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SUMMARY

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The U.S. Nuclear Security Enterprise: Background and Possible Issues for Congress

Created in 2000, the Department of Energy's (DOE's) semi-autonomous National Nuclear Security Administration (NNSA) is responsible for managing the U.S. stockpile of nuclear warheads that the Department of Defense (DOD) mounts on a triad (missiles, bombers, submarines) of U.S. nuclear delivery vehicles.

The United States is currently engaged in a generational modernization of its nuclear deterrent, which current U.S. strategy argues needs to be "safe, secure, and effective." As part of this modernization, NNSA seeks to sustain and modernize the U.S. nuclear warhead stockpile as well as recapitalize related infrastructure in the Nuclear Security Enterprise (NSE).

The NSE, whose footprint has been reduced since its Cold War peak, currently consists of eight contractor-operated research, development, and production sites overseen by NNSA. A number of other DOE facilities, described in this report, also contribute to the lifecycle of U.S. nuclear weapons.

As of 2024, NNSA is carrying out seven warhead modernization programs for the DOD and recapitalizing infrastructure to ensure its ability to produce nuclear weapons materials and components over the long-term. NNSA Administrator Jill Hruby stated in 2024 that "NNSA is being asked to do more than at any time since the Manhattan Project."

The President's fiscal year (FY) 2025 budget request for NNSA's Weapons Activities is $19.9 billion out of a total NNSA budget request of $25 billion. The outyear funding requests provided in the FY2025 budget request suggest further steady growth of the Weapons Activities account, potentially from $20.6 billion in FY2026 to $22.4 billion in FY2029.

Congress authorizes funding for NNSA Weapons Activities in the annual National Defense Authorization Act (NDAA) and appropriates funding for NNSA through the annual Energy and Water Development and Related Agencies Appropriations Act. It plays an important role in providing oversight for NNSA's implementation of Weapons Activities as well as over issues related to NNSA governance; NNSA relationship with DOD, especially insofar as it impacts nuclear weapons modernization timelines; NNSA's relationship with contractors operating NSE sites; and NNSA's ability to manage programmatic and other risks. The Senate confirms Presidential nominees for the Secretary of Energy, the NNSA Administrator, and several other senior NNSA positions. It also confirms Presidential nominees for the Defense Nuclear Facilities Safety Board, an independent agency created by Congress to advise DOE leadership regarding the safety and security of nuclear defense facilities.

Congress has periodically empaneled commissions to review NSE challenges and offer recommendations. Through authorizing and appropriations legislation, Congress also has set various requirements, timelines, and implementation guidelines for NNSA warhead modernization, material production, and infrastructure recapitalization programs. Members of Congress have expressed concerns about NNSA's ability to meet some of these goals, carry out capital infrastructure projects on time and within budget, and hire and retain contractor and federal staff in the NSE. Given an increase in NNSA's workload as part of U.S. nuclear weapons modernization, Congress has sought to balance its concerns about NNSA program implementation with overall support for NNSA's growing budget requests.

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Introduction[1]

The Department of Defense (DOD) and the Department of Energy (DOE) share responsibility for U.S. nuclear weapons. DOD develops, deploys, and operates the missiles, aircraft, and submarines that can deliver nuclear warheads.[2] It also generates military requirements for these delivery vehicles and the warheads they carry. DOE and its semi-autonomous National Nuclear Security Administration (NNSA) oversee the research, development, testing, and acquisition programs that design, produce, maintain, and sustain the U.S. nuclear warheads stockpile.

The U.S. nuclear weapons complex began with the establishment of the Manhattan Engineer District in 1942, and then grew in size and complexity over the following five decades.[3] According to one U.S. government estimate, by the end of the 1980s, over 115,000 people were engaged in the development and production of nuclear weapons and related components at 14 facilities located across 12 states in the continental United States.[4] During the Cold War, the United States produced 1,045 metric tons of highly enriched uranium[5] and 103.4 metric tons of plutonium,[6] and also conducted 1,054 explosive nuclear tests.[7] The size of the U.S. nuclear stockpile peaked in 1967 at 31,255 nuclear warheads.[8]

At the end of the Cold War, Congress and the executive branch reduced funding for nuclear weapons activities, shuttered some facilities in the nuclear weapons complex, ceased producing

[1] All information in this report has been accessed from publicly-available sources.

[2] For additional information, see U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition and Sustainment, *Nuclear Matters Handbook*, 2020, https://www.acq.osd.mil/ncbdp/nm//NMHB2020rev/index.html.

[3] For a concise historical overview, see CRS Report R45306, *The U.S. Nuclear Weapons Complex: Overview of Department of Energy Sites*, by Amy F. Woolf and James D. Werner. For a detailed timeline and a discussion of relevant science and industrial processes, see U.S. Department of Energy, Office of Scientific and Technical Information, "The Manhattan Project: An Interactive History," undated, accessed June 28, 2024, https://www.osti.gov/opennet/manhattan-project-history/index.htm.

[4] Office of Technology Assessment, *Complex Cleanup: The Environmental Legacy of Nuclear Weapons Production*, OTA-O-484, February 1991, p. 15-17, https://ota.fas.org/reports/9113.pdf. These 14 facilities include the weapons design and development at three national laboratories: Los Alamos and Sandia in NM and Livermore in CA; the production and processing of plutonium and tritium at Hanford in WA, Savannah River Site in SC, and uranium processing at the Fernald Feed Materials Production Center in OH and the Idaho National Laboratory in ID; warhead component production at Rocky Flats in CO, Y-12 in TN, the Mound Plant in OH, the Pinellas Plant in FL, the Kansas City Plant in MO, and the Pantex Plant in TX; as well as warhead testing at the then-Nevada Test Site, NV. The OTA report highlights several other facilities, including the Paducah Gaseous Diffusion Plant in KY, the Portsmouth Gaseous Diffusion Plant in OH, and the Waste Isolation Pilot Plant in NM, but doesn't include them in its count.

[5] U.S. Department of Energy, National Nuclear Security Administration, *Highly Enriched Uranium: Striking a Balance: A Historical Report on the United States Highly Enriched Uranium Production, Acquisition, and Utilization Activities From 1945 Through September 30, 1996*, January 2001, https://www.osti.gov/includes/opennet/reports/RedactedHEUReportDraft.pdf. For a nongovernmental estimate of current stocks, see International Panel on Fissile Materials, "Countries: United States," April 13, 2024, https://fissilematerials.org/countries/united_states.html.

[6] U.S. Department of Energy, National Nuclear Security Administration, *The United States Plutonium Balance, 1944-2009*, June 2021, https://www.osti.gov/biblio/1132796. For a nongovernmental estimate of current stocks, see International Panel on Fissile Materials, "Countries: United States," April 13, 2024, https://fissilematerials.org/countries/united_states.html.

[7] U.S. Department of Energy, National Nuclear Security Administration Nevada Field Office, *United States Nuclear Tests: July 1945 through September 1992*, DOE/NV—209 Rev 16, September 2015, https://nnss.gov/wp-content/uploads/2023/08/DOE_NV-209_Rev16.pdf. Also see "History of Nuclear Explosive Testing," in U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition and Sustainment, *Nuclear Matters Handbook*, 2020, https://www.acq.osd.mil/ncbdp/nm/NMHB2020rev/chapters/chapter14.html.

[8] U.S. Department of Energy, National Nuclear Security Administration, "Fact Sheet: Transparency in the U.S. Nuclear Stockpile," July 22, 2024, https://www.energy.gov/nnsa/transparency-us-nuclear-weapons-stockpile.

all nuclear weapons-usable materials, and focused on remediating negative environmental impacts of nuclear weapons production.[9] Over the next three decades, U.S.-Russian nuclear arms control contributed to significant reductions in the U.S. nuclear stockpile.[10] Beginning in 1992, the United States also began observing a moratorium on nuclear explosive testing.[11] Instead of designing and producing new nuclear warheads, Congress and the executive branch redirected efforts in the U.S. nuclear weapons complex toward sustaining existing warheads through partial refurbishment, as well as improving the complex's technological capabilities to assess the warheads' "safety, security, reliability, and effectiveness" without nuclear testing.[12] Periodically, Congress and the executive branch debated whether this approach, known as Stockpile Stewardship, was sufficient to maintain confidence that warheads in the nuclear stockpile would perform as required during a nuclear conflict.[13]

Over the last decade, DOD and NNSA have ramped up programs to modernize the U.S. nuclear deterrent[14] while also sustaining existing nuclear weapons as this modernization[15] progresses. The 2022 Nuclear Posture Review (NPR), a congressionally-mandated periodic review of U.S. nuclear policies, argues that:

> Today, much of the stockpile has aged without comprehensive refurbishment. At a time of rising nuclear risks, a partial refurbishment strategy no longer serves our interests. A safe, secure, and effective deterrent requires modern weapons and a modern infrastructure, enabled by a world-class workforce equipped with modern tools. We must develop and field a balanced, flexible stockpile capable of pacing threats, responding to uncertainty, and maintaining effectiveness. To accomplish this, we must re-establish, repair, and modernize our production infrastructure, and ensure it has appropriate capabilities and sufficient capacity to build and maintain modern nuclear weapons in a timely manner. The nuclear security enterprise must be able to respond in a timely way to threat developments

[9] See Office of Technology Assessment, *Complex Cleanup: The Environmental Legacy of Nuclear Weapons Production*, OTA-O-484, February 1991, https://ota.fas.org/reports/9113.pdf and U.S. Department of Energy video, "The Office of Environmental Management Story," 2020, https://www.energy.gov/em/about-us. In 1988, as discussed in the issues for Congress section, Congress established the Defense Nuclear Facilities Safety Board (DNFSB), an independent agency focused on the safety and security of nuclear defense facilities. See Priscilla Offenhauer, "Defense Nuclear Facilities Safety Board: The First Twenty Years," a Report Prepared by the Federal Research Division, Library of Congress under an Interagency Agreement with the Defense Nuclear Facilities Safety Board (DNFSB), September 2009, https://www.dnfsb.gov/sites/default/files/page/DNFSB%20Twenty%20Year%20Report.pdf.

[10] U.S. Department of Energy, National Nuclear Security Administration, "Fact Sheet: Transparency in the U.S. Nuclear Stockpile," July 22, 2024, https://www.energy.gov/nnsa/transparency-us-nuclear-weapons-stockpile.

[11] In 1992, Congress passed legislation mandating a nine-month U.S. moratorium on explosive nuclear tests (P.L. 102-377, §507); the Clinton Administration extended this moratorium in 1993 and signed the Comprehensive Test Ban Treaty in 1996. See CRS In Focus IF11662, *U.S. Nuclear Weapons Tests*, by Mary Beth D. Nikitin and Amy F. Woolf.

[12] The U.S. Department of Defense, *2022 Nuclear Posture Review*, October 2022, p. 23, https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF. Also see U.S. Department of Energy, National Nuclear Security Administration, "Maintaining the Nuclear Stockpile," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/maintaining-stockpile.

[13] For background, see Jonathan Medalia, *Nuclear Warheads: The Reliable Replacement Warhead Program and the Life Extension Program*, CRS Report RL33748, December 3, 2007; Jonathan Medalia, *The Reliable Replacement Warhead Program: Background and Current Developments*, CRS Report RL32929, July 27, 2009 (reports are out of print and available to congressional clients on request from the author); and Rebecca K.C. Hersman, Joseph Rodgers, and Bryce Farabaugh, "U.S. Nuclear Warhead Modernization and 'New' Nuclear Weapons," CSIS brief, December 2020, https://www.csis.org/analysis/us-nuclear-warhead-modernization-and-new-nuclear-weapons.

[14] See CRS In Focus IF10519, *Defense Primer: Strategic Nuclear Forces*, by Anya L. Fink.

[15] For how NNSA defines modernization as well as a discussion of modernization milestones, see Department of Energy, National Nuclear Security Administration, "Warhead Modernization," January 2022, https://www.energy.gov/nnsa/warhead-activities-fact-sheet.

> and technology opportunities, maintain effectiveness over time, and at all times ensure that Presidential guidance can be achieved.[16]

NNSA Administrator Jill Hruby stated in 2024 that "NNSA is being asked to do more than at any time since the Manhattan Project."[17] Congress provides funding and oversight of investments into NNSA infrastructure and capabilities as well as of NNSA's ability to execute effectively its aspects of the nuclear weapons mission, particularly in the context of a changing nuclear threat to the United States from Russia, China, and others.[18]

NNSA and Its Weapons Activities Account

NNSA, a semi-autonomous organization within DOE, was established by Congress in 2000.[19] Its predecessor agencies with responsibilities for the U.S. nuclear stockpile include the Atomic Energy Commission (1946-1974),[20] the Energy Research and Development Administration (1974-1977),[21] and DOE (beginning in 1977).[22] The Atomic Energy Act of 1954, and its amending statutes, provide DOE authorities regarding nuclear weapons.[23]

NNSA Missions

According to its website, NNSA has four primary missions:[24]

- **1. Maintaining the Stockpile**: NNSA ensures the United States maintains a safe, secure, and reliable nuclear stockpile through the application of unparalleled science, technology, engineering, and manufacturing.
- **2. Nonproliferation**: NNSA works to prevent nuclear weapon proliferation and reduce the threat of nuclear and radiological terrorism around the world. The agency endeavors to prevent the development of nuclear weapons and the spread of materials or knowledge needed to create them.
- **3. Counterterrorism and Counterproliferation**: NNSA plays a key role in preventing, countering, and responding to a terrorist or other adversary with a nuclear or radiological device.
- **4. Powering the Nuclear Navy**: NNSA provides militarily effective nuclear propulsion plants and ensures their safe, reliable and long-lived operation.

[16] The U.S. Department of Defense, *2022 Nuclear Posture Review*, October 2022, p. 23.

[17] U.S. Department of Energy, National Nuclear Security Administration, "NNSA Administrator Jill Hruby Remarks at the 2024 Nuclear Deterrence Summit," February 1, 2024, https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hruby-remarks-2024-nuclear-deterrence-summit.

[18] For a discussion of the threat environment, see Office of the Director of National Intelligence, *Annual Threat Assessment of the U.S. Intelligence Community*, February 5, 2024, https://www.dni.gov/files/ODNI/documents/assessments/ATA-2024-Unclassified-Report.pdf.

[19] Title 32 of P.L. 106-65. Congress sought to create the semi-autonomous NNSA to, inter alia, mitigate concerns about security issues in the nuclear weapons complex. NNSA is a "separately organized agency" within the DOE and circumscribes authorities for the Secretary of Energy and DOE personnel over NNSA matters as per 50 U.S.C. §2401, §2409, and §2410. For a historical overview and a discussion of legislative proposals at the time, see Carl E. Behrens and Richard E. Rowberg, "Department of Energy: Programs and Reorganization Proposals," CRS Report RL30307, October 28, 1999 (out of print and available to congressional clients on request to the author).

[20] For a historical overview, see Alice Buck, "The Atomic Energy Commission," U.S. Department of Energy, July 1983, https://www.energy.gov/management/articles/history-atomic-energy-commission.

[21] For a historical overview, see Alice Buck, "A History of the Energy Research and Development Administration," U.S. Department of Energy, March 1982, https://www.energy.gov/sites/prod/files/ERDA%20History.pdf.

