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DEPARTMENT OF ENERGY

Continued Actions Needed to Address Management Challenges

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GAO Highlights

Highlights of GAO-17-651T, a testimony before the Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate

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Why GAO Did This Study

DOE's NNSA is responsible for managing the nuclear weapons stockpile and supporting nuclear nonproliferation efforts. DOE's Office of Environmental Management's mission includes decontaminating and decommissioning facilities that are contaminated from decades of nuclear weapons production.

Over the last few years, GAO has reported on a wide range of challenges facing DOE and NNSA. These challenges contribute to GAO's continuing inclusion of DOE's and NNSA's management of major contracts and projects on the list of agencies and program areas that are at high risk of fraud, waste, abuse, and mismanagement, or are in need of transformation. GAO also recently added the U.S. government's environmental liabilities to this list.

This statement is based on 13 GAO reports issued from May 2015 through May 2017 and discusses (1) challenges related to the affordability of NNSA's nuclear modernization plans, (2) the status of DOE's efforts to improve its management of contracts and projects, (3) challenges in addressing DOE's environmental liabilities, and (4) challenges facing NNSA's nonproliferation programs.

What GAO Recommends

GAO is not making any new recommendations in this statement. GAO has suggested that Congress consider taking certain actions and that DOE continue to act on the numerous recommendations made to address these challenges. GAO will continue to monitor DOE's implementation of these recommendations.

View GAO-17-651T. For more information, contact David Trimble at (202) 512-3841 or trimbled@gao.gov.

What GAO Found

The Department of Energy's (DOE) National Nuclear Security Administration (NNSA) faces challenges related to the affordability of its nuclear modernization programs. GAO found in April 2017 that these challenges were caused by a misalignment between NNSA's modernization plans and the estimated budgetary resources needed to carry out those plans. First, GAO found that NNSA's estimates of funding needed for its modernization plans sometimes exceeded the budgetary projections included in the President's planned near-term and long-term modernization budgets. Second, GAO found that the costs of some major modernization programs—such as for nuclear weapon refurbishments—may also increase and further strain future modernization budgets that currently do not anticipate these potential increases. GAO recommended in April 2017 that NNSA include an assessment of the affordability of its modernization programs in future versions of its annual plan on stockpile stewardship; NNSA neither agreed nor disagreed with that recommendation.

DOE has taken several important steps that demonstrate its commitment to improving contract and project management, but challenges persist. In recent reports, GAO has noted progress as DOE has developed and implemented corrective actions to identify and address root causes of persistent project management challenges and progress in its monitoring of the effectiveness and sustainability of corrective actions. However, DOE's recent efforts do not address several areas of contract and project management where the department continues to struggle. GAO has made several recommendations related to these issues, many of which DOE has not yet implemented.

DOE also faces challenges with addressing its environmental liabilities—the total cost of its cleanup responsibilities. In February 2017, GAO found that DOE was responsible for over 80 percent ($372 billion) of the U.S. government's estimated $450 billion environmental liability. However, this estimate does not reflect all of DOE's cleanup responsibilities. For example, in January 2017, GAO found that the cost estimate for DOE's proposal for separate defense and commercial nuclear waste repositories excluded the costs and time frames for key activities, and therefore full costs are likely to be billions of dollars more than DOE's reported environmental liabilities. To effectively address cleanup, GAO and other organizations have reported that DOE needs to take a nation-wide, risk-informed approach, which could reduce long-term costs as well as environmental risks more quickly. Since 1994, GAO has made at least 28 recommendations to address the federal government's environmental liabilities and 4 suggestions to Congress to consider changes to the laws governing cleanup activities. Of these, 13 recommendations remain unimplemented.

Finally, NNSA faces challenges in implementing its nonproliferation programs. For example, in June 2016, GAO found that NNSA's Nuclear Smuggling Detection and Deterrence program had developed a program plan, but NNSA could not measure progress because not all of the program's goals were measurable, and performance measures were not aligned with the goals. As a result, NNSA may not be able to determine when the program has fully achieved its mission. GAO has made several recommendations related to NNSA's nonproliferation programs, some of which NNSA has yet to implement.

Chair Fischer, Ranking Member Donnelly, and Members of the Subcommittee:

Thank you for the opportunity to discuss our recent work on some of the pressing management challenges facing the Department of Energy (DOE) and its National Nuclear Security Administration (NNSA).[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. To implement NNSA's weapons modernization plans, the agency's February 2016 budget justification for the Weapons Activities appropriations account included about $49.4 billion for fiscal years 2017 through 2021, of which about $9.2 billion was for fiscal year 2017. In addition, DOE, through its Office of Environmental Management (EM), is responsible for decontaminating and decommissioning nuclear facilities and sites that are contaminated from decades of nuclear weapons production and nuclear energy research. Since its inception in 1989, EM has spent over $164 billion on cleanup efforts, including to retrieve, treat, and dispose of nuclear 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 this infrastructure.[2] The Department of Defense's (DOD) 2010 Nuclear Posture Review identified long-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.[3] In fiscal year 2011, the

[1]NNSA is a separately organized agency within the Department of Energy. It was created under Title 32 of the National Defense Authorization Act for Fiscal Year 2000, Pub. L. No. 106-65, § 3201 et seq.

