



Testimony

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DEPARTMENT OF ENERGY

Observations on Efforts by NNSA and the Office of Environmental Management to Manage and Oversee the Nuclear Security Enterprise

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Accessible Version

GAO Highlights

Highlights of [GAO-16-422T](#), a testimony before the Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate

Why GAO Did This Study

DOE's NNSA is responsible for managing the nuclear weapon stockpile and supporting nuclear nonproliferation efforts. NNSA executes its missions at eight sites that make up the nuclear security enterprise. DOE's EM's mission includes decontaminating and decommissioning facilities that are contaminated from decades of nuclear weapons production and nuclear energy research.

DOE has made progress, but GAO continues to identify challenges across the nuclear security enterprise, including with major projects' cost and schedule delays. With NNSA and EM proposing to spend tens of billions of dollars to modernize the nuclear security enterprise, it is important to ensure that scarce resources are spent in an effective and efficient manner.

This testimony discusses DOE's (1) ongoing challenges in nuclear security modernization, (2) growing cost of environmental liabilities, and (3) nonproliferation accomplishments and long-term planning challenges. GAO's statement is based mainly on information from 11 prior GAO reports issued from February 2015 to February 2016, as well as on ongoing work on (1) DOE's plans to develop a high-level waste repository and (2) environmental liabilities. That work included reviewing agency documents and interviewing agency officials.

GAO is not making any new recommendations. DOE continues to act on the numerous recommendations GAO has made in these areas. GAO will continue to monitor DOE's implementation of these recommendations.

View [GAO-16-422T](#). For more information, contact David C. Trimble at (202) 512-3841 or trimbled@gao.gov

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What GAO Found

The Department of Energy's (DOE) National Nuclear Security Administration (NNSA)—a separately organized agency within DOE—continues to face several ongoing challenges in modernizing the nuclear security enterprise, including challenges in managing life extension programs (LEP), contracts and major projects, and the alignment of plans with future budgets. As GAO reported in August 2015, NNSA estimates that it will need more than \$290 billion over the next 25 years to support its modernization plans. These plans include the execution of seven LEPs that entail refurbishing or replacing nuclear weapons' aging components. In February 2016, GAO found some improved and positive management approaches were being used on the ongoing B61-12 LEP but also noted that the cost and schedule of the LEP have been subject to significant changes since its inception. Another challenge for DOE's modernization plans is effectively managing contracts and major projects to replace aging nuclear facilities. DOE has taken some actions to improve its contract and project management but continues to face cost and schedule delays, and this remains a high-risk area. Further, in May 2015, GAO found that NNSA did not have a comprehensive policy or procedures for implementing its framework for overseeing its contractors and for evaluating their performance. Moreover, NNSA's ability to execute its modernization plans is also complicated by questions regarding the alignment of its plans with future budgets and by outstanding and new needs for funding, such as supporting a new repository for defense high-level waste.

In 2015, DOE's Office of Environmental Management (EM) estimated that cleanup of former weapons production sites would generally take until 2075 and cost \$240 billion. In March 2015, GAO found that that this estimate does not include all costs—for example, the costs for some contaminated facilities that have not yet been transferred to EM, which DOE acknowledges could cost billions to clean up. GAO's preliminary observations from ongoing work also indicate that the estimated cost of the remaining environmental cleanup has been growing, even while EM has been spending billions on cleanup. For example, from fiscal years 2011 to 2015, EM spent a total of about \$23 billion, while EM's estimate of its remaining environmental liability rose by \$77 billion. Over the past 2 decades, GAO and others have pointed out the need for DOE to take a complex-wide, risk-based approach to its long-term cleanup strategy, which could reduce costs while also maximizing risk-reduction in a more timely way. For example, a 2015 review requested by EM found that DOE needed a more systematic effort to assess and rank risks within and among sites, to remedy the highest priority risks through the most efficient means.

NNSA implements nuclear nonproliferation programs worldwide. GAO found in September 2015 that NNSA had made progress in securing nuclear materials worldwide but that it missed some goals, such as for providing physical protection upgrades at buildings containing nuclear materials. In addition, NNSA began an initiative in 2010 to identify and assess future nuclear and radiological proliferation threats and related trends over the next 5 to 10 years. In an October 2015 report, GAO found limitations in the methods NNSA used in this initiative, such as not conducting its peer review consistent with established standards.

Chairman Sessions, Ranking Member Donnelly, and Members of the Subcommittee:

Thank you for the opportunity to discuss our recent work on some of the pressing ongoing management challenges that the Department of Energy's (DOE) National Nuclear Security Administration (NNSA)—a separately organized agency within DOE—and Office of Environmental Management (EM) continue to face.¹ NNSA is responsible for managing the nation's nuclear security missions: ensuring a safe, secure, and reliable nuclear deterrent; achieving designated reductions in the nuclear weapons stockpile; and supporting the nation's nuclear nonproliferation efforts. These missions are largely executed at eight sites that comprise the nuclear security enterprise. The sites include national laboratories, production plants, and a test site, which are owned by the U.S. government but managed and operated by contractors. According to NNSA documents, NNSA's funding to support its mission and related activities has increased from \$9.6 billion in fiscal year 2009 to \$11.4 billion in fiscal year 2015²—approximately 42 percent of DOE's total fiscal year 2015 budget. EM is responsible for decontaminating and decommissioning facilities and sites that are contaminated from decades of nuclear weapons production and nuclear energy research. EM currently has responsibilities at 16 sites across the United States. Since its inception in 1989, EM has spent over \$150 billion on cleanup efforts, including multiple activities to retrieve, characterize, treat, package, store, transport, and dispose of waste.

Since the end of the Cold War, key portions of the nuclear security enterprise's weapons production infrastructure have aged and become outdated, prompting congressional and executive branch decision makers to call on DOE to develop plans to modernize the infrastructure.³ The Department of Defense's (DOD) 2010 Nuclear Posture Review identified long-

¹NNSA was created under Title 32 of the National Defense Authorization Act for Fiscal Year 2000, Pub. L. No. 106-65, § 3201 et seq.

²NNSA's budget did not increase in fiscal year 2013 compared with the previous year because of sequestration, which decreased NNSA's fiscal year 2013 budget by \$917 million.