[22] See U.S. Department of Energy, "A Brief History of the Department of Energy," undated, accessed June 28, 2024, https://www.energy.gov/lm/brief-history-department-energy.

[23] See text of the Atomic Energy Act of 1954, as amended through P.L. 118-67, enacted July 9, 2024 at https://www.govinfo.gov/content/pkg/COMPS-1630/pdf/COMPS-1630.pdf.

[24] The bullets are a direct quote from U.S. Department of Energy, National Nuclear Security Administration, "Missions," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/missions.

NNSA is led by a Senate-confirmed DOE Under Secretary for Nuclear Security who is also the NNSA Administrator (NA-1).[25] The NNSA Administrator closely works with the Senate-confirmed Secretary of Energy.[26]

The Senate also confirms the NNSA Principal Deputy Administrator (NNSA's number two leadership position, or NA-2),[27] the Deputy Administrator for Defense Programs (the NNSA office focused on maintaining the stockpile, NA-10),[28] and the Deputy Administrator for Defense Nuclear Nonproliferation (the NNSA office focused on nonproliferation, NA-20).[29] Naval Reactors, the NNSA office handling work on naval nuclear propulsion (NA-30), is managed jointly by NNSA and the U.S. Navy, and the Deputy Administrator for Naval Reactors is a Senate-confirmed Navy flag officer.[30] A number of other NNSA offices contribute to implementing the agency's mission set, and also may interact with Congress.[31]

Congress authorizes funding for NNSA in the annual National Defense Authorization Act (NDAA)[32] and appropriates funding for NNSA through the annual Energy and Water Development and Related Agencies Appropriations Act.[33] In accordance with its missions, NNSA's budget request has dedicated appropriations accounts for Weapons Activities, Defense Nuclear Nonproliferation (DNN), Naval Reactors, and Federal Salaries and Expenses.

The President's FY2025 budget request for NNSA Weapons Activities is $19.9 billion out of a total NNSA budget request of $25 billion that also includes $2.5 billion for DNN, $2.1 billion for Naval Reactors, and $564.5 million for Federal Salaries and Expenses.[34] This total request is an increase of $865 million, or 3.6%, over the FY2024 enacted level.[35]

[25] 42 U.S.C. §7132 and 50 U.S.C. §2402. See U.S. Department of Energy, National Nuclear Security Administration, "Leadership," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/leadership.

[26] See U.S. Department of Energy, "About Us," undated, accessed June 28, 2024, https://www.energy.gov/about-us.

[27] 50 U.S.C. §2403.

[28] 50 U.S.C. §2404. See U.S. Department of Energy, National Nuclear Security Administration, "Maintaining the Stockpile," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/maintaining-stockpile.

[29] 50 U.S.C. §2405. See U.S. Department of Energy, National Nuclear Security Administration, "Nonproliferation," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/nonproliferation.

[30] 50 U.S.C. §2406. See U.S. Department of Energy, National Nuclear Security Administration, "Powering the Navy," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/powering-navy.

[31] For NNSA structure, see U.S. Department of Energy, National Nuclear Security Administration, "Leadership and Offices," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/leadership-and-offices.

[32] See CRS In Focus IF10515, *Defense Primer: The NDAA Process*, by Valerie Heitshusen and Brendan W. McGarry and CRS In Focus IF10516, *Defense Primer: Navigating the NDAA*, by Brendan W. McGarry and Valerie Heitshusen.

[33]See CRS In Focus IF10514, *Defense Primer: Defense Appropriations Process*, by James V. Saturno and Brendan W. McGarry and CRS Report R48097, *Energy and Water Development: FY2025 Appropriations*, by Mark Holt and Anna E. Normand.

[34] U.S. Department of Energy, "President's Fiscal Year 2025 budget for NNSA advances ongoing modernization, strengthens response to deteriorating global environment," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/budget; White House, "National Nuclear Security Administration," in *The Budget for Fiscal Year 2025*, p. 344-346, https://www.whitehouse.gov/wp-content/uploads/2024/03/doe_fy2025.pdf.

[35] White House, "National Nuclear Security Administration," in *The Budget for Fiscal Year 2025*, p. 344. https://www.whitehouse.gov/wp-content/uploads/2024/03/doe_fy2025.pdf. Also see CRS Report R47657, *Energy and Water Development Appropriations for Nuclear Weapons Activities: In Brief*, by Anya L. Fink and Alexandra G. Neenan.

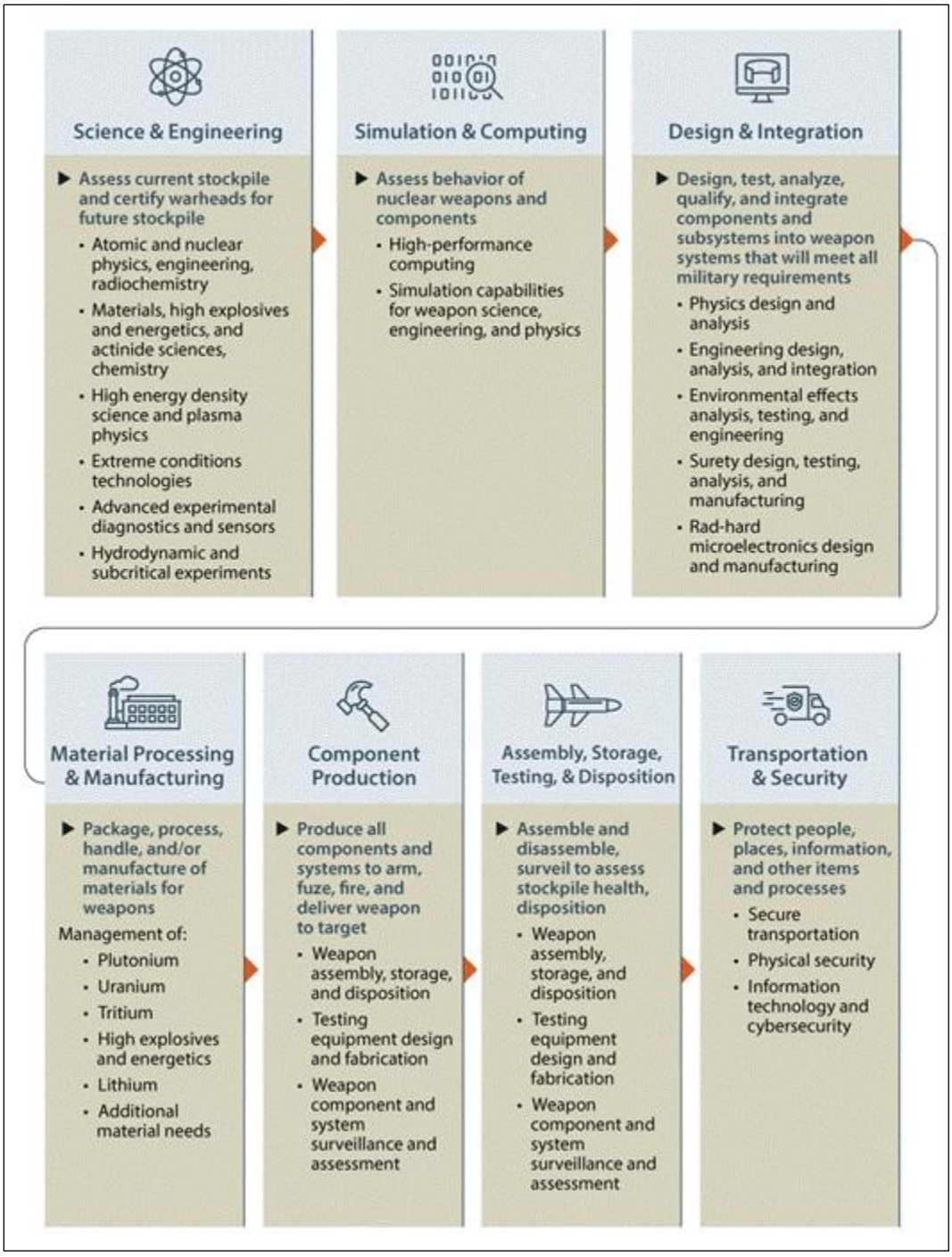
Weapons Activities Programs

NNSA's 2022 *Strategic Vision* document states that "NNSA, in partnership with the laboratories, plants, and sites, has the responsibility to design, build, and deliver a safe, secure, reliable, and militarily-effective nuclear stockpile in support of the Nation's integrated deterrent."[36] According to this document, NNSA seeks to sustain and modernize the nuclear warhead stockpile, as well as recapitalize related infrastructure and science, technology, and engineering capabilities in the nuclear weapons complex. As a result of activities across the nuclear weapon lifecycle (**Figure 1**), NNSA argues, the U.S. nuclear stockpile will be "balanced, resilient, flexible, and effective."[37]

[36] U.S. Department of Energy, National Nuclear Security Administration, *Strategic Vision*, May 2022, p. 7, https://www.energy.gov/sites/default/files/2022-05/20220502%20NNSA%20Strategic%20Vision.pdf.

[37] Ibid.

Figure 1. A Nuclear Weapon Lifecycle



Source: CRS from Appendix B in U.S. Department of Energy, National Nuclear Security Administration, *Fiscal Year 2024 Stockpile Stewardship and Management Plan*, Report to Congress, Washington, DC, November 2023, https://www.energy.gov/sites/default/files/2023-11/FY24SSMP_FINAL_NOVEMBER_2023_0.pdf.

In its FY2025 budget request, NNSA states that the "overarching mission" for Weapons Activities is to "deliver warheads that meet military requirements."[38] The Weapons Activities Account has four major programs:

- **Stockpile Management** seeks to "maintain a safe, secure, reliable and effective nuclear weapons stockpile."[39] (See **Table 3** and **Table A-1** for additional information about warheads in the U.S. nuclear stockpile and associated funding requests FY2023-FY2029 from NNSA FY2025 budget documentation.)
- **Production Modernization** is tasked with "modernizing the facilities, infrastructure, and equipment that produce materials and components to meet stockpile requirements and maintain the Nation's nuclear deterrent."[40]
- **Stockpile Research, Technology, and Engineering (SRT&E)** "provides the knowledge and expertise needed to maintain confidence in the nuclear stockpile without additional nuclear explosive testing."[41]
- **Infrastructure & Operations (I&O)** "maintains, operates, and modernizes NNSA's infrastructure," which includes planning and constructing all NNSA support facilities except for complex-construction projects (which are funded by that specific capability sponsor).[42]

The Weapons Activities account has increased over the last decade (**Table 1**). The outyear funding requests provided in the FY2025 budget requests anticipate further steady growth of the account, potentially from $20.6 billion in FY2026 to $22.4 billion in FY2029.[43]

For additional information on the NNSA's Weapons Activities budget request and NNSA priorities as noted in its most recent budget request submission, please see CRS Report R47657, *Energy and Water Development Appropriations for Nuclear Weapons Activities: In Brief*, by Anya L. Fink and Alexandra G. Neenan.

[38] U.S. Department of Energy, *Department of Energy FY 2025 Congressional Justification, National Nuclear Security Administration, Federal Salaries and Expenses, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors*, Office of the Chief Financial Officer, March 2024, Volume I, p. 139, https://www.energy.gov/sites/default/files/2024-03/doe-fy-2025-budget-vol-1-v4.pdf. Hereafter referred to as the NNSA FY2025 Budget Request.

[39] NNSA FY2025 Budget Request, p. 104.

[40] NNSA FY2025 Budget Request, p. 105.

[41] NNSA FY2025 Budget Request, p. 367.

[42] NNSA FY2025 Budget Request, p. 115.

[43] NNSA FY2025 Budget Request, p. 6.

Table 1. Funding for Weapons Activities by Major Category, FY2021-FY2025 Request

(millions of U.S. dollars)

Program	FY2022 Enacted	FY2023 Enacted	FY2024 Enacted	FY2025 Request	$ Change (FY2025 Request - FY2024 Enacted)	% Change (FY2025 Request - FY2024 Enacted)
Stockpile Management	4,637.7	4,954.1	5,329.2	5,140.7	-188.5	-3.5%
Production Modernization	2,911.0	5,116.7	5,865.9	5,877.7	11.8	0.2%
Stockpile RT&E [a]	2,843.0	2,950.0	3,280.4	3,174.2	-106.3	-3.2%
I&O	3,868.3	2,602.6	2,584.8	3,299.9	715.1	27.7%
Other [b]	1,660.0	1,889.0	2,161.3	2,356.2	195.0	9%
Prior year balances	0	-396.0	-113.6	0	113.6	-100%
Total	**15,920.0**	**17,116.1**	**19,108.0**	**19,849.0**	**740.6**	**3.9%**

Source: NNSA FY2025 budget request and Department of Energy, *Comparative Appropriation by Congressional Control FY2025 v2*; Committee on Appropriations explanatory statement to Division D—Energy and Water Development Appropriations Act, 2023, p. 175-182 of PDF; Committee on Appropriations explanatory statement to Division D-Energy and Water Development Appropriations Act, 2024, p. 116-122 of PDF.

Notes: Totals may not sum due to rounding. RT&E: Research, Technology, and Engineering; I&O: Infrastructure and Operations.

a. Stockpile RT&E: Beginning in FY2024, Academic Programs, which had previously been within the Stockpile RT&E Program, will be its own separate program.

b. Other: Secure Transportation Asset, Defense Nuclear Security, Information Technology and Cybersecurity, and Legacy Contractor Pensions and Settlement Payments, and Academic Programs beginning in FY2024

Congressional direction and requests drive a number of NNSA reporting requirements.[44] For example, NNSA annually produces a document titled the *Stockpile Stewardship and Management Plan* (SSMP) that offers an overview of the U.S. nuclear stockpile; facilities, capabilities, and personnel in the nuclear weapons complex; and other issues.[45] The SSMP provides an overview of NNSA programs for the preceding fiscal year and offers context for the upcoming NNSA budget request for the following fiscal year.

NNSA Locations and Workforce

NNSA oversees the activities at the nuclear weapons complex from headquarters (HQ) and several field offices. NNSA HQ activities take place across three facilities, including the DOE headquarters in Washington, DC, a DOE building in Germantown, MD, and the NNSA's John A. Gordon Albuquerque Complex at Kirtland Air Force Base in Albuquerque, NM. The latter is a

[44] See Appendix A in U.S. Department of Energy, National Nuclear Security Administration, *Fiscal Year 2024 Stockpile Stewardship and Management Plan*, Report to Congress, Washington, DC, November 2023, https://www.energy.gov/sites/default/files/2023-11/FY24SSMP_FINAL_NOVEMBER_2023_0.pdf. Hereafter referred to as the FY2024 SSMP.