[2]The 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.

[3]Department 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.

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 January 2017, the President directed the Secretary of Defense to initiate a new Nuclear Posture Review to ensure that the United States nuclear deterrent is modern, robust, flexible, resilient, ready, and appropriately tailored to deter 21st-century threats and reassure our allies.

To support its modernization and cleanup missions, DOE relies primarily on contractors to carry out its programs. DOE is the largest civilian contracting agency in the federal government and spends approximately 90 percent of its $32 billion in funding (in fiscal year 2017) on contracts and large capital asset projects. We designated DOE's contract management—which has included both contract administration and project management—as a high-risk area in 1990 because DOE's record of inadequate management and oversight of contractors had left it vulnerable to fraud, waste, abuse, and mismanagement.

Reports we have issued over the past several years have highlighted various challenges that NNSA and EM continue to face in carrying out their mission-related responsibilities, including challenges in contract and project management that relate to NNSA's modernization activities and EM's cleanup efforts. In our 2017 high-risk update, we reported that NNSA and EM continued to demonstrate a strong commitment and top leadership support to improve contract and project management—a key criterion for removing agencies and program areas from our High-Risk List.[4] However, we also found that DOE still needs to make more 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 continued to struggle to stay within cost and schedule estimates for some of their major projects.

As NNSA works to modernize the nuclear security enterprise, EM must address the legacy of 70 years of nuclear weapons production and

[4]GAO, *High-Risk Series: Progress on Many High-Risk Areas, While Substantial Efforts Needed on Others*, GAO-17-317 (Washington, D.C.: Feb. 15, 2017). GAO's high-risk program identifies government operations with greater vulnerabilities to fraud, waste, abuse, and mismanagement or the need for transformation to address economy, efficiency, or effectiveness challenges.

energy research by DOE 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. Various federal laws, agreements with states, and court decisions require the federal government to clean up environmental hazards at federal sites and facilities—such as nuclear weapons production facilities. DOE's approaches to addressing its environmental liabilities and cleaning up the contamination from past activities are often influenced by numerous site-specific factors, stakeholder agreements, and legal provisions. For years, we and others have reported on shortcomings in DOE's approach to addressing its environmental responsibilities, including incomplete data on the extent of cleanup needed, and in 2017 we added federal environmental liabilities to our High-Risk List—over 80 percent of these liabilities are DOE's responsibility.[5] In our 2017 high-risk update, we reported that because of incomplete information and often inconsistent approaches to making cleanup decisions, DOE does not always approach environmental cleanup using a risk-informed approach to reduce health and safety risks in a cost effective manner.

My testimony today discusses (1) challenges related to the affordability of NNSA's nuclear modernization programs, (2) the status of DOE's efforts to improve its management of contracts and projects, (3) challenges in addressing DOE's environmental liabilities, and (4) challenges facing NNSA's nonproliferation programs. My statement is based primarily on information from 13 GAO reports issued from May 2015 to May 2017 (see the end of the testimony for a list of related reports). For that work, we reviewed agency documents and interviewed agency officials, among other things. Detailed information about the scope and methodology we used to conduct our prior work can be found in each of our issued reports. The work upon which this testimony is based was conducted 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.

[5]GAO-17-317.

Misalignment between NNSA's Modernization Budget Estimates and Plans Raises Affordability Concerns

In April 2017, we issued our latest report on NNSA's 25-year plans to modernize the nation's nuclear weapons stockpile and its supporting infrastructure.[6] In this report, we identified two areas of misalignment between NNSA's modernization plans and the estimated budgetary resources needed to carry out those plans, which could result in challenges to NNSA in affording its planned portfolio of modernization programs. First, we found that NNSA's estimates of funding needed for its modernization plans sometimes exceeded the budgetary projections included in the President's planned near- and long-term modernization budgets. In the near-term (fiscal years 2018 through 2021), we found that NNSA may have to defer certain modernization work beyond that time period in order to execute its program within the planned budget, which could increase modernization costs and schedule risks. This is a pattern we have previously identified as a "bow wave"—an increase in future years' estimated budget needs that occurs when agencies are undertaking more programs than their resources can support. In the long-term (fiscal years 2022 through 2026), we found that NNSA's modernization program budget estimates sometimes exceeded the projected budgetary resources planned for inclusion in the President's budget, raising additional questions about whether NNSA will be able to afford the scope of its modernization program. Second, the costs of some major modernization programs—such as for nuclear weapon refurbishments—may also increase and further strain future modernization budgets.

