



U.S. DEPARTMENT OF
ENERGY

**Department of Energy
Activities Relating to the
Defense Nuclear
Facilities Safety Board
Fiscal Year 2017**

**Report to Congress
August 2018**

**United States Department of Energy
Washington, DC 20585**

Intentionally blank

Message from the Secretary

The Department of Energy (Department or DOE) is required¹ to submit a written annual report to Congress addressing the Department's activities related to the Defense Nuclear Facilities Safety Board (DNFSB or Board). The Department welcomes the opportunity to provide this annual report to Congress describing the Department's activities in Fiscal Year 2017 (FY17) that relate to the DNFSB.

The Board has a critical advisory role within the Department's safety framework for defense nuclear facilities. Its expertise in reviewing the content and implementation of standards and directives relating to the design, construction, operation, and decommissioning of the Department's defense nuclear facilities helps strengthen the safety protocols at the Department's facilities. We welcome the Board's advice and recommendations. Together, through healthy exchanges, DOE and the Board can fulfill our shared goal of protecting the public health and safety at the Department's defense nuclear facilities. I look forward to continuing to work closely with the Board in the coming year and welcome Congress' review of the following report, *Department of Energy Activities Relating to the Defense Nuclear Facilities Safety Board Fiscal Year 2017*.

Highlights of the Department's accomplishments are included in the report's Executive Summary. The status of the Department's actions in response to Board recommendations and other Board input are included in the body of the report.

The following members of Congress are receiving this report:

- **The Honorable Lisa Murkowski**
Chairman, Senate Committee on Energy and Natural Resources
- **The Honorable Maria Cantwell**
Ranking Member, Senate Committee on Energy and Natural Resources
- **The Honorable Thad Cochran**
Chairman, Senate Committee on Appropriations
- **The Honorable Patrick Leahy**
Vice Chairman, Senate Committee on Appropriations
- **The Honorable Lamar Alexander**
Chairman, Senate Subcommittee on Energy and Water Development
- **The Honorable Dianne Feinstein**
Ranking Member, Senate Subcommittee on Energy and Water Development

¹ Section 316(b) of the Atomic Energy Act of 1954, as amended, *codified at* 42 United States Code § 2286e(b).

- **The Honorable John McCain**
Chairman, Senate Committee on Armed Services
- **The Honorable Jack Reed**
Ranking Member, Senate Committee on Armed Services
- **The Honorable Deb Fischer**
Chairman, Senate Subcommittee on Strategic Forces
- **The Honorable Joe Donnelly**
Ranking Member, Senate Subcommittee on Strategic Forces
- **The Honorable Rodney Frelinghuysen**
Chairman, House Committee on Appropriations
- **The Honorable Nita Lowey**
Ranking Member, House Committee on Appropriations
- **The Honorable Mike Simpson**
Chairman, House Subcommittee on Energy and Water Development
- **The Honorable Marcy Kaptur**
Ranking Member, House Subcommittee on Energy and Water Development
- **The Honorable Mac Thornberry**
Chairman, House Committee on Armed Services
- **The Honorable Adam Smith**
Ranking Member, House Committee on Armed Services
- **The Honorable Mike Rogers**
Chairman, House Subcommittee on Strategic Forces
- **The Honorable Jim Cooper**
Ranking Member, House Subcommittee on Strategic Forces
- **The Honorable Greg Walden**
Chairman, House Committee on Energy and Commerce
- **The Honorable Frank Pallone**
Ranking Member, House Committee on Energy and Commerce

If you have any questions or need additional information, please contact me, or the Assistant Secretary for Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

A handwritten signature in black ink that reads "Rick Perry". The letters are cursive and fluid, with a prominent loop on the "R" and a long tail on the "y".

Rick Perry

Executive Summary

The Department welcomes the opportunity to provide this annual report to Congress.² This report describes the Department's key FY17 initiatives and activities related to the Board. The Department has a unique role as owner, operator, and regulator of the Nation's defense nuclear facilities, and the DNFSB provides additional review and analysis to enhance the Department's nuclear safety posture at these facilities.

Using a multilayered approach to nuclear safety, the Department establishes specific nuclear safety requirements, using Federal regulations, Departmental directives, and technical standards. These include several levels of safety oversight, first by DOE site contractors, followed by DOE program and independent oversight offices. This system provides safety implementation and thorough responses to nuclear safety issues potentially affecting DOE workers, the public, and the environment. Regulatory enforcement actions conducted by the Department are another means to achieve compliance with nuclear safety requirements.

The Department has undertaken safety initiatives and activities to reinforce and ensure nuclear safety performance. These initiatives respond to issues identified by the Board, as well as, issues proactively identified by the Department through (1) site, facility, and program office self-assessments; (2) independent oversight activities; and (3) safety improvement initiatives and activities.

Progress on Initiatives and Activities

Waste Isolation Pilot Plant, Carlsbad, NM - The Waste Isolation Pilot Plant (WIPP) plays a critical role in the transuranic (TRU) waste disposal strategy of the Department. WIPP resumed operations by emplacing waste in the underground on January 4, 2017. While DOE completed the recovery effort with the resumption of waste emplacement, WIPP will operate in an interim status until critical facility structures, systems, and components are repaired or replaced; and two line-item capital projects that will make up the new permanent mine ventilation system are completed: the new safety significant confinement ventilation system and utility shaft (formerly exhaust shaft).

Los Alamos National Laboratory Nuclear Safety Issues – In 2017, The National Nuclear Security Administration (NNSA) continued efforts to ensure facility seismic safety through pursuit of an enhanced structural analysis. The Los Alamos National Laboratory (LANL) operating contractor continued improvements to the Plutonium Facility (PF-4) safety posture through seismic performance upgrades and reductions in PF-4 material-at-risk inventory. NNSA and the LANL contractor presented details of these improvements during a DNFSB public hearing in Santa Fe, NM, in June 2017. NNSA and

² In accordance with Section 316(b) of the Atomic Energy Act of 1954, as amended, *codified at* 42 United States Code § 2286e(b).

LANL accomplished startup of a newly constructed Hazard Category 2 TRU Waste Facility, which facilitates LANL TRU waste risk reduction at its defense nuclear facilities. Additionally, DOE's Office of Environmental Management (EM), NNSA, and the LANL contractor completed treatment of improperly remediated nitrate salt waste that has been stored in Area G since the 2014 WIPP radiological release event.