[45] See past SSMPs at U.S. Department of Energy, National Nuclear Security Administration, *Stockpile Stewardship and Management Plan (SSMP*), November 27, 2023, https://www.energy.gov/nnsa/articles/stockpile-stewardship-and-management-plan-ssmp.

newly-constructed facility that was inaugurated in 2022 and replaced several dozen old buildings.[46]

In addition, NNSA has a number of field offices that, according to the agency, are responsible for providing oversight and compliance management over facilities of the nuclear complex.[47] Staffed by federal workers with various backgrounds to accommodate the diversity of facility missions, these field offices are "mostly co-located with the facilities they supervise."[48]

Federal workers at NNSA headquarters and field offices comprise around 2,000 employees, a number limited by Congress.[49] Across the facilities of the nuclear complex, discussed in the section that follows, the total workforce numbers over 57,000 personnel.[50]

Nuclear Security Enterprise Facilities

Title 50, Section 2501 of the U.S. Code (50 U.S.C. §2501) defines the NNSA "nuclear security enterprise" (NSE) as "the physical facilities, technology, and human capital of the national security laboratories and the nuclear weapons production facilities."[51] These NSE facilities produce nuclear materials, fabricate nuclear and nonnuclear components, assemble and disassemble nuclear warheads, conduct scientific research and analysis to maintain confidence in the reliability of existing warheads, integrate components with nuclear weapons delivery vehicles, and conduct support operations. These facilities are government-owned contractor-operated (GOCO) facilities that utilize Management & Operating (M&O) contracts.[52]

The facilities listed in 50 U.S.C. §2501 include:

- three "national security laboratories" located in CA and NM;
- four "nuclear weapons production facilities" located in TX, MO, TN, and SC;
- a facility in Nevada that performs underground subcritical nuclear testing.[53]

The rest of this section describes each of these eight facilities. **Table 2** contains summary information on these facilities drawing on FY2024 SMPP data. **Figure 2** provides maps of these facilities. **Figure 3** provides information on how these facilities interact during the lifecycle of a nuclear weapon.

[46] NNSA, "New state-of-the-art facility to house 1,200 federal and contractor employees," April 19, 2022, https://www.energy.gov/nnsa/articles/ribbon-cutting-held-nnsas-john-gordon-albuquerque-complex.

[47] NNSA, "Locations," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/locations.

[48] Ibid. These field offices include the following: Kansas City Field Office, Livermore Field Office, Los Alamos Field Office, Nevada Field Office, Pantex Field Office, Sandia Field Office, Savannah River Field Office, and the Y-12 Field Office. The Naval Nuclear Propulsion Program (Naval Reactors) is discussed separately in this report.

[49] These caps do not include Naval Reactors or NNSA's Office of Secure Transportation. 50 U.S.C. §2441 and 50 U.S.C. §2441a. FY2025 budget request suggests higher staffing numbers to 2,084 FTEs that includes 85 FTE at SRS to account for the transfer of the Savannah River Site from EM to NNSA. NNSA FY2025 Budget Request, p. 11.

[50] FY2024 SSMP, p. 7-7. All of the employee numbers in this report are those reported in the FY2024 SSMP as involved in the nuclear weapons mission as of FY2022. See Chapter 7 of the FY2024 SSMP for an in-depth discussion of the workforce.

[51] 50 U.S.C. §2501.

[52] For a description of this arrangement, see Sandia National Laboratories, "Government Owned/Contractor Operated Heritage," undated, accessed June 28, 2024, https://www.sandia.gov/about/history/goco.html.

[53] 50 U.S.C. §2501. Title 50 lists NNSS as a production facility. However, NNSA lists it separately in the SSMP.

Table 2. Facilities in the Nuclear Security Enterprise

	Facility	Capabilities Related to Stockpile	Staffing FY2022	M&O Contract Awardee
National security laboratories	Lawrence Livermore National Laboratory, CA	• Weapons physics design and analysis • Weapons engineering design, analysis, and integration • High explosives science and engineering • High performance computing • High energy density physics • Additive manufacturing	7,700	Lawrence Livermore National Security, consisting of Bechtel, University of California, BWX Technologies, the Washington Division of URS Corporation, and Battelle.
	Los Alamos National Laboratory, NM	• Weapon component production • Weapons physics design and analysis • High performance computing • Weapons engineering and energetics • Hydrodynamic and subcritical experiments • Neutron science at the Los Alamos Neutron Science Center • Uranium, beryllium, organics, and inorganics production and manufacturing processes	11,280	Triad National Security, consisting of Battelle Memorial Institute, Texas A&M University, and University of California.
	Sandia National Laboratories, NM and CA	• Weapon engineering design, analysis, and integration/weapon component and system surveillance and assessment/agile component and systems design • Radiation-hardened microelectronics design and manufacturing • Materials science and engineering/advanced manufacturing • Environmental effects analysis, testing, and engineering sciences/high energy density physics/advanced experimental diagnostics and sensors • High performance computing /simulation codes and models	14,140	National Technology and Engineering Solutions of Sandia, a subsidiary of Honeywell.

	Facility	Capabilities Related to Stockpile	Staffing FY2022	M&O Contract Awardee
Nuclear weapons production facilities	Kansas City National Security Campus, MO	• Non-nuclear weapon component manufacturing and assembly • Testing equipment design and fabrication • Fabrication and support of Secure Transportation Assets • Weapon component surveillance and assessment • Advanced manufacturing	6,350	Honeywell Federal Manufacturing and Technologies.
	Pantex Plant, TX	• Weapons assembly and disassembly • Surveillance • High explosives • Special nuclear material accountability, storage, protection, handling, and disposition	4,100	Transition ongoing to PanTeXas Deterrence, consisting of BWX Technologies, Fluor, SOC, and Texas A&M University.
	Savannah River Site, SC	• Tritium recycling • Tritium extraction • Replenishing tritium in gas transfer system reservoirs • Gas transfer system surveillance and Tritium research and development • SRS plutonium modernization	900	Savannah River Nuclear Solutions, consisting of Fluor, Honeywell, Huntington Ingalls.
	Y-12 National Security Complex, TN	• Uranium and canned subassembly production capability • Lithium capability • Material and process research and development capability	7,600	Consolidated Nuclear Security, a subsidiary of Bechtel, Leidos, ATK Launch Systems, and SOC.
	Nevada National Security Site, NV	• Hydrodynamic and subcritical experiments at weapons-relevant scales • Weapons science experiments using high-hazard materials • Support of nuclear weapons experiments by the Device Assembly Facility • Development of advanced experimental diagnostics and sensors	2,940	Mission Support and Test Services, consisting of Honeywell International, Jacobs Engineering Group, and Huntington Ingalls.

Source: CRS from Appendix F in U.S. Department of Energy, National Nuclear Security Administration, Fiscal Year 2024 Stockpile Stewardship and Management Plan, Report to Congress, Washington, DC, November 2023, https://www.energy.gov/sites/default/files/2023-11/FY24SSMP_FINAL_NOVEMBER_2023_0.pdf.

Notes: Nuclear workforce data in the FY2024 SSMP is from FY2022; the data is rounded.

National Security Laboratories

The primary mission of the three national security laboratories is to "perform research to develop, sustain, and implement nuclear weapons design, simulation, modeling, and experimental capabilities and competencies," according to NNSA.[54] The laboratories also "engage in long-term research, development, test, and evaluation activities for the nuclear weapons missions and apply science, engineering, and technology to solve other national challenges."[55] The three labs operate as federally-funded research and development centers (FFRDCs).[56]

Historically, two of the three laboratories—Los Alamos and Livermore—were responsible for the design of all U.S. nuclear weapons. Specifically, these laboratories designed the physics package, which is the integrated nuclear warhead. The warhead includes the primary (plutonium pit surrounded by explosive materials), the secondary (may consist of uranium, lithium, and other materials), and the supporting case surrounding these components.[57] The third laboratory, Sandia, was responsible for the design, development, and testing of the nonnuclear components required to arm, fuze, and fire a weapon to military specifications, as well as for the systems integration of U.S. nuclear weapons, including integration with DOD's nuclear-capable delivery vehicles.

Lawrence Livermore National Laboratory (LLNL)

Established in 1952[58] and located in Livermore, CA, LLNL is a nuclear design and physics laboratory that has high-performance computing capabilities and conducts advanced high energy density science research.[59] LLNL is the lead design agency for the W80-4 life extension and W87-1 modification and has primary assessment responsibility for the W80-1, W87-0, B83, and W-84 warheads.[60] (See **Table 3** and **Table A-1** for additional information on the stockpile.)

LLNL is fielding the first exascale computing system in the United States[61] and in 2023 conducted an experiment at the National Ignition Facility[62] that successfully achieved fusion energy ignition.[63] LLNL also operates the High Explosives Application Facility and the Site 300 Experimental Test Site.[64]

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[54] FY2024 SSMP, p. 1-3 and 1-4.

[55] Ibid.

[56] See U.S. Department of Energy, "Office of Laboratory Policy," undated, accessed June 28, 2024, https://www.energy.gov/science/office-laboratory-policy.

[57] For a discussion of technical aspects of nuclear weapons, see chapter 4, especially pp. 173-175, in Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, December 1993, available at https://apps.dtic.mil/sti/pdfs/ADA375231.pdf.

[58] For more on LLNL history, see LLNL, "Our History," undated, accessed June 28, 2024, https://www.llnl.gov/purpose/history and also see https://www.youtube.com/user/LivermoreLab.

[59] FY2204 SSMP, p. F-6.

[60] FY2024 SSMP, p. F- 6-F-14.

[61] For an explanation, see Department of Energy, Office of Science, "DOE Explains… Exascale Computing," undated, accessed June 28, 2024, https://www.energy.gov/science/doe-explainsexascale-computing.

[62] See LLNL, "What is the National Ignition Facility," undated, accessed June 28, 2024, https://lasers.llnl.gov/about/what-is-nif.

[63] According to LLNL, "Fusion ignition occurs when the heating power from alpha particles produced by fusion reactions in the hot spot at the center of the target capsule overcomes the cooling effects of x-ray losses, electron conduction, and implosion expansion." See LLNL, "Achieving Fusion Ignition," undated, accessed June 28, 2024, https://lasers.llnl.gov/science/pursuit-of-ignition.

[64] LLNL, "Hydrodynamic and Explosives Testing," undated, accessed June 28, 2024, https://sd.llnl.gov/facilities/hydrodynamic-explosives-testing.

According to data from the FY2024 SSMP, LLNL's weapons activities workforce is over 7,770 employees.[65] LLNL is operated by Lawrence Livermore National Security, a consortium involving Bechtel, University of California, BWX Technologies, the Washington Division of URS Corporation, and Battelle.

Los Alamos National Laboratory (LANL)

Established in 1943[66] and located in Los Alamos, NM, LANL is a nuclear design and physics laboratory that has high-performance computing capabilities and conducts advanced high energy density science research.[67] The lab is the lead design agency for the B61, W76, and W88 warheads and leads life extension efforts for the B61-12 and the W88 Alt 370 program.[68] (See **Table 3** and **Table A-1** for additional information on the stockpile.)

LANL also has a mission to produce plutonium pits, detonators, and other components.[69] NNSA is recapitalizing and modernizing equipment at LANL's Plutonium Facility (PF-4) and other facilities at LANL necessary to restore pit production capability.[70] NNSA intends to produce 30 plutonium pits per year at LANL; LANL's PF-4 will work alongside the facility currently under development at the Savannah River Site, discussed below, to meet the congressional and executive branch requirement for the NSE to produce 80 plutonium pits per year for the nuclear stockpile.[71]

NNSA is consolidating and modernizing the Energetic Materials Characterization Facility at LANL. LANL also operates the Dual-Axis Radiographic Hydrodynamic Test Facility (DARHT)[72] and the Los Alamos Neutron Science Center (LANSCE),[73] among other facilities supporting U.S. national security.

According to data from the FY2024 SSMP, LANL's weapons activities workforce is over 11,280 employees.[74] LANL is operated by Triad National Security, a consortium involving Battelle, Texas A&M, and University of California.

Sandia National Laboratories (SNL)

Established in 1949[75] and located in Albuquerque, NM, and Livermore, CA, SNL is the primary design agency for nuclear warheads' non-nuclear components (such as power sources, neutron generators, and trusted radiation-hardened microelectronics). It supports their production as well as engineers and integrates warhead systems. SNL is involved in all ongoing warhead stockpile modernization programs.[76] (See **Table 3** and **Table A-1** for additional information on the

[65] FY2024 SSMP, p. F-11. All of the employee numbers in this report are those reported in the SSMP as involved in the nuclear weapons mission and as of FY2022.

[66] For more on LANL history, see LANL, "Our History," undated, accessed June 28, 2024, https://about.lanl.gov/history-innovation/ and also see https://www.youtube.com/user/LosAlamosNationalLab.

[67] FY2024 SSMP, p. F-15.

[68] FY2024 SSMP, p. F-15-F-25.

[69] Ibid.

[70] FY2024 SSMP, p. 3-2-3-3.

[71] See discussion later in this report.

[72] LANL, "DARHT," undated, accessed June 28, 2024, https://science-innovation.lanl.gov/science-facilities/darht/.

[73] LANL, "Neutron and Proton Science at LANSCE," undated, accessed June 28, 2024, https://lansce.lanl.gov/.

[74] FY2024 SSMP, p. F-22.

[75] For an overview of Sandia, see https://www.sandia.gov/70-ways/ and https://www.youtube.com/SandiaLabs.

[76] FY2024 SSMP, p. F-26-F-37.

stockpile.) NNSA is investing in modernizing various capabilities at SNL, including the Power Sources Capability.[77]

According to data from the FY2024 SSMP, SNL's weapons activities workforce is over 14,140 employees.[78] SNL is operated by National Technology and Engineering Solutions of Sandia, a subsidiary of Honeywell.

Nuclear Weapons Production Facilities

Four production facilities produce and assemble materials and components for nuclear weapons. Some weapon components must be replaced on a regular basis, while others are produced on an as-needed basis. These four facilities are described below.

Kansas City National Security Campus (KCNSC)

Established in 1949[79] on the site of a former engine production plant located in Kansas City, MO, KCNSC manufactures and procures non-nuclear components for nuclear weapons. This facility also develops and surveils weapons component and material processes and designs and fabricates test equipment, among its activities.[80] NNSA moved KCNSC from its original facility to a new site in 2014, and this new facility is also undergoing expansion.

According to data from the FY2024 SSMP, KCNSC's weapons activities workforce is over 6,350 employees.[81] It is operated by Honeywell Federal Manufacturing and Technologies.

Pantex

Founded in 1951[82] at a site of a former U.S. Army ordinance plant located in Amarillo, TX, Pantex manufactures and tests high explosive components and also assembles, disassembles, and refurbishes stockpile weapons and components.[83] Pantex also stores and surveils plutonium pits. NNSA is in the process of modernizing several facilities at Pantex, including those associated with high explosives and energetics work. According to NNSA, some facilities and equipment related to warhead assembly and disassembly, as well as plutonium pit handling and storage, are continuing to age and "will require replacement at some point."[84]

According to data from the FY2024 SSMP, Pantex's weapons activities workforce is over 4,100 people.[85] After a contract competition, NNSA announced in June 2024 that PanTeXas Deterrence, LLC, consisting of BWXT Technical Services Group, Fluor, SOC LLC, and the Texas A&M University System, will be managing Pantex beginning in the fall of 2024.[86]

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[77] FY2024 SSMP, p. 3-25.

[78] FY2024 SSMP, p. F-34.

[79] See KCNSC, "KCNSC Celebrates 75 Years," January 29, 2024, https://kcnsc.doe.gov/news/newsroom/kcnsc-celebrates-75-years/.

[80] FY2024 SSMP, p. 1-4, F-38-F-46.

