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Report to the Committee on Armed Services, U.S. Senate

June 2021

NUCLEAR SECURITY ENTERPRISE

NNSA Should Use Portfolio Management Leading Practices to Support Modernization Efforts

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GAO Highlights

Highlights of GAO-21-398, a report to the Committee on Armed Services, U.S. Senate

June 2021

NUCLEAR SECURITY ENTERPRISE

NNSA Should Use Portfolio Management Leading Practices to Support Modernization Efforts

Why GAO Did This Study

NNSA is simultaneously modernizing the nation's nuclear weapons stockpile and the infrastructure on which weapons research and production programs depend. These efforts include multi-billion-dollar defense programs and projects that provide the capabilities needed for maintenance and modernization programs. Congress previously directed NNSA to identify its needed capabilities.

The Senate report accompanying the National Defense Authorization Act for Fiscal Year 2020 includes a provision for GAO to review NNSA's approach to managing its defense programs and to identifying capabilities. This report examines the extent to which NNSA (1) used selected portfolio management leading practices to manage its maintenance and modernization programs and projects and (2) developed a comprehensive and complete capability assessment to support portfolio management.

GAO reviewed NNSA documentation related to portfolio management and capabilities and compared it with leading practices and legislative requirements. GAO also interviewed NNSA officials from six agency offices.

What GAO Recommends

GAO is making two recommendations: NNSA should (1) establish a portfolio management framework and (2) develop a comprehensive and complete capability assessment. NNSA concurred in principle with the recommendations and stated that they have addressed them. GAO believes that NNSA needs to take additional actions to fully address the recommendations.

View GAO-21-398. For more information, contact Allison Bawden at (202) 512-3841 or bawdena@gao.gov.

What GAO Found

The National Nuclear Security Administration (NNSA) has partially implemented selected leading practices to manage the work necessary to maintain and modernize the nation's nuclear weapons stockpile. GAO found that NNSA is in the early stages of initiating its portfolio management processes and has partially implemented leading practices, such as establishing a clearly defined portfolio of work. For example, NNSA officials stated that its Weapons Activities appropriations account is a portfolio of work. However, NNSA has not developed clearly defined and appropriately empowered governance roles, such as a portfolio manager, for its Weapons Activities portfolio. As NNSA continues to develop its approach to portfolio management, establishing a portfolio management framework—consistent with selected leading practices—may allow NNSA to fully implement all leading practices, better define how program offices will pursue strategic stockpile modernization objectives, and optimize portfolio performance in the event that budget trade-offs become necessary.

NNSA's offices have undertaken four separate efforts to identify and assess the capabilities needed across the nuclear security enterprise to meet its stockpile maintenance and modernization mission, but NNSA has not developed a comprehensive or complete capability assessment that could support its portfolio management approach (see fig.). NNSA undertook three of these four independent efforts to identify and assess capabilities in response to different legislative direction and did not incorporate information on all elements of a capability (knowledge, human capital, and infrastructure) in any of the individual efforts. Working across the agency to conduct a comprehensive, complete capability assessment would provide NNSA with a portfolio-level view of the enterprise's capabilities and needs, allowing for planning that considers interdependencies that have been missed in the past when planning focused on individual programs or projects.

Relationship between Capability Assessment and Portfolio Management

Source: GAO analysis of Project Management Institute, Inc., information. | GAO-21-398

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Abbreviations

DOD	Department of Defense
DOE	Department of Energy
LEP	life extension program
M&O	management and operating
NNSA	National Nuclear Security Administration
OMB	Office of Management and Budget
PMI	Project Management Institute, Inc.

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June 9, 2021

The Honorable Jack Reed
Chairman
The Honorable James M. Inhofe
Ranking Member
Committee on Armed Services
United States Senate

The United States is in the midst of a long-term, multiagency effort to modernize its nuclear security enterprise. As part of this mission, the National Nuclear Security Administration (NNSA), a separately organized agency within the Department of Energy (DOE), is responsible for, among other things, maintaining and modernizing the U.S. nuclear weapons stockpile.[1] NNSA's work to achieve this mission comprises two simultaneous, interdependent efforts: (1) modernizing the stockpile of nuclear bombs and warheads and (2) modernizing the research and production infrastructure on which stockpile programs depend. These efforts include complex, multi-billion-dollar defense programs and infrastructure projects that are executed at sites across the nuclear security enterprise[2] and are intended to provide NNSA with the capabilities to produce the components and materials needed for its weapon modernization programs.[3]

[1]NNSA's other missions include defense nuclear nonproliferation, nuclear emergency response, and nuclear naval propulsion.

[2]NNSA's nuclear security enterprise is comprised of a nationwide network of government-owned, contractor-operated national security laboratories and nuclear weapons production facilities. These facilities provide the research, development, testing, and production capabilities needed to carry out nuclear weapons stockpile and infrastructure maintenance and modernization.

[3]For the purposes of this report, we generally defined the term "capability" to refer to each foundational ability necessary for an organization to achieve its mission and strategic objectives. For NNSA, this includes the agency's ability to leverage the combination of several elements (knowledge, human capital, and infrastructure) to produce the specific outputs necessary to accomplish its mission to sustain and modernize the nation's nuclear arsenal to ensure weapons remain safe and reliable. This definition incorporates the specific elements present in the legislative directives related to identifying or assessing NNSA's capabilities that we reviewed.

Managing high-dollar, complex programs and projects is a challenge for the federal government, as well as the private sector. We have found that, to manage such challenges, leading commercial companies use portfolio management—a disciplined approach that focuses on evaluating, selecting, prioritizing, and allocating limited resources to programs and projects that collectively best accomplish an organization's strategic objectives.[4] The Project Management Institute, Inc., (PMI) has established standards for project, program, and portfolio management that are generally recognized as leading practices and used worldwide by private companies, nonprofits, and others.[5] According to PMI, portfolio management is a vehicle to make a wide variety of decisions, including capability and funding trade-offs, that allow an organization to achieve the optimal mix of capabilities for a given investment.[6] We previously stated that a portfolio management approach, if implemented, could improve NNSA's ability to effectively leverage the resources needed to manage its weapons stockpile and infrastructure work in a constrained budget environment.[7]

NNSA manages its modernization efforts for the nuclear security enterprise in coordination with the Department of Defense (DOD), which is undertaking related work to modernize nuclear weapon delivery systems, such as heavy bombers and intercontinental ballistic missiles. These efforts require careful coordination between the agencies to ensure that NNSA is developing and maintaining the capabilities needed to support its own modernization efforts and to keep these efforts aligned with DOD's schedules and other requirements. DOD and DOE cost estimates show that nuclear weapon programs and related efforts to provide necessary capabilities are expected to cost hundreds of billions of

[4]GAO, *Weapon System Acquisitions: Opportunities Exist to Improve the Department of Defense's Portfolio Management,* GAO-15-466 (Washington, D.C.: Aug. 27, 2015); and *Best Practices: An Integrated Portfolio Management Approach to Weapon System Investments Could Improve DOD's Acquisition Outcomes*, GAO-07-388 (Washington, D.C.: Mar. 30, 2007).

[5]PMI is a not-for-profit association that provides global standards for, among other things, project and program management. These standards are utilized worldwide and provide guidance on how to manage various aspects of projects, programs, and portfolios. For example, NNSA cites PMI's standards as a source of best practices in its program management policy.

[6]PMI defines a portfolio as a collection of projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives.

[7]GAO, *National Nuclear Security Administration: Action Needed to Address Affordability of Nuclear Modernization Programs*, GAO-17-341 (Washington, D.C.: Apr. 26, 2017).

dollars over the next 2 decades. Delays and missed milestones have the potential to increase costs and further delay schedules. In recent years, Congress has exercised oversight of NNSA's modernization efforts in part by directing the agency to define and identify the capabilities needed to fulfill mission needs several times in legislative language.

The Senate Report 116-48 accompanying the National Defense Authorization Act for Fiscal Year 2020 includes a provision for GAO to assess whether a portfolio-based approach to managing its defense programs would benefit NNSA and to review NNSA's efforts to identify its capabilities. This report examines the extent to which NNSA (1) has used selected portfolio management leading practices to manage its nuclear weapons stockpile maintenance and modernization programs and projects and (2) has developed a comprehensive and complete capability assessment to support portfolio management.

To determine the extent to which NNSA has used selected portfolio management leading practices to manage its nuclear weapons stockpile maintenance and modernization programs and projects, we reviewed NNSA documents that reference portfolio management and decision-making processes as well as relevant strategic documents that outline NNSA's mission objectives. We reviewed PMI's *The Standard for Portfolio Management—Fourth Edition* (2017).[8] The standard does not explicitly identify leading practices but identifies principles that are generally recognized as good practices for organizations that need to effectively manage complex programs and projects.[9] From the standard, we selected 13 leading practices that, if implemented by an agency, should enhance strategic management of a portfolio and executive decision-making as well as help ensure that programs and projects contribute to an agency's ability to achieve its objectives. We selected these practices because we would expect to see them documented and fully implemented by an organization that effectively manages a portfolio

[8]Project Management Institute, Inc., *The Standard for Portfolio Management*, 4th ed. (Newtown Square, PA: 2017).

[9]According to PMI, "generally recognized" means that the principles described are applicable to most portfolios most of the time and that there is widespread consensus about their value and usefulness; and "good practice" means that there is general agreement that the application of these principles and performance management activities can enhance the chances of success and are proven to work over a wide range of portfolios.

of work through its initiation, planning, execution, and optimization phases.

We also conducted interviews between August and October 2020 with NNSA officials from the six offices that are responsible for managing or supporting NNSA's maintenance and modernization work included in its Weapons Activities appropriations account to obtain perspectives on NNSA's approach to managing its portfolio of programs and projects and how NNSA has implemented any of the leading practices we selected.[10] We assessed the extent to which they implemented the 13 practices based on our content analysis of these interviews.[11]

To determine the extent to which NNSA has developed a comprehensive and complete capability assessment to support portfolio management, we reviewed the four efforts in which NNSA identified capabilities: NNSA's fiscal years 2020 and 2021 *Stockpile Stewardship and Management Plan;* August 2019 report to Congress, *Roadmap to Meet Modernization and Hedging Production Requirements;* 2020 guidance for site strategic planning and management and operating (M&O) contractors' site strategic plans; and 2020 *Master Asset Plan*.[12] The legislative language directing NNSA to identify and define its capabilities included in statutes

[10]We interviewed officials from three NNSA program offices: Defense Programs; Safety, Infrastructure, and Operations; and Defense Nuclear Security. We also interviewed officials from two NNSA functional offices: Acquisition and Project Management, and Management and Budget. We also interviewed officials from the Office of Policy and Strategic Planning, which directly supports the Under Secretary of Nuclear Security and NNSA Administrator and provides mission-enabling support to the rest of the offices responsible for NNSA's mission.

[11]We used a three-point scale to determine the extent to which NNSA officials' current management approach followed portfolio management leading practices. We rated a practice as "fully implemented" if NNSA officials provided evidence that satisfied the leading practice; as "partially implemented" if NNSA officials provided evidence that satisfied a portion of the leading practice; and as "not implemented" if NNSA officials did not provide evidence that satisfied the leading practice.

[12]We reviewed the most current versions of these documents at the time of our review. NNSA publishes the *Stockpile Stewardship and Management Plan* annually, either in full detailed report form or as a summary, in response to statutory requirements, to support the President's Budget for Weapons Activities. The fiscal year 2020 *Stockpile Stewardship and Management Plan* is a detailed version, and the fiscal year 2021 *Stockpile Stewardship and Management Plan* is a summary version.

and a committee report do not expressly define the term "capability."[13] For the purposes of this report, we generally defined the term "capability" to refer to each foundational ability necessary for an organization to achieve its mission and strategic objectives.

To determine whether each of NNSA's four efforts was comprehensive, we identified similarities and differences across the capabilities that NNSA described in each effort. We considered an effort comprehensive if it included all capabilities NNSA needs for the enterprise to meet its stockpile maintenance and modernization mission that NNSA described in its other efforts. We considered an effort complete if it included all elements of a capability for each capability identified by that effort. Based on our review of legislative language, we identified three common elements related to capabilities: (1) the knowledge or competencies needed to conduct work; (2) the human capital or workforce conducting work; and (3) the infrastructure needed to support the work.[14] We also interviewed NNSA officials to discuss actions NNSA has taken to identify and assess its capabilities across the enterprise and how these efforts inform NNSA's strategic planning. Appendix I presents a more detailed description of our scope and methodology.