Progress on Board Recommendations

The following recommendations were closed: Recommendation 2009-2, *LANL Plutonium Facility Seismic Safety*, and Recommendation 2014-1, *Emergency Preparedness and Response*. The Department provided comments on a draft recommendation generated in February 2017 concerning *Emergency Preparedness and Response at LANL*. The Board elected not to transmit a final recommendation on this matter and provided a report summarizing their concerns in October 2017. There are four open recommendations in place at the end of FY17. This report discusses the open and closed recommendations in detail.

Intentionally blank



DEPARTMENT OF ENERGY ACTIVITIES RELATING TO THE DEFENSE NUCLEAR FACILITIES SAFETY BOARD FISCAL YEAR 2017

Table of Contents

I.	Legislative Language	2
II.	Background and Organization	2
III.	Departmental Nuclear Safety Initiatives and Activities.....	3
A.	Waste Isolation Pilot Plant	3
B.	Los Alamos National Laboratory	5
C.	Hanford Site	7
D.	Integrating Safety into the Design of Defense Nuclear Facilities	9
E.	Aging Infrastructure at the Y-12 National Security Complex	9
F.	Pantex Bay and Cell Reinvestment Strategy	10
G.	Environmental Management Nuclear Safety Initiatives.....	11
H.	National Nuclear Security Administration Nuclear Safety Initiatives.....	11
IV.	FY17 Progress on Board Recommendations	13
A.	Overview	13
B.	Open Recommendations.....	13
C.	Closed Recommendations.....	16
V.	Interface Activities.....	18
Appendix A.	FY17 Summary: Open Recommendations, Statutory Letter Reports and Public Meetings/Hearings	19
Appendix B.	Acronyms and Abbreviations	22

I. Legislative Language

This report is prepared and delivered to Congress in accordance with Section 316(b) of the Atomic Energy Act of 1954, as amended, *codified at* 42 United States Code (U.S.C.) § 2286e(b):

DOE REPORT. The Secretary of Energy shall submit to the Committees on Armed Services, Appropriations, and Energy and Commerce of the House of Representatives and the Committees on Armed Services, Appropriations, and Energy and Natural Resources of the Senate each year, at the same time that the President submits the budget to Congress pursuant to section 1105(a) of Title 31 [United States Code], a written report concerning the activities of the Department of Energy under this subchapter during the year preceding the year in which the report is submitted.

II. Background and Organization

The DNFSB is an independent executive branch agency established by Congress in 1988 to provide independent technical analysis, advice, and recommendations to the Secretary of Energy (Secretary) regarding public health and safety issues at the Department's defense nuclear facilities (shown in Figure 1). The Board:

- Reviews and evaluates the content and implementation of standards and directives relating to the design, construction, operation, and decommissioning of the Department's defense nuclear facilities;
- Performs analyses of design and operational data;
- Performs investigations of Departmental events and practices;
- Reviews the design of new defense nuclear facilities; and
- Makes recommendations to DOE relating to its defense nuclear facilities, including operations of such facilities, standards and research needs, for the purpose of ensuring adequate protection of public health and safety.

The Board and the Department communicate and interact through a variety of mechanisms, including formal Board recommendations, formal reporting requirements, Board letters requesting information, letters providing suggestions, letters providing information (e.g., staff trip reports and reports on specific issues), Board-sponsored public meetings and hearings, Board briefings, discussions, and Board member site visits.

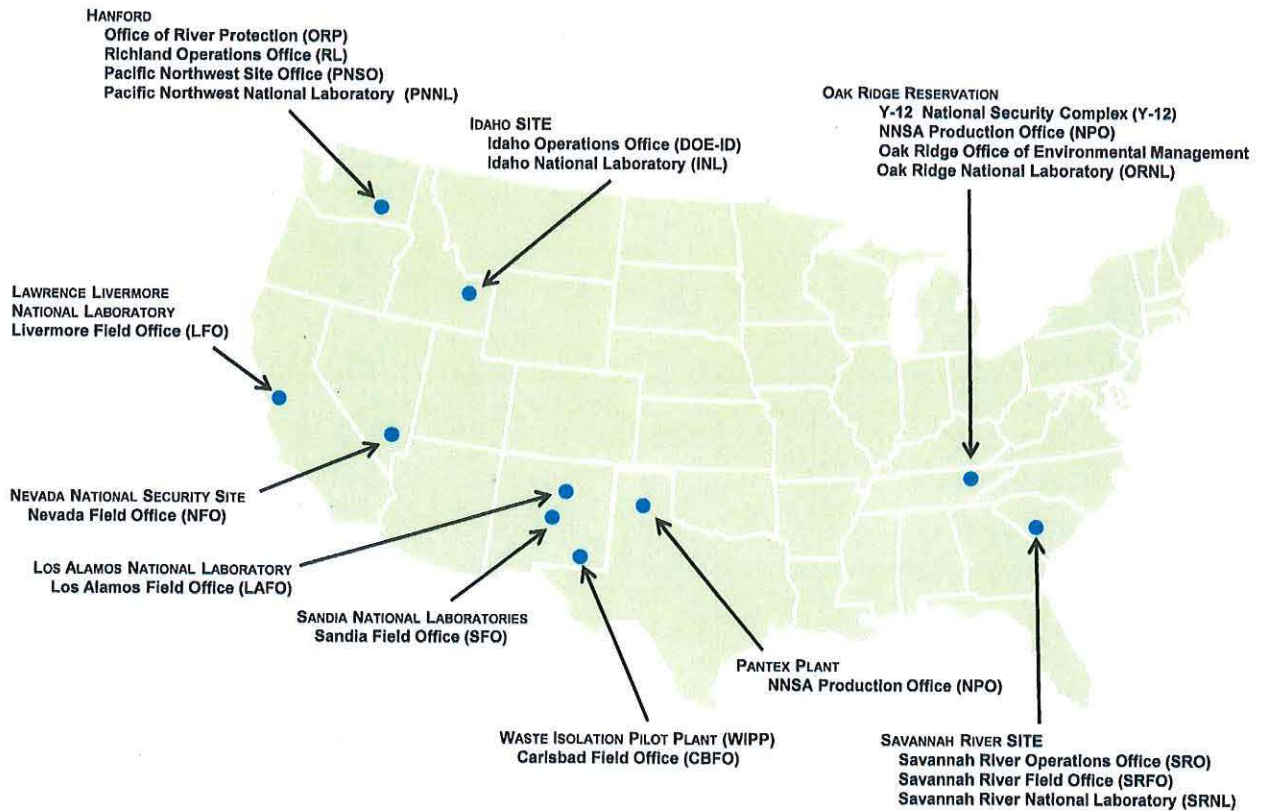


Figure 1. Locations of DOE Defense Nuclear Facilities

III. Departmental Nuclear Safety Initiatives and Activities

This section describes the major FY17 initiatives and activities the Department undertook to improve and ensure nuclear safety at DOE defense nuclear facilities. These initiatives respond to issues identified by the Board and the Department through site, facility, and program office self-assessments. Independent oversight activities by the Office of Enterprise Assessment and the Department’s Central Technical Authorities help to identify nuclear safety issues for both Federal and contractor employees. The Department protects its workers, the public, and the environment from nuclear hazards through a rigorous, proactive nuclear safety program and a robust nuclear safety regulatory framework.