³The end of the Cold War caused a dramatic shift in how the nation maintains nuclear weapons. Instead of designing, testing, and producing new nuclear weapons, the strategy shifted to maintaining the existing nuclear weapons stockpile indefinitely. Life extension programs increase, through refurbishment, the operational lives of weapons in the nuclear stockpile by 20 to 30 years and certify these weapons' military performance requirements without conducting underground nuclear testing.

term modernization goals and requirements, including sustaining a safe, secure, and effective nuclear arsenal through increasing investments to rebuild and modernize the nation's nuclear infrastructure, some of which dates back to the 1940s.⁴ In fiscal year 2011, the administration pledged over \$88 billion to NNSA over 10 years for operations and modernization, including the refurbishment of weapons in the current stockpile and the construction of facilities to support these refurbishments. In addition, the President's 2015 National Security Strategy states that the United States must invest the resources necessary to maintain a safe, secure, and effective nuclear deterrent as long as nuclear weapons exist.⁵

To meet modernization goals for the nuclear security enterprise, NNSA replaces or renovates research, development, and production facilities; refurbishes weapons in the stockpile to extend their operational lives; and performs simulations and laboratory experiments to ensure existing nuclear weapons remain safe and reliable. NNSA's Stockpile Stewardship and Management Plan, which is updated annually, provides information on modernization and operations plans and budget estimates over the next 25 years. The plan is NNSA's formal means for communicating to Congress the status of certain activities and its long-range plans and budget estimates for sustaining the stockpile and modernizing the nuclear security enterprise. The plan also discusses the current and projected composition and condition of the nuclear weapons stockpile.

NNSA is also involved in efforts to counter the proliferation of nuclear weapons. NNSA implements a range of nonproliferation programs under its Office of Defense Nuclear Nonproliferation (DNN). These programs include efforts to secure, consolidate, and dispose of weapons-usable nuclear materials and radiological sources;⁶ reduce the risks of nuclear smuggling; enhance international export controls and International Atomic

⁴Department of Defense, *Nuclear Posture Review Report* (Washington, D.C.: Apr. 6, 2010). The 2010 Nuclear Posture Review establishes the nation's nuclear weapons requirements and policy.

⁵The President is required to submit a national security strategy annually to Congress. 50 U.S.C. § 3043 (2015).

⁶Weapons-usable nuclear materials are highly enriched uranium, uranium-233, and any plutonium containing less than 80 percent of the isotope plutonium-238. Such materials are also often referred to as fissile materials or strategic special nuclear materials.

Energy Agency nuclear safeguards;⁷ and support research and development of new nonproliferation technologies.

As NNSA works to modernize the nuclear security enterprise, EM must address the legacy of 70 years of nuclear weapons production and energy research by the department and its predecessor agencies. These activities generated large amounts of radioactive waste, spent nuclear fuel, excess plutonium and uranium, and contaminated soil and groundwater. They also resulted in thousands of contaminated facilities, including land, buildings, and other structures and their systems and equipment.

NNSA and EM are also responsible for managing the design and construction of major projects (those with an estimated cost of \$750 million or more). Reports we have issued over the past several years,⁸ have highlighted various challenges that NNSA and EM face in carrying out their mission-related responsibilities, including challenges in contract and project management that relate to NNSA's modernization efforts. These challenges contribute to our continuing inclusion of NNSA's and EM's management of major contracts and projects on our list of agencies and program areas that are at high risk due to their vulnerabilities to fraud, waste, abuse, and

⁷The International Atomic Energy Agency is an independent international organization based in Vienna, Austria, that is affiliated with the United Nations and has the dual mission of promoting the peaceful uses of nuclear energy and verifying that nuclear material subject to safeguards is not diverted to weapons development efforts or other proscribed purposes. Safeguards allow the agency to independently verify that nuclear material and other specified items are not diverted by, among other things, inspecting all facilities and locations containing nuclear material declared by countries to verify its peaceful use.

⁸See for example GAO, *National Nuclear Security Administration: Observations on Management Challenges and Steps Taken to Address Them*, [GAO-15-532T](#) (Washington, D.C.: Apr. 15, 2015); *Department of Energy: Observations on DOE's Management Challenges and Steps Taken to Address Them*, [GAO-13-767T](#) (Washington, D.C.: July 24, 2013); *Modernizing the Nuclear Security Enterprise: Observations on DOE's and NNSA's Efforts to Enhance Oversight of Security, Safety, and Project and Contract Management*, [GAO-13-482T](#) (Washington, D.C.: Mar. 13, 2013); and *Modernizing the Nuclear Security Enterprise: Observations on the National Nuclear Security Administration's Oversight of Safety, Security, and Project Management*, [GAO-12-912T](#) (Washington, D.C.: Sept. 12, 2012). A list of recent GAO products assessing EM's and NNSA's management challenges is included at the end of this testimony.

mismanagement or that are most in need of transformation.⁹ In our 2015 high-risk update, we found that DOE continued to demonstrate a strong commitment and top leadership support to improve contract and project management in EM and NNSA—a key criterion for removing agencies and program areas from our high-risk list.¹⁰ However, we also found that the department had not made progress on the other four criteria for removal: organizational capacity, corrective action planning, monitoring effectiveness, and demonstrating progress. Our high-risk update also noted that NNSA and EM struggled to stay within cost and schedule estimates for most of their major projects.

My testimony today discusses (1) ongoing challenges facing DOE’s nuclear security modernization efforts, (2) EM’s growing cost of environmental liabilities, and (3) NNSA’s nonproliferation accomplishments and long-term planning challenges. My statement is based mainly on information from 11 GAO reports issued from February 2015 to February 2016.¹¹ Also included are preliminary observations from our

⁹In our 2013 high-risk update, to acknowledge progress DOE, including NNSA, has made in managing nonmajor projects (i.e., those costing less than \$750 million), we narrowed the focus of DOE’s high-risk designation to major contracts and projects (i.e., those costing \$750 million or greater) but noted that we would continue to monitor nonmajor projects to ensure that progress in this area continues. See GAO, *High-Risk Series: An Update*, [GAO-13-283](#) (Washington, D.C.: Feb. 14, 2013).