We conducted this performance audit from April 2020 to June 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[13]50 U.S.C. § 2521, Stockpile stewardship program; 50 U.S.C. § 2523, Nuclear weapons stockpile stewardship, management, and responsiveness plan; National Defense Authorization Act for Fiscal Year 2014, Pub. L. No. 113-66, § 3128, 127 Stat. 672, 1065–66 (2013); National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, § 3113, 130 Stat. 2000, 2757–58 (2016); and Senate Report 115-262, to accompany S. 2987, the John S. McCain National Defense Authorization Act for Fiscal Year 2019, 115th Cong. (2018).

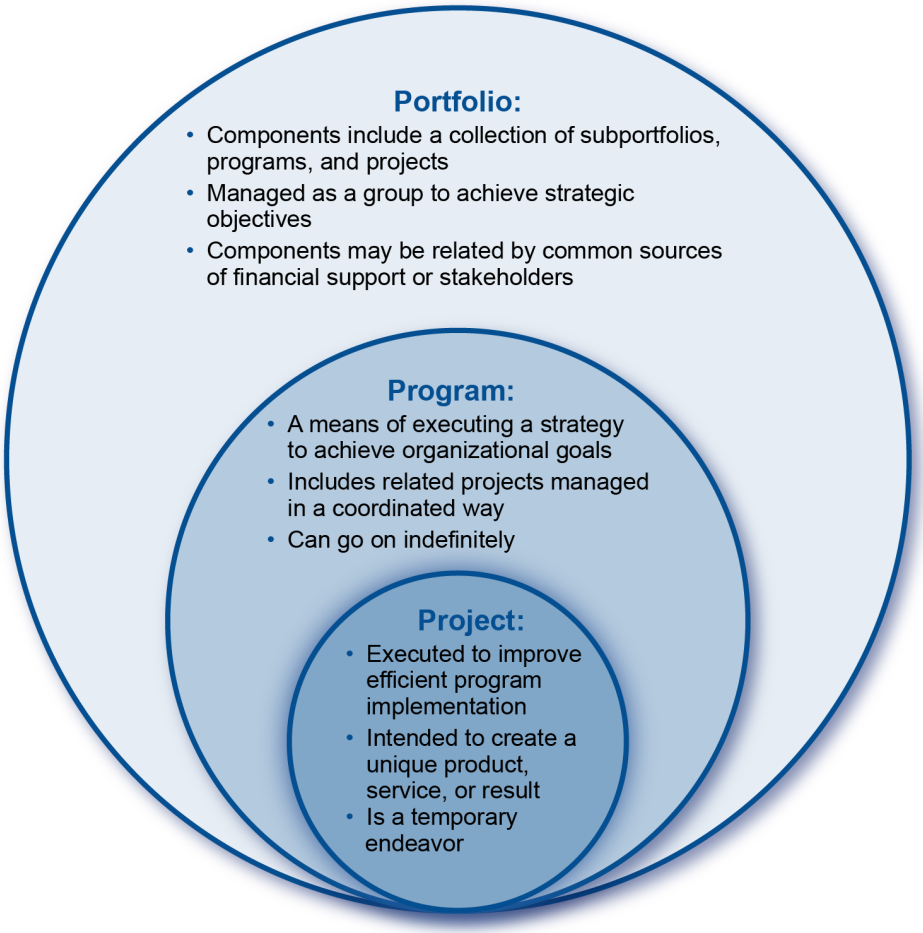
[14]We used a three-point scale for each of the elements of a capability. We rated each effort as fully considering an element of a capability if the effort included information about the element for all capabilities discussed; as partially considering an element of a capability if the effort included some information about the element for all capabilities discussed; and as not considering an element of a capability if the effort did not include any information about the element for all capabilities discussed.

Background

Requirements and Leading Practices for Project, Program, and Portfolio Management

Project, program, and portfolio management provide a structured means for organizations—such as companies and government agencies—to align and effectively pursue organizational strategic priorities. PMI established standards that provide guidance on how to manage various aspects of projects, programs, and portfolios and how they relate to each other. PMI defines a portfolio as a collection of projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives (see fig. 1).

Figure 1: Relationship between a Portfolio, a Program, and a Project, According to Leading Practices



Source: GAO analysis of Project Management Institute, Inc., information. | GAO-21-398

Government-wide requirements have identified portfolio management as a way to improve federal agencies' management of programs and projects. The Program Management Improvement Accountability Act requires the Office of Management and Budget (OMB) to adopt and oversee implementation of government-wide standards, policies, and guidelines for program and project management in executive branch agencies.[15] In its focus on improving program and project management, the act also requires OMB and agencies such as DOE, in coordination, to

[15]Pub. L. No. 114-264, § 2(a)(1), 130 Stat. 1371 (Dec. 14, 2016) codified at 31 U.S.C. § 503(c)(1)(A), (B). In June 2018, OMB issued a memorandum on the implementation of this law that included initial implementation guidance for the act.

conduct portfolio reviews as a method to assess the quality and effectiveness of the agencies' program management, identify opportunities for improvement, and hold managers accountable for program performance.

Further, we and other entities, such as PMI, have stated that effective project, program, and portfolio management are important to the success of agencies in accomplishing their missions. Specifically, we have reported that certain project, program, and portfolio management practices may benefit NNSA in carrying out multiple weapons programs and a range of related capital asset projects over the next 2 decades, as described in the following:

Project management. According to PMI, effective project management is key to implementing an organization's strategy and has dramatic impact on the bottom line.[16] It helps ensure that projects—for example, an effort with defined scope, schedule, and cost designed to accomplish a singular goal—are delivered on-time and on-budget to fulfill organizational requirements.

DOE's Order 413.3B governs the management of capital asset projects with a total project cost of greater than $50 million.[17] NNSA is required to manage construction of its capital asset projects in accordance with this order. We have previously found that DOE and NNSA have experienced ongoing issues in project management. Because of these issues, we have long designated these activities as at high risk of waste, fraud, abuse, and mismanagement.[18] In our

[16]Project Management Institute, Inc., *A Guide to the Project Management Body of Knowledge: PMBOK® Guide* – 6th ed. (Newton Square, PA: 2017).

[17]Department of Energy, *Program and Project Management for the Acquisition of Capital Assets*, DOE Order 413.3B (Washington, D.C.: Nov. 29, 2010; updated Jan. 12, 2021). According to DOE, a capital asset project is a project with defined start and end points, with an acquisition cost that includes all costs incurred to construct a project for its intended purpose, bringing it to a form and location suitable for its intended use, excluding operating expenses that are part of routine operations and maintenance functions.

[18]GAO, *High-Risk Series: Dedicated Leadership Needed to Address Limited Progress in Most High-Risk Areas*, GAO-21-119SP (Washington, D.C.: Mar. 2, 2012). GAO's biennial high-risk update identifies government operations with greater vulnerabilities to fraud, waste, abuse, and mismanagement or the need for transformation to address economy, efficiency, and effectiveness challenges. We designated DOE's contract management, which includes both contract administration and project management, as a high-risk area in 1990 because DOE's record of inadequate management and oversight of contractors left the department vulnerable to fraud, waste, abuse, and mismanagement.

2021 high-risk update, we reported that NNSA has continued to show leadership commitment to improving contract and project management and has taken some steps to improve its capacity to oversee and manage its programs, projects, and contracts.

Program management. According to PMI's standard for program management, effective program management helps ensure that a group of related projects and other activities are managed in a coordinated way to obtain benefits not available from managing them individually.[19] Program management involves aligning multiple projects and activities to achieve the program's goals.

NNSA issued a general program management policy for conducting program management activities within NNSA in February 2019.[20] The policy established program management requirements for NNSA programs and stated that NNSA programs should consider best practices developed by PMI and OMB and as recommended by us. The NNSA policy defines a program in part as an organized set of activities directed toward a common purpose or goal, undertaken or proposed in support of an assigned mission area. NNSA's offices, such as Defense Programs, and Safety, Infrastructure, and Operations, have additional guidance that establishes requirements and processes specific to nuclear weapon modernization programs or infrastructure programs.[21] We have previously reported on NNSA's history of program management challenges that have resulted in significant cost overruns and schedule delays.[22] We found that such outcomes are attributed at least in part to NNSA not effectively using key program management documents such as scopes of work,

[19]See Project Management Institute, Inc., *The Standard for Program Management*, 4th ed. (Newtown Square, PA: 2017).

[20]National Nuclear Security Administration, *Program Management Policy,* NAP-413.2 (Washington, D.C.: Feb. 4, 2019).

[21]National Nuclear Security Administration, *Office of Defense Programs DP Program Execution Instruction* (Washington, D.C.: June 19, 2019); and *Office of Safety, Infrastructure, and Operations Program Management Plan* (Washington, D.C.: September 2019).

[22]See, for example, GAO, *Nuclear Weapons: NNSA Should Adopt Additional Best Practices to Better Manage Risk for Life Extension Programs*, GAO-18-129 (Washington, D.C.: Jan. 30, 2018); and *Nuclear Weapons: Additional Actions Could Help Improve Management of Activities Involving Explosive Materials*, GAO-19-449 (Washington, D.C.: June 17, 2019).

integrated master schedules, and life cycle cost estimates.[23] We have also previously reported that NNSA has not fully developed coordinated and robust management controls to oversee certain other activities that NNSA does not define as a program but are similarly organized toward a common purpose.[24]

Portfolio management. PMI established a standard for portfolio management. The standard states that organizations can optimize their portfolios by establishing and using good practices when choosing portfolio components to fund (that is, programs, projects, and other activities or lines of effort), prioritizing their goals and work, and ensuring that they can be adequately resourced.[25] Organizations can include programs, projects, and other activities as components of a portfolio that are related by common financial support, for example, even if those components have different control structures or may be managed under different organizational policy or guidance. According to PMI, portfolios go through life cycle phases that include initiation, planning, execution, and optimization. While these phases are ongoing and flexible, organizations initiate a portfolio by establishing the approach and processes that define how it will manage the portfolio, and its components, through the rest of the portfolio life cycle phases. This includes identifying what components to include in the portfolio's scope and defining its long-term financial goals, performance metrics, and governance structure. An organization may not be able to reach the planning, execution, and optimization phases until the portfolio is established. Optimization allows an organization to make a portfolio as effective as possible by ensuring resources are best applied to the prioritized components within the portfolio.

[23]See, for example, GAO, *Modernizing the Nuclear Security Enterprise: A Complete Scope of Work Is Needed to Develop Timely Cost and Schedule Information for the Uranium* Program, GAO-17-577 (Washington, D.C.: Sept. 8, 2017); and *Nuclear Weapons: NNSA Should Further Develop Cost, Schedule, and Risk Information for the W87-1 Warhead Program*, GAO-20-703 (Washington, D.C.: Sept. 9, 2020). A scope of work is a hierarchal code structure representing the entire scope of a program. An integrated master schedule is a document that integrates the planned work, the resources necessary to accomplish that work, and the associated budget for a program. A life cycle cost estimate provides an exhaustive and structured accounting of all resources and associated cost elements required to develop, produce, deploy, and sustain a particular program.

[24]GAO, *Nuclear Weapons: NNSA Needs to Incorporate Additional Management Controls Over Its Microelectronics Activities*, GAO-20-357 (Washington, D.C.: June 9, 2020).

[25]PMI, *The Standard for Portfolio Management*.

Efforts to Modernize the Weapons Stockpile and Infrastructure

In addition to NNSA, two other organizations are responsible for the nation's nuclear weapons. DOD implements the U.S. nuclear deterrent strategy by managing a mix of delivery platforms for nuclear weapons (such as land-based intercontinental ballistic missiles) and the supporting infrastructure and personnel to build, maintain, and control these assets. DOD also establishes the military requirements for the nuclear weapons carried on those platforms. The Nuclear Weapons Council, which is composed of representatives from DOD and DOE, is responsible for matters related to executive-level management of the nuclear weapons stockpile. The council serves as a focal point for decisions to maintain and manage U.S. nuclear weapons. In response to the requirements developed by the Nuclear Weapons Council, which are ultimately approved by the President, NNSA conducts an annual planning and budgeting process to identify funding needs for its nuclear modernization programs.

