NUCLEAR WASTE CLEANUP

NNSA Should Improve Its Strategy for Managing Anticipated Waste from Defense Activities

Report to Congressional Committees

December 2024
GAO-25-107636
United States Government Accountability Office

Accessible Version

GAO Highlights

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Highlights of GAO-25-107636, a report to congressional committees

December 2024

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NNSA Should Improve Its Strategy for Managing Anticipated Waste from Defense Activities

Why GAO Did This Study

Decades of nuclear weapons production and research generated millions of gallons of hazardous and radioactive waste. NNSA's ongoing maintenance and modernization activities of the nuclear weapons stockpile are expected to generate a considerable volume of additional waste. However, a Senate committee report questioned whether there are sufficient facilities to address the waste generated by these activities, and whether such facilities are included in current plans and budgets.

NNSA was required by statute to develop a comprehensive strategy for treating, storing, and disposing of the waste generated by these activities. In July 2022, NNSA created an office to manage the planning and execution of waste operations and disposition activities for all its missions.

A Senate committee report accompanying a bill for the National Defense Authorization Act for Fiscal Year 2022 includes a provision for GAO to assess NNSA's strategy. This report examines the extent to which NNSA's strategy is comprehensive and addresses statutory requirements. GAO reviewed documents and data from DOE and interviewed department officials.

What GAO Recommends

GAO is recommending that NNSA include the key components of a comprehensive strategic plan and fully address statutory requirements in its required update to congressional committees with the President's budget request for fiscal year 2027.

NNSA concurred with this recommendation.

What GAO Found

The National Nuclear Security Administration's (NNSA)—a separately organized agency within the Department of Energy (DOE)—February 2024 strategy for treating, storing, and disposing of the anticipated increase in nuclear waste from stockpile maintenance and modernization activities is not comprehensive and does not fully address all statutory requirements. When comparing the strategy to the seven key components of a comprehensive strategic plan, GAO found that the strategy substantially meets one key component (see table).

Analysis of How the National Nuclear Security Administration's Strategy Follows Key Components of a Comprehensive Strategic Plan

Key component	GAO assessment
Mission statement	*Substantially meets*
Problem definition, scope, and methodology	*Minimally meets*
Goals and objectives	*Minimally meets*
Activities, milestones, and performance measures	*Minimally meets*
Resources and investments	*Partially meets*
Organizational roles, responsibilities, and coordination	*Partially meets*
Key external factors	*Partially meets*

Source: GAO analysis of Department of Energy information and GAO-13-201. | GAO-25-107636

NNSA's strategy includes a mission statement, but the other key components of a comprehensive strategic plan are partially or minimally addressed. In addition, the strategy does not fully address statutory requirements. For example:

- **Generated waste amounts**. Though the strategy's scope is a 25-year period, the 25-year outlook does not include anticipated waste from important upcoming activities, such as reestablishing plutonium pit production capability or surplus plutonium disposition.
- **Coordination with the Office of Environmental Management (EM)**. The strategy recommends establishing formal coordination mechanisms with EM, which has responsibilities for waste disposal, but it does not define formal coordination or describe NNSA's plans to create this mechanism.
- **Cost estimates.** NNSA estimated costs of about $2.5 billion over the next 5 years, but the estimate may not be reasonable, in part because NNSA used inconsistent and unclear information and did not perform risk and uncertainty analyses.
- **Disposal options.** The strategy did not identify disposal facilities, including any needed modifications. It states that other locations that could be used to dispose of high-risk waste should be identified or developed.

NNSA officials stated that they consider their strategy as a snapshot-in-time report that summarizes the NNSA sites' plans, rather than a plan that sites will follow in the future. Nevertheless, NNSA should include all the key components of a comprehensive strategy and fully address statutory requirements in its next strategy update. Doing so would better position NNSA to increase the probability of the strategy's success and avoid the challenges that have affected efforts to dispose of waste generated by previous atomic weapons production activities.

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Abbreviations

- DOE: Department of Energy
- EM: Office of Environmental Management
- LLW: Low-level waste
- MLLW: Mixed low-level waste
- NNSA: National Nuclear Security Administration
- TRU: Transuranic
- WIPP: Waste Isolation Pilot Plant

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December 11, 2024

Congressional Committees

Decades of federal nuclear weapons production and energy research in the United States have generated millions of gallons of radioactive waste, thousands of tons of spent nuclear fuel and special nuclear material, and large quantities of contaminated soil and water.[1] The Department of Energy (DOE) has spent hundreds of billions of dollars to treat, store, and dispose of this waste, and hundreds of billions more will be needed, according to DOE.[2] In addition, ongoing maintenance and modernization of the U.S. nuclear weapons stockpile, carried out by the National Nuclear Security Administration (NNSA)—a separately organized agency within DOE—will generate additional radioactive waste. In particular, for the first time in decades, NNSA is embarking on activities to fabricate new plutonium pits—the cores of nuclear weapons—that are expected to generate a considerable volume of waste. However, a congressional committee report questioned whether there are sufficient facilities to address the waste generated by stockpile maintenance and modernization activities, and whether such facilities are included in NNSA's current plans and budgets.[3]

In July 2022, NNSA created the Office of Environment, Safety, and Health. Within this office, NNSA created the Enterprise Waste Management Division to facilitate improvements in the planning and execution of waste operations and disposition activities across the NNSA enterprise to enable the safe, compliant, and timely processing of waste for all NNSA missions. In addition, in response to a statutory requirement, the Enterprise Waste Management Division developed a strategy for the treatment, storage, and disposition of defense nuclear waste, which NNSA issued in February 2024.[4] Specifically, section 3137 of the National Defense Authorization Act for Fiscal Year 2022 required NNSA to develop a comprehensive strategy for treating, storing, and disposing of defense nuclear waste generated as a result of stockpile maintenance and

[1]Spent nuclear fuel is fuel that has been withdrawn from a nuclear reactor following irradiation. Special nuclear material includes plutonium and uranium enriched in uranium-233 or uranium-235.

[2]It is the responsibility of DOE's Office of Environmental Management (EM) to address this waste from these Cold War legacy activities. EM has spent more than $215 billion from 1989—the beginning of its cleanup program—through fiscal year 2023. EM spends billions of dollars annually on environmental cleanup efforts, but the estimated environmental liability has generally risen over time. For example, adjusted for inflation, the fiscal year 2023 environmental liability represents a $95 billion increase (30 percent) from the fiscal year 2016. As of March 2024, EM estimated an additional $685 billion to spend on this cleanup. DOE represents about 85 percent of the federal government's reported environmental liabilities, and we have had DOE on this area of our High-Risk List since 2017. See GAO, *Nuclear Waste Cleanup: Closer Alignment with Leading Practices Needed to Improve Department of Energy Program Management*, GAO-24-105975 (Washington, D.C.: June 4, 2024).

[3]S. Rep. No. 117-39, at 352 (2021). We included DOE's management of its cleanup program, projects, and acquisitions on our 2023 High-Risk List. We have listed DOE in our High-Risk Series since 1990 because the department's record of inadequate management and oversight of contractors, which conduct the cleanup work at DOE sites, have left it vulnerable to fraud, waste, abuse, and mismanagement. See GAO, *High-Risk Series: Efforts Made to Achieve Progress Need to Be Maintained and Expanded to Fully Address All Areas,* GAO-23-106203 (Washington, D.C.: Apr. 20, 2023).

[4]Pub. L. No. 117-81, div. C, tit. XXXI, § 3137(a), 135 Stat. 1541, 2232 (2021). NNSA was required to submit the report by December 27, 2022. Department of Energy, *National Nuclear Security Administration's Strategy for the Treatment, Storage, and Disposition of Defense Nuclear Waste* (Washington, D.C.: Feb. 2024).

modernization activities for the next 5, 10, and 25 fiscal years.[5] The strategy was required to include budget estimates for the next 5 fiscal years, a description of plans to coordinate with the Office of Environmental Management (EM)—which manages the resulting waste—and identification of disposal facilities that could accept the waste and those that would need modifications to accept the waste. Section 3137 also requires NNSA to update this strategy and submit it to congressional defense committees concurrent with the President's budget request for fiscal year 2027.[6]

A Senate committee report accompanying a bill for the National Defense Authorization Act for Fiscal Year 2022 includes a provision for GAO to assess NNSA's strategy.[7] In this report, we examined the extent to which NNSA's strategy is comprehensive and addresses the statutory requirements for the strategy.