A. Waste Isolation Pilot Plant

As the Nation’s repository for the disposal of TRU radioactive waste generated by atomic energy defense activities, WIPP is a cornerstone of DOE’s cleanup effort. Located in southeastern New Mexico, 26 miles east of Carlsbad, WIPP’s facilities include disposal rooms

excavated in a stable salt formation 2,150 feet underground. Waste disposal began at WIPP on March 26, 1999, and continued until two unrelated underground incidents occurred in 2014, resulting in suspension of waste emplacement operations for approximately 3 years. The Department conducted extensive analysis and took comprehensive corrective actions to resume receipt of waste shipments; the first waste emplacement operations began on January 4, 2017.

Improvements in the management of TRU waste programs within the Federal and contractor organizations were necessary. These improvements included implementing new safety management programs and upgrading the Documented Safety Analysis (DSA) to comply with DOE Standard 3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*. The new WIPP DSA implemented on May 29, 2016, contains several enhancements. Key DSA requirements propagate through the revised WIPP waste acceptance criteria WIPP (WAC) and are applicable to all TRU waste generator sites. The updated WIPP WAC requires Enhanced Acceptable Knowledge documentation;³ expanded review of procedures and change control; enhanced chemical compatibility evaluations of TRU waste destined for WIPP; and on-site reviews of waste generator activities. Organizational realignments at the Carlsbad Field Office and EM Headquarters during FY16 established clear roles and responsibilities, and increased independence of Federal oversight over the National TRU Program activities. These improvements and realignment, allowed the Department to resume on-site waste emplacement operations in January 2017, with receipt of off-site waste shipments resuming in April 2017.

Near-term activities supporting operations include:

- Continuing waste emplacement in uncontaminated panels;
- Confirming readiness and startup of supplemental ventilation system to provide a separate ventilation path for mining;
- Mining new panels;
- Withdrawing from and sealing the south end of the repository due to mine stability and worker safety concerns; and
- Planning, design, and approval of a new permanent ventilation system.

Current WIPP underground ventilation provides 114,000 cubic feet per minute (cfm) of filtered air. This is sufficient ventilation to support or waste emplacement and ground control activities. Installation of a Supplemental Ventilation System will augment existing ventilation to support mining of additional panels. DOE is developing two line-item capital projects to

³“After the 2014 radiological release event, several new activities and process enhancements were established. One of these enhancements was to provide additional controls over the collection, verification, and validation of acceptable knowledge, thus resulting in a more robust acceptable knowledge program referred to as Enhanced Acceptable Knowledge. Use of these newly established controls by the WIPP Certified Programs is expected to ensure the receipt of WIPP WAC compliant waste containers.” WIPP WAC (Rev. 8), Appendix H

improve mine ventilation: (1) a new permanent ventilation filter building; and (2) a new airshaft to replace the current ventilation system to provide sufficient flow of filtered air to support WIPP operations. Anticipation of a new system operational in 2021 supports concurrent mining and waste emplacement.

B. Los Alamos National Laboratory

Safety Basis Upgrades and Remediated Nitrate Salt Waste Drum Activities

In FY17 EM and NNSA required the LANL contractor, Los Alamos National Security (LANS), to prepare the facilities, personnel, and procedures necessary to safely prepare, transport, and treat the improperly Remediated Nitrate Salt (RNS) waste drums at the Waste Characterization, Reduction, and Repackaging Facility (WCRRF). The LANL RNS drums – 60 in total – were incorrectly processed and packaged with an organic absorbent, similar to the RNS drum found to be the cause of the February 2014 WIPP radiological release event. The additional 60 RNS drums were isolated in protective storage on May 15, 2014, soon after DOE’s accident investigation of the WIPP radiological release determined that a drum from LANL ruptured in the underground.

To fully understand the hazards involved and safety controls required to safely transport and treat this waste at LANL, LANS revised and NNSA approved three safety basis documents prior to beginning the RNS remediation process. LANS evaluated the TA-54 Area G Basis for Interim Operations (BIO), the LANL site Transportation Safety Document, and the WCRRF BIO. A comprehensive team of experts from all the stakeholder organizations established a Safety Evaluation Board for review and approval of safety basis documentation. Additionally, due to the extended cessation of operations at WCRRF, a Federal Readiness Assessment was required, per DOE Order 425.1D, *Verification for Readiness to Start Up or Restart Nuclear Facilities*. NNSA completed this effort on March 18, 2017.

The WCRRF remediation processes began on May 12, 2017, after the Federal oversight team verified closure of all prestart findings. LANS initiated a deliberate start-up phase using nonradioactive surrogate waste, leading to the first RNS drum processed on May 18, 2017. LANS has proceeded carefully with the RNS remediation effort, accepting pauses in operations as issues arose and were resolved. Management encourages its workforce to question activities and processes, and reinforces a collective positive safety culture. Continuous oversight by EM and NNSA of the first 10 RNS drums (and periodic oversight thereafter) provide an additional measure to ensure safe and effective treatment.

By the end of FY17, 42 of 60 RNS drums were processed. In November 2017, LANS processed the last 18 RNS drums, completing this vitally important risk reduction effort and enabling WIPP acceptance for ultimate disposal.

Plutonium Facility Seismic Safety

The Plutonium Facility at LANL is the nation's only operational full capability plutonium science and manufacturing facility in the complex. In October 2009, the Board issued Recommendation 2009-2, *LANL Plutonium Facility Seismic Safety*, which identified the need to conduct immediate and long-term actions to ensure the seismic safety of the facility. LANL annually updates its project execution strategy that tracks current and planned upgrades for improving facility seismic performance. Notably, through this project execution strategy, LANL completed a multi-year project to increase the strength of the facility's roof girders. With many of the modifications complete, NNSA directed additional performance calculations to confirm seismic performance behavior. Throughout FY17, NNSA made progress on a state-of-the art non-linear dynamic analysis supporting this effort and facility seismic performance.

