in very high doses to workers in the vicinity of the Tritium Facilities.
WIPP	Board Letter – 8/27/2019 Safety Issue DOE Letter – 11/25/2019 requests 25-day extension that Board granted DOE response provided in December 2019	WIPP safety significant confinement ventilation system (SSCVS) – Performance Criteria	SSCVS may not adequately perform its intended safety functions due to the use of potentially inadequate performance criteria for damper closure time.

Site	Board Disposition and Status	Title of Safety Item	Description of Safety Item
WIPP	<p>Board Letter – 8/27/2019 Safety Issue</p> <p>DOE Letter – 11/25/2019 requests 25-day extension that Board granted</p> <p>DOE response provided in December 2019</p>	WIPP SSCVS – Supply Fans	Supply fans are not interlocked with exhaust fans to automatically shut down, which could result in the potential to up-cast unfiltered air from the contaminated circuit.
WIPP	<p>Board Letter – 8/27/2019 Safety Issue</p> <p>DOE Letter – 11/25/2019 requests 25-day extension that Board granted</p> <p>DOE response provided in December 2019</p>	WIPP SSCVS – Continuous Air Monitors (CAMs)	SSCVS may not adequately perform its intended safety functions due to unspecified design requirements for the underground safety-significant CAMs and related support systems.
Y-12	Board Letter – 7/25/2019 Safety Observation	Y-12 Criticality Safety – Criticality Safety Program	The Y-12 nuclear criticality safety organization lacks sufficient qualified staff to adequately implement the nuclear criticality safety program.
Y-12	Board Letter – 7/25/2019 Safety Observation	Y-12 Criticality Safety – Operations Personnel	There is a lack of operations personnel participation, cooperation with, and ownership of criticality safety at Y-12.
Y-12	Board Letter – 7/25/2019 Safety Observation	Y-12 Criticality Safety – Interface with Support Programs	There is inadequate interface between Y-12 criticality safety personnel and support program personnel.
Complex-wide	Board Letter – 6/5/2019 Safety Observation	DOE Standard 1158 – DOE Cancelled This Standard	DOE cancelled Standard 1158 that enables consistent and accurate self-evaluations of DOE contractor criticality safety programs.
Complex-wide	Board Letter – 6/5/2019 Safety Observation	DOE Standard 1158 – Not Consistent with ANSI/IANS-8.19	DOE Standard 1158 is not consistent with ANSI/IANS-8.19, so there is a risk of inconsistent or inaccurate self-evaluations of DOE contractor criticality safety programs across the complex.

Site	Board Disposition and Status	Title of Safety Item	Description of Safety Item
Complex-wide	Board Letter – 12/4/2019 Safety Observation	Design and Qualification of Emergency Lighting Systems	Many facilities across the complex do not have emergency lighting systems that can be expected to operate after a design basis earthquake.

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