¹⁰GAO, *High-Risk Series: An Update*, [GAO-15-290](#) (Washington, D.C.: Feb. 11, 2015).

¹¹GAO, *Nuclear Weapons: NNSA Has a New Approach to Managing the B61-12 Life Extension, but a Constrained Schedule and Other Risks Remain*, [GAO-16-218](#), (Washington, D.C.: Feb. 4, 2016); *Nuclear Weapons Sustainment: Improvements Made to Budget Estimates Report, but Opportunities Remain to Further Enhance Transparency*, [GAO-16-23](#) (Washington, D.C.: Dec. 10, 2015); *Nuclear Nonproliferation: NNSA’s Threat Assessment Process Could Be Improved*, [GAO-16-118](#) (Washington, D.C.: Oct. 30, 2015); *Nuclear Nonproliferation: DOE Made Progress to Secure Vulnerable Nuclear Materials Worldwide, but Opportunities Exist to Improve Its Efforts*, [GAO-15-799](#) (Washington, D.C.: Sept. 23, 2015); *Modernizing the Nuclear Security Enterprise: NNSA Increased Its Budget Estimates, but Estimates for Key Stockpile and Infrastructure Programs Need Improvement*, [GAO-15-499](#) (Washington, D.C.: Aug. 6, 2015); *DOE Project Management: NNSA Should Ensure Equal Consideration of Alternatives for Lithium Production*, [GAO-15-525](#) (Washington, D.C.: July 13, 2015); *National Nuclear Security Administration: Actions Needed to Clarify Use of Contractor Assurance Systems for Oversight and Performance Evaluation*, [GAO-15-216](#) (Washington, D.C.: May 22, 2015); *Hanford Waste Treatment: DOE Needs to Evaluate Alternatives to Recently Proposed Projects and Address Technical and Management Challenges*, [GAO-15-354](#) (Washington, D.C.: May 7, 2015); [GAO-15-532T](#); *DOE Facilities: Better Prioritization and Lifecycle Cost Analysis Would Improve Disposition Planning*, [GAO-15-272](#) (Washington, D.C.: Mar. 19, 2015); and *Nuclear Waste: DOE Needs to Improve Cost Estimates for Transuranic Waste Projects at Los Alamos*, [GAO-15-182](#) (Washington, D.C.: Feb. 18, 2015).

ongoing work on DOE's plans to develop a defense high-level waste repository and on nuclear waste environmental liabilities. Detailed information about the scope and methodology used to conduct our prior work can be found in each of our issued reports. We also updated information from our prior work when possible. For our ongoing work on DOE's plans to develop a high-level waste repository, we are reviewing agency documents and interviewing officials to describe DOE's analysis, and we are conducting content analyses using previous GAO reports and interviewing officials from DOE, the Nuclear Regulatory Commission, and other organizations about this approach. For our ongoing work on nuclear waste environmental liabilities, we are reviewing agency documents and interviewing agency officials to examine key elements of DOE's environmental liabilities estimate and factors contributing to growth of this estimate. In addition, we are reviewing agency documents, as well as our prior reports and those of others describing DOE's long-term waste cleanup strategy to describe how DOE prioritizes the human health and environmental risks. We are also reviewing DOE's audited financial statements for fiscal years 2011 to 2015. To assess the reliability of the data in those statements, we compared the environmental liability data in the financial statements to other published cost estimates for EM's cleanup program and interviewed officials in DOE's Office of the Chief Financial Officer and officials with the independent audit organization that annually audits DOE's financial statements. The work upon which this testimony is based was conducted or is being performed 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.

Ongoing Challenges Facing Nuclear Security Modernization Efforts

DOE faces several challenges in modernizing the nuclear security enterprise, including challenges in managing life extension programs (LEP), managing major projects, and budgetary challenges facing modernization efforts. NNSA's modernization plans call for undertaking seven LEPs and alterations¹² to refurbish or replace nuclear weapons' aging components for warheads and bombs over the next 25 years. Essential to the execution of these LEPs will be the timely completion of major projects on which they may depend, such as projects to replace aging facilities supporting their plutonium and uranium needs. These challenges are magnified by budgetary uncertainties related to the alignment of modernization plans with budget estimates and to outstanding and new needs for budgetary resources. Such needs include addressing deferred maintenance in facilities on which mission success depends, recapitalizing security infrastructure, and supporting a new repository for defense high-level waste, which will place additional demands on the defense budget.

Managing LEPs

Effective management of each planned LEP is essential to keep the modernization schedule on track.¹³ To ensure the continued safety, reliability, and performance of the aging nuclear stockpile, NNSA and DOD undertake LEPs and other efforts to refurbish or replace nuclear weapons' aging components. As we reported in August 2015, NNSA estimated that it will need more than \$290 billion over the next 25 years to support modernization of the nuclear security enterprise.¹⁴ Carrying out these LEPs is complex and difficult, and our past work has found that NNSA and DOD have had difficulty effectively managing these programs.

- In March 2009, we found that, in LEPs for the W76 warhead and legacy B61 bombs, NNSA and DOD established unrealistic schedules, did not establish consistent cost baselines, and did not

¹²A nuclear weapon alteration is a material change regarding assembly, maintenance, or storage that does not alter the weapon's operational capability.

¹³According to the fiscal year 2016 Stockpile Stewardship and Management Plan, NNSA is currently conducting four LEPs or other refurbishments (W76-1, B61-12, W88 alteration 370, W80-4). Over the next 25 years NNSA is planning three additional LEPs (IW-1, -2, -3).

¹⁴[GAO-15-499](#).

effectively manage technical risks.¹⁵ These problems resulted in delays, additional expenditures, difficulties tracking the cost of the W76 program, and a B61 refurbishment that did not meet all of NNSA's and DOD's technical objectives. NNSA agreed with our recommendation to, among other actions, develop and use consistent budget assumptions and criteria for the baseline to track costs over time, and the agency has taken steps toward improvement in this area, which we continue to monitor.

- In a May 2011 report on the B61 LEP, we found that NNSA and DOD had not prepared a long-term risk management plan to help avoid operational gaps and ensure that the United States would be able to maintain the capability to support its NATO commitments if the LEP were delayed or canceled.¹⁶ DOD and NNSA agreed with our recommendations to develop an operational risk management plan for the LEP, identifying the measures required to ensure that the United States is able to maintain its commitments to NATO with no gaps in operational capability. In September 2011, the Air Force, in coordination with NNSA, issued an initial plan for mitigating the risk of program delay, which the Air Force is currently updating.