The Board closed Recommendation 2009-2 in January 2017, stating that,

“DOE has made, and continues to make, numerous upgrades to improve the Plutonium Facility's capability to withstand the evaluation-basis seismic hazard.”

The Board noted; however, that significant questions remain regarding the suitability of Plutonium Facility (PF-4) for long-term operations and work remains to ensure the adequacy of the facility's fire suppression system and opportunities to reduce material-at-risk. LANL and NNSA continue to take action and make progress to ensure adequacy of the fire suppression system in accordance with its August 2016 communication to the Board. Several other actions are in progress to reduce TRU waste in the facility while seismic upgrades are ongoing. Plutonium facility personnel devised and implemented the capability to load TRUPACT II containers for direct shipment of TRU waste from TA-55 to WIPP and reduced waste container storage by transferring several large waste boxes to Area G.

New Transuranic Waste Facility at Los Alamos National Laboratory

NNSA and LANL completed all necessary readiness and safety basis improvement activities, and received startup approval authority for a new hazard category 2 Transuranic Waste Facility (TWF). This is the first such facility approved for startup at LANL in decades. The TWF mission is to safely receive, handle, characterize, store, and prepare packaged transuranic waste containers for shipment to WIPP. The ability to transfer and store waste at TWF is essential to LANL's defense nuclear mission as programmatic activities continue to generate transuranic waste across the site. This storage capability is particularly important as WIPP resumes operations.

C. Hanford Site

Waste Treatment and Immobilization Plant

The Department is constructing the WTP facilities and infrastructure to immobilize and dispose safely millions of gallons of liquid and sludge tank waste. The WTP consists several facilities: Analytical Laboratory, Balance of Facilities, Effluent Management Facility, Low-Activity Waste Facility, High-Level Waste Facility, and Pretreatment Facility. The Department also plans construction of additional infrastructure facilities to support the operation of WTP. The original plan required waste to be processed through the Pretreatment Facility, separating it into low-activity and high-level waste streams to be vitrified. The Analytical Laboratory, Effluent Management, and Balance of Facilities support these vitrification activities.

Construction of the Low-Activity Waste Facility, Effluent Management Facility, Balance of Facilities, and Analytical Laboratory, along with the work addressing feeding low-activity waste directly to the Low-Activity Waste Facility, is ongoing. Efforts continue to resolve technical issues associated with the Pretreatment and High-Level Waste Facilities. In FY17, the Department continued focus on construction of the Low-Activity Waste Facility and Effluent Management Facility, and startup of the Balance of Facilities and Analytical Laboratory, as they are nearest to completion. These are required to begin immobilization of low-activity waste as soon as practicable. In the near-term, DOE will address the most abundant mobile tank waste – the supernate – and will work in parallel to resolve the technical and design issues associated with the High-Level Waste and Pretreatment Facilities.

DOE and DNFSB are engaged to resolve the following WTP project issues:

- Potential criticality in process vessels;
- Potential generation and accumulation of hydrogen in process vessels;
- Pulse jet mixer control;
- Ability to obtain representative samples;
- Hydrogen gas controls: hydrogen in piping and ancillary equipment;
- Inadequacies in spray leak methodology;
- Heat transfer for process vessels;
- Safety controls for ammonia hazards;
- Erosion and corrosion of piping, vessels and pulse jet mixer nozzles;
- Design and construction of the electrical distribution system;
- Volcanic ash fall hazard;
- Unanalyzed potential melter accidents;
- Hydrogen control strategy for the High-Level Waste Facility, and
- Seismic categorization of safety controls

DNFSB and DOE identified these project technical issues, and identified potential solutions applicable to the affected WTP facilities. In January 2017, the Department transmitted a letter to the Board documenting the progress made on addressing: (1) potential criticality in process vessels; (2) potential generation and accumulation of hydrogen in process vessels; (3) heat transfer analyses for process vessels; and (4) hydrogen gas controls: hydrogen in piping and ancillary equipment. On January 31, 2017, the Department briefed the Board on the status of the WTP project technical issues. The Board's 27th Annual Report to Congress (April 2017) listed the previously identified issue of plugging and wear of process piping at the WTP as resolved.

Significant progress was made during FY17 to address the Pretreatment Facility issues associated with inadequacies in spray leak methodology, erosion and corrosion of piping, vessels and pulse jet mixer nozzles; and pulse jet mixer control. Actions in FY17 identified control strategies to demonstrate sufficient work has been done to resume design and development of the High-Level Waste Facility and issues associated with unanalyzed melter accidents, seismic categorization of safety controls, and hydrogen control strategy.

Sludge Treatment Project

The Sludge Treatment Project (STP) will dispose of approximately 7,000 gallons of radioactive sludge stored underwater in six engineered containers within the 105-K West Basin. The sludge is comprised of a combination of corrosion products from metallic spent nuclear fuel (particulates of uranium oxides and uranium metal), debris from fuel storage racks and containers, windblown dust, and spallation products from the basin's concrete walls and floors.

Phase I of the STP, referred to as the Engineered Container Retrieval and Transfer System (ECRTS), will transfer the sludge in multiple batches as slurry through a hose-in-hose transfer system into containers located in the sludge loading bay of the K West Basin Annex. The K West Basin Annex is located approximately 40 feet north of the K West Basin and approximately 1,700 feet from the Columbia River. Trucks will transport the loaded containers in casks to T-Plant for interim storage until the sludge is treated and sent to the WIPP.

In FY17, the project completed a number of key activities toward Critical Decision-4, Start of Operations, including:

- Construction of the ECRTS in the 105-KW Basin and Annex;
- Completion of T-Plant facility modifications for sludge storage;
- Completion of procurement of 12 Sludge Transportation and Storage Container Assemblies;
- Approval of the 105-KW Facility DSA and 105-KW Facility Technical Safety Requirements; and
- Approval of the One-Time Request for Shipment for Sludge Transport from K West Basin to T-Plant.

D. Integrating Safety into the Design of Defense Nuclear Facilities

DOE continues to strengthen its management of nuclear projects and the integration of safety into the design of nuclear facilities. NNSA projects (as well as other nuclear facility projects in DOE) incorporate DOE Standard (STD) 1189, *Integration of Safety into the Design*, in project design and the development of project safety documentation. NNSA successfully completed the construction and startup of the Hazard Category 2 TWF at LANL. NNSA approved the Preliminary Safety Design Report for the Y-12 Uranium Processing Facility (UPF) in late 2016. The DNFSB review of the report identified no formal issues. The UPF project is now completing final design. NNSA approved the Preliminary DSA (PDSA) in November 2017. Other NNSA nuclear projects are achieving the tenets of DOE-STD-1189 and requirements of DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*.