Misalignment between Estimates and Plans May Result in Increased Cost and Schedule Risks and Raises Affordability Concerns

As we reported in April 2017, NNSA estimates of funding needed for its modernization plans sometimes exceeded the budgetary projections included in the President's planned near- and long-term modernization budgets.

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

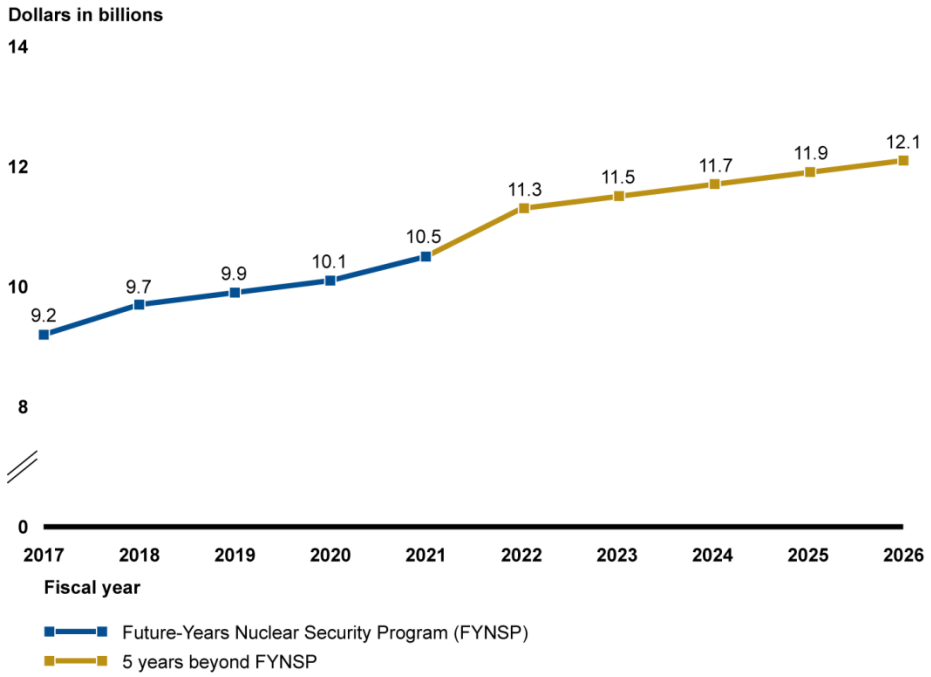
Near-term Misalignment between Modernization Plans and Estimated Budgetary Resources

We found that NNSA may have to defer certain modernization work planned for fiscal years 2018 through 2021 beyond its current 5-year planning period, called the Future-Years Nuclear Security Program (FYNSP). As we reported in April 2017, this is caused by a misalignment between NNSA's budget estimates for certain nuclear modernization programs and the President's budgets for that period.[7] We concluded that this deferral could exacerbate a significant bow wave of modernization funding needs that NNSA projects for the out-years beyond the FYNSP and could potentially increase modernization costs and schedule risks. As we have previously reported, such bow waves occur when agencies defer costs of their programs to the future, beyond their programming periods, and they often occur when agencies are undertaking more programs than their resources can support.[8] As NNSA's fiscal year 2017 budget materials show, its modernization budget estimates for fiscal years 2022 through 2026—the first 5 years beyond the FYNSP—may require significant funding increases. For example, in fiscal year 2022, NNSA's estimates of its modernization budget needs are projected to rise about 7 percent compared with the budget estimates for fiscal year 2021, the last year of the FYNSP, as shown in figure 1.

[7]Two key documents, updated annually, describe NNSA's operations, modernization plans, and budget estimates for implementing these plans; these documents comprise NNSA's nuclear security budget materials. First, the *Stockpile Stewardship and Management Plan* (the plan) is NNSA's formal means of communicating to Congress information on modernization and operations plans and budget estimates over the next 25 years. Second, NNSA's annual justification of the President's budget provides program information and budget estimates for the next 5 years. This 5-year plan is called the Future-Years Nuclear Security Program (FYNSP), and the budget estimates in this plan reflect funding levels approved by the Office of Management and Budget (OMB). The budget estimates for years included in the FYNSP must align with the 5-year overall federal budget estimates in the President's budget. The budget estimates for years beyond the FYNSP are not subject to this requirement.

[8]GAO, *Orion Multi-Purpose Crew Vehicle: Action Needed to Improve Visibility into Cost, Schedule, and Capacity to Resolve Technical Challenges*, GAO-16-620 (Washington, D.C.: Jul. 27, 2016) and *Weapon System Acquisitions: Opportunities Exist to Improve the Department of Defense's Portfolio Management*, GAO-15-466 (Washington, D.C.: Aug. 27, 2015).