More recently, in a February 2016 report, we reviewed the status of the B61-12 LEP.¹⁷ With thousands of individual components, the B61-12 LEP is the most complicated and expensive LEP undertaken since DOE initiated stockpile life extension activities in January 1996. Our report noted some improved and positive management approaches being used in the B61-12 LEP but also noted that the cost and schedule of the LEP have been subject to significant changes since the LEP's inception. Since May 2011, NNSA's and the Air Force's total cost estimate for the LEP increased from an initial estimate of about \$4 billion to about \$8.9 billion as of September 2015, and the first production date moved from 2017 to 2020. Much of the work under this LEP remains to be executed, with the largest share of program spending yet to come; as of September 2015, about \$1.6 billion had been spent on the LEP. We also found that, as the

¹⁵GAO, *Nuclear Weapons: NNSA and DOD Need to More Effectively Manage the Stockpile Life Extension Program*, [GAO-09-385](#) (Washington, D.C.: Mar. 2, 2009).

¹⁶GAO, *Nuclear Weapons: DOD and NNSA Need to Better Manage Scope of Future Refurbishments and Risks to Maintaining U.S. Commitments to NATO*, [GAO-11-387](#) (Washington, D.C.: May 2, 2011).

¹⁷[GAO-16-218](#).

B61-12 LEP moves forward, a significant challenge may be a constrained development and production schedule that the joint DOE and DOD Nuclear Weapons Council characterized as having “little, if any, margin left” to deal with potential program risks. We also found that factors constraining the schedule of the LEP include the aging of components in current versions of the B61, delays in starting the B61-12 LEP because of a lengthy design study, the effects of sequestration, and the need to complete the B61-12 LEP so that NNSA can begin other planned LEPs. We have previously made recommendations in this area and will continue to monitor these issues as we assess the LEP in its later stages.

Managing Contracts and Major Projects

Another significant challenge for DOE’s modernization plans for the nuclear security enterprise is effectively managing contracts including those for the design and construction of major projects that are intended to replace large components of the aging nuclear security infrastructure. Regarding contracts, about 90 percent of DOE’s budget is spent on contracts, and effective management of these contracts and associated contractors is essential for DOE to achieve its complex and challenging missions. In May 2015, we found that NNSA had not fully established policies or guidance for using information from contractor assurance systems to conduct oversight of management and operations contractors. These systems are designed by contractors to assure their own performance and can be leveraged by NNSA for oversight purposes and thereby improve efficiency.¹⁸ In the absence of a headquarters policy, we found that NNSA field offices had established their own procedures, but these procedures were not always complete and differed among field offices. We also found that NNSA had discontinued a process for validating oversight approaches without replacing it with another approach. In addition, we found that NNSA had not determined if it had sufficient qualified staff to implement its framework for using information from the contractor assurance systems. We recommended, among other things, that NNSA develop guidance on using information from contractor assurance systems to oversee and evaluate management and operations contractors, and study staffing needs. In NNSA’s response to our report, the agency agreed with our recommendations and outlined planned actions to address these recommendations, as well as timelines for completion.

¹⁸[GAO-15-216](#).

Regarding major projects, our past reports have found that NNSA has struggled to manage these projects within their initial cost and schedule estimates.¹⁹ In April 2015, we reported to this subcommittee that DOE had taken a number of actions to address its contract and project management challenges in NNSA and EM.²⁰ The most recent actions have included the issuance of memorandums from the Secretary of Energy in December 2014 and June 2015. These memorandums put into effect several important recommendations to improve contract and project management made in a report by the Contract and Project Management Working Group that was established by the Secretary in 2013.²¹ The December 2014 memorandum directed that several recommendations made by the Working Group be implemented immediately, including that program offices conduct analyses of project alternatives independent of the contractor responsible for the proposed project. The memo also established a project management risk committee to provide department-wide project management risk assessment and expert advice on projects with a cost of \$100 million or greater. The June 2015 memorandum implemented several more recommendations from the working group. For example, it directed program offices to develop project cost and schedule estimates consistent with methods and best practices identified in GAO's Cost and Schedule Guides, and to conduct analyses of the root causes underlying project cost overruns, schedule delays, and performance shortcomings.

We support the actions taken by the Secretary, but as reported in our 2015 high-risk update, we remain concerned that the department still may not truly understand the underlying causes of its contract and project management problems. As we testified in April 2015, the recommendations made in the Working Group report and the actions taken by DOE in response to these recommendations represent the third

¹⁹In addition, although we removed nonmajor projects from our high-risk list in 2013, we continue to monitor these projects to ensure that progress in this area continues and is sustained. We recently evaluated progress with the Lithium Production Facility at NNSA's Y-12 complex and the Transuranic Waste Facility at NNSA's Los Alamos National Laboratories. See [GAO-15-525](#) and [GAO-15-182](#).

²⁰[GAO-15-532T](#).

²¹U.S. Department of Energy, *Improving Project Management: Report of the Contract and Project Management Working Group* (Washington, D.C.: November 2014). The working group is chaired by a senior advisor to the Secretary and includes a group of senior project management leaders, including from NNSA and EM. The purpose of the working group is to improve project management execution.

such cycle since 2008, and the recommendations include some issues that the department had declared it previously mitigated, such as difficulties with front-end planning and project funding.²²

Our recent work indicates that implementation of and adherence to departmental requirements is essential if the department's most recent corrective actions are to succeed, as shown in the examples below:

- In July 2015, we found that NNSA had not followed established departmental policy that requires analyzing a mission need independent of a particular solution.²³ Specifically we found that, when considering how it might replace an aging lithium production facility, NNSA included a description of alternatives for addressing its mission need, such as building a new facility or outsourcing lithium processing, but that it also expressed a preference for a particular solution—specifically, a new facility. We concluded that by having completed a mission need statement that is not fully independent of a particular solution and having prepared cost and schedule estimate ranges for only one of the seven alternatives, NNSA could potentially undermine its ability to choose the best alternative that satisfies the mission need. We recommended that NNSA objectively consider all alternatives, without preference for a particular solution, as it proceeds with its analysis of alternatives process. NNSA neither agreed nor disagreed with our recommendation; however, it disagreed with our conclusion. We continue to believe our conclusion is fair and well supported.
- In February 2015, we found that the cost estimates associated with NNSA's Transuranic Waste Facility only partially followed best practices.²⁴ Among other things, we found that NNSA did not follow best practices in developing the cost estimate for the facility's operations and maintenance costs because, among other things, the agency did not sufficiently document its approach for developing the estimate and did not use an inflation rate in its calculations. We recommended that

²²[GAO-15-532T](#).