To examine the extent to which NNSA's strategy is comprehensive, we reviewed relevant documents received from NNSA, such as published and draft versions of the waste strategy. We also interviewed NNSA headquarters officials, including those from NNSA's Division of Enterprise Waste Management—which oversees NNSA's waste management and development of this strategy—and from NNSA's Office of Defense Nuclear Nonproliferation. We also assessed the strategy against seven key components of a comprehensive strategic plan that we identified in prior work.[8] We used a five-point scale to score each component.[9] According to these criteria, for a strategy to be comprehensive, it must meet all seven key components.

To further examine the comprehensiveness of NNSA's strategy, we:

- reviewed information in the final strategy about the types and amounts of defense nuclear waste generated as a result of stockpile maintenance and modernization activities over a 25-year period from the time of issuance—as required by section 3137.[10] We also reviewed a prior draft of the strategy and additional

[5]Pub. L. No. 117-81, div. C, tit. XXXI, § 3137(a), (b)(1), 135 Stat. 1541, 2232 (2021). The strategy was required to include a projection of the location, type, and quantity of defense nuclear waste NNSA anticipates generating as a result of stockpile maintenance and modernization activities for the next 5 and 10 fiscal years and a long-term outlook for the next 25 fiscal years.

[6]Pub. L. No. 117-81, div. C, tit. XXXI, § 3137(c), 135 Stat. 1541, 2232-2233 (2021).

[7]S. Rep. No. 117-39, at 351 (2021).

[8]The seven key components of a comprehensive strategy are: mission statement; problem definition, scope, and methodology; goals and objectives; activities, milestones, and performance measures; resources and investments; organizational roles, responsibilities, and coordination; and key external factors. GAO identified these criteria in prior reports. See GAO-24-105975.

[9]The five-point scoring system was as follows: "fully met" means that NNSA's strategy completely met the key component; "substantially met" means that NNSA's strategy met a large portion of the key component; "partially met" means that NNSA's strategy met about half of the key component; "minimally met" means that NNSA's strategy met a small portion of the key component; and "not met" means that NNSA's strategy did not meet the key component at all. In contrast, if the score was "partially met," "minimally met," or "not met," we concluded that the strategy did not follow the key component. To develop the scoring, two analysts independently examined and provided a score for each key component. A third independent supervisory analyst then verified that the initial analysts came to an appropriate conclusion in their initial review.

[10]The strategy is required to include a projection of the location, type and quantity of defense nuclear waste NNSA anticipates generating as a result of stockpile maintenance and modernization activities for the next 5 and 10 fiscal years and a long-term outlook for the next 25 fiscal years. Pub. L. No. 117-81, div. C, tit. XXXI, § 3137(b)(1), 135 Stat. 1541, 2232 (2021).

sources of data, such as the 2023 Annual Transuranic (TRU) Waste Inventory Report.[11] We reviewed data on waste amounts received by NNSA headquarters from the sites and interviewed NNSA headquarters officials about the data listed in the strategy and the data received from the sites. We reviewed the reasonableness of the data on waste amounts by reviewing how the data in the final version compared with data in an initial, unpublished version of the strategy, and with data NNSA headquarters received from the sites. We also interviewed NNSA officials about the quality of the waste data, as discussed later in the report.[12]

- reviewed information included in NNSA's strategy and interviewed NNSA and EM headquarters officials in charge of waste management and coordination about the agencies' plans to coordinate treatment, storage, and disposal of the anticipated waste. We also reviewed DOE's Radioactive Waste Management Manual that describes responsibilities for coordinating the waste management program across the DOE complex.[13] In addition, we reviewed GAO's leading practices for enhancing interagency collaboration (see app. I for a full list of these leading practices).[14]
- reviewed the 5-year cost estimate that NNSA developed for the strategy against key elements from each of the four characteristics of a quality cost estimate described in GAO's Cost Estimating Guide.[15] We reviewed cost information that NNSA headquarters received from sites, and interviewed NNSA officials about this information and the process used to develop the estimate.

We conducted this performance audit from June 2024 through December 2024 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

[11]DOE's annual TRU waste inventory report is intended to keep track of the TRU waste disposed of at the Waste Isolation Pilot Plant (WIPP), a repository in New Mexico, and to estimate the volumes of TRU waste planned for disposal at WIPP until the facility's closure.

[12]We also reviewed the reliability of the waste amount data in DOE's Annual Transuranic Waste Inventory Report as part of work conducted on a prior report. We found the data were reliable for the purposes of reporting transuranic waste volumes beyond 2033. However, we noted that the estimated future volumes are uncertain due factors that may increase or decrease the volume.

[13]Department of Energy, *Radioactive Waste Management Manual*, Manual 435.1-1 (Washington, D.C.: Jan. 11, 2021).

[14]As we stated in May 2023, interagency collaboration involves collaboration or coordination between two or more federal entities, or within components of the same entity. Collaboration can be broadly defined as any joint activity that is intended to produce more public value than could be produced when the entities act alone. These leading practices were developed as part of supporting the implementation of the performance planning and reporting framework originally put into place by the Government Performance and Results Act of 1993. GAO, *Government Performance Management: Leading Practices to Enhance Interagency Collaboration and Address Crosscutting Challenges*, GAO-23-105520 (Washington, D.C.: May 24, 2023).

[15]We identified the following elements for evaluation as being applicable to the level of detail in NNSA's strategy (1) the technical baseline, ground rules and assumptions (under the comprehensive characteristic), (2) estimating methodologies and data (under the accurate characteristic), (3) application of risk, sensitivity, and crosschecks (under the credible characteristic), and (4) the approval process (under the well-documented characteristic). We did not perform a full reliability assessment against all GAO's cost estimating best practices. However, our review enabled us to describe the scope of the estimate, the detail included in the technical baseline, and assess the approach and data used to inform the cost estimate methodologies. GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs,* GAO-20-195G (Washington, D.C.: Mar. 20, 2020).

audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

NNSA's Weapons Maintenance and Modernization Activities

The United States is amid a long-term effort to modernize its nuclear security enterprise. The primary goal of this effort is to ensure the country's nuclear stockpile—composed of thermonuclear warheads and bombs—is safe, secure, and reliable as the nation's nuclear deterrent. To support this mission, NNSA is responsible for overseeing research, development, testing, and acquisition programs that produce, maintain, and sustain the stockpile.

NNSA undertakes nuclear stockpile modernization programs in coordination with the Department of Defense. The programs refurbish or replace nuclear weapons and their components to enhance their safety and security characteristics. They also seek to consolidate the stockpile into fewer weapon types to minimize maintenance and testing costs while preserving needed military capabilities.[16]