E. Aging Infrastructure at the Y-12 National Security Complex

Sustaining safe execution of the enriched uranium mission at the Y-12 National Security Complex (Y-12) is dependent on maintaining a self-critical focus on the significant challenges posed by continued operation of legacy facilities that have exceeded their design lives. In 2012, the scope of the UPF was reduced, delaying the transition of enriched uranium operations from Buildings 9215 and 9204-2E to new facilities until the year 2040 or beyond. The extended life of these facilities, as well as, the need to operate Building 9212 through the year 2025, relies on effective implementation of maintenance, repair, and replacement activities. Subsequent to the change in the scope of UPF, an Extended Life Program (ELP) was established to provide additional management focus on Buildings 9204-2E and the 9215 Complex.

The primary features of Y-12's enhanced facilities management programs include:

- Minimizing nuclear safety risks through consistent reductions in the quantity of hazardous radiological and toxicological materials (i.e., material-at-risk) stored in legacy facilities,
- Continuous and comprehensive monitoring of the conditions of structures, systems, and processes associated with these legacy facilities,
- Planning, prioritizing, and executing projects to refurbish or replace degraded or deficient structures, systems, and components, with the goal of maximizing the operational dependability and safety posture of these facilities,
- Providing independent oversight of legacy facilities management programs through the Continued Safe Operating Oversight Team, which is comprised of a group of senior managers and subject matter experts knowledgeable about operations and mission execution.

Noteworthy accomplishments during FY17 include:

- Removing six metric tons of uranium from legacy facilities;
- Refurbishing the 9 kV electrical distribution system in Building 9204-2E and replacing seven motor control centers and four electrical panels in Building 9215 as part of executing the Nuclear Facilities Electrical Modernization project;
- Replacing an exhaust fan and steam station in Building 9212;
- Developing a significant revision to the ELP Safety Strategy document, providing a forum for key stakeholders to come to agreement on the strategy to reduce, mitigate, and accept the nuclear safety risk associated with long-term operation of these facilities.

In a May 11, 2017 letter to the NNSA Administrator, the Board commended the Y-12 extended line program. Specifically, the DNFSB highlighted that the ELP and associated safety strategy are effectively mitigating the risks associated with aging infrastructure, and suggested other DOE sites could benefit from adopting similar programs. Despite recent successes in reducing the material-at-risk and replacing substandard equipment in Buildings 9215 and 9204-2E, a consistent and substantial investment of resources will be required to ensure the long-term viability of these facilities, which are vital to our national defense.

F. Pantex Bay and Cell Reinvestment Strategy

In October 2013, the Bay & Cell Reinvestment Strategy was developed as a conceptual plan for coordinating replacement of three “cornerstone” safety systems: (1) High Pressure Fire Loop (HPFL) Lead-ins; (2) Fire Detection System (FDS); and (3) Radiation Alarm Monitoring System (RAMS) Replacements. HPFL Lead-ins were averaging 2.4 breaks per year between FY1995-FY2016 impacting production activities. The existing ultra-violet (UV) FDS parts are no longer available from the manufacturer. Spare parts for the RAMS are no longer available from the manufacturer and the RAMS repair and calibration processes are outdated. The UV FDS is being replaced with a new infrared FDS that provides the following advantages: (1) individual control panels in each facility to limit impacts to the facility during system maintenance and repairs; (2) detection of smaller fires for earlier response; (3) detectors that are not affected by background radiation; and (4) enhanced fire alarm communication. To accommodate the new infrared FDS and RAMS, Zone 12 received an upgrade to fiber optics to accommodate the network installation to Production Bays/Cells.

The following accomplishments to Bay & Cell Reinvestment Strategy projects were made in FY17:

- Completed HPFL Lead-in replacements for Building 12-84, Bays 18 and 20; Building 12-98, Cells 2 and 4;

- Completed FDS/RAMS Fiber Network installation for Zone 12 nuclear facilities;
- Completed designs for the replacement of the HPFL piping manifold in the courtyard between Buildings 12-84 and 12-104;
- Completed advanced designs to replace 18 HPFL Lead-ins and 16 FDS;
- Accelerated the design of Building 12-104 Bay 21 HPFL Lead-in replacement from FY18 to FY17;
- Completed the 60 percent prototype and construction design for the new RAMS; and,
- Mobilized for construction on 6 Lead-ins (Building 12-84 Bays 5 and 7, Building 12-99 Bays 6 and 8, and Building 12-104 Bays 9 and 11), and 4 FDS (Building 12-99 Bays 6 and 8, and Building 12-104 Bays 9 and 11).

G. Environmental Management Nuclear Safety Initiatives

In FY17, the Chief of Nuclear Safety (CNS) for EM continued initiatives to promote technical responsibility and nuclear safety within EM and its facilities. The CNS performs oversight, provides technical support, and executes technical activities, as appropriate, to support nuclear operations. Examples of specific activities in FY17 include:

- Conducting over 20 field operational awareness visits and assessments guided by the CNS nuclear facility risk ranking;
- Reviewing and concurring on revisions to nuclear safety directives and technical standards;
- Providing technical expert reviewers to support the Office of Project Management Oversight and Assessments Project Peer Reviews at EM nuclear facilities;
- Providing technical expert reviewers for the 60 percent design review of the Low Activity Waste Pre-treatment System at Hanford;
- Leading a peer review of precipitation and landslide hazard analyses affecting the UPF and Y-12 site for NNSA;
- Providing technical support for the LANL transition of TRU Waste Operations, including development of a new safety basis; and,
- Providing technical support to NNSA for the review of LANL and Y-12's site-specific dispersion analysis to support safety basis development.

H. National Nuclear Security Administration Nuclear Safety Initiatives

In FY17, the NNSA Office of Safety, Infrastructure, and Operations (NA-50) undertook initiatives to promote technical expertise, operations excellence, performance culture, and nuclear safety at NNSA facilities. NA-50 performs oversight, provides technical support, and executes technical activities to support nuclear operations at NNSA facilities.