[81] FY2024 SSMP, p. F-43.

[82] See Pantex, "About," May 2024, https://pantex.energy.gov/about; Pantex, "History," 2024, https://pantex.energy.gov/about/history.

[83] FY2024 SSMP, p. 1-4, F-47-F-53.

[84] FY2024 SSMP, p. F-48.

[85] FY2024 SSMP, p. F-50.

[86] U.S. Department of Energy, National Nuclear Security Administration, "NNSA awards Pantex Management and (continued...)

Savannah River Site (SRS)

Established in 1951 to produce and process tritium and plutonium-239,[87] SRS is spread across three counties in SC (Aiken, Allendale, and Barnwell).[88] Today, the facility extracts, recycles, and loads tritium produced at Tennessee Valley Authority reactors (discussed in the section below) into reservoirs, which are then sent to DOD for installation into nuclear weapons.[89] NNSA is modernizing some of the facilities related to tritium processing. Though not formally part of SRS, DOE's Savannah River National Laboratory provides support to this SRS tritium mission.

Today, NNSA is establishing a plutonium pit production capacity at SRS, with the goal of eventually producing 50 pits per year at SRS to meet the congressional and executive branch goal of producing 80 plutonium pits per year for the nuclear stockpile. NNSA originally planned for this facility to be part of an arms control agreement with Russia that would convert surplus nuclear weapons plutonium into mixed-oxide (MOX) fuel assemblies to power nuclear reactors. [90] Due to rising costs, NNSA cancelled the program in 2018 in favor of an alternative plutonium disposition approach.[91]

SRS, which also stores, processes, and eliminates radioactive wastes from the production of nuclear materials, is operated by Savannah River Nuclear Solutions, comprised of Fluor, Honeywell, Huntington Ingalls. The nuclear weapons mission at SRS currently employs over 900 people, according to the FY2024 SSMP.[92] This number is set to increase as the site transitions from EM to NNSA management on October 1.[93]

Y-12 National Security Complex

Established in 1943[94] and located in Oak Ridge, TN, Y-12 manufactures nuclear weapons components from uranium and lithium for secondaries. The complex "manufactures uranium, along with other nuclear weapon components, and dismantles and stores highly enriched uranium."[95] NNSA is in the process of constructing a new Uranium Processing Facility (UPF) at Y-12. Y-12 is also at the center of NNSA efforts to reestablish reliable supply of high-purity

Operating contract," June 13, 2024, https://www.energy.gov/nnsa/articles/nnsa-awards-pantex-management-and-operating-contract.

[87] See SRS, "SRS History Highlights," undated, accessed June 28, 2024, https://www.srs.gov/general/about/history1.htm and "SRS Overview," 2021, https://www.youtube.com/watch?v=rRBqdP-yC8I.

[88] DOE's Savannah River National Laboratory at Savannah River Site also conducts work related to tritium.

[89] FY2024 SSMP, p. 1-4, 3-20-3-22, F-54-F-60. For a technical discussion, see U.S. Department of Energy, "Gas Transfer Systems and Reservoir Development," undated, accessed June 28, 2024, https://www.energy.gov/srs/articles/gas-transfer-systems-and-reservoir-development.

[90] For a background on this policy, see CRS Report R43125, *Mixed-Oxide Fuel Fabrication Plant and Plutonium Disposition: Management and Policy Issues*, by Mark Holt and Mary Beth D. Nikitin.

[91] See U.S. Department of Energy, National Nuclear Security Administration, "Record of Decision for the Final Environmental Impact Statement for the Surplus Plutonium Disposition Program," *Federal Register*, April 19, 2024, https://www.federalregister.gov/documents/2024/04/19/2024-08390/record-of-decision-for-the-final-environmental-impact-statement-for-the-surplus-plutonium.

[92] FY2024 SSMP, p. F-57.

[93] NNSA's FY2025 budget request suggests higher staffing numbers to 2,084 FTEs that includes 85 FTE at SRS to account for the transfer of the Savannah River Site from EM to NNSA. NNSA FY2025 Budget Request, p. 11.

[94] Y-12, "History," undated, accessed June 28, 2024, https://www.y12.doe.gov/about/history.

[95] FY2024 SSMP, p. 1-4, F-61-F-68.

depleted uranium before supplies run out around 2030. NNSA is also constructing a Lithium Processing Facility while supporting operations to meet requirements in the near-term.

According to data from the FY2024 SSMP, the weapons activities workforce at Y-12 is over 7,600 people.[96] Y-12 is currently operated by Consolidated Nuclear Security, a subsidiary of Bechtel, Leidos, ATK Launch Systems, and SOC, LLC.

Nevada National Security Site (NNSS)

Established in 1950, NNSS, formerly the Nevada Test Site, no longer conducts nuclear explosive tests because of the 1992 U.S. nuclear test moratorium, but maintains facilities needed for subcritical and other testing for the stockpile stewardship program.[97] According to NNSA, the NNSS "is the primary location where experiments with radioactive and other high-hazard materials are conducted and the only location where high explosive-driven plutonium experiments can be conducted at weapon-scale with weapon-relevant amounts of special nuclear material."[98]

The United States has conducted 34 subcritical experiments consistent with the U.S. zero-yield standard[99] at the facility since the 1992 moratorium began.[100] Administrator Hruby stated in 2023 that NNSA plans to "to execute two subcritical experiments in 2024 and plans to conduct approximately three subcritical experiments per year by the end of the decade." [101] According to NNSA's Deputy Administrator for Defense Programs Marvin Adams, "we plan to increase the frequency of these subcritical experiments so we can continue to gather important data on nuclear weapons materials, with no technical need for a return to underground nuclear explosive testing."[102] The site also maintains the capability to resume nuclear explosive testing within 36 months,[103] if ordered to do so by the President. (For an overview of U.S. policy on nuclear testing

[96] FY2024 SSMP, p. F-65.

[97] According to NNSA Administrator Hruby, "between 1951 and 1963, nearly 100 atmospheric explosive nuclear tests were conducted [at the NNSS]. After the passage of the Partial Test Ban Treaty, testing moved underground. Between 1963 and 1992, another 828 underground explosive nuclear tests were carried out" before Congress initiated a U.S. nuclear testing moratorium in 1992. Department of Energy, National Nuclear Security Administration, "NNSA Administrator Jill Hruby Remarks at DOE/NNSA Nevada National Security Site Clean Energy Project Information Day," February 14, 2024, https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hruby-remarks-doennsa-nevada-national-security-site-clean.

[98] FY2024 SSMP, p. 1-5. Also see p. F-69-F-75, 4-20-4-21.

[99] Zero-yield refers to the nuclear explosions' production of a "self-sustaining, supercritical chain reaction of any kind whether for weapons or peaceful purposes." See Department of State, "Scope of the Comprehensive Nuclear Test-Ban Treaty," undated, accessed June 28, 2024, https://2009-2017.state.gov/t/avc/rls/212166.htm.

[100] Department of Energy, National Nuclear Security Administration, "NNSA completes subcritical experiment at PULSE facility in Nevada," May 16, 2024, https://www.energy.gov/nnsa/articles/nnsa-completes-subcritical-experiment-pulse-facility-nevada; and "Remarks by NNSA Deputy Administrator for Defense Nuclear Nonproliferation Corey Hinderstein at the CTBT: Science and Technology Conference 2023," June 20, 2023, https://www.energy.gov/nnsa/articles/remarks-nnsa-deputy-administrator-defense-nuclear-nonproliferation-corey-hinderstein.

[101] Department of Energy National Nuclear Security Administration, "Remarks by NNSA Administrator Jill Hruby at the CTBT: Science and Technology Conference 2023," June 19, 2023, https://www.energy.gov/nnsa/articles/remarks-nnsa-administrator-jill-hruby-ctbt-science-and-technology-conference-2023.

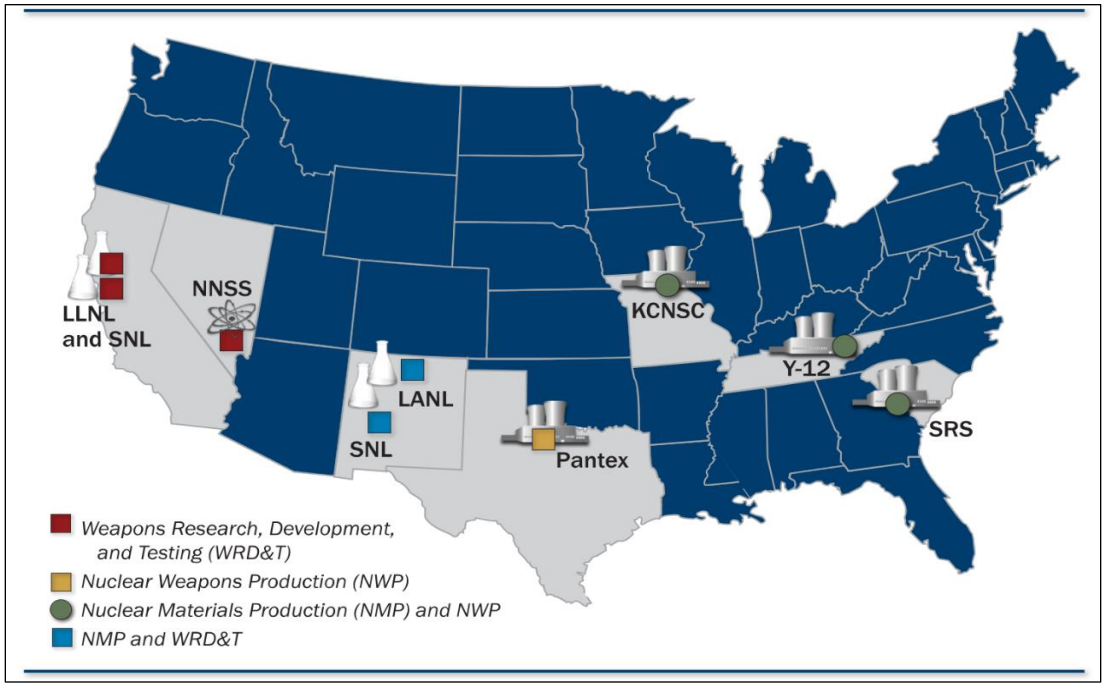
[102] Department of Energy National Nuclear Security Administration, "NNSA completes subcritical experiment at PULSE facility in Nevada," May 16, 2024, https://www.energy.gov/nnsa/articles/nnsa-completes-subcritical-experiment-pulse-facility-nevada.

[103] FY2024 SSMP, p. 4-20.

and the CTBT, see CRS In Focus IF11662, *U.S. Nuclear Weapons Tests*, by Mary Beth D. Nikitin and Amy F. Woolf).

According to data from the FY2024 SSMP, NNSS's weapons activities workforce is over 2,940 people.[104] The site is operated by Mission Support and Test Services, which is a joint venture involving Honeywell International, Jacobs Engineering Group, and Huntington Ingalls Industries Nuclear.

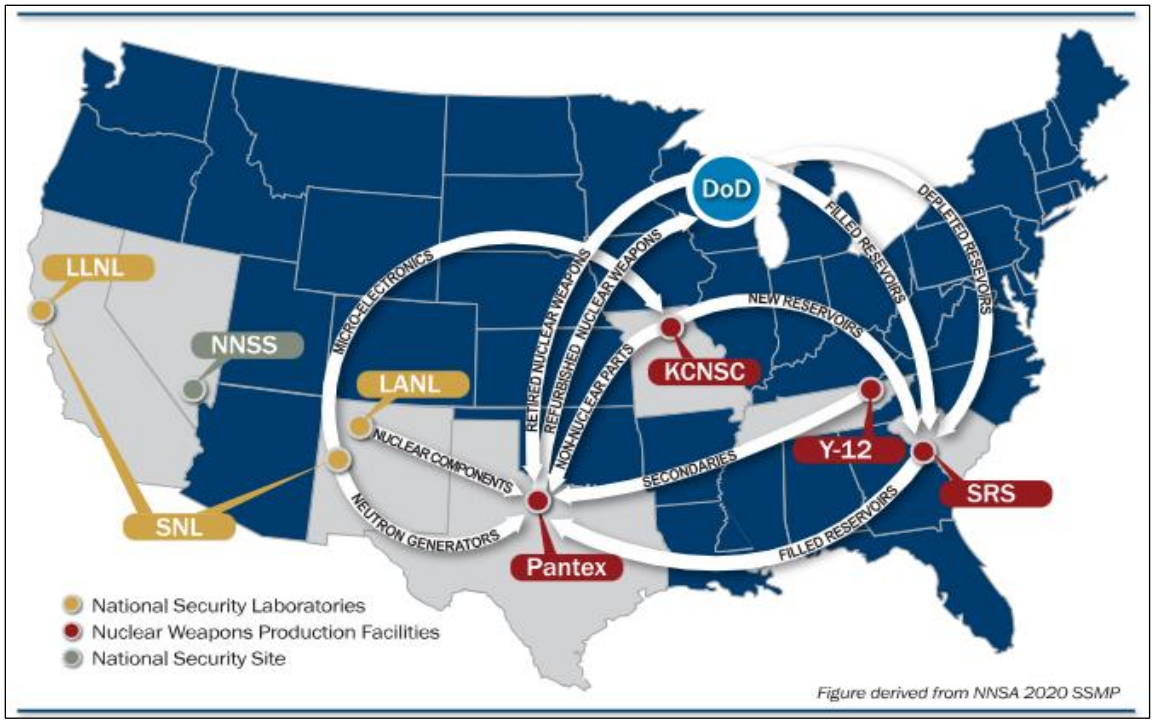
Figure 2. NNSA Nuclear Security Enterprise



Source: U.S. Department of Defense, "NNSA Nuclear Security Enterprise," *Nuclear Matters Handbook*, 2020, https://www.acq.osd.mil/ncbdp/nm//NMHB2020rev/chapters/chapter5.html.

[104] FY2024 SSMP, p. F-72.

Figure 3. NNSA Nuclear Weapon Product Flow



Source: U.S. Department of Defense, "NNSA Nuclear Security Enterprise," *Nuclear Matters Handbook*, 2020, https://www.acq.osd.mil/ncbdp/nm//NMHB2020rev/chapters/chapter5.html.

Other Relevant Facilities

This section describes other facilities relevant to the nuclear weapons mission that are not formally part of the NSE. These facilities include non-NNSA production facilities such as the Tennessee Valley Authority's (TVA's) Watts Barr civilian nuclear power plant that produces tritium, a relatively short-lived nuclear material vital to modern nuclear warheads, and several sites integral to efforts to establish domestic uranium enrichment production. These facilities also include defense waste facilities managed by DOE's Office of Environmental Management (EM), such as the WIPP geologic waste repository in NM. Other relevant sites described in this section include those associated with NNSA's Office of Secure Transportation, DOE's national laboratories, and the Naval Nuclear Laboratory facilities.

Non-NNSA Production Facilities

Tritium Production

TVA is a federally-owned electric utility corporation. NNSA has produced tritium from lithium rods irradiated at TVA's Watts Bar nuclear power reactor units since FY2003.[105] Located in Rhea County, TN, these reactors are key to NNSA's efforts to increase its tritium production capacity by 2025.[106] The Nuclear Regulatory Commission is currently reviewing the possibility of an increase in the loading level of these rods that would allow NNSA to increase production

[105] FY2024 SSMP, p. 3-19.