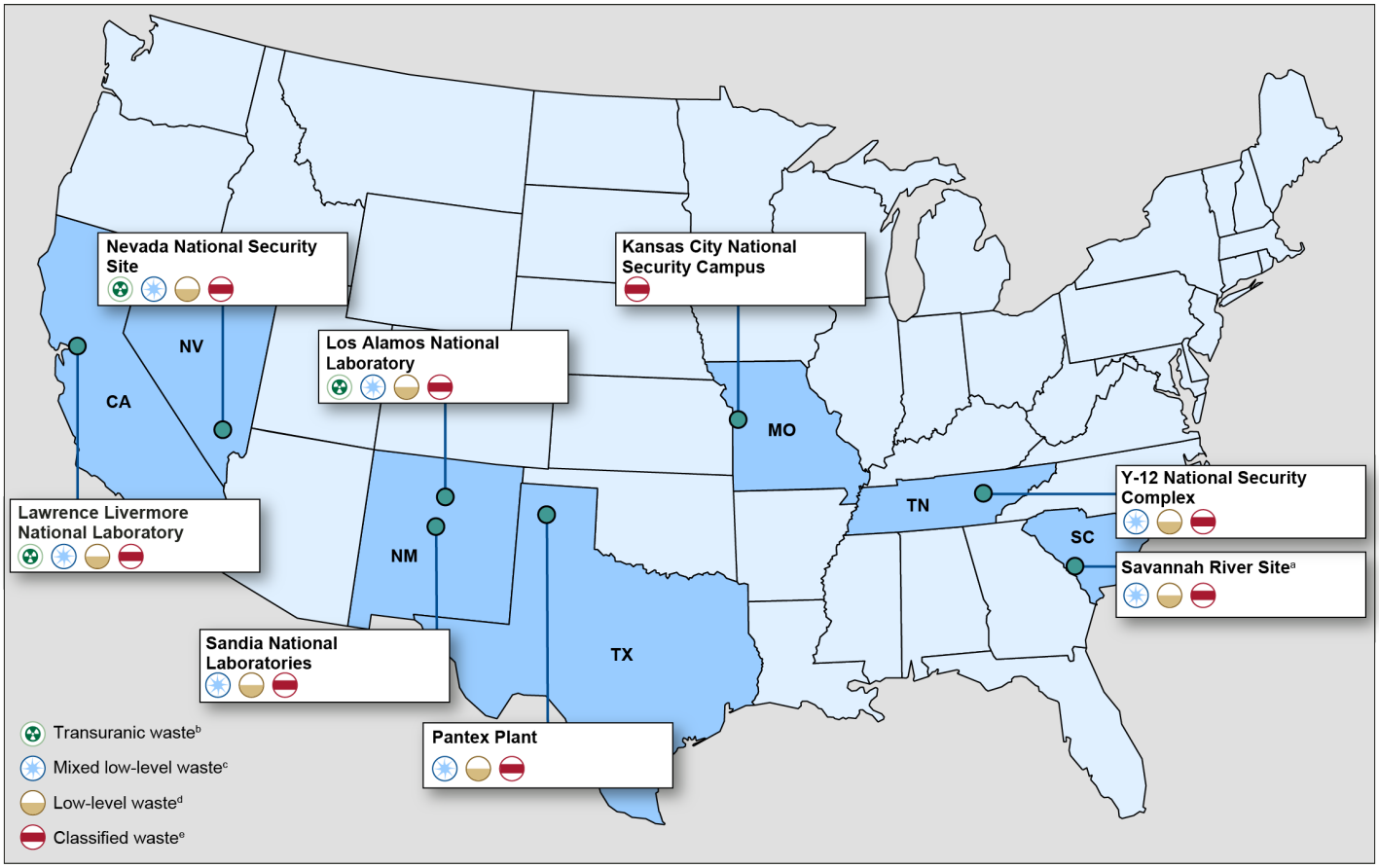
NNSA produces defense nuclear waste as a byproduct of its stockpile maintenance and modernization activities at eight sites (see fig. 1). This waste includes the following types:

- **Transuranic (TRU) waste.** TRU waste consists of material contaminated with man-made radioactive elements, which have atomic numbers greater than that of uranium (e.g., waste contaminated with plutonium, neptunium, or americium) with half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram. This waste consists of solid sludge, clothing, tools, rags, residues, soils, and debris.
- **Mixed low-level waste (MLLW).** MLLW includes radioactive waste types that could also contain hazardous components regulated under the Resources Conservation and Recovery Act of 1976, as amended (i.e., certain heavy metals, lead and arsenic, or toxic chemicals), referred to as "mixed waste." Two examples of MLLW include (1) protective clothing contaminated with both hazardous solvents and cleaners and radioactive materials like tritium and uranium, and (2) laboratory chemicals containing residues of both hazardous and radioactive materials.
- **Low-level waste (LLW).** LLW is radioactive waste material that is generally acceptable for disposal in a land disposal facility and can consist of the same sludge and debris types as TRU waste.
- **Classified waste.** Classified waste contains classified material that may or may not have radioactive and/or hazardous constituents for which permanent disposal must be protected in the interest of national security. It may be classified due to its form and/or content. Classified waste can include radioactive and

[16]In May 2021, we reported on Department of Defense and NNSA efforts to modernize nuclear weapons. For more information, see GAO, *Nuclear Triad: DOD and DOE Face Challenges Mitigating Risks to U.S. Deterrence Efforts*, GAO-21-210 (Washington, D.C.: May 6, 2021).

non-radioactive weapon components from dismantlement activities or computing equipment and electronic media that were once used to store or process classified information. It requires special secure disposition in a government facility.

Figure 1. Types of Nuclear Waste Produced by Stockpile Maintenance and Modernization Activities at National Nuclear Security Administration Sites as Indicated in NNSA's Strategy



Sources: GAO analysis of Department of Energy information; GAO (icons); and Map Resources (map). | GAO-25-107636

Accessible Data for Figure 1. Types of Nuclear Waste Produced by Stockpile Maintenance and Modernization Activities at National Nuclear Security Administration Sites as Indicated in NNSA's Strategy

Site	Transuranic waste[a]	Mixed low-level waste[b]	Low-level waste[c]	Classified waste[d]
Kansas City National Security Campus				yes
Los Alamos National Laboratory	yes	yes	yes	yes
Lawrence Livermore National Laboratory	yes	yes	yes	yes
Nevada National Security Site	yes	yes	yes	yes
Pantex		yes	yes	yes

Site	Transuranic waste[a]	Mixed low-level waste[b]	Low-level waste[c]	Classified waste[d]
Sandia National Laboratory		yes	yes	yes
Savannah River Site[e]		yes	yes	yes
Y-12 National Security Complex		yes	yes	yes

Sources: GAO analysis of Department of Energy information; GAO (icons); and Map Resources (map). I GAO-25-107636

[a]NNSA stated in its waste strategy that it did not include transuranic waste at Savanah River Site produced by surplus plutonium disposition program in its strategy because it determined that surplus plutonium is not waste generated by stockpile maintenance and modernization activities. Department of Energy, *National Nuclear Security Administration's Strategy for the Treatment, Storage, and Disposition of Defense Nuclear Waste* (Washington, D.C.: Feb. 2024).

[b]Transuranic (TRU) waste includes discarded rags, tools, equipment, soils or other materials that have been contaminated by man-made radioactive elements, like plutonium.

[c]Mixed low-level waste includes radioactive waste types that could also contain hazardous components regulated under the Resources Conservation and Recovery Act of 1976, as amended (i.e., certain heavy metals or toxic chemicals), referred to as "mixed waste."

[d]Low-level waste is radioactive waste material that is generally acceptable for disposal in a land disposal facility and can consist of the same sludge and debris types as TRU waste.

[e]Classified waste contains classified material that may or may not have radioactive and/or hazardous constituents for which permanent disposal must be protected in the interest of national security.

Plutonium Pit Production Mission

The United States has not regularly manufactured plutonium pits—the central core of a nuclear weapon—since 1989. Military and legal requirements direct DOE to have capacity to produce at least 80 pits per year by 2030.[17] NNSA plans to sustain this capability into the future. According to a May 2020 NNSA report to Congress, reestablishing a pit production capability is considered critical to maintaining the nation's nuclear weapons stockpile.[18] Because plutonium is dangerous and must be handled carefully, the production of pits for nuclear warheads is difficult and expensive.

NNSA plans to produce 80 plutonium pits per year at two sites. At Los Alamos National Laboratory, NNSA plans to produce 30 pits per year using a broad range of program activities, five large capital asset projects, and other projects. At the Savannah River Site, NNSA plans to produce 50 pits per year using one large capital asset project and some program activities. Several other NNSA and DOE sites will play important supporting roles. Reestablishing pit production likely represents NNSA's largest investment in weapons production infrastructure to date.

[17]50 U.S.C. § 2538a(a)(5). For additional information, see GAO, *Nuclear Weapons: NNSA Does Not Have a Comprehensive Schedule or Cost Estimate for Pit Production Capability*, GAO-23-104661 (Washington, D.C.: Jan. 12, 2023).