²³[GAO-15-525](#).

²⁴[GAO-15-182](#). The term transuranic means those elements with an atomic number greater than that of uranium. Transuranic waste generally includes radioactive waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years.

NNSA update the facility's cost estimate to allow better management of the project's life-cycle costs going forward. DOE generally agreed with our recommendations.

In addition, certain major projects that we have examined in past and ongoing work continue to experience cost and schedule delays. For example:

- NNSA proposed in its fiscal year 2017 congressional budget request to terminate its Mixed Oxide (MOX) Fuel Fabrication Facility,²⁵ which has been under construction since 2007, and for which NNSA has already spent approximately \$4.6 billion on design and construction. NNSA's request stated that its MOX fuel approach to dispose of 34 tons of weapons-grade plutonium will be significantly more expensive than anticipated and will require approximately \$800 million to \$1 billion annually for decades. Instead, NNSA proposes to focus on a new alternative to dilute and dispose of the surplus plutonium and dispose of the material in a geologic repository. According to DOE officials, they are currently conducting pre-conceptual design work for this dilute and dispose option, evaluating whether a portion or all of this material could be disposed of in DOE's geologic repository, the Waste Isolation Pilot Plant (WIPP), located near Carlsbad, New Mexico; and examining alternative options for disposal. We have ongoing work examining the extent to which WIPP has the capacity to dispose of this quantity of plutonium.
- EM does not have updated information on the cost and schedule delays for key portions of the Waste Treatment and Immobilization Plant (WTP) at Hanford, Washington. This is the largest construction project at DOE, and it continues to face delays and cost increases. In May 2015, we noted that in 2006,²⁶ EM increased the project cost baseline to \$12.3 billion and extended completion to 2019. We also reported that this project will not meet its cost and schedule baselines. In addition, we found that DOE is limited in its ability to measure cost and schedule performance. In January 2016, DOE stated that it would not be able to develop new cost and schedule baselines for at least 3 years for key portions of the WTP. In May 2015, we found that DOE's costs for the

²⁵The facility was to produce MOX fuel (i.e., a mix of plutonium and uranium oxides) for nuclear reactors.

²⁶[GAO-15-354](#).

WTP will likely increase by billions.²⁷ DOE also proposed adding 17 years to the completion date in its proposal to modify the consent decree in its dispute with the state of Washington.²⁸

We have ongoing work to evaluate DOE's contract and project management practices. Specifically, we have ongoing reviews examining major projects including the WTP, as well as the Chemistry and Metallurgy Research Replacement project at NNSA's Los Alamos National Laboratories in New Mexico, and the Uranium Processing Facility at NNSA's Y-12 complex in Oak Ridge, Tennessee. In addition, we have ongoing reviews examining DOE's use of management and operating contracts, and NNSA's qualifications for program managers.

Budgetary Challenges Facing Modernization Efforts

NNSA's ability to execute its modernization plans is also complicated by questions about the alignment of its plans with future budgets and competing demands for budgetary funding. Our work has identified instances where NNSA's long-term budget estimates to support its modernization plans and the President's budget request were not in alignment. We have also identified outstanding and new demands for resources, such as the need to address deferred maintenance in facilities on which mission success depend; to recapitalize security infrastructure; and to support a new repository for defense high-level waste, which may place additional demands on the defense budget.

²⁷As we reported in May 2015, on September 30, 2014, the WTP contractor submitted a contract modification proposal to DOE's Office of River Protection that includes revised cost estimates to complete portions of the WTP. According to the proposal, the cost for this work is about \$3.7 billion, including the contractor's fee, which is in addition to the \$151 million to \$2 billion the contractor estimated it may need to address risks facing the Low Activity Waste facility. This proposal does not include the costs for the Pretreatment and High-level Waste facilities, on which construction has been stalled for several years. According to DOE headquarters officials, these costs are estimates developed by the contractor that have not been validated or accepted by DOE.

²⁸On October 25, 2010, a federal district court approved a consent decree as part of the settlement of a lawsuit that the state filed against DOE. This consent decree imposed an enforceable schedule for cleaning up waste from Hanford's underground tanks. DOE agreed in this consent decree to achieve "initial plant operations" of the WTP no later than December 31, 2022. *Washington v. Chu*, Civ. No. 08-05085 (E.D. Wash), entered October 25, 2010. DOE has proposed in court to change that deadline to December 31, 2039.

Budgetary Alignment with Program Plans

In a December 2015 report,²⁹ we assessed budget estimates for sustaining and modernizing the nuclear stockpile and nuclear security enterprise over the next 10 years that were contained in a joint DOD-DOE report.³⁰ We found that DOE's overall budget estimates for fiscal years 2021 through 2025—the 5 years beyond the Future-Years Nuclear Security Program (NNSA's 5-year funding plan)—totaled \$56.4 billion, \$4.2 billion more than the estimates identified in the joint report as the President's budget figures. This apparent nonalignment between these estimates has raised questions about the alignment of NNSA's modernization funding needs based on program plans with potential future budgets.

In our August 2015 and December 2015 reports, we also found some nonalignment over a 10-year period (fiscal years 2016 to 2025) between the program cost estimates and budget estimates for a number of LEPs.³¹ We concluded in both reports that this misalignment, if left uncorrected, could result in a potential funding shortfall for those programs in some years. NNSA agreed with our recommendation from August 2015 to be more transparent about differences between program and budget cost estimates and noted that it would include such information in its fiscal year 2017 planning documents. We have ongoing work on this issue.