Figure 1: Comparison of the National Nuclear Security Administration's Fiscal Year 2017 Budget Estimates for the Future-Years Nuclear Security Program and 5 Years Beyond



Source: GAO analysis of National Nuclear Security Administration data. | GAO-17-651T

Note: Amounts are presented in nominal dollars, which are not adjusted for the effects of inflation.

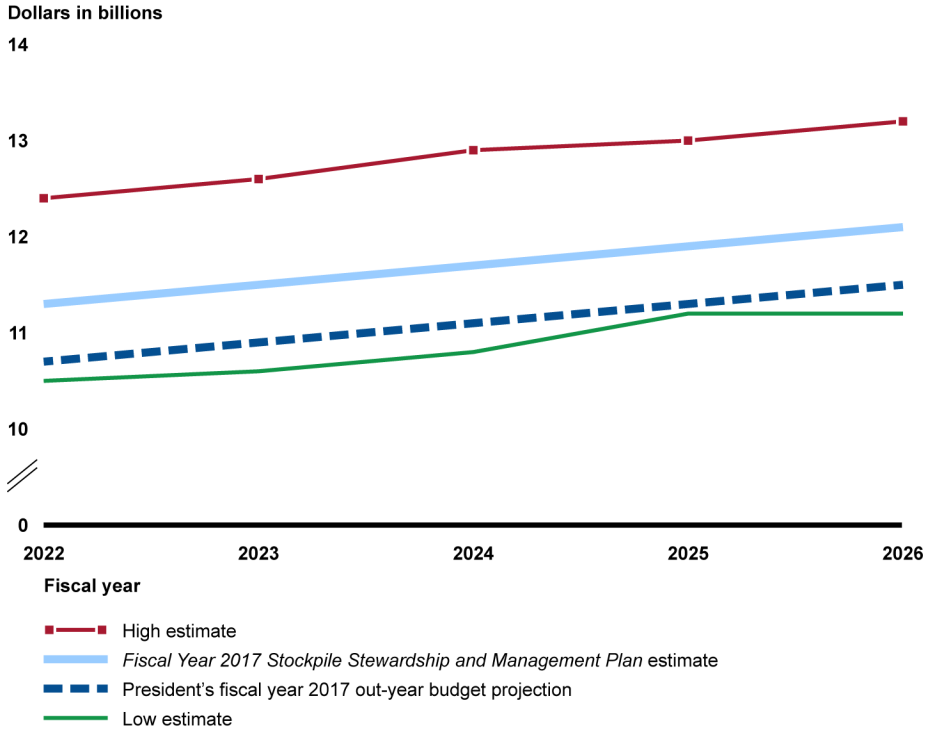
The analysis in our April 2017 report showed that NNSA has shifted this modernization bow wave to the period beyond the FYNSP time frame in each of the past four versions of the annual *Stockpile Stewardship and Management Plan.* For example, in the *Fiscal Year 2014 Stockpile Stewardship and Management Plan,* NNSA's budget estimates for its modernization programs increased from a total of about $9.3 billion in fiscal year 2018, the last year of the FYNSP, to about $10.5 billion in fiscal year 2019, the first year after the FYNSP—an increase of about 13 percent. Similar patterns showing a jump in funding needs immediately after the last year of the FYNSP are repeated in the funding profiles contained in the fiscal year 2015, 2016, and 2017 plans. As we have previously reported, deferring more work to future years can increase cost and schedule risks and can put programs in the position of potentially facing a backlog of deferred work that grows beyond what can be accommodated in future years.

Long-term Misalignment between Modernization Plans and Estimated Budgetary Resources

The *Fiscal Year 2017 Stockpile Stewardship and Management Plan* shows that NNSA's overall modernization budget estimates for fiscal years 2022 through 2026—the out-years beyond the FYNSP—may exceed the projected funding levels in the President's budgets for that time period, raising further questions about the affordability of NNSA's nuclear modernization plans. According to NNSA's data, the agency's estimated budget needed to support modernization totals about $58.4 billion for fiscal years 2022 through 2026, and the out-year funding projections contained in the President's fiscal year 2017 budget for the same period total about $55.5 billion. The President's out-year funding projections, therefore, are approximately $2.9 billion, or about 5.2 percent, less than NNSA estimates it will need over the same time period.

Despite this potential shortfall, NNSA's *Fiscal Year 2017 Stockpile Stewardship and Management Plan* concludes that the modernization program is generally affordable in the years beyond the FYNSP for two reasons. First, the President's out-year funding projections are sufficient to support NNSA's low-range cost estimates for its modernization programs for fiscal years 2022 through 2026. Based on NNSA data, the low-range cost estimates for fiscal years 2022 through 2026 total approximately $54.4 billion and the President's out-year funding projections total about $55.5 billion. Figure 2 illustrates data from the 2017 plan showing NNSA's nominal budget estimates, including high- and low-range cost estimates for its modernization program, along with the out-year funding projections from the President's fiscal year 2017 budget, for fiscal years 2022 to 2026. Second, NNSA concludes that its modernization programs are generally affordable beyond the FYNSP because the agency's estimated modernization budget needs will begin to decrease in fiscal year 2027.