[18]For the purposes of this report, the phrase "pit production capability" refers to the capability to produce 80 plutonium pits per year, unless otherwise noted. According to a May 2020 NNSA report to Congress, reestablishing a pit production capability is considered critical to maintaining the nation's nuclear weapons stockpile to meet modern standards for safety and reliability.

Surplus Plutonium Disposition

The United States has 57.2 metric tons of weapons-usable plutonium it has declared surplus and that requires disposition, as we reported in 2019.[19] This plutonium exists in various metal and non-metal forms, including older, previously produced plutonium pits. To prevent insidious use of this plutonium, DOE plans to disassemble the pits into metal; convert the plutonium metal to plutonium oxide (a powder-like substance); dilute it with inert material; and dispose of it at the Waste Isolation Pilot Plant (WIPP), a repository in New Mexico. Of DOE's inventory of surplus plutonium, about 43.8 metric tons, or 77 percent, is plutonium metal that could be converted to plutonium oxide for dilution and disposal. Of this amount, NNSA manages about 33.3 metric tons in the form of pits.

Under the Plutonium Management and Disposition Agreement—signed in 2000 and amended in 2006 and 2010—the United States and Russia pledged to dispose of at least 34 metric tons of surplus weapons-grade plutonium no longer needed for defense purposes. In April 2024, NNSA announced its decision to use the dilute-and-dispose method to permanently dispose of 34 metric tons of surplus plutonium, which is the scope of NNSA's Surplus Plutonium Disposition Program.[20]

NNSA's Strategy for Managing Its Anticipated Waste Is Not Comprehensive and Does Not Fully Address the Statutory Requirements

NNSA's strategy for managing waste resulting from stockpile maintenance and modernization activities is not comprehensive and does not fully address the statutory requirements. Section 3137 required NNSA to issue a comprehensive strategy. However, the strategy that NNSA submitted to Congress was not comprehensive because it substantially met one of seven key components for comprehensive strategic plans. NNSA's strategy includes little information on the scope of waste to be disposed; the challenges NNSA may face with treating, storing, and disposing of the waste; and the resources needed (see table 1).[21]

In addition to being comprehensive, section 3137 specifically required NNSA's strategy to include (1) a projection of the location, type, and quantity of defense nuclear waste NNSA anticipates generating as a result of stockpile maintenance and modernization activities during the next 5 and 10 fiscal years and a long-term

[19]In addition, EM manages 6.5 metric tons, and DOE's Office of Nuclear Energy manages 4 metric tons in the form of reactor fuel. EM manages another 11 percent, or 6.4 metric tons, of DOE's surplus plutonium that is already in oxide form. We previously reported the information in this paragraph in GAO, *Surplus Plutonium Disposition: NNSA's Long-Term Plutonium Oxide Production Plans Are Uncertain*, GAO-20-166 (Washington, D.C.: Oct. 23, 2019).

[20]*Record of Decision for the Final Environmental Impact Statement for the Surplus Plutonium Disposition Program*, 89 Fed. Reg. 28763 (Apr. 19, 2024).

[21]To be comprehensive, the strategy must follow all key components. If the score for the key component was "fully met" or "substantially met," we concluded that the strategy followed that key component. In contrast, if the score was "partially met," "minimally met," or "not met," we concluded that the strategy did not follow the key component.

outlook for the next 25 fiscal years; (2) a description of how NNSA plans to coordinate with EM to treat, store, and dispose of the type and quantity of waste projected to be generated; (3) budgetary estimates for the projected waste for the period of 5 fiscal years after the submission of the strategy; and (4) identification of disposal facilities that could accept the projected waste, and disposal facilities that could accept the waste with modifications, along with the modifications necessary. We found that the strategy included a cost estimate but did not fully address the remaining requirements.

Table 1: Analysis of How the National Nuclear Security Administration's Strategy for Managing Defense Nuclear Waste Resulting from Stockpile Maintenance and Modernization Activities Follows Key Components of a Comprehensive Strategic Plan

Key component	Definition	GAO assessment
Mission statement	A comprehensive statement that summarizes the main purposes of the strategy.	*Substantially meets*
Problem Definition, Scope, and Methodology.	Identification of the issues to be addressed by the strategy, the scope of its coverage, the process by which it was developed, and key considerations and assumptions used in the development of the plan.	*Minimally meets*
Goals and Objectives	Identification of goals and objectives to be achieved by the strategy.	*Minimally meets*
Activities, Milestones, and Performance Measures	Identification of the steps to achieve the goals and objectives, as well as milestones and performance measures to gauge results.	*Minimally meets*
Resources and Investments	Identification of costs to execute the plan and the sources and types of resources and investments, including skills and technology, human capital and other resources required to meet the goals and objectives.	*Partially meets*
Organizational Roles, Responsibilities, and Coordination	Development of roles and responsibilities in managing and overseeing the implementation of the strategy and the establishment of mechanisms for multiple stakeholders to coordinate their efforts throughout implementation and make necessary adjustments to the strategy based on performance.	*Partially meets*
Key External Factors	Identification of key factors external to the organization and beyond its control that could significantly affect the achievement of the long-term goals contained in the strategy. These external factors can include economic, demographic, social, technological, or environmental factors, as well as conditions that would affect the ability of the agency to achieve the results desired.	*Partially met*

Source: GAO analysis of Department of Energy information and GAO-13-201. | GAO-25-107636

NNSA's Strategy Has a Mission Statement That Largely Mirrors the Statutory Language

NNSA's strategy substantially meets the key component for including a results-oriented mission statement because it largely mirrors the statutory language requiring it. Specifically, the strategy states that its purpose is to summarize "the generation, disposition, and management strategies for defense nuclear waste related to stockpile maintenance and modernization and associated activities." In addition, the strategy acknowledges that coordination is required between NNSA, EM, and many other DOE offices. We assessed this component to be "substantially met," rather than "fully met," because it does not discuss the details called for in a

comprehensive strategic plan. For example, the strategy does not discuss whether duplication of mission exists and, if so, how the duplication of mission is addressed.[22]

The Strategy Does Not Fully Define the Extent of the Problem, such as Including All Anticipated Waste

NNSA's strategy minimally meets the key component for including a problem definition, scope, and methodology. NNSA's strategy does not describe the problem it is intended to address. It does not identify the problems DOE may face with storing, treating, and disposing of this waste or explain how this strategy will address those problems. For example, though the strategy's scope covers a 25-year period, its discussion of waste amounts includes data on average annual waste generated for the first 10 years for the types of waste—TRU, MLLW, LLW, and classified waste—that NNSA anticipates generating from stockpile maintenance and modernization activities.[23] NNSA estimated in the strategy that the amount of MLLW is about 1 percent of the total amount of DOE waste disposed in 2021 and LLW is about 5.6. We separately calculated that the amount of TRU waste is about 12 percent of the average annual amount of waste planned for disposal at WIPP through calendar year 2033.[24] The Los Alamos National Laboratory and Y-12 sites will produce the most waste, according to the strategy.

The strategy contains a long-term outlook for the next 25 fiscal years, but the outlook does not include all waste NNSA anticipates generating in that period. The strategy assumes that waste generation beyond the first 10 years would continue at the same rate as prior years. However, NNSA stated in an initial, unpublished draft version of the strategy that, in addition to the waste streams discussed for the first 10-year period, radioactive waste will also be generated from the plutonium pit production mission and the surplus plutonium disposition program.

Specifically, the 2022 draft version of NNSA's strategy stated that:

- waste resulting from reestablishing pit production capability is not expected to be generated until the 11- to 25-year long-term outlook period,[25]
- the TRU waste generated by the pit production mission has already been considered in planning for disposal at WIPP, and

[22]NNSA officials told us that the objective of coordination between NNSA and EM is to provide planning data and generally to assure nuclear waste generated by stockpile management activities conforms to waste acceptance criteria at disposal facilities.

[23]NNSA's strategy states that these are estimated annual waste generation amount in cubic meters between 2023-2032.