Outstanding and New Demands for Budgetary Resources

Our work has found that outstanding and new needs for budgetary resources—such as the outstanding needs to address deferred maintenance and recapitalize security infrastructure as well as the new need to support a separate repository for defense high-level waste—may place additional demands on the defense budget. As we found in August 2015, NNSA's infrastructure budget estimates are not adequate to address the agency's reported \$3.6 billion deferred maintenance backlog, and the backlog will continue to grow.³² We found that one reason the

²⁹ [GAO-16-23](#).

³⁰ These estimates were included in the fiscal year 2016 DOD-DOE joint report. DOD and DOE are required to submit to certain congressional committees a report—referred to as the “section 1043” report or the “DOD-DOE joint report”—on among other things, the plan for the nuclear weapons stockpile and its delivery systems and 10-year budget estimates for modernization.

³¹ [GAO-15-499](#) and [GAO-16-23](#). Our reviews examined the following LEPs: W76-1, the B61-12, the W88 Alteration 370, the W80-4, the Interoperable Warhead-1, and the Interoperable Warhead-2.

³² [GAO-15-499](#).

backlog will continue to grow is that the 2015 budget estimates to address the problem fell below DOE infrastructure investment benchmarks for maintaining and recapitalizing existing facilities. We reported that NNSA is investing in systems and processes to improve data available for program planning and budget estimating to address deferred maintenance and that NNSA expects improved estimates to contribute to the President's budget request in fiscal year 2017. In addition to a large backlog of deferred maintenance, NNSA faces other infrastructure challenges that are not included in NNSA's long-range plans. For instance, NNSA's fiscal year 2017 budget request notes that more than \$2 billion may be needed over a 15-year period to address aging and obsolete security infrastructure.³³ Congress directed the creation of a Security Improvements Program to address the backlog of needed security infrastructure upgrades, and provided \$30 million in fiscal year 2016 to begin that process. According to NNSA's fiscal year 2017 budget request, NNSA will use the fiscal year 2016 funding to meet immediate requirements, while developing a funding plan and list of prioritized upgrade projects to address security infrastructure and Perimeter Intrusion Detection and Assessment System upgrades in future years.

Further, a recent policy change may place additional demands on the defense budget. In March 2015, DOE released a report supporting the need for a separate defense high-level radioactive waste repository, which would hold waste from atomic energy defense activities. In addition to this repository, defense spent nuclear fuel along with commercial spent nuclear fuel would be placed in separate comingled repository. Until 2010, DOE had been proceeding with a plan to use a single repository at Yucca Mountain, Nevada, that comingled defense and commercial waste. We have ongoing work examining what is known about the projected cost and schedule of DOE's new plan. According to DOE's analysis, developing two repositories is generally more expensive than one. According to DOE, the upper end of DOE's cost estimate range for the two repository option is \$33 billion higher than the upper end of their cost estimate range for a single comingled repository option.³⁴ Further, DOE

³³DOE, *Department of Energy: FY 2017 Congressional Budget Request for the National Nuclear Security Administration*, vol. 1 (Washington, D.C.: Feb. 2016).

³⁴DOE's analysis from the March 2015 plan shows the cost of a two-repository option as being \$38 billion to \$129 billion, while the cost of a single comingled repository option is shown as \$29 billion to \$96 billion.

documents indicate that these estimates do not include the full cost of the program. For example, the estimates do not include the cost of packaging and transporting the waste. DOE's previous cost estimate for packaging and transportation at Yucca Mountain exceeded \$20 billion. According to DOE officials, these costs may be offset to some degree by future benefits, such as efficiencies in site selection that could shorten the amount of time it takes the department to choose a site for the comingled repository, but such benefits cannot be quantified at this time. Our preliminary observations show that the additional costs for a two-repository approach could place additional demands on future defense budgets. Under DOE's new plan for two repositories, defense appropriations are to cover the entire cost of the defense high-level radioactive waste repository. In addition, according to DOE documents, the defense appropriation share for a comingled repository could be up to 20 percent of its cost, but according to DOE officials the share will likely be lower than 20 percent.

Growing Costs of Environmental Liabilities

EM is responsible for the large and complex mission of cleaning up the nuclear security complex, and the cost of addressing this environmental liability is significant. Based on our preliminary observations from ongoing work, of the total environmental liability held by the federal government, DOE is responsible for the majority, or \$340 billion.³⁵ Of this amount, EM's cleanup of former weapons production sites is by far the largest piece. In 2015, EM estimated that cleanup of former weapons production and nuclear energy research sites would generally take until 2075 and could cost as much as \$240 billion (in current dollars).³⁶ Some of our recent work indicates that this \$240 billion figure is likely understated, in part because there are additional future cleanup costs in other portions of DOE liabilities that will likely shift to EM. For example, we found in March 2015 that EM's portion of the environmental liability estimate does not include the cost to clean up NNSA's excess facilities that have not yet been transferred to EM, which DOE acknowledges could cost billions.³⁷

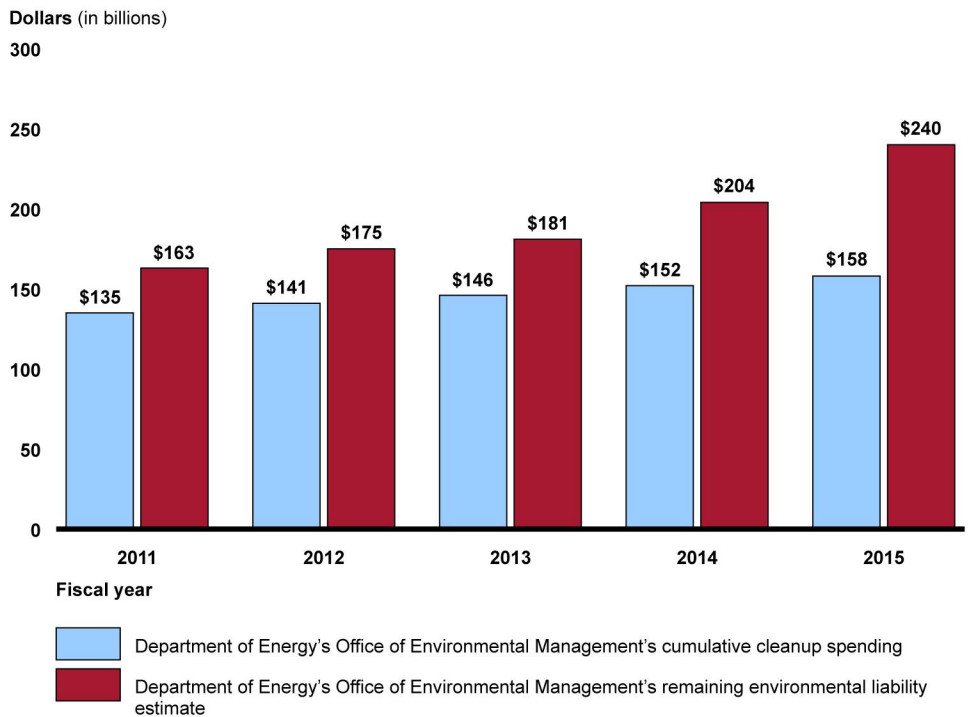
³⁵As of this testimony, the most current federal government environmental liability estimate of \$370 billion was for 2014.