Figure 2: Comparison of the Fiscal Year 2017 Stockpile Stewardship and Management Plan's Budget Estimates and High- and Low-Range Cost Estimates with the President's Fiscal Year 2017 Out-Year Budget Projections, Fiscal Years 2022 through 2026



Source: GAO analysis of National Nuclear Security Administration data. | GAO-17-651T

Note: Amounts are presented in nominal dollars, which are not adjusted for the effects of inflation.

In our April 2017 report, we noted that NNSA's conclusion—that its modernization program is affordable because the President's out-year funding projections fall within NNSA's modernization cost ranges—is overly optimistic. This is because NNSA's conclusion is predicated on optimistic assumptions regarding the cost of the modernization program beyond the FYNSP, particularly for fiscal years 2022 through 2026. For the program to be affordable, NNSA's modernization programs would need to be collectively executed at the low end of their estimated cost ranges. The plan does not discuss any options NNSA would pursue to support or modify its modernization program if costs exceeded its low-range cost estimates. In addition, the *Fiscal Year 2017 Stockpile Stewardship and Management Plan* states that the nominal cost of NNSA's modernization program is expected to decrease by approximately $1 billion in fiscal year 2027. In that year, according to the

2017 plan, it is anticipated that NNSA's estimated budgets for its modernization program will begin to fall in line with projections of future presidential budgets. However, as we noted in our April 2017 report, the decrease that NNSA anticipates in its modernization funding needs beginning in fiscal year 2027 may not be achievable if the projected mismatch between NNSA's estimates of its modernization budget needs and the projections of the President's modernization budget for fiscal years 2022 through 2026 is not resolved. This mismatch creates concerns that NNSA will not be able to afford planned modernization costs during fiscal years 2022 through 2026 and will be forced to defer them to fiscal year 2027 and beyond, continuing the bow wave patterns discussed above.

Potential Rising Costs of Some Modernization Programs May Further Strain NNSA's Modernization Budgets

Our April 2017 report identified misalignment between NNSA's estimate of its budget needs and NNSA's internal cost range estimates for several of its major modernization programs. Further, we found that the costs of some major life extension programs (LEPs) may increase in the future, which may further strain NNSA's planned modernization budgets.

With respect to the alignment of NNSA's estimate of its budget needs and NNSA's internal cost range estimates, we found that NNSA's budget estimates were generally consistent with NNSA's high- and low-range cost estimates.[9] However, for some years, NNSA's low-range cost estimates exceeded the budget estimates for some of the programs, suggesting the potential for a funding shortfall for those programs in those years. Specifically, we found that the low-range cost estimates for the W88 Alteration 370 program and all LEPs discussed in our April 2017

[9]According to NNSA officials, two approaches are used to estimate the costs of the LEPs, except for the W76-1. Under the first approach, according to officials, NNSA develops specific budget estimates by year through a "bottom-up" process. NNSA officials described this as a detailed approach to developing the LEP budget estimates that, among other things, integrates resource and schedule information from site participants. Under the second approach, which NNSA refers to as a "top-down" process, NNSA uses historical LEP cost data and complexity factors to project high and low cost ranges for each LEP distributed over the life of the program using an accepted cost distribution method. According to NNSA, the W76-1 LEP, which is the only weapon program that has been through the development phase and the majority of the production phase, is used as the primary basis for modeling cost ranges for all future LEPs. NNSA does not prepare high- and low-range cost estimates for it. Officials noted that the values in these cost ranges reflect idealized funding profiles and do not account for the actual detailed schedule of program activities, planning for risk in the project, or the results of execution to date.

report exceeded their budget estimates for some fiscal years within the 10-year time period from fiscal year 2017 to 2026.[10] As we reported in the 2013 and 2016, this misalignment indicates that NNSA's estimated budgets may not be sufficient to fully execute program plans and that NNSA may need to increase funding for these programs in the future.[11]

Additionally, we found that the costs of two ongoing nuclear weapon LEPs and the W88 Alteration 370 program may increase in the future, based on NNSA information that was produced after the release of the fiscal year 2017 budget materials.[12] These potential cost increases could further challenge the extent to which NNSA's budget estimates support the scope of modernization efforts. The LEPs facing potential cost increases include:

- **B61-12 LEP.** An independent cost estimate for the program completed in October 2016 exceeded the program's self-conducted cost estimate (conducted in June 2016) by $2.6 billion. We are conducting ongoing work to determine how NNSA has, if at all, reconciled this difference.
- **W80-4 LEP.** Officials from NNSA's Office of Cost Policy and Analysis told us that this program may be underfunded by at least $1 billion to meet the program's existing schedule.
- **W88 Alteration 370.** According to officials from NNSA's Office of Cost Policy and Analysis, this program's expanded scope of work may result in about $1 billion in additional costs.