[24]We based this calculation on information from DOE's 2023 Annual Transuranic (TRU) Waste Inventory Report.

[25]While military and legal requirements direct DOE to have capacity to produce no fewer than 80 pits per year by 2030, the commander of U.S. Strategic Command testified in March 2022 that NNSA would not meet the 80-pit-per-year manufacturing capability in 2030. As we reported in a January 2023 report, meeting required pit production levels of 80 per year would take 2 to 5 years longer than NNSA originally planned (2032-2035). See GAO-23-104661.

- waste from surplus plutonium disposition being generated at the current rate could be generated at a higher rate in the future.

However, this information was not included in the final version. Plutonium pit production is part of nuclear weapons stockpile maintenance and modernization that is expected to generate a considerable amount of waste, as noted in a Senate committee report discussion of the NNSA waste strategy requirement.[26] NNSA officials told us that the published version of the strategy did not include estimated waste amounts from reestablishing a pit production capability because it was too early in the process to provide meaningful information. The information they needed was not available or able to be verified before the final strategy was published.

Officials further explained that waste amounts from surplus plutonium disposition were also excluded from the published version after internal deliberations. These deliberations led to the conclusion that section 3137 did not require surplus plutonium to be included in the strategy because it is not waste generated from stockpile maintenance and modernization activities.[27] In addition, NNSA officials stated that NNSA had not had a record of decision on the method to treat 34 metric tons of surplus plutonium at the time the strategy was published.[28]

Based on information in DOE's 2023 Annual Transuranic Waste Inventory, we calculated that TRU waste from reestablishing a plutonium pit production capability represents about 68 percent of DOE's total amount bound for WIPP in New Mexico, while TRU waste from surplus plutonium represents about 4 percent, beyond 2033 (see fig. 2).[29] Based on the design of existing panels at WIPP,[30] the waste that will be generated from reestablishing a pit production capability and surplus plutonium disposition may require up to three additional panels at WIPP.[31]

[26]S. Rep. No. 117-39, at 351-352 (2021).

[27]Surplus plutonium disposition is a major source of waste that NNSA must manage over the next several decades, according to NNSA officials.

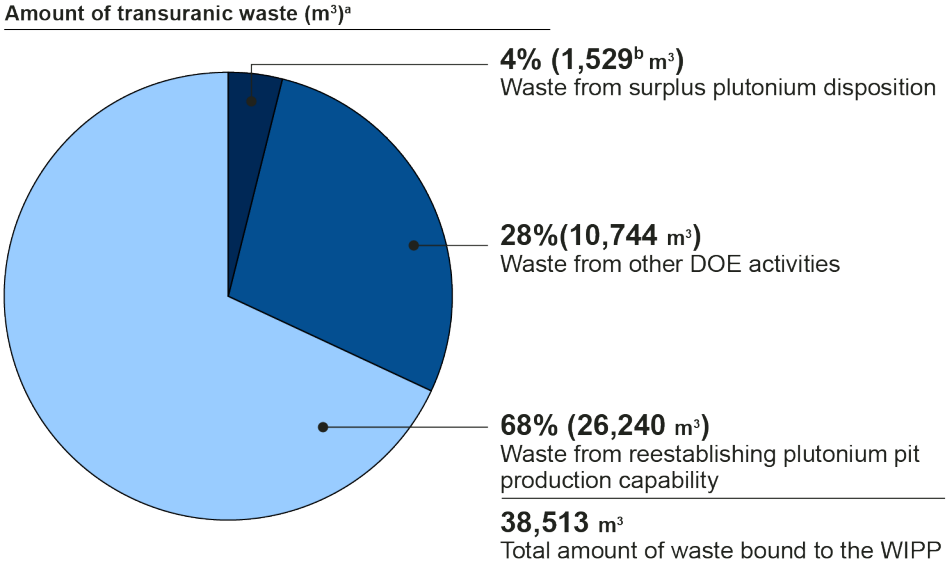
[28]The strategy was issued in February 2024, while the record of decision was published in April 2024. *See* 89 Fed. Reg. 28763 (Apr. 19, 2024).

[29]The draft strategy states that the anticipated LLW and MLLW from reestablishing plutonium pit production capability and surplus plutonium disposition are small percentages of DOE's disposal volumes and are not expected to affect waste management capabilities.

[30]At WIPP, the waste is disposed of in underground "panels," made up of rooms mined out of an ancient salt formation approximately 2,150 feet below the earth's surface. WIPP was designed to accommodate 175,565 m^3 of TRU waste in 10 disposal panels. GAO, *Waste Isolation Pilot Plant: Construction Challenges Highlight the Need for DOE to Address Root Causes*, GAO-22-105057 (Washington, D.C.: Mar. 15, 2022); GAO, *Plutonium Disposition: Proposed Dilute and Dispose Approach Highlights Need for More Work at the Waste Isolation Pilot Plant*, GAO-17-390 (Washington, D.C.: Sept. 5, 2017).

[31]We based our calculation for the number of panels needed for waste from reestablishing a pit production capability on the following: (1) the maximum amount of TRU waste permitted to go in a panel and (2) the amount of waste that is projected to be produced from reestablishing a pit production capability in DOE's 2023 Annual Transuranic Waste Inventory. We reported the number of panels needed for waste from surplus plutonium disposition in September 2017. GAO-17-390. However, according to DOE's 2023 Annual Transuranic Waste Inventory Report and DOE officials, the volume of this waste will not result in the WIPP facility exceeding the statutory capacity established in the Waste Isolation Pilot Plant Land Withdrawal Act.

Figure 2. Percentage of Estimated Transuranic Waste Bound for the Waste Isolation Pilot Plant (WIPP) from Reestablishing Plutonium Pit Production Capability and Surplus Plutonium Disposition Beyond 2033



Source: GAO analysis of information in Department of Energy's (DOE) 2023 Annual Waste Inventory Report. | GAO-25-107636

Accessible Data for Figure 2. Percentage of Estimated Transuranic Waste Bound for the Waste Isolation Pilot Plant (WIPP) from Reestablishing Plutonium Pit Production Capability and Surplus Plutonium Disposition Beyond 2033

Waste from activity	Amount of transuranic waste (m³)[a]	Percent
Waste from surplus plutonium disposition	1,529[b]	4
Waste from other DOE activities	10,744	28
Waste from reestablishing plutonium pit production capability	26,240	68
Total amount of waste bound to the WIPP	38,513	100

Source: GAO analysis of information in Department of Energy's (DOE) 2023 Annual Waste Inventory Report. I GAO-25-107636

[a]We are using data from 2033 and beyond because DOE's 2023 Annual Transuranic Waste Inventory Report provides separate data on waste streams expected to come to WIPP over this timeframe and it coincides with the timeframe when most pit production is expected to occur.

[b]NNSA separated the volume of waste expected to be generated by the Surplus Plutonium Program in the 2023 Annual TRU Waste Inventory Report, because NNSA had not yet issued a Record of Decision for disposing of the entire 34 metric tons at the time of the inventory report's issuance. This Record of Decision was issued in April 2024, so we included in this figure all waste volumes identified for this program in the inventory report.

The Strategy Does Not Include Goals and Objectives

The strategy minimally meets the key component of including goals and objectives. Specifically, the strategy does not include goals or objectives, such as how much waste NNSA must dispose of annually. Conveying such information would allow the agency and Congress to assess if progress is being made.

The Strategy Does Not Include Activities, Milestones, and Performance Measures Needed to Meet Its Goals and Objectives

The strategy minimally meets the key component of including activities, milestones, and performance measures. Specifically, the strategy does not identify the activities NNSA needs to undertake to meet its goals and objectives—which, as noted above, are also not included in the strategy—or the steps NNSA needs to take to store, treat, and dispose of the identified waste. It also does not include any milestones, timeframes, or performance metrics that NNSA can use to gauge results. For example, the strategy does not present a schedule reflecting the order of waste being removed from each site.