According to DOD and DOE estimates, weapon modernization programs and related efforts will cost hundreds of billions of dollars over the next 2 decades. We found in April 2017 that the modernization work that NNSA had deferred by more than 5 years contributed to a significant "bow wave"—or sharp increase—of funding needs in those future years in order for the agency to undertake the multiple, simultaneous weapon modernization programs included in its plan.[26] DOE's appropriation for fiscal year 2021 includes a 23 percent increase over the prior fiscal year for NNSA's modernization activities. We found in July 2020 that an increase such as this suggests that the bow wave has arrived, because this increase largely supported existing programs rather than new ones.[27] We stated that NNSA may need to sustain this higher level of funding over future years to continue supporting these existing programs. If

[26]GAO-17-341. A funding "bow wave"—that is, an impending and significant increase in the requirements for additional funds—occurs when agencies defer costs of their programs to the future, beyond their programming periods, and often occurs when agencies are undertaking more programs than their resources can support.

[27]Our July 2020 report based this statement on DOE's budget justification for fiscal year 2021, which included a 25 percent increase for NNSA's modernization activities that was sustained over 5 fiscal years, through fiscal year 2025. GAO, *National Nuclear Security Administration: Information on the Fiscal Year 2021 Budget Request and Affordability of Nuclear Modernization Activities,* GAO-20-573R (Washington, D.C.: July 30, 2020).

funding is reduced, appropriate prioritization across modernization work will be essential.

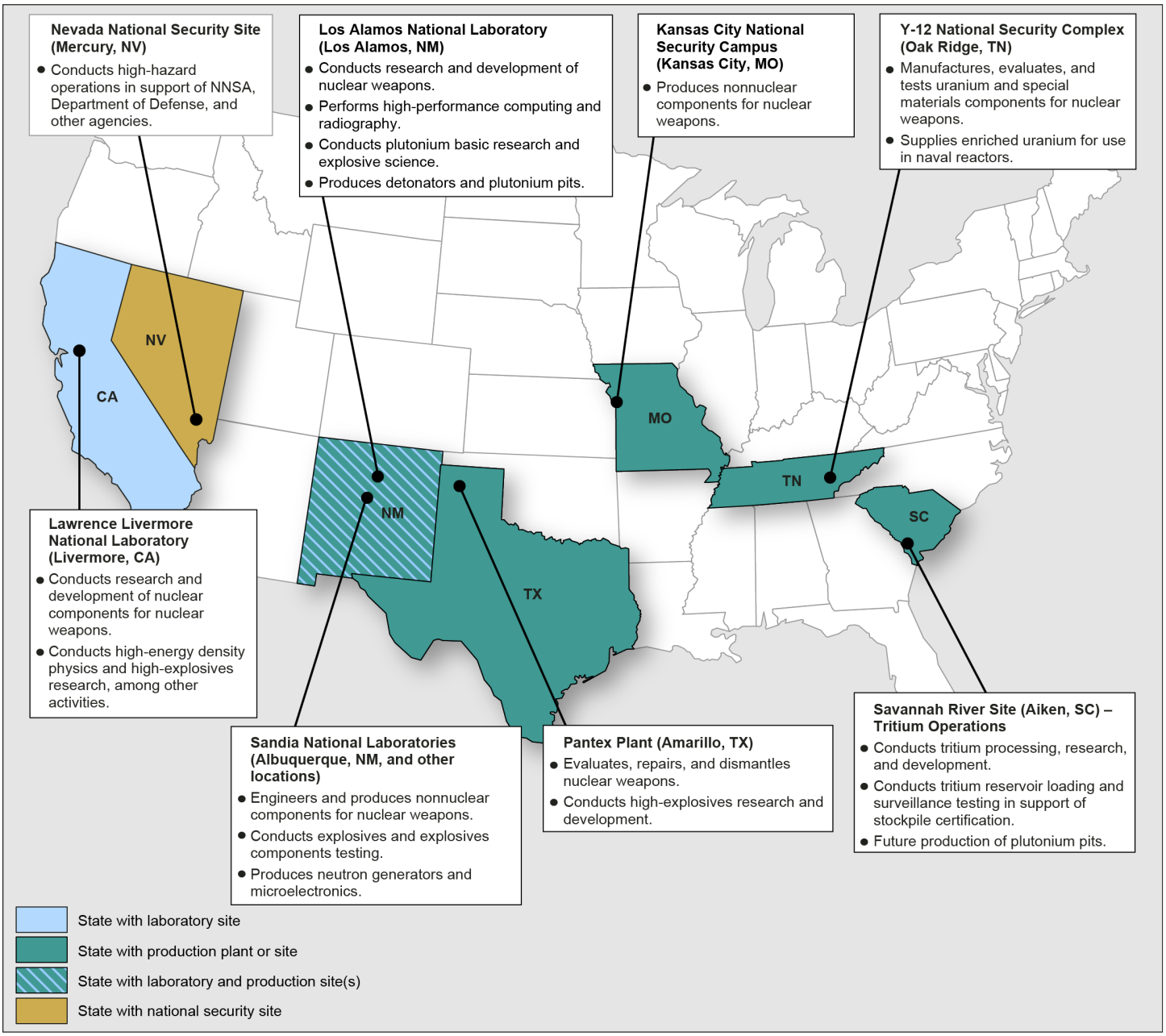
NNSA largely funds its nuclear weapons stockpile maintenance and modernization efforts through its Weapons Activities appropriation, under which Congress directs funds to specific programs, projects, and other activities. The Weapons Activities appropriations account includes programs, projects, and other activities managed by some of NNSA's program offices: the Office of Defense Programs; the Office of Safety, Infrastructure, and Operations; and the Office of Defense Nuclear Security. Two NNSA functional offices, the Office of Acquisition and Project Management, and the Office of Management and Budget, as well as the Office of Policy and Strategic Planning, provide mission-enabling support to the program offices responsible for NNSA's modernization efforts. See appendix II for a list of selected subportfolios, programs, projects, and other activities included in NNSA's Weapons Activities appropriations account for fiscal year 2021.

NNSA's federal workforce manages and oversees the M&O contractors who conduct the majority of work needed to fulfill NNSA's mission, including five weapon modernization programs, numerous multi-billion-dollar construction projects, and hundreds of smaller construction and revitalization projects to modernize its infrastructure.[28] M&O contractors perform the work at eight government-owned sites that comprise the nuclear security enterprise.[29] As shown in figure 2, each of NNSA's eight sites has specific responsibilities within the nuclear security enterprise.

[28]These weapon modernization programs are the B61-12 Life Extension Program (LEP), the W88 Alteration 370, the W80-4 LEP, the W87-1 Modification program, and the W93 program. NNSA undertakes LEPs to refurbish or replace nuclear weapons' components to extend their lives, enhance their safety and security characteristics, and consolidate the stockpile into fewer weapon types to minimize maintenance and testing costs while preserving needed military capabilities. Much like a nuclear weapon LEP, a weapon alteration replaces or refurbishes weapon components to ensure the weapon can continue to meet military requirements. However, an alteration generally refurbishes fewer components than an LEP and does not specifically extend a weapon's operational lifetime. The W87-1 Modification program will replace another weapon's capabilities with a weapon composed of all newly manufactured components. The W93 program is being treated as a new weapon acquisition.

[29]NNSA also executes portions of its missions across several other DOE sites, such as the Pacific Northwest National Laboratory in Washington and the Oak Ridge National Laboratory in Tennessee.

Figure 2: The National Nuclear Security Administration's (NNSA) National Security Laboratories, Production Plants, and Sites



Sources: GAO presentation of NNSA information; Map Resources (map). | GAO-21-398

Accessible Text for Figure 2: The National Nuclear Security Administration's (NNSA) National Security Laboratories, Production Plants, and Sites

Nevada National Security Site (Mercury, NV)
- Conducts high-hazard operations in support of NNSA, Department of Defense, and other agencies.

Los Alamos National Laboratory (Los Alamos, NM)
- Conducts research and development of nuclear weapons.
- Performs high-performance computing and radiography.
- Conducts plutonium basic research and explosive science.
- Produces detonators and plutonium pits.

Kansas City National Security Campus (Kansas City, MO)
- Produces nonnuclear components for nuclear weapons.

Y-12 National Security Complex (Oak Ridge, TN)
- Manufactures, evaluates, and tests uranium and special materials components for nuclear weapons.
- Supplies enriched uranium for use in naval reactors.

Lawrence Livermore National Laboratory (Livermore, CA)
- Conducts research and development of nuclear components for nuclear weapons.
- Conducts high-energy density physics and high-explosives research, among other activities.

Sandia National Laboratories (Albuquerque, NM, and other locations)
- Engineers and produces nonnuclear components for nuclear weapons.
- Conducts explosives and explosives components testing.
- Produces neutron generators and microelectronics.

Pantex Plant (Amarillo, TX)
- Evaluates, repairs, and dismantles nuclear weapons.
- Conducts high-explosives research and development.

Savannah River Site (Aiken, SC) – Tritium Operations
- Conducts tritium processing, research, and development.
- Conducts tritium reservoir loading and surveillance testing in support of stockpile certification.
- Future production of plutonium pits.

For the KEY -
- Blue color box State with laboratory site
- Teal color box State with production plant or site
- Blue/Teal stripes box State with laboratory and production site(s)
- Tan box State with national security site

Congressional Interest in NNSA's Capabilities

As part of its oversight, Congress has directed NNSA on multiple occasions to identify and define the key capabilities needed to achieve its mission of modernizing the nuclear weapons stockpile and maintaining

and modernizing infrastructure needed to support the stockpile. In addition to identifying capabilities, Congress has also directed NNSA to report costs for these capabilities across the enterprise and strategic planning efforts. See table 1 for a list of the legislative language directing NNSA to identify and define capabilities.

Table 1: Legislative Language for National Nuclear Security Administration (NNSA) to Identify and Define Capabilities

Legislative source	Description of directives related to identifying and defining capabilities	Capability elements addressed in legislative language
50 U.S.C. § 2521, Stockpile stewardship program	Directs NNSA to establish a program to preserve the core intellectual and technical competencies of the United States in nuclear weapons, including weapons design, system integration, manufacturing, security, use control, reliability assessment, and certification.	Knowledge, including operational and academic competencies
50 U.S.C. § 2523, Nuclear weapons stockpile stewardship, management, and responsiveness plan	Directs NNSA—as an element of its mandated biennial reporting to Congress—to conduct an assessment of the core scientific and technical competencies required to achieve the objectives of the stockpile stewardship program and other weapons activities and weapons-related activities of the administration, including— (i) the number of scientists, engineers, and technicians, by discipline, required to maintain such competencies; and (ii) a description of any shortage of such individuals that exists at the time of the assessment compared with any shortage expected to exist during the period covered by the future-years nuclear security program.	Knowledge, including operational and academic competencies Human capital or workforce
National Defense Authorization Act for Fiscal Year 2014[a]	Directs NNSA to develop a plan for improving and integrating the financial management of the nuclear security enterprise that considers, among other elements, methodologies for identifying costs for programs of record and base capabilities required for programs carried out by the nuclear security enterprise.[b]	Knowledge, including functional and operational competencies Human capital, including federal employees and M&O contractors Infrastructure, including facilities, equipment, and tools
National Defense Authorization Act for Fiscal Year 2017[c]	Directs NNSA to complete, to the extent practicable, the implementation of a common financial reporting system for the nuclear security enterprise. This plan should include definitions and methodologies for identifying and reporting costs for programs of record and base capabilities within NNSA.	No specific elements listed
Senate Report 115-262 accompanying the National Defense Authorization Act for Fiscal Year 2019[d]	Directs the Administrator of NNSA to submit a detailed roadmap to the congressional defense committees, including infrastructure and staffing requirements, key milestones, and an assessment of any additional capacity needed at NNSA's production sites in order to meet modernization and force posture requirements.	Human capital or workforce, including staffing requirements Infrastructure

Source: GAO analysis of NNSA information and legislative language. | GAO-21-398

[a]National Defense Authorization Act for Fiscal Year 2014, Pub. L. No. 113-66, § 3128, 127 Stat. 672, 1065–66 (2013).

[b]In its report in response to the National Defense Authorization Act for Fiscal Year 2014 Sections 3128 and 3112, NNSA determined that the following steps, among others, should be taken to identify programs of record and base capabilities across the nuclear security enterprise: (1) identify the skill sets and dedicated personnel needed at the NNSA headquarters, and field office level, as well as at the management and operating (M&O) contractor level; (2) identify facilities, equipment, and tools needed (the base capability is an essential enabling capability); and (3) consider essential "enabling" capabilities needed to maintain the stockpile, when determining resource allocation. See NNSA's

National Defense Authorization Act Fiscal Year 2014, Section 3128, Financial Management Improvement Team Report (Washington, D.C.: December 2014).