Accomplishments in FY17 include:

- Completed accreditation of the balance of the NA-50 technical qualification program (TQP) (Office of Safety, NA-51 was accredited in FY16). NA-50 is also facilitating the expansion of the accreditation process for TQP throughout NNSA Headquarters Offices and is assisting Field Offices to achieve TQP accreditation. This will improve technical competence and enhance transportability of qualifications throughout the enterprise.
- Continued work to improve the seismic resilience of the PF-4. A panel of experts in seismic studies developed a statement of work and NNSA has solicited proposals for a non-linear, dynamic analysis of the structure. Contractors provided bids and a methodology to test the facility's seismic performance through computational probabilistic analysis. These studies should confirm the components with the highest demand/capacity ratios in the structure, which will allow for prioritized upgrades if warranted.
- Supported Field Offices by conducting or supporting over 50 technical reviews of nuclear safety programs and activities to ensure safe operations of NNSA nuclear facilities. Continued coordination to support field oversight through the site integrated assessments plans, leveraging Field and Headquarters' resources to maximize coverage and effectiveness.
- Assisted the Los Alamos Field Office and NA Acquisition and Project Management in the completion of construction and transition to operations of the TWF. This facility completed construction in FY17 and readiness preparation and review, successfully moving into an operational status in FY17.
- Established a Safety Basis Review Team pilot project to enhance the safety basis review and approval process at an enterprise level, improve consistency in reviews, and to improve the use of complex-wide resources. This effort will facilitate Field Office focus on day-to-day oversight of operational activities in the field. NNSA Office of Safety will manage the program and integrate the teams from the enterprise conducting these reviews.
- Decreased the total deferred maintenance in NNSA nuclear facilities, slowing the degradation of legacy facilities throughout the enterprise.
- Began implementation of the governance process in accordance with revised NNSA Supplemental Directive 226.1B, *NNSA Site Governance*. Implementation of the order will increase transparency in the government and contractor relationship, leverage the expertise of parent company organization in the execution of the mission, and improve NNSA Field and Headquarters' efforts through the "one NNSA" concept.
- Improved integration between the infrastructure and safety missions through a "deep dive" process at all NNSA Field Sites. The "deep-dive" process facilitates the application of re-capitalization funding to the highest safety priorities at individual sites, as well as, providing the information needed to make decisions to address the highest risks.

IV. FY17 Progress on Board Recommendations

A. Overview

The Board issues recommendations to the Secretary for specific measures the Department should adopt to ensure adequate protection of public health and safety. The Secretary is required to respond to each Board recommendation within 45 days of its publication in the *Federal Register* (or longer, if granted additional time). In addition, the Secretary must provide an implementation plan (IP) to the Board within 90 days after publication in the *Federal Register* of the Secretary's acceptance of all or part of a recommendation (or longer, upon appropriate notice).

Legislation requires the Secretary to complete the IP within one year of issuance, or if the IP takes more than one year to complete, a report to Congress is required. The scope and technical complexity of the safety issues addressed in DOE's IPs generally requires more than one year for completion. Many IPs require changes in DOE directives, resource planning and scheduling, and coordination with many different sites and offices to solve complex-wide challenges.

Appendix A, Table A.1, *Open Board Recommendations*, lists the four recommendations that remained open at the end of FY17, the date of issuance of each recommendation, and the timeframe that DOE currently projects for completing the associated IP actions. The Board closed two recommendations in FY17. All recommendations (both open and closed), the associated IPs, and a chronological record of related correspondence between DOE and the Board are available on the websites of the DOE Office of the Departmental Representative to the DNFSB (<https://ehss.energy.gov/deprep/>) and/or the DNFSB (<http://www.dnfsb.gov/>).

B. Open Recommendations

2015-1: Emergency Preparedness and Response at the Pantex Plant

On November 24, 2015, the Board issued Recommendation 2015-1, *Emergency Preparedness and Response at Pantex*, to address significant safety issues specific to Pantex. The recommendation was accepted on January 13, 2016, and an IP was issued on June 16, 2016. The Recommendation identified three areas of concern: 1) inadequate drill and exercise programs; 2) no demonstrated capability to provide timely, accurate information to the public regarding off-site radiological consequences; and 3) inadequate technical planning bases and decision-making tools. DOE approved and executed an IP to address the areas of concern and to make improvements to the Pantex program.

Improvements included an increase in the number of exercises conducted each year (from one to three) and drilling the Emergency Response Organization every quarter. The quality and consistency of exercise planning improved with the use of software that systematically establishes exercise objectives to test preparedness. The exercise schedule includes severe events, e.g., extreme weather and fires/explosions, which purposely challenge site responders and decision-makers in executing their duties. Pantex deployed the Emergency Management Information System (EMInS) in order to improve the timeliness and accuracy of information provided to local leaders and communities. EMInS is considered a best practice within DOE. Pantex updated its technical planning bases documents to ensure adequate analysis of hazards and then completed a revision of site emergency actions and recommended protective actions to the public based on the updated analysis. Pantex strengthened its readiness assurance program in order to sustain readiness and identify areas needing future improvement.

DOE submitted its final set of deliverables to the Board on June 13, 2017. NNSA indicated that a series of effectiveness reviews would be conducted to verify actions taken to address the Board's recommendation. These reviews require additional time for completion. On July 25, 2017, the Board acknowledged receipt of the final IP deliverables and the need for effectiveness reviews in determining the efficacy in responding to the recommendation.

2012-2: Hanford Tank Farms Flammable Gas Safety Strategy

The Board issued Recommendation 2012-2, *Hanford Tank Farms Flammable Gas Safety Strategy*, on September 28, 2012, reflecting the Board's assessment that current operations at the Hanford Tank Farms require safety-significant active ventilation of double-shell tanks to ensure the removal of flammable gas from the tanks' headspace. A significant flammable gas accident could have considerable local radiological consequences, endanger personnel, contaminate portions of the Tank Farms, and seriously disrupt the Hanford waste cleanup mission. The Board also recommended that DOE install real-time monitoring systems for tank ventilation flow rates and perform other upgrades on systems used to perform safety-related functions. DOE accepted this recommendation on January 7, 2013, and transmitted the IP to the Board on June 6, 2013.

The Department provided the Board with a revised IP on March 24, 2016, describing a more efficient approach for the deployment of safety significant exhausters units for use during off-normal events. The Board responded to the Department via letter on September 16, 2016, concluding that the proposed safety-significant portable exhauster concept was consistent with the Board's recommendation and expressing appreciation for the IP's updated deliverable schedule. Conceptual design is ongoing for a safety significant portable exhauster using off-the-shelf components based on equipment successfully deployed at the Savannah River Site (SRS) in similar applications.