The strategy includes a section called "Recommended Strategies" with some general future plans, such as improving focus on positive regulatory relationships and establishing formal coordination mechanisms between EM and NNSA regarding NNSA waste management risks. However, the strategy does not include more specific activities, milestones, and performance measures to address these recommended strategies. It contains few specific examples of actions NNSA will take. In addition, NNSA officials said that these recommended strategies are not actually a plan that NNSA will follow moving forward, but rather suggestions for actions that sites could take.

NNSA's Strategy Does Not Account for All Resources Needed, such as Long-term Cost Estimates for All Activities and the Adequacy of Disposal Facilities

The strategy partially meets the key component of including resources and investments. NNSA developed a 5-year cost estimate for waste disposal activities, as required by statute, which is part of addressing this key component for a comprehensive strategy. However, the cost estimates may not be reasonable, and the strategy does not identify possible resource and investment needs related to additional disposal facilities.

NNSA's Cost Estimates

NNSA estimated costs of about $2.5 billion over the next 5 years for waste management operations. This estimate is based on an average of $460 million per year[32] in ongoing activities for waste disposal and $180 million in non-recurring, one-time investments to address projected waste management challenges.[33] However, while these cost estimates address the statutory requirement, they may not be reasonable because NNSA's estimate used inconsistent or unclear information, and NNSA did not perform risk and uncertainty analyses. In addition, the estimate included costs for activities managed by NNSA and did not include costs for activities managed by EM, nor does it include cost estimates for waste disposal associated with reestablishing plutonium

[32]NNSA estimated that most of the average cost per year spent on ongoing activities is at Los Alamos National Laboratory for $370 million per year (or about 81 percent) of $460 million per year.

[33]Almost all of the amount for non-recurring activities is for improvements at the Los Alamos National Laboratory. Los Alamos identified the Chemistry and Metallurgy Research Risk Reduction portfolio, Radioactive Liquid Waste Treatment Facility Stabilization, and the Transuranic Liquid Waste project as specific risk-reduction investments, with a total cost of $180 million over the 5-year period.

pit production capability.[34] NNSA officials noted that the cost estimate does not include waste from reestablishing plutonium pit production capability because this activity will not generate waste in the next 5 fiscal years.

We evaluated the cost estimate against key elements for a quality cost estimate that we identified as being applicable to the level of detail in NNSA's strategy. These are: the technical baseline, ground rules and assumptions (under the comprehensive characteristic); estimating methodologies and data (under the accurate characteristic); application of risk, sensitivity, and crosschecks (under the credible characteristic); and approval process (under the well-documented characteristic). Based on the documentation provided by NNSA, we found deficiencies in NNSA's 5-year cost estimate associated with all of these key elements (see table 2). As a result, NNSA officials do not have a full understanding of the disposal costs for newly generated waste and may have difficulties comparing and reconciling costs between the sites.

Table 2: GAO's Evaluation of Selected Elements of the National Nuclear Security Administration's Cost Estimate for Waste Disposal Activities

Key Element[a]	Deficiency
Technical baseline, ground rules, and assumptions	• NNSA did not use a common work breakdown structure to collect cost data from the sites, so it is difficult to determine that all costs are being appropriately captured and reported consistently between them.[b] • Boundaries, exclusions, and assumptions for what is included in the estimate are not documented with supporting information within the waste stream or cost estimating documentation. • NNSA included costs for activities that NNSA is responsible for. Officials explained that NNSA only pays for storing the waste and getting it ready for certification at the generating site, and this cost was included in the cost estimate in the strategy. Costs for activities that are the Office of Environmental Management's responsibility—such as for ensuring NNSA generating sites meet WIPP's waste acceptance criteria, transportation, and disposal of the waste—were not included in this cost estimate. • Cost information on the largest long-term waste generating activities, such as the upcoming plutonium pit production activities, was not included. Section 3137 did not require and NNSA did not provide cost estimates for the entire period of the strategy, 25 fiscal years.
Estimating methodologies and data	• NNSA officials explained that none of the sites break down costs specifically for weapons-related activities. The sites conducted a rough cost estimate based on how funding is sourced and on the collective judgment across programs, sites, contractors, and NNSA subject matter experts. • NNSA officials stated they were not completely familiar with how sites developed their cost estimates.
Application of risk, sensitivity, and crosschecks	• The cost estimate documentation provided by the sites had no evidence that NNSA conducted risk and uncertainty analysis or sensitivity analysis. • NNSA headquarters officials stated that they performed a high-level crosscheck comparing the weapons-related waste generation numbers with the total waste generated by the sites that NNSA reported in other public documents to ensure the weapons-related numbers were not higher. However, no additional crosschecks were performed.

[34]According to our Cost Estimating and Assessment Guide, a life-cycle cost estimate should include all past (or sunk), present, and future costs for every aspect of the program, regardless of funding source. GAO-20-195G.

Key Element[a]	Deficiency
Approval process	• Formal review and approval of site level cost estimate methodologies and data sources was limited and not formally documented. • NNSA headquarters officials said that review of the cost estimates was not rigorous and was just to make sure the sites provided the costs NNSA headquarters asked for.

Source: GAO analysis of DOE information. | GAO-25-107636

[a]The key elements selected are best practices from GAO's Cost Estimating Guide.

[b]A work breakdown structure defines in detail the work necessary to accomplish a program or project's objectives. A work breakdown structure deconstructs the program or project's end product in successive levels with smaller specific elements until the work is subdivided to a level suitable for management control. It facilitates establishing a baseline for measuring progress.

NNSA officials said that sites generally told them that estimating costs for the next 5 years, as statutorily required, was difficult, and NNSA officials assumed these same costs for the following 6 to 10 years as well. NNSA officials said that they believe that estimating costs beyond 10 years is not tenable due to uncertainties in future activities and waste production. Some sites will ramp up waste production and others will ramp down. In addition, the amount of waste that will be produced by projects that are being designed remains uncertain. For example, officials said that they can only provide a rough cost estimate for the plutonium pit production mission now and that a more reliable estimate cannot be developed until actual pit production begins.

However, having life-cycle cost estimates early in the program that cover the entire cost of the program, even if they are rough estimates, is important for successfully planning program resource requirements and informing decisions by DOE and Congress.[35] According to our Cost Estimating and Assessment Guide, the maturity of the program will influence the quantity of detail in the cost estimate. For example, an estimate early in the life-cycle may not require extensive detail, however, these estimates can be updated and become more certain as actual costs begin to replace earlier estimates.[36]

Additional Disposal Facility Needs

The NNSA strategy was required to identify disposal facilities that can accept the waste and disposal facilities that could accept the waste with modifications, along with the modifications necessary. However, the strategy did not address this statutory requirement. The strategy mentions the need to identify other disposal locations for the waste profiles with a high waste management risk. However, NNSA officials stated that doing so is complex and beyond NNSA's control. They said that identifying and developing any options requires DOE-wide discussions and coordination—especially with EM—and likely will include consideration and involvement of legislative and federal and state regulators staff. Additionally, NNSA officials said these are usually controversial activities that include significant stakeholder interest.

[35]According to our Cost Estimating and Assessment Guide, a life-cycle cost estimate provides a structured accounting of all labor, material, and other efforts required to develop, produce, operate and maintain, and dispose of a program. The development of a life-cycle cost estimate entails identifying and estimating all cost elements that pertain to the program from initial concept all the way through each phase in the program's duration. The program life-cycle cost estimate encompasses all past (or sunk), present, and future costs for every aspect of the program, regardless of funding source. GAO-20-195G.

[36]GAO-20-195G.

The Strategy Does Not Describe NNSA's Formal Coordination Mechanisms with EM for Waste Management

The strategy partially meets the key component of including organizational roles, responsibilities, and coordination mechanisms. The strategy lists the NNSA sites, programs, and number of facilities that generate the waste within NNSA. The strategy also states that the waste management process is decentralized, with each NNSA waste generator site and contractor directing its own waste generation, management, transportation, and disposal activities. It also states that each site and contractors are also responsible for coordination with EM disposal site operators. However, the strategy does not discuss the roles and responsibilities of NNSA offices in charge of various tasks to implement this strategy.