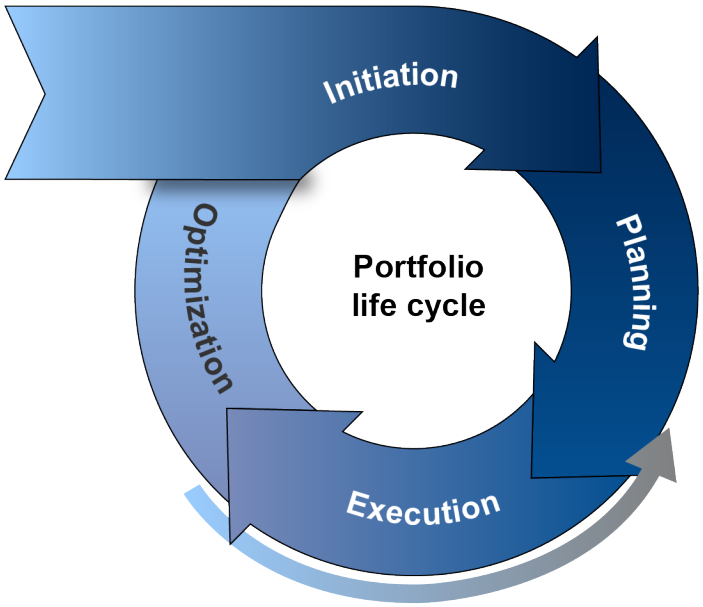
[c]National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, § 3113, 130 Stat. 2000, 2757–58 (2016).

[d]Senate Report 115-262, to accompany S. 2987, the John S. McCain National Defense Authorization Act for Fiscal Year 2019, 115th Cong. (2018).

NNSA Has Partially Implemented Selected Portfolio Management Leading Practices for the Weapons Activities Portfolio

NNSA has partially implemented all of the selected portfolio management leading practices we identified as relevant for managing its Weapons Activities portfolio of maintenance and modernization programs, projects, and other activities. According to PMI's portfolio management standard, there are four phases in the portfolio life cycle: initiation, planning, execution, and optimization (see fig. 3).[30]

Figure 3: Phases in the Portfolio Life Cycle



Source: GAO analysis of Project Management Institute, Inc., information. | GAO-21-398

[30]PMI, *The Standard for Portfolio Management*.

PMI states that the first of these phases—initiation—occurs when an organization establishes the approach and processes that define how it will manage the portfolio, and its components (programs, projects, and other activities), through the rest of the portfolio life cycle phases. Thus, initiation includes identifying what programs, projects, and other activities to include in the portfolio's scope and defining its long-term financial goals, performance metrics, and governance structure. After a portfolio has been initiated, the goals of the planning phase include developing a portfolio management plan; identifying the portfolio's budget and resourcing requirements, interdependencies, and risks; and prioritizing its components. The goals of the execution phase include delivering program and projects outcomes, actively managing and resolving risk, reprioritizing components as needed, and tracking the portfolio based on its performance metrics. Organizations can then optimize the portfolio by ensuring that the available human, material, and financial resources are best applied to any ongoing programs and projects as conditions change, according to PMI.

We identified and selected 13 leading practices that, if implemented by an agency, should enhance strategic management of a portfolio and executive decision-making as well as help ensure that programs and projects contribute to an agency's ability to achieve its objectives (see table 2). These are practices that we would expect to see fully implemented by organizations that effectively manage a portfolio of work through its initiation, planning, execution, and optimization phases.

Table 2: Selected Portfolio Management Leading Practices Identified by GAO, and Life Cycle Phases

Portfolio management leading practice	Portfolio life cycle phase(s)
1. Establish a clearly defined portfolio that is linked to strategic objectives and includes component selection and prioritization criteria.	Initiation
2. Establish clear metrics for judging the portfolio.	Initiation
3. Establish clearly defined and appropriately empowered governance roles for the portfolio.	Initiation
4. Clearly identify stakeholders and a stakeholder engagement plan for the portfolio.	Initiation and planning
5. Develop processes and time lines for updating strategic and governance documents, carrying out capacity and capability planning, and refining metrics for the portfolio.	Planning
6. Develop a risk management plan in which portfolio risk tolerance, risk processes, and risk responses are defined.	Planning
7. Conduct capacity planning and management for the portfolio.	Planning and execution
8. Conduct capability assessments, and develop needed capabilities for the portfolio.	Planning and execution
9. Develop a risk register in which risks to the portfolio are identified and risk owners are assigned.	Planning and execution
10. Document evidence of stakeholder engagement activities for the portfolio.	Execution
11. Document evidence of measuring portfolio performance, as judged by the defined metrics.	Execution
12. Conduct and document portfolio risk assessments.	Execution and optimization
13. Negotiate and realize the portfolio's expected value based on metrics, budget, and other factors.	Execution and optimization

Source: GAO analysis of Project Management Institute, Inc., *The Standard for Portfolio Management*, 4th ed. (Newtown Square, PA: 2017). | GAO-21-398

Based on our review of documents and interviews with senior officials from NNSA program and other supporting offices, we found that NNSA is in the early stages of initiating associated portfolio management processes and has made progress toward establishing its Weapons Activities work as a portfolio. We found that NNSA has partially implemented the three leading practices we identified as key to the initiation phase of portfolio management.[31] Specifically:

- **Establishing a clearly defined portfolio that is linked to strategic objectives and includes component selection and prioritization criteria.** NNSA has partially implemented this leading practice for portfolio management, in that some officials and agency documents describe its Weapons Activities work as a portfolio. However, NNSA has not consistently defined this portfolio as including all the maintenance and modernization programs and projects in other key documents. Senior NNSA officials said they viewed the Weapons Activities portfolio as the integrated suite of programs, projects, and

[31]We used a three-point scale to determine the extent to which NNSA officials' current management approach followed portfolio management leading practices. We rated a practice as "partially implemented" if NNSA officials provided evidence that satisfied a portion of the leading practice.

other activities that support NNSA's weapons stockpile and infrastructure maintenance and modernization mission; therefore, they reorganized the fiscal year 2021 budget justification to align with this approach. Specifically, NNSA's policy on the planning, programming, budgeting, and evaluation process states that each major mission area, such as Weapons Activities, is a portfolio with an account integrator who is responsible for integrating and prioritizing the work.[32] However, in other documents, NNSA discusses groups of programs, projects, and other activities as individual portfolios, when they should be viewed as subportfolios. For example, NNSA's fiscal year 2020 and 2021 *Stockpile Stewardship and Management Plans* use the term "portfolio" in reference to different groups of related work that fall within the Weapons Activities appropriations account but do not describe Weapons Activities as a single, integrated portfolio that should be managed according to any specific practices. Officials from NNSA's Office of Acquisition and Project Management and NNSA's Office of Management and Budget did not share a common understanding of the Weapons Activities portfolio and told us that they were not aware of any effort to organize it into a distinct portfolio of work.

- **Establishing clear metrics for judging the portfolio.** NNSA has partially implemented this leading practice for portfolio management by taking actions to collaborate across the enterprise to develop strategic management documents that outline the agency's strategic objectives. However, NNSA has not established portfolio-level metrics for the Weapons Activities portfolio. Officials from the Office of Policy and Strategic Planning discussed an annual planning process in which they reach out to program and functional offices, as well as to field offices and M&O contractors, to ensure that the work being executed remains valid and aligned with NNSA's strategic vision document and strategic objectives therein. NNSA officials from Office of Policy and Strategic Planning and Office of Defense Programs told us that actions such as these are largely tied to the agency's programming and budgeting processes. The actions' focus tends to be on establishing objectives and performance metrics for programs and projects within the Weapons Activities portfolio rather than at the Weapons Activities portfolio level. NNSA officials stated that this program and project-level information may be rolled up to the portfolio level for discussion with the Administrator of NNSA, but NNSA does not have guidance or formal processes to do so.

[32]National Nuclear Security Administration, *Planning, Programming, Budgeting, and Evaluation (PPBE) Process*, NNSA Policy NAP-130.1A (Washington, D.C.: Dec. 9, 2019).

- **Establishing clearly defined and appropriately empowered governance roles for the portfolio.** NNSA has partially implemented this leading practice for portfolio management by identifying officials that may have roles and responsibilities for decision-making that could rise to the portfolio level. However, NNSA has not clearly defined the governance roles and specific responsibilities for managing the Weapons Activities portfolio of work. According to NNSA documents and officials, various levels of management could be considered as "acting" in portfolio governance roles.[33] NNSA's planning, programming, budgeting, and evaluation process policy states that the Deputy Administrator for Defense Programs is responsible for integrating and prioritizing the programs within the Weapons Activities appropriation.[34] NNSA officials stated that they consider this account integrator as an important portfolio management role because of the authority to coordinate activities across Weapons Activities work between the Office of Defense Programs and the mission-enabling programs that support the programmatic work, such as the Office of Safety, Infrastructure, and Operations. However, this policy document does not specify that the account integrator is the portfolio manager or another governance role for the Weapons Activities portfolio. Further, officials we interviewed from the program offices generally agreed that they consider senior executives within the organization to act in a role similar to that of a portfolio manager even if not explicitly titled as such. Based on our review of NNSA documents and officials' responses, we found that assistant deputy administrators oversee what may be considered subportfolios within the Weapons Activities portfolio rather than oversee the overall Weapons Activities portfolio of work. For example, the Office of Defense Programs includes five suboffices that are managed by assistant deputy administrators.[35] Officials stated that these assistant deputy administrators' roles and responsibilities include managing their own work that is focused on executing aspects of the Defense Programs.

Based on our review of documents and interviews with senior NNSA officials, we found that NNSA has also taken actions that partially implement the remaining 10 leading practices that we identified as key to

[33]Portfolio governance roles may include a portfolio sponsor, portfolio manager, and a portfolio governance board.

[34]NNSA Policy NAP-130.1A.

[35]The Office of Defense Programs includes the following five offices: (1) Research, Development, Test and Evaluation; (2) Stockpile Management; (3) Secure Transportation; (4) Systems Engineering and Integration; and (5) Production Modernization.

the planning, execution, and optimization phases of portfolio management. NNSA officials stated that some of the actions NNSA has taken that partially implement the leading practices are generally a result of the planning and execution required under DOE and NNSA program and project management policy and guidance, which may allow NNSA to more easily manage at a portfolio level in some instances.

For example, NNSA has taken action that may support conducting and documenting risk assessments at the portfolio level (listed as leading practice number 12 in table 2). Office of Defense Programs officials told us that they conduct program-level risk assessments and collect additional risk information within the Weapons Activities portfolio. They stated that they may discuss risks that rise to the portfolio level (i.e., those risks that impact multiple weapons or infrastructure modernization programs) with the Administrator of NNSA but do not have a formal process to guide what and how much information may be rolled up to the Weapons Activities portfolio level. In February 2021, the Office of Defense Programs published a guide for risk management that provides guidance on how to carry out risk management planning and activities at all levels, including both program and project levels. However, the guide does not describe Weapons Activities as a single, integrated portfolio or how Office of Defense Programs' risk planning and management information should roll up to the Weapons Activities portfolio level. Instead, it defines the term "portfolio" broadly and in reference to different groups of related work that fall under the Office of Defense Programs' responsibility.

NNSA has partially implemented selected portfolio management leading practices for its Weapons Activities portfolio of work because the agency has not established a clear policy, guidance, or other strategic document—an enterprise-wide portfolio management framework—for its weapons stockpile and infrastructure maintenance and modernization efforts. According to NNSA officials, the agency is early in its adoption of a portfolio management approach in managing its nuclear weapons stockpile maintenance and modernization work and does not have a policy or guidance document pertaining to portfolio management.