[106] FY2024 SSMP, p. 3-20.

capacity.[107] NNSA plans for the units to continue production through 2055 and 2075.[108] The tritium produced at TVA is processed at SRS.

Uranium Enrichment

NNSA, along with DOE's Office of Nuclear Energy, are facilitating the development of centrifuges and cascades for domestic uranium enrichment.[109] NNSA's defense needs include low-enriched uranium (LEU) for tritium production and high-enriched uranium (HEU) for nuclear weapons and naval reactors that would draw on unobligated enriched uranium (or, enriched uranium that is free of peaceful-use obligations).[110] Facilities involved in this effort include private and government-owned sites at the Portsmouth Site in Piketon, OH, and the Oak Ridge National Laboratory, TN. Work is also taking place at facilities involved in the nuclear propulsion program (below).

Office of Environmental Management Defense Waste Facilities

DOE EM manages various sites that were formerly part of the nuclear weapons mission, but have since been shuttered for dismantlement and environmental remediation. According to 2024 testimony of then-EM chief William (Ike) White, "from an original 107 sites, some dating back to the Manhattan Project Era and the birth of the Atomic Age, EM has cleaned up 92 sites, leaving just 15 to go."[111] However, these 15 sites require significant cleanup, some of which may not be completed for several decades.[112] According to White's 2024 testimony, priority programs for EM involve the remediation at the former Hanford plutonium production site in WA, at SRS, and at the Idaho National Laboratory, among other facilities.[113]

[107] FY2024 SSMP, p. 3-20.

[108] Ibid., and Nuclear Regulatory Commission, "Tennessee Valley Authority; Watts Bar Nuclear Plant, Units 1 and 2; Environmental Assessment and Finding of No Significant Impact," *Federal Register*, February 23, 2024, https://www.federalregister.gov/documents/2024/02/23/2024-03665/tennessee-valley-authority-watts-bar-nuclear-plant-units-1-and-2-environmental-assessment.

[109] See FY2024 SSMP, p. 3-23-3-24. Also see Department of Energy National Nuclear Security Administration, "Remarks by Administrator Jill Hruby, Council on Strategic Risks, Commission on Nuclear Energy and Climate Security, Dinner and Reception," October 12, 2023, https://www.energy.gov/nnsa/articles/remarks-administrator-jill-hruby-council-strategic-risks-commission-nuclear-energy.

[110] See discussion of this issue in U.S. Department of Energy, *Tritium and Enriched Uranium Management Plan Through 2060*, Report to Congress, October 2015.

[111] Senate Committee on Armed Services, "Testimony of William "Ike" White, Senior Advisor for the Office of Environmental Management, Before the Subcommittee on Strategic Forces Committee on Armed Services United States Senate," May 22, 2024, https://www.armed-services.senate.gov/imo/media/doc/white_statement.pdf.

[112] GAO, "Environmental Cleanup: Status of Major DOE Projects and Operations," May 4, 2022, https://www.gao.gov/products/gao-22-104662; Wayne Barber, "'Keith Richards might be dead by then,' King says of best-case Hanford scenario," *Weapons Complex Monitor*, May 31, 2024, https://www.exchangemonitor.com/keith-richards-might-be-dead-by-then-king-says-of-best-case-hanford-scenario-2/; GAO, "Nuclear Waste Cleanup: Changes Needed to Address Current and Growing Shortages in Mission-Critical Positions," July 18, 2024, https://www.gao.gov/products/gao-24-106479.

[113] Senate Committee on Armed Services, "Testimony of William "Ike" White Senior Advisor for the Office of Environmental Management Before the Subcommittee on Strategic Forces Committee on Armed Services United States Senate," May 22, 2024, https://www.armed-services.senate.gov/imo/media/doc/white_statement.pdf. (Also see CRS In Focus IF11372, *Uranium Enrichment Decontamination and Decommissioning Fund: Status and Funding Issues*, by Lance N. Larson).

Waste Isolation Pilot Plant (WIPP)

Located near Carlsbad, NM, WIPP is an EM facility that manages plutonium-contaminated (transuranic) waste produced by nuclear weapons facilities. In operation since 1999 and 2,150 feet below ground in an ancient salt bed, it is the only facility in the United States that accepts this type of waste for disposition.[114] The facility is upgrading ventilation and mining a new "disposal panel," which is still within the original capacity permitted by Congress.[115] WIPP is managed by Salado Isolation Mining Contractors, a Bechtel Company.

NNSA's Office of Secure Transportation (OST)

Founded in 1975 as the then-ERDA's Transportation and Safeguards Division, OST personnel are responsible for moving nuclear weapons, weapons components, and special nuclear materials in tractor-trailer and other special vehicles between NNSA facilities, DOE facilities, and military bases.[116] According to NNSA, OST has three commands: "Albuquerque, New Mexico (covering 11 states in the Western Region); Amarillo, Texas (covering 11 states in the Central Region); [and] Oak Ridge, Tennessee (covering 26 states in the Eastern Region)."[117] OST is headquartered in Albuquerque, while the OST Training Command is located in Fort Chaffee, AR.[118]

OST staff comprise roughly 300 federal agents (nuclear materials couriers) and approximately 250 supporting staff.[119] OST uses specially-designed Peterbilt 18-wheel trailers for cargo transport.[120] The current generation of the tractor-trailers is known as Safeguards Transporters. New Mexico Operations (NMO), a division of the Kansas City National Security Campus (KCNSC), and Sandia are tasked with designing and testing a new Mobile Guardian Transporter with a full rate production scheduled for 2029.[121] OST also has several aircraft, based in Albuquerque.[122] Separately from OST, NNSA also has contracted protective forces stationed at LANL, NSSS, Pantex, and Y-12 for the physical protection of special nuclear materials.[123]

[114] U.S. Department of Energy, "WIPP SITE," undated, accessed June 28, 2024, https://wipp.energy.gov/wipp-site.asp and see "WIPP Virtual Tour" at https://wipp.energy.gov/about-us.asp

[115] U.S. Department of Energy, "WIPP Begins Mining New Waste Disposal Panel for First Time in Decade," January 23, 2024, https://www.energy.gov/em/articles/wipp-begins-mining-new-waste-disposal-panel-first-time-decade.

[116] For more information, also see FY2024 SSMP, chapter 5.

[117] Department of Energy National Nuclear Security Administration, "Office of Secure Transportation," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/office-secure-transportation.

[118] Ibid.

[119] Department of Energy National Nuclear Security Administration, "NNSA Principal Deputy Administrator Frank Rose's remarks to the Office of Secure Transportation's Nuclear Materials Courier Basic program," May 16, 2023, https://www.energy.gov/nnsa/articles/nnsa-principal-deputy-administrator-frank-roses-remarks-office-secure-transportations.

[120] Department of Energy National Nuclear Security Administration, "Then and Now: Secure Transportation," July 11, 2018, https://www.energy.gov/nnsa/articles/then-and-now-secure-transportation.

[121] FY2024 SSMP, p. 5-2-5-3; KCNSC, "New Mexico Operations partners with Sandia Labs on critical secure transportation mission," October 4, 2023, https://kcnsc.doe.gov/news/newsroom/new-mexico-operations-partners-with-sandia-labs-on-critical-secure-transportation-mission/.

[122] Department of Energy National Nuclear Security Administration, "Then and Now: Secure Transportation," July 11, 2018, https://www.energy.gov/nnsa/articles/then-and-now-secure-transportation.

[123] For additional data on the nuclear security forces as a whole, see FY2024 SSMP, chapter 5, and GAO, "Sexual Harassment: NNSA Could Improve Prevention and Response Efforts in Its Nuclear Security Forces," report GAO-21-307, April 2021, p. 5-9.

Other Department of Energy Laboratories

The DOE has a number of other national laboratories that work on some aspects of the NNSA weapons activities mission. In the FY2025 budget submission, these are listed as follows:[124]

- Argonne National Laboratory
- Brookhaven National Laboratory
- Idaho National Laboratory
- Lawrence Berkley National Laboratory
- Naval Research Laboratory
- National Energy Technology Laboratory (NETL) Pittsburgh
- Oak Ridge National Laboratory
- Pacific Northwest National Laboratory
- Savannah River National Laboratory
- SLAC National Accelerator Laboratory
- University of Rochester

Naval Nuclear Laboratory (NNL)

The NNL is a set of facilities that work on the Naval Nuclear Propulsion program. This involves "the design, development, improvement, maintenance, training for operation of naval nuclear propulsion plants, and ultimate disposition of the plants."[125] These facilities are the Bettis Atomic Power Laboratory in West Mifflin, PA; Knolls Atomic Power Laboratory in Niskayuna, NY; the Kenneth A. Kesselring Site in West Milton, NY; and the Naval Reactors Facility in ID. NNL, which comprises 8,000 employees,[126] is managed and operated by Fluor Marine Propulsion.[127]

Possible Issues for Congress

As Congress conducts oversight of DOE's and NNSA's management, operations, and programs, and also authorizes and appropriates funds for NNSA Weapons Activities, it may address a range of issues. This section of the report covers the following: NNSA governance and management, the DOD-NNSA relationship, NNSA's relationship with M&O contractors, workforce issues across the nuclear weapons complex, costs and schedule of capital projects, and plutonium pit production. This section also discusses issues related to the Defense Nuclear Facilities Safety Board.

[124] NNSA FY2025 Budget Request, p. 13.

[125] NNSA, "Locations," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/locations.

[126] Naval Nuclear Laboratory, "About Us," undated, accessed June 28, 2024, https://navalnuclearlab.energy.gov/about-us/.

[127] NNSA, "Locations," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/locations.

NNSA Governance and Management

Congress established the semiautonomous NNSA as part of DOE in 2000 to manage the nuclear weapons complex.[128] Since then, Congress has directed numerous studies and appointed panels focused on NNSA governance and management issues. These have included the 2014 Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise panel (referred to as Augustine-Mies, for its co-chairs) that was highly critical of NNSA governance.[129] In particular, the panel's reports detailed a lack of national leadership focus, flawed NNSA governance design and implementation, management and oversight issues at both NNSA and DOE, dysfunctional relationships between NNSA and M&O contractors, and the lack of effective joint collaboration between DOE and its "DOD customers."[130] The panels' final report proposed a variety of recommendations and argued that, if these recommendations were not adopted, the NNSA needed to be made an "independent, autonomous" agency.[131]

A Congressionally-mandated 2016-2020 National Academy of Sciences/National Academy of Public Administration (NAS/NAPA) study monitored and assessed the implementation of the 2014 panel's recommendations.[132] The NAS/NAPA panel's final report, issued in 2020, noted progress on some of the issues identified by the 2014 Augustine-Mies panel.[133]

Both the Augustine-Mies and NAS/NAPA reports emphasized the importance of continuing governance and management reforms at NNSA.[134] The reports also called for certain bureaucratic changes to prevent gaps in the appointments of Senate-confirmed senior NNSA political appointee positions.[135]

The Congressional Commission on the Strategic Posture of the United States (hereafter SPC), which included a former NNSA Administrator and a former Augustine-Mies panel commissioner, and was co-chaired by a former NNSA Principal Deputy Administrator, also offered recommendations related to NNSA governance and management in its 2023 final report.[136] The report recommended that:

[128] 50 U.S.C. Ch. 41. Also see U.S. Department of Energy National Nuclear Security Administration, "The National Nuclear Security Administration Act (NNSA Act) and other relevant legislation," undated, accessed June 28, 2024, https://www.energy.gov/nnsa/national-nuclear-security-administration-act-nnsa-act-and-other-relevant-legislation.

[129] *Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, A New Foundation for the Nuclear Enterprise: Report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise*, 2014, http://cdn.knoxblogs.com/atomiccity/wp-content/uploads/sites/11/2014/12/Governance.pdf; hereafter referred to Augustine-Mies.

[130] See the prepared statement by Adm. Richard Mies, at the House of Representatives Committee on Armed Services, Subcommittee on Strategic Forces, "Interim Report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise," March 26, 2014, https://www.govinfo.gov/content/pkg/CHRG-113hhrg87857/html/CHRG-113hhrg87857.htm.

[131] Augustine-Mies, p. 98, p. 147-148.

[132] National Academies and National Academy of Public Administration, *Governance and Management of the Nuclear Security Enterprise*, 2020, https://nap.nationalacademies.org/catalog/25933/governance-and-management-of-the-nuclear-security-enterprise. Hereafter referred to as NAS/NAPA.

[133] NAS/NAPA, p. 1-8.

[134] NAS/NAPA, p. 8; Augustine-Mies, p. 9-10.

[135] NAS/NAPA, p. 24-26; Augustine-Mies, p. 30.

[136] For additional information, see CRS In Focus IF12621, *Congressional Commission on the U.S. Strategic Posture*, by Anya L. Fink.

- The Secretaries of Defense and Energy establish the nuclear deterrence mission as the top priority in their Departments' processes, to help eliminate the gap between statements of priority and actual results;
- The Secretary of Energy protect and reinforce NNSA's independent role as steward of the nuclear warhead stockpile and its semi-autonomous operating model; and
- Congress elevate the DOE Under Secretary for Nuclear Security/NNSA Administrator position to Deputy Secretary for Nuclear Security.[137]

All three panels described in this section called for national leadership to continue focus on NNSA governance and management issues from the executive branch and Congress, citing the importance of NNSA's contribution to the nuclear deterrence mission. These panels all also posited the importance of stable and predictable funding for NNSA activities.

DOD-NNSA Relationship

DOD's nuclear modernization programs depend on NNSA's ability to provide warheads for the DOD nuclear delivery systems in a timely manner. The 2014 Augustine-Mies panel highlighted challenges in the DOD-NNSA relationship, stating that "DOE/NNSA's history of over-promising and under-delivering has seriously undermined the trust of the DOD's weapons customers."[138] The 2020 NAS/NAPA final report "found significant improvements in the relationship," but also recommended that NNSA and DOD "continue to implement and institutionalize practices that promote the transparent exchange of information and a strong, collaborative working relationship" particularly concerning the "coordination of the agencies' budgets for the stockpile and weapons delivery systems."[139]

Delays or challenges in NNSA programs may impact DOD's efforts to modernize the triad of nuclear delivery vehicles. For example, the Government Accountability Office (GAO) has previously raised concerns about potential delays in NNSA's delivery of the W87-1 warhead for the new Sentinel intercontinental ballistic missile (ICBM) and the W80-4 warhead for air-launched cruise missiles.[140] Challenges in DOD programs can also impact NNSA programs. For example, in April 2024 congressional testimony, NNSA Administrator Hruby described NNSA concerns about the potential impact of DOD Sentinel ICBM flight testing delays on the W87-1 development and production.[141]

As **Table 3** highlights, NNSA is in the midst of executing seven warhead modernization activities.[142] (See **Table A-1** for additional information about warheads in the U.S. nuclear stockpile.)

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[137] Congressional Commission on the Strategic Posture of the United States, *America's Strategic Posture*, October 2023, p. 60-62, https://www.ida.org/-/media/feature/publications/a/am/americas-strategic-posture/strategic-posture-commission-report.ashx.