The strategy also does not discuss integration and coordination within NNSA and with other DOE offices, such as EM, as required by section 3137. The strategy recommends establishing formal coordination mechanisms with EM for waste management, but the strategy does not define formal coordination or describe how the agency plans to create this mechanism. The strategy states that establishing formal and routine coordination mechanisms with EM to address NNSA's waste management needs and risks will help both agencies address limitations with key disposal facilities. According to the strategy, doing so will also help address other waste management coordination risks, such as competing resources for similar waste being generated by other DOE activities.

NNSA officials in charge of the strategy said that NNSA conducts informal coordination on a case-by-case basis with EM, but that formal coordination has not yet been discussed with EM. They told us that NNSA's new waste management office has existed for 15 months, and NNSA officials have not had a chance to develop a plan and agenda to discuss such coordination. In addition, the officials said waste management from stockpile maintenance and modernization activities is not an urgent priority to expedite discussions with EM. In their opinion, a formal coordination mechanism would be beneficial to ensure coordination is performed every time for every situation which would reduce risk of disconnects between EM and NNSA.

EM officials seemed uncertain about whether formal coordination is needed or what it would look like. They said that the two agencies are already interacting and coordinating work through some mechanisms, and directives are already in place. For example, EM officials stated that NNSA officials are part of regular meetings between DOE offices related to transuranic waste. They also mentioned regular calls between top EM and NNSA leadership in which leadership could ask to get briefed on waste management issues; monthly calls between EM and NNSA counterparts; and many ad-hoc calls, emails, and documentation sharing between officials.

DOE guidance and leading practices call for agencies to collaborate on efforts that cut across multiple agencies. For example, EM officials said that a key directive—DOE's Radioactive Waste Management Manual (Order M435.1-1)—discusses responsibilities and guides how EM will collaborate with NNSA and other

agencies.[37] This manual describes the requirements and establishes specific responsibilities for implementing DOE's order for managing high-level waste TRU waste, LLW, and the radioactive component of mixed waste.[38] This manual also directs the establishment and maintenance of integrated complex-wide radioactive waste management programs for high-level, TRU waste, LLW, and MLLW. Program officials are to use a systematic approach to planning, execution, and evaluation to ensure that waste generation, storage, treatment, and disposal needs are met and coordinated across the DOE complex, which includes NNSA.

In our prior work, we have identified leading practices for enhancing interagency collaboration and addressing crosscutting challenges.[39] Agencies can enhance and sustain their collaborative efforts by engaging in these leading practices, such as defining and articulating a common outcome and agreeing on roles and responsibilities, and by developing and updating written guidance and agreements. See appendix I for a full list of these leading practices.

The Strategy Identifies Some Key External Factors that Could Affect Disposal

The strategy partially meets the key component of including key external factors. The strategy identifies two single-point failures as important external factors. Specifically, the strategy notes that any disruption to WIPP or the Nevada National Security Site operations has the potential to adversely impact NNSA's mission. The strategy notes that (1) problems at the WIPP facility could impact all NNSA TRU waste, including any classified TRU waste, and (2) problems at the Nevada National Security Site could impact several low-level waste and mixed low-level waste profiles and classified waste that could only be disposed of at this site. The strategy states at a high level some mitigation actions for these problems, such as options for temporary storage at the generator sites or identifying other locations to dispose of the waste.

Another external factor mentioned by the strategy is to improve focus on positive regulatory relationships. The strategy states that NNSA's waste management activities are highly regulated, and that improving and maintaining positive relationships with the regulators is a critical component of minimizing disruptions to missions from any interruptions to waste management activities and flows. However, the strategy does not discuss how the regulatory process impacts the waste management process or how NNSA plans to work with the regulators to ensure a smooth waste management process.

[37]The purpose of the manual is to catalog those procedural requirements and existing practices that ensure that all DOE elements and contractors continue to manage DOE's radioactive waste in a manner that is protective of worker and public health and safety and the environment. EM officials explained that revisions to this directive are co-chaired between EM and NNSA. DOE Manual 435.1-1.

[38]DOE Manual 435.1-1.

[39]As we stated in May 2023, interagency collaboration involves collaboration or coordination between two or more federal entities, or within components of the same entity. Collaboration can be broadly defined as any joint activity that is intended to produce more public value than could be produced when the entities act alone. These leading practices were developed as part of supporting the implementation of the performance planning and reporting framework originally put into place by the Government Performance and Results Act of 1993. GAO-23-105520.

NNSA officials stated they consider the strategy document more of a snapshot-in-time report that summarizes the NNSA sites' plans, rather than a strategy that NNSA sites will follow in the future. Officials stated that they had no further plans to use this strategy document but would update the strategy for submission with the fiscal year 2027 budget request as required by statute. By ensuring that its strategy includes the seven key components of a comprehensive strategic plan and fully addressing the statutory requirements, NNSA, its sites, and DOE partners, such as EM, could better understand the full spectrum of the needed investments to evaluate, prioritize, and align with DOE's operational strategy. NNSA could also better ensure that it has a comprehensive planning documents to efficiently manage the waste resulting from stockpile maintenance and modernization activities.

Conclusions

DOE has long struggled with disposing of nuclear waste. The nation's only repository for defense-origin transuranic waste has limited capacity and no guarantees that it can accept the waste that DOE already intends to send it. Nevertheless, DOE—through NNSA—is now embarking on a modernization mission that will generate additional waste. Treating, storing, and disposing of the additional waste will cost billions of dollars, take decades, and depend on significant interagency coordination.

The strategy that NNSA submitted to congressional defense committees was not comprehensive because it followed one of seven key components for comprehensive strategic plans. In addition, NNSA's strategy partially addressed the statutory requirements because it did not identify all sources and amounts of waste that might be generated in the next 11 to 25 years, identify disposal facilities, or describe plans to coordinate with EM. Including such information in its updated strategy that NNSA must submit to congressional defense committees concurrent with the President's budget request for fiscal year 2027 would better position DOE to avoid the challenges that have affected efforts to dispose of waste generated by previous atomic weapons production activities.

Recommendation for Executive Action

The NNSA Administrator should include the key components of a comprehensive strategic plan and fully address statutory requirements in its update to the strategy for treating, storing, and disposing of waste resulting from stockpile maintenance and modernization activities, which NNSA must submit to congressional defense committees concurrent with the President's budget request for fiscal year 2027. The strategy update should include, among other things, the amounts and types of the anticipated waste and reasonable cost estimates for the entire 25-year period of the strategy, and a coordination mechanism with EM that incorporates leading practices for enhancing interagency collaboration. (Recommendation 1)

Agency Comments

We provided a draft of this report to DOE for review and comment. In its comments, reproduced in appendix II, NNSA, responding on behalf of DOE, concurred with our recommendation. NNSA stated that, as the program

matures leading to the next update in 2026, NNSA will provide a comprehensive strategy consistent with the requirements of section 3137 of the National Defense Authorization Act for Fiscal Year 2022. NNSA also stated that the updated strategy will incorporate GAO's characteristics of a comprehensive strategic plan, including an expanded 25-year cost estimate (noting the inherent limitations, assumptions, and risks associated with the extended timeframe). We agree with NNSA that a cost estimate may have lower fidelity as it includes costs further in time, and believe that understanding and documenting these limitations, assumptions, and risks is worthwhile to provide a general view of the direction of the cost estimate.

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

We are sending copies of this report to the appropriate congressional committees, the Secretary of Energy, the Administrator of NNSA, and other interested parties. In addition, the 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 andersonn@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 III.

Nathan Anderson
Director, Natural Resources and Environment

List of Committees

The Honorable Jack Reed
Chairman
The Honorable Roger Wicker
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Patty Murray
Chair
The Honorable John Kennedy
Ranking Member
Subcommittee on Energy and Water Development
Committee on Appropriations
United States Senate

The Honorable Mike Rogers
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Chuck Fleischmann
Chairman
The Honorable Marcy Kaptur
Ranking Member
Subcommittee on Energy and Water Development,
and Related Agencies
Committee on Appropriations
House of Representatives

Appendix I: List of Interagency Collaboration Leading Practices and Key Considerations

Interagency collaboration involves collaboration or coordination between two or more federal entities, or within components of the same entity. Collaboration can be broadly defined as any joint activity that is intended to produce more public value than could be produced when the entities act alone. We have identified eight leading practices for interagency collaboration that include key considerations for collaborating entities to use when implementing them.[1] See figure 3.