Establishing a framework that clearly defines what programs, projects, and other activities are included in the Weapons Activities portfolio; clearly defines its governance roles; and includes portfolio-level selection criteria, prioritization criteria, and performance metrics could lead to several benefits for NNSA. First, a portfolio management framework would allow NNSA to fully implement the three leading practices

specifically associated with the initiation phase of the portfolio life cycle. Unified and formal documentation of NNSA's approach to portfolio management would allow NNSA to better define how it will pursue strategic objectives through executing its modernization programs and projects and describe how NNSA's mission-enabling and supporting offices will support that work. NNSA's functional offices—specifically the offices of Management and Budget, and Acquisition and Project Management—may then more clearly understand their roles in supporting management of the Weapons Activities portfolio and how to support implementation of those leading practices of which they may not have been aware at the time of our review. With a framework in place, NNSA program offices that directly manage Weapons Activities work and the offices that support Weapons Activities work may be better able to make program and project decisions from a portfolio-level perspective. They may also better understand the impacts of their program or project-specific decisions on the larger portfolio.

Second, establishing a portfolio management framework that helps mature NNSA's management of the Weapons Activities portfolio through the initiation phase allows NNSA to focus on fully implementing the remaining 10 leading practices that relate to planning, executing, and optimizing the Weapons Activities portfolio. For example, developing a framework may help NNSA to better measure overall performance of the Weapons Activities portfolio as judged by the metrics defined in the framework. This may help ensure more efficient management and consistent reporting on the status of its programs and projects at the portfolio level. Doing so would make it easier for the agency and other decisionmakers to track the progress and outcomes of all programs and projects that are critical to achieving NNSA's strategic objectives and to better coordinate and integrate activities across the enterprise.

Finally, a framework can establish a way for NNSA to mature its management of the Weapons Activities portfolio into the optimization phase of the portfolio life cycle (leading practices 12 and 13). This may allow NNSA to better focus on selecting the optimum mix of components (programs, projects, and other activities) and modifying that mix as needed over time to achieve objectives, rather than optimizing individual components, especially if the agency came under budget pressure. For example, NNSA's Deputy Administrator for Defense Programs discussed technical issues associated with electrical components of two weapons modernization programs within the Weapons Activities portfolio—the B61-12 Life Extension Program (LEP) and the W88 Alteration 370—during a

September 2019 hearing.[36] The NNSA official stated that the agency was coordinating with DOD to mitigate scheduling delays of about 20 months due to replacement of those components.

The Deputy Administrator and other officials we interviewed stated that while this technical issue will cause a cost increase for the two programs, NNSA will consider changes to the scopes of other weapons modernization programs so that the overall budget for the major modernization programs will not increase.[37] Having a clear way to sort competing priorities—such as through a framework—will help the decision-making process when future budget constraints arise that may not allow for the overall Weapons Activities portfolio budget to increase or remain the same. This may be especially true considering uncertainty about future budgets due to the reduced role of nuclear weapons outlined in the March 2021 *Interim National Security Strategy Guidance*.[38] Working from a portfolio management framework allows NNSA to realize the expected value of the portfolio, regardless of the overall budgeted or appropriated amount. The framework could also help congressional decisionmakers better understand the feasibility of implementing the Weapons Activities portfolio at current and future budget levels and understand NNSA's prioritization and trade-off decisions that may be necessary if the budget for the agency's modernization work does not continue to increase.

NNSA Has Not Developed a Comprehensive or Complete Capability Assessment to Support Portfolio Management

NNSA offices have initiated four separate efforts to identify and assess capabilities that allow the agency to achieve its nuclear weapons stockpile maintenance and modernization mission, but have not

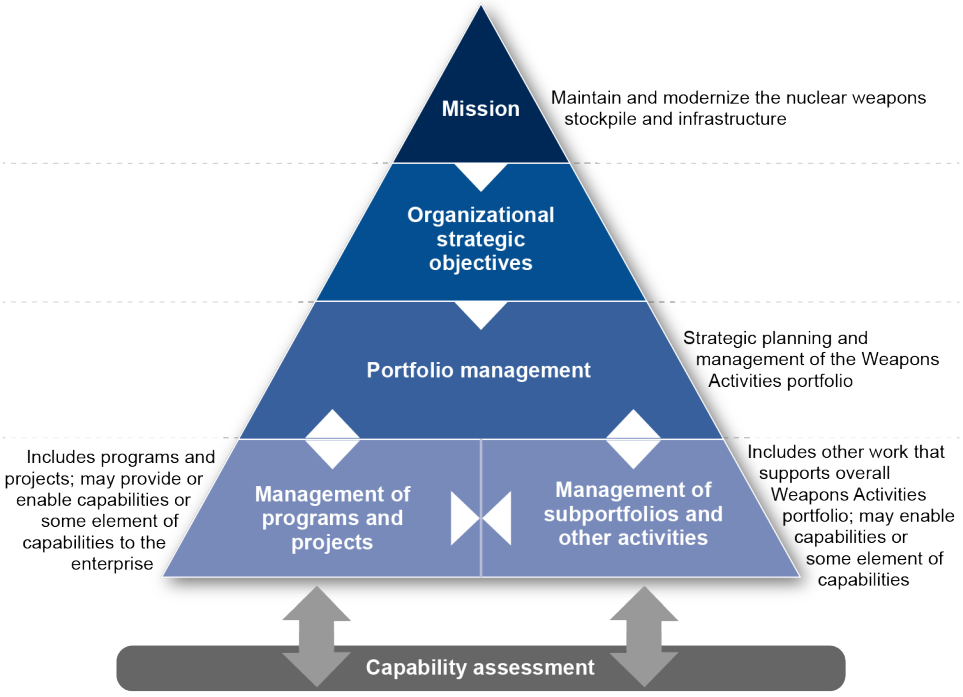
[36]National Nuclear Security Administration, *Status of the B61-12 Life Extension and W88 Alteration 370 Programs*, Statement of Dr. Charles P. Verdon, Deputy Administrator for Defense Programs, Before the Subcommittee on Strategic Forces, House Committee on Armed Services, 116th Cong. (Sept. 25, 2019).

[37]Each LEP, alteration program, and modification program are individual line items with specifically requested budget amounts and annual appropriations but are all considered to be a part of NNSA's major modernization programs.

[38]The White House, *Interim National Security Strategy Guidance* (Washington, D.C.: March 2021).

developed a comprehensive or complete capability assessment that could better support NNSA's portfolio management approach. NNSA's capabilities support its Weapons Activities portfolio of programs, projects, and other activities. As shown in figure 4, a capability assessment would support NNSA's management of its portfolio of programs, projects, and other activities that produce the outcomes needed to achieve its strategic objectives related to weapons stockpile maintenance and modernization.

Figure 4: Capability Assessment Supports Portfolio Management, Strategic Objectives, and Mission



Source: GAO analysis of Project Management Institute, Inc., and NNSA information. | GAO-21-398

PMI's portfolio management standard encourages organizations to use a portfolio management framework to ensure that their mission is translated into strategic objectives that can be achieved through programs and projects.[39] Capabilities can emerge from and also support the programs, projects, and other activities in a portfolio. To continuously optimize the mix of programs and projects in a portfolio, organizations must also have a comprehensive and complete organization-wide assessment of existing

[39]PMI, *The Standard for Portfolio Management.*

and planned capabilities and resources necessary to develop and sustain those capabilities, according to PMI.

NNSA's offices of Defense Programs; Policy and Strategic Planning; and Safety, Infrastructure, and Operations have independently identified and assessed capabilities within their areas of responsibility through four separate efforts. Specifically:

- The Office of Defense Programs identified and assessed "weapons activities capabilities" in the detailed and summary versions of the *Stockpile Stewardship and Management Plan* for fiscal years 2020 and 2021. These capabilities included discipline-based knowledge or competencies needed by staff for NNSA to meet its mission. The Office of Defense Programs developed these capabilities in response to legislative language.[40]
- The Office of Defense Programs identified and assessed "production capabilities" in its *Roadmap to Meet Modernization and Hedging Production Requirements* in 2019. These capabilities included production capabilities needed to meet planned milestones. The Office of Defense Programs developed these capabilities in response to a committee report accompanying defense authorization legislation.[41]
- The Office of Policy and Strategic Planning identified "core capabilities" in its *Strategic Planning Guidance* for 2020. These capabilities included the skill and knowledge-based competencies represented at each site, which M&O contractors used to develop site strategic plans and assess their own capabilities.[42] The Office of Policy and Strategic Planning developed these capabilities in response to legislative language.[43]
- The Office of Safety, Infrastructure, and Operations identified and assessed "infrastructure capabilities" in its *Master Asset Plan* for 2020. These capabilities include the programmatic functions provided

[40]50 U.S.C. §§ 2521, 2523.

[41]Senate Report 115-262 to accompany S. 2987, the John S. McCain National Defense Authorization Act for Fiscal Year 2019, 115th Cong. (2018).

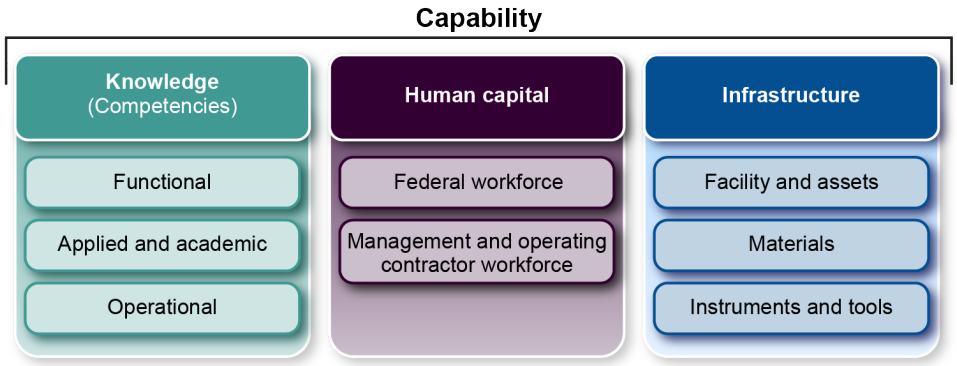
[42]DOE's Office of Science also maintains a list of core capabilities to track and manage capabilities at each national laboratory. These core capabilities are used by laboratory leadership to develop long-term strategic plans for their respective institutions.

[43]National Defense Authorization Acts for Fiscal Years 2014 and 2017.

by individual facilities and assets. The Office of Safety, Infrastructure, and Operations developed these capabilities on its own initiative.[44] See appendix III for more information on NNSA's efforts to identify and assess capabilities.

The relevant statutes and committee report that directed NNSA to identify and define the capabilities needed to achieve its strategic objectives do not provide an express definition for the term "capability." Based on our review of these documents, congressional direction to develop these capabilities generally included the following three elements: (1) the knowledge or competencies needed to conduct work; (2) the human capital or workforce conducting the work; and (3) the infrastructure necessary to support the work (see fig. 5).

Figure 5: Elements of Capabilities Necessary for the National Nuclear Security Administration (NNSA) to Meet Objectives



Source: GAO analysis of legislative language and NNSA documents. | GAO-21-398

[44]NNSA produces the *Master Asset Plan* to fulfill general requirements of 50 U.S.C. § 2401; however, the Office of Infrastructure, Safety, and Operations did not develop the infrastructure capabilities contained within the plan to fulfill these requirements.

Accessible Text for Figure 5: Elements of Capabilities Necessary for the National Nuclear Security Administration (NNSA) to Meet Objectives

Capability

- Knowledge (Competencies)
  - Functional
  - Applied and academic
  - Operational
- Human Capital
  - Federal workforce
  - Management and operating contractor workforce
- Infrastructure
  - Facility and assets
  - Materials
  - Instruments and tools

We found that none of NNSA's four efforts to identify and assess capabilities is comprehensive because none of the efforts identified and assessed all of the capabilities needed across the enterprise for NNSA to achieve its modernization objectives and mission. According to officials from the offices that undertook these efforts, each effort to identify and assess capabilities is distinct, with a different focus tailored to individual office needs. Officials noted that some of these efforts can be crosswalked to one another and may continue to inform each other's development as the offices' understanding of NNSA's capabilities evolves. For example, the core capabilities developed by the Office of Policy and Strategic Planning and the weapons activities capabilities developed by the Office of Defense Programs are both centered on the key scientific disciplines (knowledge-based capabilities) needed to achieve NNSA's mission. Officials from both offices characterized these two efforts to identify and assess capabilities as consistent and well-coordinated, although they planned to maintain separate efforts and will continue to tailor the efforts they manage to meet their own needs. While it is possible to crosswalk the knowledge-based capabilities identified in the core capabilities to the weapons activities capabilities, we found that even similar capabilities do not have a one-to-one crosswalk, as they may be characterized differently in each effort. We also found that these two efforts to identify and assess capabilities cannot be easily crosswalked to the Office of Safety, Infrastructure, and Operations' infrastructure capabilities effort.