[138] Augustine-Mies, p. 83. See Chapter 5, p. 83-93.

[139] NAS/NAPA, p. 22-24.

[140] See GAO, "NNSA Should Further Develop Cost, Schedule, and Risk Information for the W87-1 Warhead Program," GAO-20-703, September 9, 2020, https://www.gao.gov/products/gao-20-703; and "Action Needed to Address the W80-4 Warhead Program's Schedule Constraints," GAO-20-409, July 24, 2020, https://www.gao.gov/products/gao-20-409.

[141] House Armed Services Committee, "STR Hearing FY25 Budget Request for Nuclear Forces and Atomic Energy Defense Activities," April 30, 2024, https://armedservices.house.gov/committee-activity/hearings/str-hearing-fy25-budget-request-nuclear-forces-and-atomic-energy. Also see CRS In Focus IF11681, *Defense Primer: LGM-35A Sentinel Intercontinental Ballistic Missile*, by Anya L. Fink.

[142] Also see FY2024 SSMP, Chapter 2, "Stockpile Management" for more information.

Table 3. Stockpile Major Modernization Subprogram Funding and Request

(millions of U.S. dollars)

Program	FY2023 Enacted	FY2024 Enacted	FY2025 Request	Outyears FY2026	Outyears FY2027	Outyears FY2028	Outyears FY2029
B61-12 LEP	672.02	449.85	27.50	16.00	0	0	0
B61-12 is a warhead for a bomb carried by a nuclear-capable aircraft/bomber. NNSA completed the first production unit (FPU) in FY2022. Warhead is currently in production, which is expected to end in FY2026.							
B61-13 LEP	0	52.00	16.00	42.00	28.00	6.00	0
B61-13 is an air-delivered bomb. Its production takes advantage of B61-12 production capacities. NNSA plans to complete the program in FY2028.							
W88 Alt 370	162.06	178.82	78.70	17.70	0	0	0
W88 is a warhead for the Trident II D5 submarine-launched ballistic missile. NNSA completed FPU in FY2021. Warhead currently in production, which is expected to end FY2026+.							
W80-4 LEP	1,122.45	1,009.93	1,164.80	1,154.05	1,112.09	972.51	838.96
W80-4 is a warhead for the air-launched Long Range Standoff (LRSO) cruise missile. It is currently in studies and engineering. NNSA expects an FPU in FY2027. Production expected to end FY2031+.							
W80-4 ALT-SLCM*	20.00	70.00	0	0	0	0	0
This is a warhead for the sea-launched cruise missile. *This program was not included in FY2025 budget request, but was an NNSA unfunded priority of $70.00.							
W87-1 Mod	680.13	1,068.91	1,096.03	1,119.05	1,142.55	1,166.54	1,191.04
W87-1 is a warhead for the Sentinel inter-continental ballistic missile. It is currently in studies and engineering. NNSA expects an FPU in 2032, subsequent deployment on the missile, and an end to production FY2039+.							
W93	240.51	389.66	455.78	465.35	725.73	852.21	939.54
W93 is a warhead for the submarine-launched ballistic missile. It is currently in studies and engineering. NNSA expects a notional FPU in mid-2030s, and for production to end FY2040+.							
Future Strategic Warhead				0	0	0	0
NNSA and DOD are engaged in a process to define "appropriate warheads to support anticipated future threats." Warheads currently include the Future Strategic Land-Based Warhead (to replace the W87), the Future Strategic Sea-Based Warhead (to replace the W88), the Future Air-Delivered Warhead, and a Submarine-Launched Warhead (to replace the W76-1/2). This entry appears in the Outyears of the FY2025 budget request.							

Source: U.S. Department of Energy, *Department of Energy FY 2025 Congressional Justification, National Nuclear Security Administration, Federal Salaries and Expenses, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors*, March 2024, Office of the Chief Financial Officer, Volume I, p. 145-157, https://www.energy.gov/sites/default/files/2024-03/doe-fy-2025-budget-vol-1-v4.pdf; U.S. Department of Energy, National Nuclear Security Administration, *Fiscal Year 2024 Stockpile Stewardship and Management Plan*, Report to Congress, Washington, DC, November 2023, pp. 2-7--2-11, https://www.energy.gov/sites/default/files/2023-11/FY24SSMP_FINAL_NOVEMBER_2023_0.pdf.

Notes: The numbers in the table have been rounded. *NNSA Administrator Jill Hruby stated in a May 22, 2024, congressional hearing that the W80-4 is on the NNSA unfunded priorities list.

In January 2024 remarks, NNSA Administrator Hruby stated, "This past year alone, NNSA has delivered more than 200 modernized weapons" to the DOD. "There should be no doubt in anyone's minds—NNSA is modernizing our stockpile both on-schedule and at pace," she added.[143] Undersecretary of Defense for Acquisition and Sustainment (USD A&S) William LaPlante testified to Congress in April 2024 that:

> On the DOE/NNSA side, progress has been made toward the current program of record of maintaining a safe, secure, effective, and reliable nuclear weapons stockpile. However, despite this progress, we know that significant risks remain. We appreciate DOE/NNSA's strong commitment to meeting DOD's objectives and our shared deterrence mission as reflected in the FY 2025 budget request. As the evolving geopolitical environment challenges deterrence and assurance in new ways, DOD and DOE/NNSA will continue to closely collaborate, through the [Nuclear Weapons Council], to identify ways to mitigate near-term risks and develop the capabilities and processes necessary to meet the long-term demands of the mission.[144]

The House and Senate Armed Services committees' strategic forces subcommittees have organized hearings featuring joint appearances by DOD and NNSA officials. Congress may wish to continue tracking the evolution of and providing oversight over the DOD-NNSA relationship, particularly on joint efforts to manage programmatic and technological risks.

DOD-NNSA Efforts to Manage Risks

NNSA partners with DOD through the congressionally-established Nuclear Weapons Council (NWC) "to facilitate aligning requirements and determine priorities as the two departments fulfill their shared responsibility to provide the Nation's nuclear deterrent."[145] The NWC is also responsible for the annual certification of NNSA's budget request.[146]

The SPC noted in its 2023 report that the "just-in-time" nature of the transition from "legacy to modernized systems" of the nuclear triad "poses significant risk and additional cost."[147] In a 2022 report, GAO recommended that DOD and NNSA set up a "joint risk management process" that would "periodically identify, analyze, and respond to risks that affect the U.S. nuclear enterprise (including the nuclear weapons stockpile, delivery platforms, and nuclear command and control)," as well as "report, internally and externally to relevant stakeholders, those risks and any associated mitigation efforts."[148]

The NWC has been at the center of DOD-NNSA risk-management efforts. The 2022 NPR identified improved DOD-NNSA "coordination and integration" as a key component of a

[143] Department of Energy, "NNSA Administrator Jill Hruby Remarks at the 2024 Nuclear Deterrence Summit," February 1, 2024, https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hruby-remarks-2024-nuclear-deterrence-summit.

[144] House Armed Services Committee, "STR Hearing FY25 Budget Request for Nuclear Forces and Atomic Energy Defense Activities," April 30, 2024, https://armedservices.house.gov/committee-activity/hearings/str-hearing-fy25-budget-request-nuclear-forces-and-atomic-energy.

[145] FY2024 SSMP, p. 1-9.

[146] For more on the NWC see 10 U.S.C. §179 and U.S. Department of Defense, "Nuclear Weapons Council," in *Nuclear Matters Handbook*, 2020, https://www.acq.osd.mil/ncbdp/nm/NMHB2020rev/docs/NMHB2020rev_Ch6.pdf.

[147] This means that legacy platforms will be aging out as new and modernized systems are set to come online. Congressional Commission on the Strategic Posture of the United States, *America's Strategic Posture*, October 2023, p. 43, https://www.ida.org/-/media/feature/publications/a/am/americas-strategic-posture/strategic-posture-commission-report.ashx.

[148] GAO, *DOD and NNSA Could Further Enhance How They Manage Risk and Prioritize Efforts*, GAO-22-104061, January 20, 2022, https://www.gao.gov/products/gao-22-104061.

"resilient and adaptive nuclear security enterprise."[149] The NPR stated that the two organizations would "develop and implement" a Nuclear Deterrent Risk Management Strategy to "identify, prioritize, and recommend actions across the portfolio of nuclear programs and monitor the overall health of the nuclear deterrent as we sustain current capabilities and transition to modernized systems."[150] "This strategy," the review further noted, "will be informed by ongoing assessment of the security environment and early identification of potential risks, with the goal of enhancing senior leader visibly and framing options for risk mitigation."[151]

During an April 2023 conference, Administrator Hruby gave an update on the NWC process of developing the Nuclear Deterrent Risk Management Strategy:

> [T]here is a new level of coordination and risk management needed between NNSA and DoD as we modernize all three legs of the nuclear triad with both new delivery systems and refurbished or new warheads. In addition, we are simultaneously recapitalizing the NNSA's captive production complex and the U.S. defense industrial base. To align resources, schedules, goals, and efforts, the Nuclear Weapons Council in dialogue with other relevant stakeholders, is developing a Deterrent Risk Management Strategy. The overarching purpose of the Strategy is to make sure our nuclear deterrent is always safe, secure, reliable, and effective.
>
> The Nuclear Weapons Council Requirements and Capacity Working Group has developed detailed requirements and associated planning documents to manage the current triad sustainment and modernization that focus on avoiding future deterrence gaps.[152]

USD A&S LaPlante further explained this process during an April 2024 Congressional hearing:

> [T]he NWC has developed and exercised a strategic framework founded on an identification and ranking of its priorities to understand and make strategic and risk-informed choices, with the understanding that not everything can be accomplished simultaneously. We are focused on understanding suites of decisions that reflect our priorities and enable the NWC to trade and balance risk across the entire nuclear enterprise. The phrases "pacing the threat" and "mitigating transition risk" have become key principles for the NWC as we look to understand where we need to be in the next decade and beyond in relation to the projected threat environment, the challenges associated with our modernization efforts, and what we can do today to create greater options for decisionmakers in the future. We look at the nuclear enterprise as a holistic system--from fielded systems modernization efforts to the workforce, supply chain, and NC3 [nuclear command, control, and communications]. We are focused on understanding our risks, how we can best buy them down, and how these risks fit with national-level decision-making.[153]

Congress may continue to track the development of the Nuclear Deterrent Risk Management Strategy. The 2023 SPC report argued that "sustained focus will be required from DOD,

[149] The U.S. Department of Defense, *2022 Nuclear Posture Review*, October 2022, p. 23.

[150] Ibid.

[151] Ibid.

[152] U.S. Department of Energy National Nuclear Security Administration, NNSA Administrator Jill Hruby's remarks for the 17th Annual Symposium on Strategic Weapons in the 21st Century - Nuclear Deterrence at the "Inflection Point," April 27, 2023, https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hrubys-remarks-17th-annual-symposium-strategic-weapons-21st.

[153] House Armed Services Committee, "STR Hearing FY25 Budget Request for Nuclear Forces and Atomic Energy Defense Activities," April 30, 2024, https://armedservices.house.gov/committee-activity/hearings/str-hearing-fy25-budget-request-nuclear-forces-and-atomic-energy.

DOE/NNSA, and senior leaders throughout the transition period to ensure the programs are delivered on time."[154]

NNSA Relationship with M&O Contractors

Congress also has been interested in NNSA's relationship with its M&O contractors.[155] The 2014 Augustine-Mies report described the relationship as "dysfunctional" and "adversarial" instead of "collaborative."[156] It argued that a set of "fundamental problems" required repair "to restore the effective and efficient operation of the enterprise." [157] The report also observed a culture of risk aversion and "transactional oversight" across the Enterprise that "skew[ed] incentives toward delay and excessively conservative approaches."[158] The 2020 NAS/NAPA final report found that some improvements in the NNSA-M&O relationship had been made, but also proposed recommendations to continue to strengthen that relationship.[159] NNSA has been taking steps to build on some of these recommendations.

In January 2024 remarks, NNSA Administrator Hruby reaffirmed the importance of NNSA efforts to "improve NNSA M&O contracting to be more strategic and holistic, less disruptive to mission and workforce, and more of a true partnership."[160] NNSA has been engaged in various efforts to improve the contracting process, including by implementing recommendations from its internal Enhancing Mission Delivery Initiative (EMDI).[161] EMDI posited in a 2022 report that a variety of factors (including the structure of the contracting process[162] and generational workforce changes[163]) have contributed to a relationship between NNSA and the M&O contractors that is inconsistent with "NNSA's FFRDC model."[164]

Among the many recommendations in its 2022 report, EMDI argued for the need to "rebalance" the relationship between NNSA and M&O contractors in ways to "give each more equal

[154] Congressional Commission on the Strategic Posture of the United States, *America's Strategic Posture*, October 2023, p. 43.

[155] Congress has commissioned numerous GAO assessments of this issue and empaneled commissions, as discussed in this section, to explore it.

[156] Augustine-Mies, p. x, p. 65-82.

[157] Augustine-Mies, p. x, p. 65-82. These five "fundamental problems" were: "breakdown of the FFRDC model," "unclear responsibilities for managing operations at the operating sites," "insufficient influence of the M&O parent organizations' cultures," "costly and ineffective transactional oversight," and "contract requirements and performance metrics that divert attention and resources from mission execution."

[158] Augustine-Mies, p. 6, p. 23.

[159] NAS/NAPA, p. 44-54.

[160] Department of Energy, "NNSA Administrator Jill Hruby Remarks at the 2024 Nuclear Deterrence Summit," February 1, 2024, https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hruby-remarks-2024-nuclear-deterrence-summit.

[161] U.S. Department of Energy, "Evolving the Nuclear Security Enterprise: A Report of the Enhanced Mission Delivery Initiative," September 2022, https://www.energy.gov/sites/default/files/2024-04/Enhanced%20Mission%20Delivery%20Initiative%20FINAL.pdf. Hereafter referred to as EMDI.

[162] EMDI, p. 3. EMDI states: "The existing M&O contracts, with a focus on award fee and one year contract extensions, are not appropriate for the special long-term relationship between the Government and an M&O contract which operates in the public interest, as envisioned by NNSA's FFRDC model. NNSA should evaluate transitioning back to the fixed fee contract model with five-year (or longer) extensions and review its contract and performance review processes to ensure transparency and agreement with the laboratories, plants, and sites."

[163] Discussed below.

[164] See EMDI, p. 6-7 for an explanation.

authority."[165] EMDI also proposed ways for NNSA to reduce risk aversion across the NSE.[166] The EMDI report argued:

> If the enterprise is to deliver on its mission, the labs, plants, and site should be empowered to accept risk, manage it appropriately, and be held accountable for delivering on schedule. In practice, this means people must be rewarded for taking risks; processes and procedures should be risk-based and uniformly applied across the enterprise; approval authority should be delegated to the lowest level, ideally the field office manager; and commercial construction should be treated as low risk.[167]

Recent GAO studies commissioned by Congress focused on, among other issues, the extent to which M&O contractors are accountable and whether the contracts to manage these M&O facilities are sufficiently competitive.[168] Congress may wish to continue to provide oversight of NNSA's relationship with its M&O contractors, as well as possible effects of NNSA changes in those relationships on workforce, capital projects, and other NSE sites' contributions to the nuclear mission.