To help NNSA put forth more credible modernization plans, we recommended in our April 2017 report that the NNSA Administrator include an assessment of the affordability of NNSA's portfolio of modernization programs in future versions of the *Stockpile Stewardship and Management Plan,* such as by presenting options (e.g., potentially deferring the start of or canceling specific modernization programs) that

[10]See GAO-17-341 for greater detail on these and other examples.

[11]GAO, *Modernizing the Nuclear Security Enterprise: NNSA's Budget Estimates Increased but May Not Align with All Anticipated Costs*, GAO-16-290 (Washington, D.C.: Mar. 4, 2016) and *Modernizing the Nuclear Security Enterprise: NNSA's Budget Estimates Do Not Fully Align with Plans*, GAO-14-45 (Washington, D.C.: Dec. 11, 2013).

[12]NNSA's fiscal year 2017 budget materials include two key documents: the *Fiscal Year 2017 Stockpile Stewardship and Management Plan*, which was issued in March 2016, and the agency's annual justification of the President's budget, which was issued in February 2016.

NNSA could consider taking to bring its estimates of modernization funding needs into alignment with potential future budgets. In commenting on our report, NNSA neither agreed nor disagreed with our recommendation.

DOE Has Taken Steps to Improve Contract and Project Management, but Challenges Persist, Particularly in Contract Management

The Secretary of Energy has taken several important steps that demonstrate DOE's commitment to improving contract and project management. In our recent reports, we have noted progress as DOE has developed and implemented corrective actions to identify and address root causes of persistent project management challenges, as well as progress in the department's monitoring of the effectiveness and sustainability of corrective actions. However, DOE's recent efforts have not fully addressed several areas where the department continues to have shortcomings.

DOE Has Made Progress in Contract and Project Management

As we noted in our 2017 high risk report, DOE has taken several important steps that demonstrate its commitment to improving project management—steps that have been supported by senior leadership within the department.[13] Specifically, based in part on our December 2014 recommendation,[14] DOE issued a revised project management order, DOE Order 413.3B, in May 2016 and added the following requirements for its program offices:

- Develop cost estimates in accordance with industry best practices.
- Conduct analyses of alternatives for projects consistent with industry best practices and independent of the contractor organization responsible for managing the construction or constructing a capital asset project.
- Ensure that major projects' designs and technologies are sufficiently mature before contractors are allowed to begin construction.

[13]GAO-17-317.

[14]GAO, *DOE and NNSA Project Management: Analysis of Alternatives Could Be Improved by Incorporating Best Practices*, GAO-15-37 (Washington, D.C.: Dec. 11, 2014).

- Conduct a root cause analysis if a major project is expected to exceed its approved cost or schedule.

DOE also made significant efforts to monitor the effectiveness and sustainability of corrective actions address project management challenges. For example, the Secretary strengthened the Energy Systems Acquisition Advisory Board by changing it from an ad hoc body to an institutionalized board responsible for reviewing all capital asset projects with a total project cost of $100 million or more. The Secretary also created the Project Management Risk Committee, which includes senior DOE officials and is chaired by a new departmental position—the Chief Risk Officer. The committee is chartered to assess the risks of projects across DOE and advise DOE senior leaders on cost, schedule, and technical issues for projects.[15]

Although DOE has taken these important actions, it is too early to tell whether front-end planning problems persist. DOE has previously acknowledged its longstanding problems with front-end planning, stating that insufficient front-end planning has consistently contributed to DOE projects not finishing on budget or schedule. Our recent work also indicates that continued senior-level attention on front-end planning may be warranted.

- In August 2016, we found problems with DOE's front-end project planning at the Waste Isolation Pilot Plant (WIPP) for the new permanent ventilation system.[16] This system is being built to enable DOE to resume full operations of the geological nuclear waste repository, which were suspended after a radiological release accident in February 2014. DOE did not follow all best practices in analyzing and selecting an alternative for the new ventilation system at WIPP, which DOE estimated will cost between $270 million and

[15]As we stated in our 2017 High Risk List update, additional time is needed for us to assess how effectively these recent monitoring improvements will validate the sustainability of corrective measures. We have not yet evaluated the operations of the newly created Project Management Risk Committee. In addition, DOE's new oversight and monitoring efforts are not comprehensive, as certain activities within EM are not subject to review by the committee, even though together they cost billions of dollars and last for numerous years. Finally, the effectiveness of DOE's monitoring of its contracts, projects, and programs depends upon the availability of reliable enterprise-wide cost information on which to base oversight activities. See: GAO-17-317.

[16]GAO, *Nuclear Waste: Waste Isolation Pilot Plant Recovery Demonstrates Cost and Schedule Requirements Needed for DOE Cleanup Operations*, GAO-16-608 (Washington, D.C.: Aug. 4, 2016).