We found that none of NNSA's four efforts to identify and assess capabilities is complete because none of these efforts included

information on all three elements needed to achieve each of the capabilities identified. Table 3 summarizes the extent that each of the efforts included all of the elements of a capability.

Table 3: The National Nuclear Security Administration's (NNSA) Efforts to Identify and Assess Capabilities Emphasized Different Elements of a Capability

Category	Office of Defense Programs' weapons activities capabilities[a]	Office of Defense Programs' production capabilities	Office of Policy and Strategic Planning's core capabilities	Office of Safety, Infrastructure, and Operation's infrastructure capabilities
Knowledge and competencies	partially considered	not considered	partially considered	n/a
Human capital	partially considered	partially considered	partially considered	n/a
Infrastructure	partially considered	partially considered	partially considered	fully considered

Legend:
● – Capability effort fully considered this element for all of NNSA's capabilities.
◐ – Capability effort partially considered this element for all of NNSA's capabilities.
○ – Capability effort did not consider this element for all of NNSA's capabilities.
n/a – Element not applicable to Office of Safety, Infrastructure, and Operation's area of responsibility.

Source: GAO analysis of NNSA information. | GAO-21-398

[a]The *Stockpile Stewardship and Management Plan* for fiscal year 2021 included a chapter titled "Weapons Activities Capabilities That Support the Nuclear Security Enterprise," which provided information on the interdependencies among capabilities and the challenges and mitigation strategies for each capability. The plan also includes an appendix titled "Capabilities and Definitions," which provided information on capabilities maintained by the Weapons Activities programs and represent underlying disciplines, activities, and specialized skills. Our assessment considered all information related to the three elements of capabilities included in the plan.

In our review of NNSA's efforts to identify and assess capabilities, we found that the NNSA offices did not fully consider each of the three elements of a capability:

- **Knowledge and competencies information.** Two efforts to identify and assess NNSA's capabilities—the Office of Defense Programs' weapons activities capabilities and the Office of Policy and Strategic Planning's core capabilities—partially considered knowledge and competencies information by including the scientific knowledge and competencies needed to develop and produce nuclear weapons. However, these efforts identified the knowledge and competencies needed by the M&O contractors at the national laboratories, production plants, and sites; they did not include all of the mission-enabling knowledge and competencies needed to support the nuclear security enterprise typically provided by the agency's federal workforce. Information on mission-enabling knowledge and competencies that NNSA needs to effectively oversee and resource the Weapons Activities portfolio of work as part of a complete capability effort may allow NNSA to better strategically plan across the agency's offices. We have previously found that NNSA's federal employees use these mission-enabling competencies and critical skills, such as contract management and oversight, to manage and

oversee the M&O contractors who conduct the necessary work across the nuclear security enterprise.[45] Determining critical skills and competencies needed to support management of programs in mission-critical areas, such as NNSA's strategic materials, is important for addressing any gaps in staffing needs.

- **Human capital information.** Three efforts to identify and assess NNSA's capabilities—the Office of Defense Programs' weapons activities capabilities and production capabilities, as well as the Office of Policy and Strategic Planning's core capabilities—partially considered the human capital needed to successfully maintain the readiness of each capability in its description. The fiscal year 2021 *Stockpile Stewardship and Management Plan* provided information on the challenges and mitigation strategies for each weapons activities capability, including some challenges related to developing and maintaining a certain level of an experienced workforce for certain capabilities. The production capabilities, outlined in the *Roadmap to Meet Modernization and Hedging Production Requirements* from the Office of Defense Programs, and the core capabilities in the Office of Policy and Strategic Planning's guidance, included human capital needs by referring to staffing plans developed and maintained by M&O contractors. However, none of these three efforts fully considered human capital information for the federal workforce. Information on the human capital that NNSA needs to effectively oversee and resource the Weapons Activities portfolio of work as part of a complete capability effort may provide NNSA with information needed for strategic planning across the agency's offices. For example, past studies on NNSA's management found that the agency was understaffed across all functions.[46] We reported in our March 2021 high-risk update that NNSA requested and received an increase in its statutory cap on staffing in 2019.[47] However, we also reported that NNSA had not yet filled those additional positions as of

[45]GAO, *Nuclear Weapons: NNSA Needs to Determine Critical Skills and Competencies for Its Strategic Materials Programs,* GAO-18-99 (Washington, D.C.: Nov. 14, 2017).

[46]In June 2018, an Office of Personnel Management study found that NNSA was understaffed across all functions. The number of additional staff that the Office of Personnel Management recommended in the study would exceed the statutory cap on NNSA's full-time-equivalent employees. In addition, in August 2018, a statutorily required internal review of NNSA's capacity identified unmet critical staffing needs, especially staffing to manage and oversee work on the agency's uranium and plutonium missions, which are expected to grow.

[47]GAO-21-119SP.

December 2020. We also reported that an April 2020 NNSA internal review found that NNSA had not adequately resourced program offices to provide oversight of two activities and recommended that NNSA strengthen its oversight of the work by M&O contractors.

- **Infrastructure information.** One effort to identify and assess capabilities focused on infrastructure information and fully considered the infrastructure needed for the enterprise.[48] However, the remaining three efforts to identify and assess capabilities did not consider all of the infrastructure needed to achieve each capability. For example, the weapons activities capabilities described in the fiscal year 2021 *Stockpile Stewardship and Management Plan* included some information on challenges to certain infrastructure that supports the weapons activities capabilities. The plan did not include the full range of infrastructure needed to achieve each capability if it was not specified as a challenge or identify any interdependencies among the capabilities and supporting infrastructure. Information on the infrastructure as part of a complete effort to identity and assess capabilities may provide NNSA with information needed to strategically plan for the Weapons Activities portfolio of work. We previously found that NNSA estimated that it had a limited supply of certain materials related to production of depleted uranium, an important strategic material for the ongoing and planned work for multiple programs.[49] Although NNSA has taken steps to consolidate management of depleted uranium activities under a single program, at the time of our prior report, NNSA officials stated this prior decentralized management had limited NNSA's ability to comprehensively and effectively oversee the program. This limited NNSA's ability to compile and use complete information on the amount of material needed by the agency and across programs and whether the necessary infrastructure was in place to support the capability.

None of NNSA's four efforts to identify and assess capabilities is comprehensive or complete because its offices acted in response to

[48]NNSA's Office of Safety, Infrastructure, and Operations maintains the list of infrastructure capabilities, which includes mission-enabling capabilities.

[49]Depleted uranium for fabrication of weapons components must be in high-purity metal form. Producing depleted uranium metal generally involves first converting a byproduct of uranium enrichment, known as "tails," into a salt "feedstock," which is then converted into metal. This depleted uranium metal and an alloy of depleted uranium and niobium are used to manufacture weapon components. See GAO, *Nuclear Weapons: NNSA Plans to Modernize Critical Depleted Uranium Capabilities and Improve Program Management*, GAO-21-16 (Washington, D.C.: Oct. 15, 2020).

separate congressional direction and based on their own areas of responsibility and oversight, rather than working across the enterprise to develop a comprehensive and complete capability assessment. According to PMI, within an established portfolio, a capability assessment should be comprehensive, by identifying the full range of the organization's current abilities, and complete, by assessing information on the elements needed to maintain those abilities. A capability assessment should provide an understanding of the current state of the organization's capabilities, identify any interdependencies among capabilities and portfolio components (programs, projects, and other activities), and describe any current and potential capability gaps and needs. A capability assessment may provide an organization with a shared vocabulary so that decisionmakers understand how the capabilities that are a result of some programs or projects may support others and contribute to the collective portfolio rather than function as independent and unrelated.

Working across the agency to conduct a single capability assessment that is both comprehensive and complete, and can be maintained over time, could allow NNSA to manage the complex and interdependent lines of work in its Weapons Activities portfolio more strategically. Such a comprehensive and complete capability assessment should rise to a portfolio level (higher than the program office level) and consolidate relevant information for program offices that have work spanning the enterprise that can then be tailored to offices' needs. Rather than NNSA offices tailoring their individual efforts to identify and assess capabilities to meet their needs and crosswalking that information, NNSA would have a consistent and uniform shared vocabulary describing all of the enterprise's capabilities to inform the agency's strategic planning at the portfolio level. For example, since none of NNSA offices' efforts to identify and assess capabilities fully considered information on knowledge and competencies or human capital, including those for the federal workforce, NNSA officials would have to crosswalk across efforts to inform any portfolio-level decisions regarding these issues and still may not have a complete understanding of those elements of the enterprise's capabilities.

A portfolio-level view of the nuclear security enterprise's capabilities would provide a better understanding of the complexities, interdependencies, linkages, and other relationships between its programs and projects and the capabilities that they provide or support. This may also better position NNSA to identify and assess, plan for, and address capability challenges for the enterprise in advance rather than react to them as they emerge. For example, a comprehensive and complete capability assessment would include descriptions of all strategic

material requirements so that any capabilities that depend on a shared stock of strategic materials would know how much of each material they require to achieve each capability compared with the enterprise-wide demand. This centralized information on the enterprise-wide demand for each strategic material should inform the prioritization and management of programs and projects that depend on each material. Finally, this capability assessment could provide NNSA with the information needed to align the portfolio's strategic objectives with mission priorities and provide support for budgetary decision-making across the portfolio.

Conclusions

NNSA's work to maintain and modernize the U.S. stockpile of nuclear bombs and warheads, and modernize the research and production infrastructure on which stockpile programs depend, will cost billions of dollars over the next 2 decades. NNSA has leveraged selected leading practices for portfolio management, such as identifying the activities funded by its Weapons Activities appropriations as a portfolio of work to achieve its maintenance and modernization strategic objectives. We found that NNSA is in the early stages of initiating its portfolio management processes and has partially implemented selected portfolio management leading practices. Establishing a portfolio management framework to guide its approach to managing its modernization work would help NNSA fully implement portfolio management leading practices. A framework would provide NNSA with scaffolding to guide high-level decision-making and allow decisionmakers to think through potential future trade-off scenarios before any budgeting shortfalls or other challenges emerge. It could provide a clear way to optimize competing priorities when budget constraints arise.

In response to congressional direction, NNSA has undertaken four separate efforts to identify and assess capabilities needed to complete its mission of modernizing the nuclear weapons stockpile and maintaining and modernizing infrastructure needed to support the stockpile. However, none of these efforts to identify and assess capabilities is comprehensive because none of the efforts includes all of the capabilities needed for NNSA to meet its mission. Similarly, none of these efforts to identify and assess capabilities is complete because none includes all elements of a capability—knowledge or competencies, human capital, and infrastructure. We recognize the utility of NNSA's offices identifying and assessing capabilities in response to different requirements and in a way that serves their offices' needs. However, we believe that by working

across the agency to develop a comprehensive and complete capability assessment, NNSA could manage these complex and interdependent lines of work in its Weapons Activities portfolio more strategically and understand the competencies, human capital, and infrastructure needed to do so. Such an assessment would provide NNSA with a higher-level view of the nuclear security enterprise, including complexities, interdependencies, linkages, and other relationships that have been missed in the past when considering individual programs or projects.

Recommendations for Executive Action

We are making the following two recommendations to NNSA:

The NNSA Administrator should establish an enterprise-wide portfolio management framework. The framework should define the portfolio of weapons stockpile and infrastructure maintenance and modernization programs and its governance roles, as well as include portfolio-level selection criteria, prioritization criteria, and performance metrics. (Recommendation 1)

The NNSA Administrator should work across the agency's offices that contribute to achieving the goals and objectives of the stockpile maintenance and modernization portfolio to develop a comprehensive capability assessment that incorporates the three elements of capabilities (knowledge, human capital, and infrastructure). (Recommendation 2)

Agency Comments and Our Evaluation

We provided a draft of this report to NNSA for review and comment. In its written comments, reproduced in appendix IV, NNSA agreed in principle with both of our recommendations. However, NNSA stated that it considers both recommendations to be closed—that sufficient action has already been taken to address the recommendations—based on existing documents and processes. We reviewed NNSA's existing documents and processes as part of our review and disagree that they fully address our two recommendations. We also believe that NNSA's response indicates that the agency does not recognize the urgency in which they should take the additional actions needed to fully implement our recommendations—particularly considering uncertainty about future budgets or the potentially reduced role of nuclear weapons in national security strategy, outlined in

the March 2021 *Interim National Security Strategic Guidance*, that is part of current debate.