The IP includes completed actions incorporated into the Tank Farms DSA. The margin of safety at the Tank Farms will improve as IP actions are completed. The implementation of safety-

significant real-time flow monitoring will be of particular benefit, adding both defense in depth and a simplified control strategy. The installation of safety-significant real-time flow monitoring has been completed in three of the five double-shell tank ventilation systems with the remainder to be completed in FY18. Additionally, a safety significant annulus liquid level detection system has been installed in all of the active double shell tanks. The system is in operational testing and work is ongoing to resolve potential issues in the area of wireless communication systems.

The Department will continue to work with the Board to keep it apprised of ongoing IP efforts for Recommendation 2012-2, currently scheduled for completion in December 2018.

2012-1: Savannah River Site Building 235-F Safety

On May 9, 2012, the Board issued Recommendation 2012-1, *Savannah River Site Building 235-F Safety*, and on July 10, 2012, DOE accepted the Recommendation. The Secretary issued the IP on December 5, 2012. This IP identified multi-year actions to reduce the hazards associated with the material at risk (MAR) that remains as residual contamination in the building's Plutonium Fuel Form (PuFF) facility cells one through nine. DOE's Savannah River Operations Office (DOE-SR) developed a Deactivation Project Plan to guide near-term activities, as necessary, to improve the safety posture and long-term activities required to immobilize and/or remove remaining plutonium-238 because of potential dose consequence to the collocated workers and the public. The Department recognizes this is the Board's main safety concern.

In November 2014, the Secretary transmitted a summary of schedule changes for the remaining IP actions and deliverables, citing unforeseeable challenges that led to schedule setbacks during FY13, and which carried into FY14. The changes reflected modifications to completion dates for the remaining actions and deliverables, but did not change specified actions. The completion date moved 29 months to May 31, 2021.

During FY17, DOE-SR continued to execute actions to mitigate hazards posed from the MAR. Progress to date includes: (1) electrical and mechanical isolation of PuFF cells three through nine; (2) outer shield window removal on cells one through nine; (3) successful demonstration of the in cell vacuum in cell six; and (4) characterization in cells one through nine. As a result of the enhanced characterization in cells six through nine, DOE-SR determined that the MAR present in cells eight and nine was minimal and did not need to be removed. Window remediation began to allow enhanced characterization to be performed on the wing cabinets in East Maintenance. Cumulatively, the actions taken to date have significantly improved Building 235-F's safety posture and reduced the likelihood of a full facility fire leading to design basis event consequences. Planning and conducting facility drills each year continues to demonstrate the site's ability to protect workers in all facilities and construction projects around Building 235-F.

DOE-SR continues to look for opportunities to improve schedule performance. By focusing on completing the enhanced characterization for all cells and gloveboxes, the project will provide a better understanding of the distribution of the MAR and more effectively plan removal activities.

2011-1: Safety Culture at the Waste Treatment and Immobilization Plant

The Board issued Recommendation 2011-1, *Safety Culture at the Waste Treatment and Immobilization Plant*, on June 9, 2011. This recommendation reflected the Board's assessment that, taken as a whole, the safety culture at the WTP was in need of prompt, major improvement and that corrective actions would be successful and enduring only if championed by the Secretary. The Secretary accepted the Recommendation on June 30, 2011, and DOE transmitted its IP on December 27, 2011. On September 14, 2012, DOE delivered an IP addendum, based on information and experience accumulated during execution of the original IP. DOE sent a revised IP schedule on September 27, 2013.

Consistent with the letter to the Board dated December 19, 2014, DOE revised WTP contract language to include the DOE Integrated Safety Management (ISM) requirements. The inclusion of this contract language emphasizes the Department's expectations for balancing priorities, which includes establishing the desired ISM environment (e.g., a positive safety culture and a safety conscience work environment [SCWE]).

The DOE Office of River Protection (ORP) Safety Culture Sustainment Plan (SCSP), most recently updated in August 2017, identified improvement actions related to organizational culture, safety culture, and SCWE with emphasis on the areas of leadership, employee engagement, and organizational learning. This update included an assessment of activities completed in 2016 and identified actions that would be sustained in 2017. Based on senior monitoring panel safety culture evaluations and results of safety culture self-assessment conducted in FY17, new actions were added to the SCSP that include: (1) safety culture refresher training; (2) issue management refresher training; (3) management refresher training; (4) improvements to the ORP safety culture survey; and (5) development of an ongoing strategic safety culture communications plan. ORP completed the refresher training, revised its safety culture survey and is finalizing its safety culture communications plan.

EM continues its commitment to improving safety culture across the EM complex consistent with DOE Safety Culture Improvement Panel (chartered by the Deputy Secretary in 2015) activities. As recommended in EM's Safety Culture Sustainment Plan Review Report, issued in April 2015, EM Federal and contractor organizations are now required to submit updated SCSPs as part of the ISM Periodic Declaration, beginning in FY17. EM and the Department continue to be committed to leading a shift in the organization and culture, by fostering a work environment of trust, a questioning attitude, and a receptiveness to raising issues.

C. Closed Recommendations

2014-1: Emergency Preparedness and Response

The Department completed the final major IP deliverable for Recommendation 2014-1 Revision 1 in January 2018; the Baseline Emergency Management Criteria and Review Approach Document.

During March 13-16, 2017, the Office of Emergency Operations convened a working group consisting of emergency management representatives from the DOE defense nuclear facilities to review existing policies and evaluate the effectiveness of corrective actions' procedures. The working group determined that site managers at all DOE defense nuclear facilities have revised, or have a plan to revise, site procedures to incorporate the policy and requirements, as appropriate, for enhanced corrective action procedures in accordance with: 1) DOE Order 151.1D, *Comprehensive Emergency Management System* 2) DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy* and 3) DOE G 226.1-2A, *Federal Line Management Oversight of Department of Energy Nuclear Facilities*.

The working group concluded that corrective actions procedures at defense nuclear facilities are adequate to address deficiencies and findings. On August 9, 2016, the Deputy Secretary of Energy issued DOE Policy 226.2, *Policy for Federal Oversight and Contractor Assurance System*, to reaffirm the importance of integrating contractor management systems and the Department's risk management process. The existing Secretarial direction to use risk-informed and performance-based management systems, including oversight, is emphasized along with the importance of implementing effective corrective action process as essential elements to mitigate risk at defense nuclear facilities. This reaffirmation supported the completion of thorough self-assessment, independent reviews and feedback systems that focus on continuous improvement, and development of corrective actions that are based on risk and appropriate safety significance factors at each site. This action resulted in the revision of the oversight structure and approach and improve the corrective actions process in the Department's IP.