$398 million to build and will be completed by the end of March 2021. For example, DOE did not select the preferred alternative based on assessing the difference between the life-cycle costs and benefits of each alternative, as called for by best practices and now required by DOE's revised project management order. We recommended that DOE require projects, including the WIPP ventilation system, to implement recommendations from independent analysis of alternatives reviews or document the reasons for not doing so. DOE concurred with the recommendation and planned to incorporate guidance in its updated project review guide on how DOE offices should address recommendations from independent reviews.

- In August 2016, we found that DOE did not follow project management requirements in its front-end planning for an alternative to the Chemistry and Metallurgy Research Replacement (CMRR) project.[17] After spending $450 million designing the project, NNSA reversed its decision to build a large nuclear facility because of projected excessive cost growth. Instead, NNSA revised the CMRR project to use existing and smaller new facilities. We found that NNSA did not define key parameters for one aspect of the new project, including the capacity for analyzing plutonium that the project should provide, as directed by NNSA policy. We made several recommendations, including that NNSA identify the capacity for analyzing plutonium for the revised CMRR project. NNSA neither agreed nor disagreed with the recommendations.

Areas Where Challenges Continue to Persist

DOE's recent efforts do not address several areas where it continues to have shortcomings including (1) acquisition planning for its major contracts, (2) the quality of enterprise-wide cost information available to DOE managers and key stakeholders, (3) DOE's need for a program management policy, (4) how DOE's new project management requirements will be applied to its major legacy projects, and (5) whistleblower protections.

Acquisition Planning for Major Contracts

During the acquisition planning phase for contracts, critical contract decisions are made that have significant implications for the cost and overall success of an acquisition. In August 2016, we examined DOE's use of management and operating (M&O) contracts.[18] We found that

[17]GAO, *DOE Project Management: NNSA Needs to Clarify Requirements for Its Plutonium Analysis Project at Los Alamos,* GAO-16-585 (Washington, D.C.: Aug. 9, 2016).

[18]GAO, *Department of Energy: Actions Needed to Strengthen Acquisition Planning for Management and Operating Contracts*, GAO-16-529 (Washington, D.C.: Aug. 9, 2016).

DOE did not consider acquisition alternatives beyond continuing its longstanding M&O contract approach for 16 of its 22 M&O contracts. We concluded that without considering broader alternatives in the acquisition planning phase, DOE cannot ensure that it is selecting the most effective scope and form of contract, raising risks for both contract cost and performance.

The size and duration of DOE's M&O contracts—22 M&O contracts with an average potential duration of 17 years, representing almost three-quarters of DOE's spending in fiscal year 2015—underscore the importance of planning for every M&O acquisition. According to DOE officials, one of the primary reasons DOE uses this type of contract is because it is less burdensome to manage. According to DOE officials, such contracts are easier to manage with fewer DOE personnel because they are less frequently competed and have broadly written scopes of work, among other attributes. Moreover, a 2013 study found that, on average, each NNSA M&O procurement employee was associated with about $287 million in contract spending, compared with a federal government average of $9 million per procurement employee. We made two recommendations in that report, including that DOE establish a process to analyze and apply its experience with contracting alternatives. DOE generally concurred with our recommendations.

Quality of Enterprise-Wide Information

The effectiveness of DOE's monitoring of its contracts, projects, and programs depends upon the availability of reliable enterprise-wide information on which to base oversight activities. For example, reliable enterprise-wide cost information is needed to identify the cost of activities, ensure the validity of cost estimates, and provide information to Congress to make budgetary decisions. However, meaningful cost analyses across programs, contractors, and sites are not possible because NNSA's contractors use different methods of accounting for and tracking costs. NNSA developed a plan to improve and integrate its cost reporting structures; however, we found in our January 2017 report that this plan did not provide a useful road map for guiding NNSA's effort.[19] For example, NNSA did not define strategies and identify resources needed to achieve its goals, which is a leading practice for strategic planning. NNSA's plan contained few details on the elements it must include, such

[19]GAO, *National Nuclear Security Administration: A Plan Incorporating Leading Practices Is Needed to Guide Cost Reporting Improvement Effort*, GAO-17-141 (Washington, D.C.: Jan. 19, 2017).

as its feasibility assessment, estimated costs, expected results, and an implementation timeline. We concluded that, until a plan is in place that incorporates leading strategic planning practices, NNSA cannot be assured that its efforts will result in a cost collection tool that produces reliable enterprise-wide cost information that satisfies the information needs of Congress and program managers. We recommended that NNSA develop a plan for producing cost information that fully incorporates leading planning practices. NNSA agreed with our recommendation.