In its comments on our recommendation to establish an enterprise-wide portfolio management framework, NNSA recognized that it is in the early stages of implementing portfolio management processes for its Weapons Activities portfolio of work and that the leading practices we identified can be useful in developing a portfolio management approach. NNSA stated that its current budget and planning documents represent the core of its portfolio management framework.

We are encouraged that NNSA recognizes the usefulness of incorporating portfolio management leading practices into its management of the Weapons Activities portfolio. Our recommendation to establish a framework includes leading practices that are broad and flexible enough for NNSA to apply to managing its weapons stockpile and infrastructure maintenance and modernization efforts. Implementing our recommendation will help NNSA mature its efforts to the optimization phase. Optimizing the Weapons Activities portfolio would help ensure that NNSA's available human, material, and financial resources are best applied to any ongoing programs and projects as conditions change. An established portfolio management framework—a cohesive, strategic document that clearly defines the portfolio and how to manage it and prioritize its components—would provide NNSA with a more structured and defensible approach to managing the billions of dollars of work that comprise the Weapons Activities portfolio. A framework that includes prioritization criteria, for example, would clearly indicate to Congress how NNSA plans to prioritize its programs and projects and would support congressional decision-making on where to direct limited funding. Otherwise, NNSA may face challenges in achieving its critical missions if future budget constraints result in decisions to direct funding in ways not aligned with what NNSA would have prioritized.

In its comments on our recommendation to work across offices to develop a comprehensive and complete capability assessment, NNSA specifically referenced the *Stockpile Stewardship and Management Plan*—one of its four efforts to identify and assess capabilities needed for its nuclear weapons stockpile maintenance and modernization mission. As stated in the report, we found that NNSA's effort to identify and assess capabilities in the *Stockpile Stewardship and Management Plan* was incomplete in that it did not fully consider all three elements of a capability (knowledge, human capital, and infrastructure). While we are encouraged that NNSA stated it will refine these assessments in the future versions of the

Stockpile Stewardship and Management Plan, we continue to believe that NNSA should work to develop a single comprehensive and complete capability assessment rather than maintain and coordinate four separate efforts. We believe that this would better support NNSA's strategic management of the Weapons Activities portfolio and better position NNSA to identify and assess, plan for, and address capability challenges for the enterprise in advance rather than react to them as they emerge. NNSA could include this single comprehensive and complete capability assessment in future iterations of its *Stockpile Stewardship and Management Plan*.

NNSA also provided technical comments, which we incorporated, as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Energy, the Acting Administrator of NNSA, and other interested parties. In addition, this report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or bawdena@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made significant contributions to this report are listed in appendix V.

Allison Bawden
Director, Natural Resources and Environment

Appendix I: Objectives, Scope, and Methodology

The Senate Report 116-48 accompanying the National Defense Authorization Act for Fiscal Year 2020 includes a provision for GAO to assess whether a portfolio-based approach to managing its defense programs would benefit the National Nuclear Security Administration (NNSA) and to review NNSA's efforts to identify its capabilities. This report examines the extent to which NNSA (1) has used selected portfolio management leading practices to manage its nuclear weapons stockpile maintenance and modernization programs and projects and (2) has developed a comprehensive and complete capability assessment to support portfolio management.

To address our objectives, we focused our scope on NNSA's mission to modernize the nuclear weapons stockpile and maintain and modernize infrastructure for the stockpile. We included the six NNSA offices that are responsible for managing or supporting the work of this mission. We interviewed officials from three NNSA program offices: Defense Programs; Safety, Infrastructure, and Operations; and Defense Nuclear Security. We interviewed officials from two NNSA functional offices, Acquisition and Project Management, and Management and Budget, which provide mission-enabling support to the program offices responsible for NNSA's mission. We also interviewed officials from the Office of Policy and Strategic Planning, which directly supports the Under Secretary of Nuclear Security and NNSA Administrator, and provides mission-enabling support to the rest of the offices responsible for NNSA's mission.

To determine the extent to which NNSA used selected portfolio management leading practices to manage its nuclear weapons stockpile maintenance and modernization programs and projects, we reviewed documents that reference NNSA's portfolio-level management and decision-making processes as well as relevant strategic documents that outline NNSA's mission objectives. We also reviewed the Project Management Institute, Inc.'s (PMI) *The Standard for Portfolio Management—Fourth Edition* (2017).[1] The portfolio management

[1]Project Management Institute, Inc., *The Standard for Portfolio Management*, 4th ed. (Newtown Square, PA: 2017).

standard does not explicitly identify leading practices but defines portfolio life cycle phases (initiation, planning, execution, and optimization) and performance management domains (strategic management, governance, capacity and capability management, stakeholder engagement, value management, and risk management). Within these phases and domains, PMI identifies principles that are generally recognized as good practices for organizations that need to effectively manage complex programs and projects.[2]

To create actionable leading practices that we might expect to see documentation of when carried out by a government agency, three GAO analysts separately reviewed the portfolio management standard and agreed on a set of 13 leading practices that adequately captured the standard's portfolio life cycle phases and performance management domains. The three analysts determined that these 13 leading practices were relevant for this analysis and were broad and flexible enough to apply to NNSA's management of its nuclear weapons stockpile maintenance and modernization work. Specifically, if implemented by an agency, these leading practices should enhance strategic management of a portfolio and executive decision-making as well as help ensure that programs and projects contribute to an agency's ability to achieve its objectives. We selected these practices because we would expect to see them documented and fully implemented by an organization that effectively manages a portfolio of work through its initiation, planning, execution, and optimization phases.

We also conducted semistructured interviews with NNSA officials from the six offices identified above between August and October 2020 to obtain perspectives on NNSA's current approach to managing its portfolio of programs and projects and how NNSA has implemented the leading practices we selected. In advance and support of these interviews, we provided NNSA officials with a summary of PMI's definitions of a portfolio and portfolio management and how PMI describes the phases and performance management domains of a portfolio. We also provided NNSA officials with our written questions that were organized topically by performance management domains, which we further described in writing

[2]According to PMI, "generally recognized" means that the principles described are applicable to most portfolios most of the time and that there is widespread consensus about their value and usefulness; and "good practice" means that there is general agreement that the application of these principles and performance management activities can enhance the chances of success and are proven to work over a wide range of portfolios.

and verbally. We identified each of our questions as being associated with at least one of the 13 portfolio management leading practices that we selected, recognizing that there was some overlap among our questions due to the high-level nature of portfolio management.

Following these interviews, we conducted a content analysis of NNSA officials' responses to our interview questions to determine how NNSA's approach to managing its portfolio of programs and projects compared with the 13 leading practices for portfolio management. We used a three-point scale to determine the extent to which NNSA officials' current management approach followed portfolio management leading practices. We rated a practice as "fully implemented" if NNSA officials provided evidence that satisfied the leading practice; as "partially implemented" if NNSA officials provided evidence that satisfied a portion of the leading practice; and as "not implemented" if NNSA officials did not provide evidence that satisfied the leading practice. To assess NNSA's approach, two GAO analysts independently reviewed the NNSA officials' responses to our semistructured interview questions and came to agreement upon all assessments. Officials had the opportunity to review our initial assessments of each of the 13 leading practices and provide additional information to us, which we incorporated as appropriate.

To determine the extent to which NNSA has developed a comprehensive and complete capability assessment to support portfolio management, we identified and reviewed the four documents in which NNSA identified and assessed capabilities for the nuclear security enterprise to maintain and modernize the nuclear weapons stockpile. Three of these efforts were in response to legislative language or committee report language directing NNSA to identify and define its capabilities: NNSA's fiscal years 2020 and 2021 *Stockpile Stewardship and Management Plan;* the agency's August 2019 report to Congress, *Roadmap to Meet Modernization and Hedging Production Requirements;* and the 2020 guidance for site strategic planning and management and operating (M&O) contractors' site strategic plans.[3] The fourth effort that we reviewed, the 2020 *Master Asset Plan,* was not in response to specific legislative language. We

[3]NNSA publishes the *Stockpile Stewardship and Management Plan* annually, either in full detailed report form or as a summary, in response to statutory requirements, to support the President's Budget for Weapons Activities. The fiscal year 2020 *Stockpile Stewardship and Management Plan* is a detailed version, and the fiscal year 2021 *Stockpile Stewardship and Management Plan* is a summary version.

reviewed the most current versions of these documents at the time of our review.

The legislative language directing NNSA to identify and define its capabilities included in statutes and a committee report do not expressly define the term "capability."[4] For the purposes of this report, we generally defined the term "capability" to refer to each foundational ability necessary for an organization to achieve its mission and strategic objectives. To determine whether each of NNSA's four efforts to identify and assess capabilities were comprehensive, we identified similarities and differences across the capabilities that NNSA described in each effort. For the purposes of this report, we considered an effort comprehensive if it included all capabilities NNSA needs for the enterprise to meet its nuclear weapons stockpile maintenance and modernization mission that NNSA described in the other efforts.

We considered an effort complete if it included all elements of a capability for each capability identified by the effort. Based on our review of legislative language, we identified common elements related to capabilities: (1) the knowledge or competencies needed to conduct work; (2) the human capital or workforce conducting work; and (3) the infrastructure needed to support the work. To assess the completeness of the four efforts, we used a three-point scale for each of the elements of a capability. We rated each effort as fully considering an element of a capability if the effort included information about the element for all capabilities discussed; as partially considering an element of a capability if the effort included some information about the element for all capabilities discussed; and as not considering an element of a capability if the effort did not include any information about the element for all capabilities discussed. Two GAO analysts reviewed the documents and came to agreement upon all assessments. Officials had the opportunity to review these initial assessments and provide additional information about their capability efforts, which we incorporated as appropriate. We also interviewed NNSA officials from the six relevant offices to discuss steps NNSA has taken to identify and assess its capabilities across the

[4]50 U.S.C. § 2521, Stockpile stewardship program; 50 U.S.C. § 2523, Nuclear weapons stockpile stewardship, management, and responsiveness plan; National Defense Authorization Act for Fiscal Year 2014, Pub. L. No. 113-66, § 3128, 127 Stat. 672, 1065–66 (2013); National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, § 3113, 130 Stat. 2000, 2757–58 (2016); and Senate Report 115-262, to accompany S. 2987, the John S. McCain National Defense Authorization Act for Fiscal Year 2019, 115th Cong. (2018).

enterprise and the extent to which these four efforts inform NNSA's strategic planning and decision-making.

We conducted this performance audit from April 2020 to June 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: The National Nuclear Security Administration's (NNSA) Weapons Activities Portfolio of Work Identified in Fiscal Year 2021 Appropriations

Under the Weapons Activities portfolio, NNSA's weapons programs operate simultaneously with the other programs, projects, and activities for modernizing the infrastructure that the weapons programs rely on for components and strategic materials. NNSA's major modernization programs—which fall under the stockpile management subportfolio—directly support weapons programs such as the W80-4 Life Extension Program. The funding that is not directly appropriated to NNSA's major modernization programs goes to the other programs, projects, and activities that support maintaining or modernizing the weapons stockpile and the enterprise's infrastructure (see table 4).

Table 4: The National Nuclear Security Administration's (NNSA) Weapons Activities Portfolio of Programs, Projects, and Other Activities Identified in Fiscal Year 2021 Appropriations

Dollars in billions

Selected subportfiolios ($)	Programs and other activities	Selected programs, projects, and other activities	Fiscal year 2021 appropriations ($)
Stockpile management (4.3)	Major modernization	W80-4 Life Extension Program (LEP)	1.0
Stockpile management (4.3)	Major modernization	B61 LEP	0.8
Stockpile management (4.3)	Major modernization	W87-1 Modification	0.5
Stockpile management (4.3)	Major modernization	W88 Alteration	0.3
Stockpile management (4.3)	Major modernization	W93	0.05
Stockpile management (4.3)	Sustainment	n/a	1.0
Stockpile management (4.3)	Production operations	n/a	0.6
Stockpile management (4.3)	Dismantlement and disposition	n/a	0.06
Infrastructure and operations (4.1)	Operations and recapitalization	n/a	2.6
Infrastructure and operations (4.1)	Construction	Includes capital asset projects such as uranium processing facility, lithium processing facility, and emergency operations centers	1.5
Stockpile research, technology, and engineering (2.8)	Assessment science	n/a	0.8
Stockpile research, technology, and engineering (2.8)	Advanced simulation and computing	n/a	0.7
Stockpile research, technology, and engineering (2.8)	Inertial confinement fusion	n/a	0.6
Stockpile research, technology, and engineering (2.8)	Engineering and integrated assessments	n/a	0.3
Stockpile research, technology, and engineering (2.8)	Weapon technology and manufacturing maturation	n/a	0.3
Stockpile research, technology, and engineering (2.8)	Academic programs	n/a	0.1

Selected subportfiolios ($)	Programs and other activities	Selected programs, projects, and other activities	Fiscal year 2021 appropriations ($)
Production modernization (2.5)	Primary capability	n/a	1.4
Production modernization (2.5)	Tritium and domestic uranium	n/a	0.5
Production modernization (2.5)	Secondary capability	Includes uranium, depleted uranium, and lithium programs	0.5
Production modernization (2.5)	Nonnuclear capability	n/a	0.1
Defense nuclear security	n/a	n/a	0.8

Source: GAO analysis of NNSA budget information. | GAO-21-398

Note: We listed the subportfolios that included over $0.5 billion in appropriations for fiscal year 2021. Totals may not sum due to rounding.