[1]GAO-23-105520.

Figure 3: Leading Interagency Collaboration Practices and Key Considerations

Leading Collaboration Practices	Key Considerations
 **Define Common Outcomes**	• Have the crosscutting challenges or opportunities been identified? • Have short- and long-term outcomes been clearly defined? • Have the outcomes been reassessed and updated, as needed?
 **Ensure Accountability**	• What are the ways to monitor, assess, and communicate progress toward the short- and long-term outcomes? • Have collaboration-related competencies or performance standards been established against which individual performance can be evaluated? • Have the means to recognize and reward accomplishments related to collaboration been established?
 **Bridge Organizational Cultures**	• Have strategies to build trust among participants been developed? • Have participating agencies established compatible policies, procedures, and other means to operate across agency boundaries? • Have participating agencies agreed on common terminology and definitions?
 **Identify and Sustain Leadership**	• Has a lead agency or individual been identified? • If leadership will be shared between one or more agencies, have roles and responsibilities been clearly identified and agreed upon? • How will leadership be sustained over the long term?
 **Clarify Roles and Responsibilities**	• Have the roles and responsibilities of the participants been clarified? • Has a process for making decisions been agreed upon?
 **Include Relevant Participants**	• Have all relevant participants been included? • Do the participants have the appropriate knowledge, skills, and abilities to contribute? • Do participants represent diverse perspectives and expertise?
 **Leverage Resources and Information**	• How will the collaboration be resourced through staffing? • How will the collaboration be resourced through funding? If interagency funding is needed, is it permitted? • Are methods, tools, or technologies to share relevant data and information being used?
 **Develop and Update Written Guidance and Agreements**	• If appropriate, have agreements regarding the collaboration been documented? – A written document can incorporate agreements reached for any or all of the practices. • Have ways to continually update or monitor written agreements been developed?

Source: GAO (data and icons). | GAO-25-107636

Accessible Data for Figure 3: Leading Interagency Collaboration Practices and Key Considerations

Collaboration Practice	Selected Key Considerations
Icon – Define Common Outcomes	Have the crosscutting challenges or opportunities been identified? Have the short-term and long-term outcomes been clearly defined?

Collaboration Practice	Selected Key Considerations
Icon – Ensure Accountability	What are the ways to monitor, assess, and communicate progress toward the short- and long-term outcomes? Have the means to recognize and reward accomplishments related to collaboration been established?
Icon – Bridge Organizational Cultures	Have strategies to build trust among participants been developed? Have participating agencies agreed on common terminology and definitions?
Icon – Identify and Sustain Leadership	Has a lead agency or individual been identified? How will leadership be sustained over the long term?
Icon – Clarify Roles and Responsibilities	Have the roles and responsibilities of the participants been clarified? Has a process for making decisions been agreed upon?
Icon – Include Relevant Participants	Have all relevant participants been included? Do participants represent diverse perspectives and expertise?
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Icon – Develop and Update Written Guidance and Agreements	If appropriate, have agreements regarding the collaboration been documented? Have ways to continually update and monitor written agreements been developed?

Source: GAO (data and icons). I GAO-25-107636

Appendix II: Comments from the Department of Energy

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

November 22, 2024

Mr. Nathan J. Anderson
Director, Natural Resources
and Environment
U.S. Government Accountability Office
Washington, DC 20548

Dear Mr. Anderson:

Thank you for the opportunity to review the Government Accountability Office (GAO) draft report "Nuclear Waste Cleanup: NNSA Should Improve Its Strategy for Managing Anticipated Waste from Defense Activities" (GAO-25-107636). The Department of Energy's National Nuclear Security Administration (NNSA) appreciates GAO's review and observations on our *Strategy for the Treatment, Storage, and Disposition of Defense Nuclear Waste*, published in February 2024.

As noted in the report, the initial strategy issued under the newly created Office of Environment, Safety, and Health represents a snapshot in time, early in the program's development. As the program continues to mature, the scope and fidelity of the information in the plans will also be enhanced. The next required update to the plan will be issued in 2026, concurrent with the President's Budget Request for 2027, and will provide a comprehensive strategy consistent with the requirements of section 3137 of the *National Defense Authorization Act for Fiscal Year 2022*. That updated strategy will also incorporate GAO's suggested characteristics of a comprehensive plan, recognizing the inherent limitations of an expanded 25-year cost estimate.

The enclosed management decision provides NNSA's detailed response to the auditors' recommendation. 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 (202) 836-3327.

Sincerely,

Jill Hruby

Enclosure

Enclosure

NATIONAL NUCLEAR SECURITY ADMINISTRATION
Management Decision

"Nuclear Waste Cleanup: NNSA Should Improve Its Strategy for Managing Anticipated Waste from Defense Activities" (GAO-25-107636)

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

Recommendation 1: Include the key components of a comprehensive strategic plan and fully address statutory requirements in its update to the strategy for treating, storing, and disposing of waste resulting from stockpile maintenance and modernization activities, which NNSA must submit to Congressional defense committees concurrent with the President's budget request for fiscal year 2027. The strategy update should include, among other things, the amounts and types of the anticipated waste and reasonable cost estimates for the entire 25-year period of the strategy, and a coordination mechanism with the Department's Office of Environmental Management that incorporates leading practices for enhancing interagency collaboration.

Management Response: Concur in part. The initial strategy issued under the newly created Office of Environment, Safety, and Health represents a snapshot in time, early in the program's development. While the initial plan provided baseline information to address each of the statutory requirements, NNSA recognizes not all the requested information was fully developed at that time. As the program matures leading to the next update in 2026, the program will provide a comprehensive strategy consistent with the requirements of section 3137 of the *National Defense Authorization Act for Fiscal Year 2022*. That updated strategy will also incorporate GAO's suggested characteristics of a comprehensive plan, including an expanded 25-year cost estimate, while noting the inherent limitations, assumptions, and risks associated with the extended timeframe. The estimated completion date for these actions is February 2026, commensurate with issuance of the updated plan.

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

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

November 22, 2024

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

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“Nuclear Waste Cleanup: NNSA Should Improve Its Strategy for Managing Anticipated Waste from Defense Activities” (GAO-25-107636)

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

Recommendation 1: Include the key components of a comprehensive strategic plan and fully address statutory requirements in its update to the strategy for treating, storing, and disposing of waste resulting from stockpile maintenance and modernization activities, which NNSA must submit to Congressional defense committees concurrent with the President’s budget request for fiscal year 2027. The strategy update should include, among other things, the amounts and types of the anticipated waste and reasonable cost estimates for the entire 25-year period of the strategy, and a coordination mechanism with the Department’s Office of Environmental Management that incorporates leading practices for enhancing interagency collaboration.

Management Response: Concur in part. The initial strategy issued under the newly created Office of Environment, Safety, and Health represents a snapshot in time, early in the program’s development. While the initial plan provided baseline information to address each of the statutory requirements, NNSA recognizes not all the requested information was fully developed at that time. As the program matures leading to the next update in 2026, the program will provide a comprehensive strategy consistent with the requirements of section 3137 of the National Defense Authorization Act for Fiscal Year 2022. That updated strategy will also incorporate GAO’s suggested characteristics of a comprehensive plan, including an expanded 25-year cost estimate, while noting the inherent limitations, assumptions, and risks associated with the extended timeframe. The estimated completion date for these actions is February 2026, commensurate with issuance of the updated plan.

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contact named above, Jeffrey T. Larson (Assistant Director), Cristian Ion (Analyst in Charge), Gwen Kirby, and Benjamin Wilder made key contributions to this report. Also contributing to this report were Jeanette Soares, Cindy Gilbert, Jennie Leotta, Eli Lewine, and Sara Sullivan.

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