Workforce Recruitment and Retention Issues

Congress has expressed concern about workforce issues across the NSE.[169] Most recently, Congress has focused on NNSA's ability to recruit and retain employees, such as scientists and engineers, craft workers, and federal agents at the Office of Secure Transportation, across the complex and in NNSA HQ.[170] The 2023 SPC report highlighted the negative impact of personnel recruitment and retention issues as well as retirements on NNSA warhead modernization and production activities.[171]

In April 2024 congressional testimony, Energy Secretary Jennifer Granholm stated that hiring dynamics have improved across the enterprise, but attrition remained high due to overwork, as well as private sector competition for employees.[172] NNSA Administrator Hruby stated during the same hearing that NNSA also "made changes to our hiring practices to lean forward" and is

[165] EMDI, p. 4.

[166] EMDI, p. 13. "Risk aversion is the accumulation and interpretation of requirements, procedures, and processes that must be completed before an action or decision is taken. Individually, each requirement, procedure, or process may not significantly impede progress and in fact was put in place to address previous deficiencies, but cumulatively they create what our interviewees termed "friction in the system." The net effect of this friction is implicit or delegated authorities to avoid risk is broad and dispersed to many functional, programmatic, and operational elements but actual explicit authority to accept risk is often unclear and restricted to very senior levels within the M&O or NNSA."

[167] EMDI, p. 16.

[168] For example: GAO, *Department of Energy Contracting: Additional Actions Could Further Strengthen Competition,* January 24, 2023, https://www.gao.gov/products/gao-23-105209; and GAO, *Department of Energy: Performance Evaluations Could Better Assess Management and Operating Contractor Costs*, February 26, 2019, https://www.gao.gov/products/gao-19-5.

[169] For example, U.S. Senate Committee on Armed Services, "Open/Closed: To Receive Testimony on the Department of Energy and National Nuclear Security Administration Atomic Energy Defense Activities in Review of the Defense Authorization Request for Fiscal Year 2025 and the Future Years Defense Program," April 17, 2024, https://www.armed-services.senate.gov/imo/media/doc/41724fulltranscript.pdf.

[170] Ibid. Section 7 of the FY2024 SSMP offers a profile of the workforce across the complex.

[171] Congressional Commission on the Strategic Posture of the United States, *America's Strategic Posture*, October 2023, p. 57-62.

[172] U.S. Senate Committee on Armed Services, "Open/Closed: To Receive Testimony on the Department of Energy and National Nuclear Security Administration Atomic Energy Defense Activities in Review of the Defense Authorization Request for Fiscal Year 2025 and the Future Years Defense Program," April 17, 2024.

"hopeful we can help solve this shortage."[173] In a recent industry panel, national security laboratory directors stated that housing and office space also contributed to their challenges in recruiting and retaining personnel.[174] Several 2024 GAO reports highlighted recruitment and retention challenges across the NNSA federal and M&O contractor workforces and proposed closer NNSA tracking of this issue, among several other recommendations.[175]

In addition, "forty percent or more of M&O staff and a large percentage of the federal workforce have less than five years of experience in the nuclear enterprise," according to the 2022 EMDI report.[176] EMDI argued that "this lack of experience has resulted in a loss of understanding of how the federal and M&O staff historically interact."[177] Among the report's many recommendations was a proposal for greater M&O "authority over salaries, benefits, and management of its workforce" and a proposal for NNSA efforts to improve "workspaces and to work with the M&Os to incentivize retired NSE staff to continue mentoring and advising the current workforce."[178]

EMDI also argued that NNSA's should create "an integrated plan with time-phased investments to recapitalize facilities and create new capabilities and technologies while revitalizing the workforce."[179] In this regard, national security laboratory directors have also highlighted the importance of planning for the next generation of relevant science and technological infrastructure.[180]

NNSA relies on a variety of skilled trade and craft workers.[181] In a recent event, Administrator Hruby highlighted NNSA efforts to recruit "high-productivity craft workers" and stated that worker shortages have delayed completion of certain NNSA construction projects.[182]

The 2023 SPC report recommended that NNSA increase "technical education and vocational training programs" to bolster skilled-trades for the NSE, emphasized the need for agency leadership to "establish a workplace culture" that "reinforces the strategic importance of such work," and called on NNSA to "expand use of innovative contracting methods" to improve

[173] Ibid.

[174] Mitch Ambrose, "Nuclear Security Lab Directors Spotlight Workforce and Infrastructure Needs," AIP, February 2, 2024, https://ww2.aip.org/fyi/nuclear-security-lab-directors-spotlight-workforce-and-infrastructure-needs.

[175] GAO, "National Nuclear Security Administration: Actions to Recruit and Retain Federal Staff Could Be Improved," May 29, 2024, https://www.gao.gov/products/gao-24-106167 and GAO, "National Nuclear Security Administration: Improvements Needed for Overseeing Contractor Workforce Recruitment and Retention Efforts," May 29, 2024, https://www.gao.gov/products/gao-24-106861

[176] EMDI, p. 4. Also see FY2024 SSMP, p. 7-18.

[177] EMDI, p. 4.

[178] EMDI, p. 3.

[179] EMDI, p. 4.

[180] Mitch Ambrose, "Nuclear Security Lab Directors Spotlight Workforce and Infrastructure Needs," AIP, February 2, 2024, https://ww2.aip.org/fyi/nuclear-security-lab-directors-spotlight-workforce-and-infrastructure-needs.

[181] FY2024 SSMP, Section 7.

[182] U.S. Department of Energy National Nuclear Security Administration, "NNSA Administrator Jill Hruby's remarks for the 17th Annual Symposium on Strategic Weapons in the 21st Century - Nuclear Deterrence at the 'Inflection Point,'" April 27, 2023. "We have expanded nationwide recruiting with labor unions and provided pay, transportation, and housing incentives as needed by geographic area. We also established new pipeline programs for technicians and skilled craft trades like the pipelines we have been building for our STEM workforce and the first awards for this program were distributed in February 2023. Along with these actions, we have reevaluated our current construction portfolio and chosen to delay three planned projects to focus personnel and resources on our most pressing needs. While these delays are disappointing, we intentionally decided not to compete with ourselves and to prioritize completion of projects on-schedule and -budget."

agency recruitment and retention.[183] Congress may wish to continue to track NNSA recruitment and retention efforts and consider the 2023 SPC report's recommendations to further develop a supply of skilled-trade workers for the NSE.

Costs and Schedule of NNSA Capital Projects

NNSA is recapitalizing its capital infrastructure. NNSA Administrator Hruby has said that some buildings across the Nuclear Security Enterprise date back to the Manhattan project.[184] NNSA has argued that half of the agency's facilities are "in poor or very poor condition, thus putting the ability to carry out the mission at risk," according to the Congressional Commission on the Strategic Posture of the United States.[185]

In particular, NNSA is modernizing and recapitalizing its infrastructure dedicated to producing nuclear weapons materials, as directed by Congress and the executive branch. According to the 2020 edition of DOD's *Nuclear Matters Handbook*:

> "To ensure U.S. nuclear weapons capabilities meet mission requirements, new capacity demands require reinstating production of components and materials within the NNSA [NSE]. Specifically, the United States plans to restore plutonium pit production, increase tritium production, restart lithium processing, and reestablish several uranium production capabilities (to include developing a domestic uranium enrichment capability)."[186]

Furthermore, as the second of three pillars of its plan for a resilient and adaptive NSE, the 2022 NPR called for a "Production-based Resilience Program" (PRP).[187] According to the NPR, this program would "complement" Stockpile Stewardship to "ensure" that the NSE is "capable of full-scope production."[188] The 2022 NPR stated:

> The PRP will establish the capabilities and infrastructure that can efficiently produce weapons required in the near-term and beyond, and that are sufficiently resilient to adapt to additional or new requirements should geopolitical or technology developments warrant. Key attributes are flexibility, supply chain security and resilience, production capacity margin, and elimination of single point failures. The PRP will enable more regular and timely incorporation of advanced technologies to improve safety, security, and reliability; accommodate arms control considerations as design features as weapons and infrastructure are modernized; and enable improved stockpile management and risk mitigation without overreliance on single warhead types, a large reserve stockpile, or increases to the size of the stockpile.

[183] Congressional Commission on the Strategic Posture of the United States, *America's Strategic Posture*, October 2023, p. 61.

[184] Department of Energy, National Nuclear Security Administration, "NNSA Administrator Jill Hruby Remarks at National Institute for Deterrence Studies Peace Through Strength Breakfast," July 30, 2024, https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hruby-remarks-national-institute-deterrence-studies-peace-2.

[185] Congressional Commission on the Strategic Posture of the United States, *America's Strategic Posture*, October 2023, p. 54.

[186] U.S. Department of Defense, "NNSA Nuclear Security Enterprise," Nuclear Matters Handbook, 2020, https://www.acq.osd.mil/ncbdp/nm//NMHB2020rev/chapters/chapter5.html. Also see explicit discussion of the role of each of these materials in nuclear weapons in this reference.

[187] The U.S. Department of Defense, *2022 Nuclear Posture Review*, October 2022, p. 23-24.

[188] The U.S. Department of Defense, *2022 Nuclear Posture Review*, October 2022, p. 23.

> The PRP will address all elements of the enterprise including production of primaries, secondaries, tritium, and non-nuclear components; domestic uranium enrichment; and system assembly and disassembly.[189]

In April 2023, NNSA Administrator Hruby stated that PRP involves "a new enterprise" that "is meant to be more resilient to outages and failures" and also "have modern capabilities to attract the best talent, to be efficient, and to deliver the highest quality products."[190] Hruby explained in February 2024 that NNSA's "objective in infrastructure modernization" is to "substantively increase our flexibility and resilience, meet production schedules safely, introduce modern and efficient technologies, and be realistic about costs while exercising fiscal responsibility."[191]

The NNSA plan to restore production has five components: establishing a capacity to produce plutonium pits; reestablishing capabilities for high explosives synthesis, formulation, and production; modernizing facilities and capabilities to meet tritium requirements; modernizing capabilities to produce secondary assemblies and radiation cases, as well as replacing the lithium production facility; and modernizing research, development, testing, and production capabilities for non-nuclear components.[192] (See **Figure 4** for an NNSA timeline of its key infrastructure priorities.)

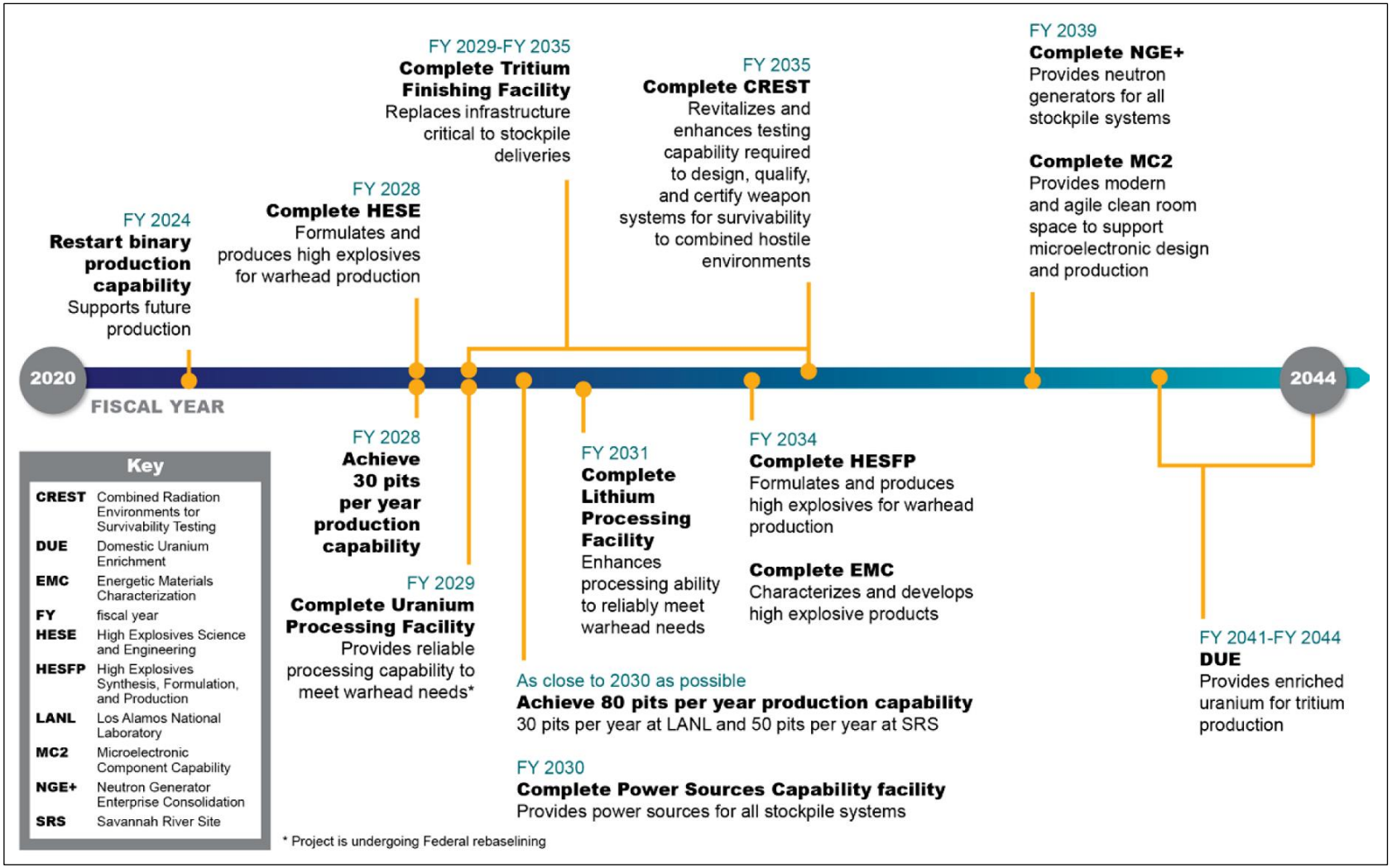
[189] The U.S. Department of Defense, *2022 Nuclear Posture Review*, October 2022, p. 23-24.

[190] Department of Energy National Nuclear Security Administration, "NNSA Administrator Jill Hruby's remarks for the 17th Annual Symposium on Strategic Weapons in the 21st Century - Nuclear Deterrence at the 'Inflection Point,'" April 27, 2023, https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hrubys-remarks-17th-annual-symposium-strategic-weapons-21st.

[191] Department of Energy, "NNSA Administrator Jill Hruby Remarks at the 2024 Nuclear Deterrence Summit," February 1, 2024, https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hruby-remarks-2024-nuclear-deterrence-summit.

[192] FY2024 SSMP, p. 1-10.

Figure 4. NNSA Timeline for Key Infrastructure and Capability Investments



Source: FY2024 SSMP, p. 1-10.