NNSA is developing a risk-informed and performance-based criteria review approach document (CRAD) and lines of inquiry for assessing emergency management programs at defense nuclear facilities. The proposed CRAD will be a single source of criteria that may be used to facilitate satisfying the requirements of DOE's Emergency Management Directive at defense nuclear facilities. A copy of the draft CRAD was sent to the Defense Board in January 2018 but the final development and issuance of CRADs still need to follow the DOE technical standards development process and be approved by DOE. This final action is scheduled for completion in FY18.

The Office of Emergency Operations and the Department's line management continue to be fully committed and supportive toward achieving an effective emergency management program and will continue to monitor progress of implementation of all final actions in the DOE IP through the collaborative efforts of the newly revived Emergency Management Advisory Committee.

The Board voted to close Recommendation 2014-1 at its public meeting on September 26, 2017.

2009-2: Los Alamos National Laboratory Plutonium Facility Seismic Safety

In October 2009, the Board issued Recommendation 2009-2, *LANL Plutonium Facility Seismic Safety*. The Recommendation identified the need to conduct immediate and long-term actions to ensure the seismic safety of the facility. The Department has made, and continues to make, numerous upgrades to improve the Plutonium Facility's capability to withstand the evaluation-basis seismic hazard. NNSA continues to work to demonstrate improvements in the facility's long-term operability. These efforts include completion of an alternate seismic analysis, upgrades to the fire suppression system, and opportunities to reduce material-at-risk inside the facility. The Department is satisfied that controls in place are satisfactory to provide reasonable assurance of adequate protection to the worker, public, and the environment for current operations to continue.

The Board closed Recommendation 2009-2 in its letter dated January 3, 2017, noting that DOE has made numerous upgrades to improve the Plutonium Facility's capability to withstand the seismic hazard postulated in the DSA. The Board further noted that significant questions remain regarding the suitability of the Plutonium Facility for long-term operations, and that NNSA is working towards the completion of an alternate seismic analysis.

V. Interface Activities

In addition to formal recommendations, the Board and its staff regularly communicate with the Department through correspondence, site visits at the Department's defense nuclear facilities to review the implementation of safety programs and initiatives, assessments of defense nuclear facilities and their respective operations, and briefings. Information about DNFSB interactions with DOE, including all related correspondence, is available on the Departmental Representative website at <https://ehss.energy.gov/deprep/> and categorized by chronological order as well as by DOE sites.

In addition to completing IP actions, DOE responds to the Board's reporting requirements, pursuant to 42 U.S.C. Section 2286b (d). During FY17, DOE completed actions in compliance with the reporting requirements listed in Appendix A, Table A.2

Appendix A. FY17 Summary: Open Recommendations, Statutory Letter Reports and Public Meetings/Hearings

Table A.1 Open Recommendations

Rec #	Title	Date Opened	Projected Timeframe for Completing Implementation Plan Actions
2015-1	Emergency Preparedness and Response at the Pantex Plant	11/24/2015	2018
2012-2	Hanford Tank Farms Flammable Gas Safety Strategy	09/28/2012	2018
2012-1	SRS Building 235-F Safety	05/09/2012	2021
2011-1	Safety Culture at the WTP	06/09/2011	Final IP deliverable made on 5/16/17

Table A.2 DOE Reports Required by DNFSB Letters - Completed In 2017

Date Completed	Reporting Requirements	Date of Board Letter
10/3/2016	DOE to provide the results of the holistic evaluation of the effectiveness of DOE Federal nuclear safety oversight processes.	9/2/2016
12/2/2016	A briefing on DOE's plan to implement Policy 226.2, Policy for Federal Oversight and Contractor Assurance Systems.	9/23/2016
2/2/2017	A briefing on the safety of operations at the Waste Isolation Pilot Plant.	12/13/2016
8/31/2017	Annual report and briefing on the Department's nuclear criticality safety program.	2/26/2016
10/11/2017	A report regarding any supplemental actions planned by line management to ensure safety oversight is not degraded at defense nuclear facilities prior to implementing DOE Order 232.2A, <i>Occurrence Reporting and Processing of Operations Information</i> .	5/10/2017

Table A.3 DNFSB Public Meetings/Hearings Conducted

Date	Topic	Location	Discussion Areas
6/7/2017	Understanding the Safety Posture of the Plutonium Facility at LANL	Santa Fe Community Convention Center Santa Fe, NM	<ol style="list-style-type: none"> 1. The risk associated with current and future Plutonium Facility inventory levels, 2. Actions taken by the NNSA and LANL to address opportunities identified by the Board to minimize material-at-risk, 3. Actions to reduce facility risk for long-term operations, and 4. The adequacy and status of safety systems to support long-term operations.
9/26/2017	Oversight of Emergency Preparedness and Response	DNFSB Headquarters, Washington D.C.	Meeting to discuss oversight of emergency preparedness and response, with a special emphasis on open Board Recommendation 2014-1, <i>Emergency Preparedness and Response</i> .

Appendix B. Acronyms and Abbreviations

BIO	Basis for Interim Operations
Board	Defense Nuclear Facilities Safety Board
CNS	Chief of Nuclear Safety
Department	U.S. Department of Energy
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOE-SR	DOE's Savannah River Operations Office
DSA	Documented Safety Analysis
ECRTS	Engineered Container Retrieval and Transfer System
ELP	Extended Life Program
EM	Office of Environmental Management
EMInS	Emergency Management Information System
FDS	Flame Detection Systems
FY	Fiscal Year
HPFL	High-Pressure Fire Loop
IP	Implementation Plan
ISM	Integrated Safety Management
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
MAR	Material at Risk
NA-50	Office of Safety, Infrastructure, and Operations
NNSA	National Nuclear Security Administration
ORP	Office of River Protection
PF-4	LANL Plutonium Facility
PuFF	Plutonium Fuel Form
RAMS	Radiation Alarm Monitoring Systems
RNS	Remediated Nitrate Salt
SCSP	Safety Culture Sustainment Plan
SCWE	Safety Conscious Work Environment
Secretary	Secretary of Energy
SRS	Savannah River Site
STP	Sludge Treatment Project
TQP	Technical Culture Program
TRU	Transuranic
TWF	Transuranic Waste Facility
UPF	Uranium Processing Facility
UV	Ultra Violet
WAC	Waste Acceptance Criteria
WCRRF	Waste Characterization, Reduction, and Packaging Facility

WIPP	Waste Isolation Pilot Plant
WTP	Waste Treatment and Immobilization Plant
Y-12	Y-12 National Security Complex