³⁶DOE, *FY 2016 Congressional Budget Request*, DOE/CF-0111 (Washington, D.C.: Feb. 2015). DOE, *Fiscal Year 2015: Agency Financial Report*, DOE/CF-0144 (Washington, D.C.: Nov. 16, 2015).

³⁷[GAO-15-272](#).

Our preliminary observations based on our ongoing work indicate that the remaining environmental cleanup estimate has been growing since fiscal year 2011, even as EM has continued to spend money on cleanup work. For example, our preliminary analysis of EM audited financial statements indicates that EM spent \$23 billion from fiscal years 2011 through 2015—with the cumulative total spent by EM rising from \$135 billion to \$158 billion—for environmental cleanup work at its EM sites (see fig. 1). During this same time, EM’s estimate to complete the cleanup work (remaining environmental liability estimate) rose by \$77 billion—from \$163 billion to \$240 billion. In its fiscal year 2015 financial statement, DOE attributes recent increases to (1) inflation adjustments to reflect constant dollars for the current year; (2) improved and updated estimates for the same scope of work, including changes resulting from deferral or acceleration of work; (3) revisions in technical approach or scope; and (4) regulatory changes.

Figure 1: DOE’s Office of Environmental Management’s Cumulative Spending on Cleanup and Remaining Environmental Liability Estimates from Fiscal Years 2011 to 2015



Source: GAO analysis of Department of Energy financial statement data. | GAO-16-422T

Data Table for Figure 1: DOE’s Office of Environmental Management’s Cumulative Spending on Cleanup and Remaining Environmental Liability Estimates from Fiscal Years 2011 to 2015

	Department of Energy’s Office of Environmental Management’s cumulative cleanup spending	Department of Energy’s Office of Environmental Management’s remaining environmental liability estimate
FY2011	\$135	\$163
FY2012	\$141	\$175
FY2013	\$146	\$181
FY2014	\$152	\$204
FY2015	\$158	\$240

Over the past 2 decades, we and others have pointed out the need for DOE to take a complex-wide, risk-based approach to its long-term cleanup strategy, which could reduce costs while also maximizing risk-reduction in a more timely way. For example, in 1995, we reported that DOE’s cleanup strategy had been shaped by site-specific environmental agreements whose priorities and requirements had not always been consistent with technical or fiscal realities and that, under budgetary constraints, the use of many separately negotiated agreements was not well suited to setting priorities among sites and may result in the selection of cleanup approaches that are costlier than needed to address risks.³⁸ Most recently, in 2015, a review by the Omnibus Risk Review Committee found that DOE needed a more systematic effort to assess and rank risks within and among sites, including through headquarters guidance to sites, and to allocate federal taxpayer monies to remedy the highest-priority risks through the most efficient means to help secure more effective use of available resources and greater overall protection.³⁹ The report noted that DOE has

³⁸GAO, *Department of Energy: National Priorities Needed for Meeting Environmental Agreements*, [GAO/RCED-95-1](#) (Washington, D.C.: Mar. 3, 1995).

³⁹Omnibus Risk Review Committee, *A Review of the Use of Risk-Informed Management in the Cleanup Program for Former Defense Nuclear Sites* (Washington, D.C.: August 2015). EM requested the Consortium for Risk Evaluation with Stakeholder Participation, an independent multidisciplinary consortium of universities led by Vanderbilt University, to organize a review in response to congressional direction accompanying the Consolidated Appropriations Act, 2014. To carry out the reviews, the consortium constituted a committee of eight nationally distinguished individuals with diverse experience in risk analysis; public health and safety; nuclear safety; risk management; and environmental law, regulation, and public policy.

not achieved the best risk-reducing use of available resources. According to the report, inconsistent regulatory approaches across cleanup sites, selection of cleanup remedies that are not tailored to risks, and certain requirements in federal facility agreements and consent decrees cause disproportionate resources to be directed at lower-priority risks.

We have ongoing work looking at (1) DOE's long-term cleanup strategy, (2) what is known about the potential cost and time frames to address DOE's environmental liabilities, (3) what factors DOE considers when prioritizing cleanup activities across its sites, and (4) how DOE's long-term cleanup strategy addresses the various risks that long-term cleanup activities encounter.

Nonproliferation Accomplishments and Long-Term Planning Challenges

We have found that NNSA has made progress securing nuclear materials around the world but that it faces challenges in meeting some future nuclear security goals. In addition, we have found limitations in some of NNSA's long-term planning efforts for DNN programs, particularly in its effort to assess proliferation threats and trends over the next 5 to 10 years and their implications for the future of DNN programs.

In September 2015, we reported that NNSA had made progress in securing nuclear materials around the world, particularly in achieving goals under the President's 2009 initiative to secure all vulnerable nuclear materials within 4 years.⁴⁰ Specifically, we found that from April 2009 through December 2013, NNSA exceeded its goal for removing or disposing of highly enriched uranium (HEU) or plutonium, and it exceeded its goal of downblending HEU.⁴¹ However, we found that NNSA missed its goals for other activities under the initiative, including for providing physical protection upgrades at buildings containing nuclear materials and for converting foreign reactors to use more proliferation-resistant low-enriched uranium. In addition, we identified several challenges that may hamper NNSA's ability to meet future nuclear material security goals. For instance, we found that NNSA had neither completed a prioritization list of nuclear materials, including recently identified HEU of U.S.-origin, for return to the

⁴⁰[GAO-15-799](#).