In May 2024 congressional testimony, NNSA Administrator Hruby highlighted the following priorities for production modernization in the NNSA's FY2025 budget: plutonium pit production at LANL and SRS (see the following section); the Uranium Processing Facility and the Lithium Processing Facility at Y-12; the High Explosives Science and Engineering Facility at Pantex; the Power Sources Capability at Sandia; and the Kansas City Non-Nuclear Expansion Transformation.[193]

Congress has at times required NNSA to shift priorities. For example, the Section 3127 of FY2024 NDAA (P.L. 118-31), includes statutory language mandating by certain dates the completion of the High Explosives Synthesis, Formulation, and Production Facility at Pantex and the Tritium Finishing Facility (TFF) at SRS. NNSA Administrator Hruby stated in May 2024 testimony that "funding for these project schedules was not factored into the FY2025 request as NNSA's strategy was to prioritize funding of a reduced number of critical projects, and both [of these facilities] are of a lower priority."[194]

Some members of Congress have expressed concerns about the costs and schedules of NNSA's capital projects.[195] GAO reports commissioned by Congress have recommended NNSA develop and improve capital project schedules, cost estimates, and management practices.[196] Both House and Senate Appropriations Committee reports on the FY2024 Energy and Water Development and Related Agencies Appropriations Act criticized the NNSA's inability to "properly estimate costs" and develop schedules "for large projects."[197] The FY2024 NDAA (P.L. 118-31) included NNSA reporting requirements that include the costs and schedule of numerous capital projects and also mandated in Section 3128 that NNSA "develop and maintain a high-level milestone schedule document for all covered construction projects that includes production infrastructure modernization schedules with weapons modernization programs."

The 2023 SPC report argued that NNSA needs to shorten timelines for and develop "plans to accelerate the design and construction of these complex facilities using modern tools and analyses with streamlined approvals."[198] It also stated that DOE/NNSA is "not sufficiently staffed to effectively execute all the necessary infrastructure projects even if industry could support the needed construction and funds were unlimited."[199] Congress may continue to track NNSA's execution of substantial capital projects.

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[193] Senate Committee on Armed Services, "Testimony Statement of The Honorable Jill Hruby, U.S. Department of Energy Under Secretary for Nuclear Security Administrator of the National Nuclear Security Administration, Before the Senate Armed Services Committee Subcommittee on Strategic Forces," May 22, 2024, https://www.armed-services.senate.gov/imo/media/doc/joint_hruby-adams_statement1.pdf.

[194] Ibid.

[195] For example, see Senate Committee on Armed Services, "Senate Armed Services Subcommittee on Strategic Forces Holds Hearing on Fiscal Year 2024 Atomic Energy Defense Activities and Nuclear Weapons Programs Defense Authorization Request," April 18, 2023, https://www.armed-services.senate.gov/hearings/to-receive-testimony-on-the-department-of-energys-atomic-energy-defense-activities-and-department-of-defense-nuclear-weapons-programs-in-review-of-the-defense-authorization-request-for-fiscal-year-2024-and-the-future-years-defense-program.

[196] GAO, *Nuclear Weapons: NNSA Does Not Have a Comprehensive Schedule or Cost Estimate for Pit Production Capability*, January 12, 2023, https://www.gao.gov/products/gao-23-104661; GAO, *National Nuclear Security Administration: Actions Needed to Improve Integration of Production Modernization Programs and Projects*, July 9, 2024, https://www.gao.gov/products/gao-24-106342.

[197] H.Rept. 118-126 accompanying H.R. 4394, https://www.congress.gov/congressional-report/118th-congress/house-report/126/1; S.Rept. 118-72 accompanying S. 2443, https://www.congress.gov/congressional-report/118th-congress/senate-report/72/1.

[198] SPC, p. 55.

[199] SPC, p. 55.

Plutonium Pit Production

Congress has mandated that NNSA develop a capability to annually produce 80 plutonium pits by 2030.[200] Since 2018, NNSA has pursued a "two-site strategy" to produce annually 30 pits at LANL and 50 pits at SRS. As discussed above, NNSA is modernizing facilities at LANL and repurposing a site at SRS from its former MOX fuel fabrication mission to the plutonium pit production mission.[201] In the FY2024 SSMP, NNSA stated that LANL has "transitioned to 24/7 facility availability," but still needs additional personnel to "meet rate production goals."[202] In that document, the agency also acknowledged that producing 50 pits annually at SRS by 2030 was "not feasible," but meeting that requirement "as close as possible to 2030" remained "a high priority."[203] Congress has expressed, and Government Accountability Office (GAO) reports have echoed, concerns about the costs and schedule of these efforts.[204]

In January 2024 remarks, NNSA Administrator Hruby stated, "in FY23, the Nuclear Security Enterprise completed nine development plutonium pit builds with five more pits assembled." Referencing concerns about the NSE's ability to produce certified pits for the W87-1 warhead described above, Hruby explained that NNSA expects "the first 'diamond stamped' war reserve plutonium pit for the W87-1 this year."[205]

In addition to developing pit production capabilities, NNSA is studying plutonium pit aging in order to improve the agency's ability to "predict pit lifetimes for each weapon system in the stockpile," according to a February 2024 GAO report.[206] The explanatory statement for the FY2024 Energy and Water Development and Related Agencies Appropriations Act directs NNSA to task the JASON scientific advisory panel to assess NNSA work on plutonium pit aging.[207]

Defense Nuclear Facilities Safety Board

In 1988, Congress established the Defense Nuclear Facilities Safety Board (DNFSB), an independent agency to advise Department of Energy leadership regarding the safety and security

[200] 50 U.S.C. §2538a.

[201] FY2024 SSMP, p. 3-1-3-5.

[202] FY2024 SSMP, p. 3-3.

[203] FY2024 SSMP, p. 3-3.

[204] GAO, *NNSA Does Not Have a Comprehensive Schedule or Cost Estimate for Pit Production Capability*, January 2023, https://www.gao.gov/products/gao-23-104661. In the FY2024 NDAA, Congress directed NNSA to "to develop and manage the plutonium modernization program, or any subsequently developed program, using an integrated master schedule and a life cycle cost estimate that fully meets GAO best practices for both schedule development and cost estimating." H.Rept. 118-301 accompanying H.R. 2670, https://www.congress.gov/congressional-report/118th-congress/house-report/301.

[205] Department of Energy, "NNSA Administrator Jill Hruby Remarks at the 2024 Nuclear Deterrence Summit," February 1, 2024, https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hruby-remarks-2024-nuclear-deterrence-summit. "Diamond-stamped" refers to a quality certification process of "war reserve" pits. For more on this process, see Department of Energy, "NNSA Pit Production Efforts," July 2023, https://www.energy.gov/sites/default/files/2023-07/2023%20SES%20Pit%20Production%20Fact%20Sheet-0623-R2.pdf.

[206] GAO, *Nuclear Weapons: Information on the National Nuclear Security Administration's Research Plan for Plutonium and Pit Aging*, February 2024, https://www.gao.gov/assets/d24106740.pdf.

[207] P.L. 118-42. U.S. House Committee on Appropriations, Division D-Energy and Water Development and Related Agencies Appropriations Act explanatory statement, 2024, March 3, 2024, p. 40, https://docs.house.gov/billsthisweek/20240304/FY24%20EW%20Conference%20JES%20scan.pdf. JASON is a group of scientists and engineers that have advised NNSA, DOD, and other parts of the U.S. government on a range of critical national security issues. See Aaron Mehta, "Not dead yet: Nuclear weapons agency moves to save Jason advisory group," *Defense News*, April 25, 2019, https://www.defensenews.com/smr/nuclear-arsenal/2019/04/25/nuclear-weapons-agency-moves-to-save-jason-advisory-group/.

of nuclear defense facilities from their design and construction, throughout their operations, and through decommissioning.[208] The board has resident nuclear inspectors at some defense nuclear facilities managed by NNSA and EM and is empowered to conduct investigations and develop recommendations.[209] If the Secretary of Energy rejects any Board recommendations in whole or in part, the Secretary must publish the reasons for that decision in the *Federal Register*.

The President's FY2025 budget request for the DNFSB is $47.2 million.[210] In July 2024, 28 non-governmental organizations, many located near NSE facilities, sent a letter to the Senate Appropriations Committee urging full funding for DNFSB the FY25 budget request, emphasizing the importance of its safety mission in light of NSE expansion.[211]

Congress has examined DNFSB's internal functioning, including by commissioning a National Academy of Public Administration (NAPA) comprehensive organizational assessment of the DNFSB, published in November 2018 which resulted in legislated changes to the organization, including the creation of an Executive Director of Operations (EDO).[212] A 2023 Office of the Inspector General audit raised concerns about DNFSB management practices, in particular with regard to the board's inability to delegate administrative functions to the EDO.[213]

The DNFSB is governed by a five-member bipartisan board appointed by the President and confirmed by the Senate; three board members are required for a quorum. The DNFSB currently has three members: the Chair, Joyce Connery, whose term expires October 2024; the Vice Chair, Thomas Summers, whose term expires October 2025; and Patricia Lee, whose nomination the Senate confirmed on July 9, 2024.[214] In May 2024, the Biden Administration announced its intent to nominate former EM chief William (Ike) White to the Board.[215] On September 24, 2024, the Senate Armed Services committee approved White's nomination, and it was placed on the Senate

[208] See Priscilla Offenhauer, "Defense Nuclear Facilities Safety Board: The First Twenty Years," a Report Prepared by the Federal Research Division, Library of Congress under an Interagency Agreement with the Defense Nuclear Facilities Safety Board (DNFSB), September 2009, https://www.dnfsb.gov/sites/default/files/page/DNFSB%20Twenty%20Year%20Report.pdf; DNFSB, "Enabling Statute of the Defense Nuclear Facilities Safety Board," May 2022, https://www.dnfsb.gov/sites/default/files/page/DNFSB%20-%20Enabling%20Legislation%20-%202022.pdf. The DNFSB is funded by Title IV of the annual Energy and Water Development appropriations bill. It is authorized by the Atomic Energy Act of 1954, as amended by P.L. 100-456, section 1441.

[209] DNFSB, "Resident Inspectors," undated, accessed June 28, 2024, https://www.dnfsb.gov/about/resident-inspectors.

[210] DNFSB, "FY 2025 Congressional Budget Justification," March 11, 2024, https://www.dnfsb.gov/sites/default/files/document/30221/FY%202025%20Congressional%20Budget%20Justification%20and%20FY%202023%20Annual%20Performance%20Report.pdf.

[211] "Nuclear critics urge Senate appropriators to fully fund DNFSB," *Exchange Monitor*, July 31, 2024, https://www.exchangemonitor.com/nuclear-critics-urge-senate-appropriators-to-fully-fund-dnfsb/.

[212] National Academy of Public Administration, "Defense Nuclear Facility Safety Board Organizational Assessment," November 2018, p. 56, https://s3.us-west-2.amazonaws.com/napa-2021/studies/defense-nuclear-facilities-safety-board-organizational-assessment/Revised_NAPA_DNFSB_Final_Report.pdf. Following this report's recommendations, Sec. 3202 of the FY2020 NDAA (P.L. 116-92) created an Executive Director of Operations position at the DNFSB.

[213] Office of the Inspector General, U.S. Nuclear Regulatory Commission and the Defense Nuclear Facilities Safety Board, Semiannual Report to Congress, April 1, 2023-September 30, 2023, p. 44, https://www.oversight.gov/sites/default/files/oig-sa-reports/SARC%20April%201%202023%20September%2030%202023.pdf.

[214] DNFSB, "Board Members," undated, accessed June 28, 2024, https://www.dnfsb.gov/about/board-members. See "PN830 — Patricia L. Lee — Defense Nuclear Facilities Safety Board," Congress.gov, July 9, 2024, https://www.congress.gov/nomination/118th-congress/830.

[215] White House, "President Biden Announces Nominees," May 23, 2024, https://www.whitehouse.gov/briefing-room/statements-releases/2024/05/23/president-biden-announces-nominees/.

Executive Calendar.[216] Congress may continue to provide oversight over and funding for DNFSB operations.

[216] See "PN1785 — William Isaac White — Defense Nuclear Facilities Safety Board," Congress.gov, September 24, 2024, https://www.congress.gov/nomination/118th-congress/1785.

Appendix.

Table A-1. Current U.S. Nuclear Weapons and Delivery Systems

	Type* and Description	Carrier	Military
Warheads—Strategic Ballistic Missile Platforms	W78 Reentry vehicle warhead	Minuteman III Intercontinental Ballistic Missile	Air Force
	This LANL/SNL warhead originally entered into the stockpile in 1979. It will eventually be replaced by the W87-1.		
	W87-0 Reentry vehicle warhead	Minuteman III Intercontinental Ballistic Missile	Air Force
	This LLNL/SNL warhead originally entered into the stockpile in 1986. A partial LEP was completed with FPU in 1999. It will eventually be replaced by the Future Strategic Land-Based Warhead.		
	W76-0/1/2 Reentry body warhead	Trident II D5 Strategic Weapon System (Submarine Launched Ballistic Missile)	Navy
	This LANL/SNL warhead originally entered into the stockpile in 1978. The W76-1 LEP FPU was in 2008, and the W76-2 MOD FPU was in 2020. It will eventually be replaced by the Submarine-Launched Warhead.		
	W88 Reentry body warhead	Trident II D5 Strategic Weapon System (Submarine Launched Ballistic Missile)	Navy
	This LANL/SNL warhead originally entered into the stockpile in 1989. It is currently in the process of Alt 370. It will eventually be replaced by the Future Strategic Sea-Based Warhead.		
Bombs—Aircraft Platforms	B61-3/4 Non-strategic bomb	F-15, F-16, certified NATO aircraft	Air Force/ Select NATO forces
	This LANL/SNL bomb initially entered the stockpile in 1979. Its LEP is B61-12. It will eventually be replaced by the Future Air-Delivered Warhead.		
	B61-7 and B61-11 Strategic bomb	B-2 bomber	Air Force
	These LANL/SNL bombs initially entered the stockpile in 1985 and 1997, respectively. Their LEP is B61-12. They will eventually be replaced by the Future Air-Delivered Warhead.		
	B61-12 Non-strategic bomb; strategic bomb	F-15, F-35A, certified NATO aircraft, B-2 bomber	Air Force/ Select NATO forces
	This LANL/SNL warhead is currently in production.		
	B83-1 Strategic bomb	B-2 bomber	Air Force
	This LLNL/SNL bomb originally entered the stockpile in 1983.		
Warheads—Cruise	W80-1 Air-launched cruise missile strategic	B-52 bomber	Air Force
	This LLNL/SNL warhead originally entered into the stockpile in 1982. It is undergoing life extension via the W80-4 LEP program and will eventually be replaced by the Future Air-Delivered Warhead.		

Source: U.S. Department of Energy, *Department of Energy FY 2025 Congressional Justification, National Nuclear Security Administration, Federal Salaries and Expenses, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors*, March 2024, Office of the Chief Financial Officer, Volume I, p. 157, https://www.energy.gov/sites/default/files/2024-03/doe-fy-2025-budget-vol-1-v4.pdf; Congressional Commission on the Strategic Posture of the United States, *America's Strategic Posture*, October 2023, p. 42, https://www.ida.org/-/media/feature/publications/a/am/americas-strategic-posture/strategic-posture-commission-report.ashx.

Notes: LANL = Los Alamos National Laboratory; SNL = Sandia National Laboratories; LLNL = Lawrence Livermore National Laboratory; NATO = North Atlantic Treaty Organization. * The suffix associated with each warhead or bomb type (e.g., "-0/1" for the W76) represents the multiple modifications associated with the respective weapon.

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