Appendix III: The National Nuclear Security Administration's (NNSA) Efforts to Identify and Assess Capabilities across the Enterprise

NNSA offices have four separate efforts to identify and assess the agency's capabilities. NNSA's Office of Defense Programs maintains a list of the weapons activities capabilities and a list of the production capabilities; NNSA's Office of Policy maintains a list of the core capabilities for the laboratories, plants, and sites; and the Office of Safety, Infrastructure, and Operations developed a list of infrastructure capabilities (see table 5).

Table 5: The National Nuclear Security Administration's (NNSA) Efforts to Identify Capabilities across the Enterprise

Category	Office of Defense Programs' weapons activities capabilities	Office of Defense Programs' production capabilities	Office of Policy and Strategic Planning's core capabilities	Office of Safety, Infrastructure, and Operation's infrastructure capabilities
Capability effort documented	*Stockpile Stewardship and Management Plan* (fiscal year 2021)	*Roadmap to Meet Modernization and Hedging Production Requirements* (August 2019)	*Strategic Planning Guidance* (2020)	*Master Asset Plan* (2020)
Legislative directive for the document	50 U.S.C. §§ 2521, 2523	Senate Report 115–262 to accompany S. 2987, the John S. McCain National Defense Authorization Act for Fiscal Year 2019	National Defense Authorization Acts for Fiscal Years 2014 and 2017	No legislative requirement for this effort
Definition of capability used for capability effort	Weapons activities capabilities directly contribute and support maintaining the safety, security, and effectiveness of the nation's nuclear deterrent. The *Stockpile Stewardship and Management Plan* for fiscal year 2021 organizes the capabilities into seven groups. Weapons activities capabilities are not mutually exclusive and may overlap.	Production capabilities include the lines of effort needed to produce the war reserve product needed for the stockpile. These capabilities support the modernization of existing facilities and capabilities, and replacement of those that will be at end of life during the next 20 years.	Core capabilities are the skill- and knowledge-based competencies located at each site that support NNSA mission priorities. NNSA guidance notes that core capabilities at a site may differ across time but should always link to mission priorities.	Infrastructure capabilities refer to the programmatic functions, including mission-enabling functions, performed in NNSA operating real property assets to support mission activities.
Purpose of the capability effort	**NNSA's Office of Defense Programs** led development of 33 weapons activities capabilities, included in the fiscal year 2021 *Stockpile Stewardship and Management Plan.* This information is included to fulfill the requirements established in 50 U.S.C. §§ 2521, 2523.	**NNSA's Office of Defense Programs** led development of 23 production capabilities in this strategic document to guide its modernization efforts. The Roadmap is organized into three sections of capabilities: (1) primary production; (2) canned subassemblies and radiation cases; and (3) nonnuclear production. This information is included in response to Senate Report 115–262 to accompany S. 2987, the John S. McCain National Defense Authorization Act for Fiscal Year 2019.	**NNSA's Office of Policy and Strategic Planning** led development of 18 core capabilities in response to legislative requirements in the National Defense Authorization Act for Fiscal Year 2014. The office uses core capabilities during its annual site strategic planning effort to collect information from each site to assess the state of health of laboratories, plants, and sites and to identify trends that potentially impact the nuclear security enterprise.	**NNSA's Office of Safety, Infrastructure, and Operations** developed the infrastructure capabilities in coordination with NNSA program offices to identify interdependencies and improve decision-making and to pinpoint and prioritize investments.

Category	Office of Defense Programs' weapons activities capabilities	Office of Defense Programs' production capabilities	Office of Policy and Strategic Planning's core capabilities	Office of Safety, Infrastructure, and Operation's infrastructure capabilities
How the capability effort is used	Since 2018, the annual *Stockpile Stewardship and Management Plan* has included iterations of weapons activities capabilities as part of a broader strategic effort.	The Roadmap outlines the actions necessary to integrate the identified future stockpile maintenance, production, and modernization requirements and to align programs of record with the current Future-Years Nuclear Security Program and other investment needs.	In fiscal year 2020, each laboratory, plant, and site submitted a strategic plan, which identifies its top five core capabilities. Based on this information, the Office of Policy and Strategic Planning may convene working groups to develop action plans to address any issues identified across the nuclear security enterprise.	Every operating real property asset is assigned at least one of 17 infrastructure capabilities. When a combination of facilities functions as one, they are rolled up into a complex. Facilities for some capabilities are assigned subgroups, such as Waste, to enable additional differentiation.
Example of a capability included	**Atomic and plasma physics:** Atomic physics is the study of atomic systems—in particular, atoms, electrons, and their interaction with different energies of light. Plasma physics is the study of systems containing separate ions and electrons that exhibit a collective behavior. The extremely high temperatures of functioning nuclear weapons generate plasma and X-rays. Capability includes status, and challenges and strategies.	**Detonators:** Technical Area-22 at the Los Alamos National Laboratory is the production site for explosive detonators. It contains laboratory space for detonator development and facilities for warehousing and production, among other things. Aging infrastructure and increased production requirements necessitate new infrastructure. Capability includes infrastructure, critical equipment, and human capital.	**Nuclear physics, nuclear chemistry, and nuclear engineering:** Advances the understanding, production, analysis, and application of nuclear isotopes and nuclear decay pathways, as well as the development of experimental and production energy sources based on nuclear fission and fusion reactions.	**Capability linkages:** The capabilities are grouped into primaries; secondaries; nonnuclear components; research, development, test, an evaluation; weapons operation; and other activities.

Source: GAO analysis of NNSA information. | GAO-21-398

Note: Capability efforts are subject to change to better reflect users' needs. For example, the Office of Policy and Strategic Planning previously identified 25 core capabilities for the site strategic planning effort in fiscal year 2019 and 18 capabilities for fiscal year 2020. The *Stockpile Stewardship and Management Plan* included 28 weapons activities capabilities in fiscal year 2018 and 30 weapons activities capabilities in fiscal years 2019 and 2020. The *Stockpile Stewardship and Management Plan* for fiscal year 2021 included 33 weapons activities capabilities. Our analysis is based on the latest versions of each document or strategic effort.

Appendix IV: Comments from the Department of Energy

Department of Energy
Under Secretary for Nuclear Security
Administrator, National Nuclear Security Administration
Washington, DC 20585

May 10, 2021

Ms. Allison B. Bawden
Director, Natural Resources
and Environment
U.S. Government Accountability Office
Washington, DC 20548

Dear Ms. Bawden:

Thank you for the opportunity to review the Government Accountability Office (GAO) draft report "Nuclear Security Enterprise: NNSA Should Use Portfolio Management Leading Practices to Support Modernization Efforts" (GAO-21-398). As noted in the draft report, the National Nuclear Security Administration (NNSA) is in the early stages of implementing its portfolio management processes. We appreciate GAO's acknowledgment of our progress in applying a portfolio management approach to our Weapons Activities work.

NNSA agrees with the report's premise that leading practices can be useful in developing a portfolio management strategy. Implementation of these generic principles, however, must be flexible to suit the unique needs and processes of the nuclear security enterprise. We must also balance the desire to invest in new approaches and leading practices with the urgencies of achieving our critical missions. NNSA concurs in principle with GAO's recommendations, and will continue to evaluate and implement selected leading practices where appropriate as our portfolio management approach continues to mature, while tailoring implementation to meet the unique needs of the enterprise. Documentation of related policies and procedures will also evolve over time as resources and circumstances are assessed.

The attached Management Decision outlines specific current and planned activities related to the auditors' recommendations. Our subject matter experts have also provided technical and general comments under separate cover for your consideration to enhance the clarity and accuracy of the report. If you have any questions about this response, please contact Dean Childs, Director, Audits and Internal Affairs, at (301) 903-1341.

Sincerely,

Charles P. Verdon
Acting Under Secretary for Nuclear Security
and Administrator, NNSA

Enclosure

Enclosure

NATIONAL NUCLEAR SECURITY ADMINISTRATION

Management Decision
"Nuclear Security Enterprise: NNSA Should Use Portfolio Management Leading Practices to Support Modernization Efforts" (GAO-21-398)

The Government Accountability Office (GAO) recommends the Department of Energy's (DOE) National Nuclear Security Administration (NNSA):

Recommendation 1: Establish an enterprise-wide portfolio management framework. The framework should define the portfolio of weapons stockpile and infrastructure maintenance and modernization programs and its governance roles as well as include portfolio-level selection criteria, prioritization criteria, and performance metrics.

Management Response: Concur in principle. NNSA agrees that leading practices can be useful in developing a portfolio management approach. Implementation of these generic principles, however, must be flexible to suit the unique needs and processes of the agency. NNSA's well-established budget portfolios reflected in the Fiscal Year 2021 budget structure, together with capability portfolios as defined in the Stockpile Stewardship and Management Plan, represent the core of our portfolio management framework. Weapons Activities efforts are closely coordinated with the Department of Defense and other stakeholders to ensure strategic objectives are met and unity of purpose is achieved. Performance metrics for the Weapons Activities portfolio are tracked throughout the year through execution reviews and reported to leadership twice annually, and prioritization is developed as part of the budget process. While we will continue to enhance and refine the framework as our portfolio management activities mature, we believe the core framework is both defined and in place. NNSA considers this recommendation closed based on existing documents and processes.

Recommendation 2: Work across the agency's offices that contribute to achieving the goals and objectives of the stockpile maintenance and modernization portfolio to develop a comprehensive capability assessment that incorporates the three elements of capabilities (knowledge, human capital, and infrastructure).

Management Response: Concur in principle. Capability assessments in the annual Stockpile Stewardship and Management Plan are coordinated across the NNSA enterprise to identify the knowledge, human capital, and infrastructure capabilities and needs required to achieve strategic goals and mission objectives. NNSA will continue to refine these assessments in future Stockpile Stewardship and Management Plans. As this is an existing, ongoing process, NNSA considers this recommendation closed.

Accessible Text for Appendix IV: Comments from the Department of Energy

Page 1

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Director, Natural Resources and Environment
U.S. Government Accountability Office
Washington, DC 20548

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Sincerely,

Charles P. Verdon
Acting Under Secretary for Nuclear Security and Administrator, NNSA

Enclosure

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NATIONAL NUCLEAR SECURITY ADMINISTRATION

Management Decision

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Recommendation 2: Work across the agency's offices that contribute to achieving the goals and objectives of the stockpile maintenance and modernization po1tfolio to develop a comprehensive capability assessment that incorporates the three elements of capabilities (knowledge, human capital, and infrastructure).

Management Response: Concur in principle. Capability assessments in the annual Stockpile Stewardship and Management Plan are coordinated across the NNSA enterprise to identify the knowledge, human capital, and infrastructure capabilities and needs required to achieve strategic goals and mission objectives. NNSA will continue to refine these assessments in future Stockpile Stewardship and Management Plans. As this is an existing, ongoing process, NNSA considers this recommendation closed.

Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

Allison B. Bawden at (202) 512-3841 or bawdena@gao.gov

Staff Acknowledgments

In addition to the contact named above, Hilary Benedict (Assistant Director), Elizabeth Luke (Analyst in Charge), William Gerard, Cindy Gilbert, Gwen Kirby, Christina Pineda, and Sara Sullivan made key contributions to this report. Also contributing to this report were William Bauder, Alisa Carrigan, Penney Harwell Caramia, Jason Holliday, Travis Masters, Madhav Panwar, and William Reinsberg.

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