⁴¹HEU is uranium enriched in the isotope uranium-235 to 20 percent or greater. Downblending is a process that involves mixing HEU with either depleted or natural uranium, or low-enriched uranium, to produce a new product that has a lower concentration of uranium-235.

United States or disposition, nor established a time frame for doing so. We also found that NNSA and other agencies had not visited key foreign sites to determine whether the U.S.-origin nuclear material on-site was protected according to international physical security guidelines. We recommended that NNSA complete its prioritization of nuclear materials at foreign locations and that NNSA and other agencies visit sites containing key quantities of U.S nuclear materials that have not been visited in at least 5 years. NNSA agreed with our recommendations and reported to us in December 2015 that it had completed a revised list, prioritizing the removal or disposition of civilian nuclear material inventories.

We have also reported on other limitations related to NNSA's long-term nonproliferation planning. Notably, in response to the changing nonproliferation environment, NNSA began an initiative in 2010, known as the "Over the Horizon" (OTH) initiative, to identify and assess future nuclear and radiological proliferation threats and related trends over the next 5 to 10 years—beyond NNSA's 5-year budget planning horizon—and to consider the implications for the future of DNN programs. The establishment of the OTH initiative was intended to institutionalize long-term DNN planning, and the information produced by the initiative would, among other things, support DNN program planning and organization decisions.

In an October 2015 report, we found that NNSA used a variety of established methods in its OTH initiative to assess potential proliferation threats, but the implementation of these methods had several limitations.⁴² For example, NNSA officials used the established method of subjecting OTH results to peer review. However, we found that the peer review was not conducted in a way consistent with established standards, for instance, by documenting the results of the peer review. The limitations we identified raised concerns about the quality of the analyses produced and about the usefulness of the OTH initiative, as it had been implemented so far, as a DNN planning tool. Additionally, it was unclear how information generated by the OTH initiative informed recent organizational changes and planning decisions in the DNN office. For instance, we found that the extent to which the OTH initiative informed the January 2015 DNN reorganization, which consolidated five DNN program offices into four

⁴²[GAO-16-118](#).

offices, was unclear because NNSA officials could not provide documentation or examples of links between OTH findings and elements of the reorganization. In addition, we found that it was unclear how the OTH initiative informed the development of a March 2015 strategic plan for NNSA's programs—including DNN programs—to prevent, counter, and respond to future nuclear proliferation and terrorism threats because of conflicting information about the role of the initiative in the plan's development. We did not make recommendations on these matters because NNSA officials told us that a new strategic planning function was being created that will oversee the OTH process and manage integration of OTH and other long-range studies into future versions of the NNSA strategic plan. We will continue to monitor NNSA's actions in this area.

Chairman Sessions, Ranking Member Donnelly, and Members of the Subcommittee, this completes my prepared statement. I would be pleased to respond to any questions you may have at this time.

GAO Contact and Staff Acknowledgments

If you or your staff members have any questions about this testimony, please contact me at (202) 512-3841 or trimbled@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony are Nathan Anderson, Dan Feehan, Jonathan Gill, and William Hoehn (Assistant Directors); David Bennett; Mark Braza; Antoinette Capaccio; Lee Carroll; Rob Grace; Bridget Grimes; Cristian Ion; Richard Johnson; Nancy Kintner-Meyer, Jeff Larson; Cynthia Norris; Chris Pacheco; Leslie Pollock; Dan Royer; Robert Sanchez; and Kiki Theodoropoulos.

Appendix: Selected GAO Products

The following is a selection of GAO's recent work assessing the National Nuclear Security Administration's and the Office of Environmental Management's management efforts:

Nuclear Weapons: NNSA Has a New Approach to Managing the B61-12 Life Extension, but a Constrained Schedule and Other Risks Remain. [GAO-16-218](#). Washington, D.C.: Feb. 4, 2016.

Nuclear Weapons Sustainment: Improvements Made to Budget Estimates Report, but Opportunities Remain to Further Enhance Transparency. [GAO-16-23](#). Washington, D.C.: Dec. 10, 2015.

Nuclear Nonproliferation: NNSA's Threat Assessment Process Could Be Improved. [GAO-16-118](#). Washington, D.C.: Oct. 30, 2015.

Nuclear Nonproliferation: DOE Made Progress to Secure Vulnerable Nuclear Materials Worldwide, but Opportunities Exist to Improve Its Efforts. [GAO-15-799](#). Washington, D.C.: Sept. 23, 2015.

Modernizing the Nuclear Security Enterprise: NNSA Increased Its Budget Estimates, but Estimates for Key Stockpile and Infrastructure Programs Need Improvement. [GAO-15-499](#). Washington, D.C.: Aug. 6, 2015.

DOE Project Management: NNSA Should Ensure Equal Consideration of Alternatives for Lithium Production. [GAO-15-525](#). Washington, D.C.: July 13, 2015.

National Nuclear Security Administration: Actions Needed to Clarify Use of Contractor Assurance Systems for Oversight and Performance Evaluation. [GAO-15-216](#). Washington, D.C.: May 22, 2015.

Hanford Waste Treatment: DOE Needs to Evaluate Alternatives to Recently Proposed Projects and Address Technical and Management Challenges. [GAO-15-354](#). Washington, D.C.: May 7, 2015.

National Nuclear Security Administration: Observations on Management Challenges and Steps Taken to Address Them. [GAO-15-532T](#). Washington, D.C.: April 15, 2015.

DOE Facilities: Better Prioritization and Lifecycle Cost Analysis Would Improve Disposition Planning. [GAO-15-272](#). Washington, D.C.: Mar. 19, 2015.

Nuclear Waste: DOE Needs to Improve Cost Estimates for Transuranic Waste Projects at Los Alamos. [GAO-15-182](#). Washington, D.C.: Feb. 18, 2015.

High-Risk Series: An Update. [GAO-15-290](#). Washington, D.C.: Feb. 11, 2015.

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