In addition, quality data is needed for DOE to manage its risk of fraud. The Fraud Reduction and Data Analytics Act of 2015 establishes requirements aimed at improving federal agencies' controls and procedures for assessing and mitigating fraud risks through the use of data analytics. In our March 2017 report, however, we found that because DOE does not require its contractors to maintain sufficiently detailed transaction-level cost data that are reconcilable with amounts charged to DOE, it is not well positioned to employ data analytics as a fraud detection tool.[20] The data were not suitable either because they were not for a complete universe of transactions that was reconcilable with amounts billed to DOE or because they were not sufficiently detailed to determine the nature of costs charged to DOE. We concluded that, without requiring contractors to maintain such data, DOE will not be well positioned to meet the requirements of the Fraud Reduction and Data Analytics Act of 2015 and manage its risk of fraud and other improper payments. We recommended that DOE require contractors to maintain sufficiently detailed transaction-level cost data that are reconcilable with amounts charged to the government. DOE did not concur with our recommendation. Specifically, DOE stated that the recommendation establishes agency-specific requirements for DOE contractors that are more prescriptive than current federal requirements and that its M&O contractors, not DOE, are responsible for performing data analytics and determining what data are needed to do so. We are concerned that DOE's response demonstrates that it does not fully appreciate its responsibility for overseeing contractor costs. We continue to believe that the use of data-analytic techniques by DOE employees could help mitigate some of the challenges that limit the effectiveness of DOE's approach for overseeing M&O contractor costs. However, effectively

[20]GAO, *Department of Energy: Use of Leading Practices Could Help Manage the Risk of Fraud and Other Improper Payments*, GAO-17-235 (Washington, D.C.: Mar. 30, 2017).

applying data-analytics is dependent upon the availability of complete and sufficiently detailed contractor data. Therefore, we continue to believe that DOE needs to implement our recommendation and require contractors to maintain sufficiently detailed transaction-level cost data that are reconcilable with amounts charged to the government.

Program Management

Program management can help ensure that a group of related projects and activities are managed in a coordinated way to obtain benefits not available from managing them individually. This approach helps federal agencies get what they need, at the right time, and at a reasonable price. However, in 2016 we found that DOE had not established a department-wide program management policy and that DOE had not established a career development program for program managers. Specifically,

- In an August 2016 report examining NNSA's plans to build the CMRR, we found that the agency had not clarified whether the project would satisfy the mission needs of other NNSA and DOE programs.[21] NNSA might have been better able to clarify this project's mission needs if DOE and NNSA had been operating under a DOE-wide program management policy incorporating leading practices. DOE and NNSA officials said they recognize the importance of establishing a program management policy, but at the time DOE had not done so. We recommended that DOE establish a program management policy that addresses internal control standards and leading practices. DOE provided no comments on our recommendation. After we issued our report, the President signed the 2016 Program Management Improvement Accountability Act, which requires the development of standards, policies, and guidelines for program and project management across the federal government. We will continue to monitor and report on the Act's implementation as part of our biennial high risk updates, and we will also include an assessment of the effectiveness of the standards, policies, and guidelines that are to be developed.
- In a November 2016 report, we found that DOE and NNSA had not established training programs, such as a career development program, for program managers.[22] Program managers are responsible for interacting with project managers to provide support

[21]GAO-16-585.

[22]GAO, *Program Management: DOE Needs to Develop a Comprehensive Policy and Training Program,* GAO-17-51. (Washington, D.C.: Nov. 21, 2016).

and guidance on individual projects, but they also must take a broad view of program objectives and organizational culture. In contrast, DOE had established a training program for project managers, which DOE said was open to program managers. In the absence of a current DOE or NNSA training program for program managers, most of the NNSA program managers we interviewed did not have training related to program management. As a result, we concluded that NNSA may have difficulty developing and maintaining a cadre of professional, effective, and capable program managers. We recommended that DOE establish a training program for program managers.[23] DOE provided no comments on this report.

Major Legacy Projects

DOE has instituted project management reforms that—if fully implemented—will help ensure that future projects are not affected by the challenges that have persisted for DOE's major legacy projects. Specifically, DOE has taken action on certain major projects, but has not consistently applied these reforms, and in particular, DOE has not applied such reforms to its largest legacy cleanup project at its Hanford Site in Washington state. As we found in a May 2015 report, DOE continues to allow construction of certain Waste Treatment and Immobilization Plant (WTP) facilities at DOE's Hanford Site before designs are 90 percent complete.[24] This contrasts with DOE's revised project management order that now requires a facility's design to be at least 90 percent complete before establishing cost and schedule baselines and cost and schedule estimates that meet industry best practices. The WTP is DOE's largest project, and it has faced numerous technical and management challenges that have added decades to its schedule and billions of dollars to its cost. We recommended in May 2015 that DOE (1) consider whether to limit construction on the WTP until risk mitigation strategies are developed to address known technical challenges, and (2) determine the extent to which the quality problems exist, in accordance with its quality assurance policy, for the facilities' systems that have not been reviewed to determine if additional vulnerabilities exist. However, as of September 2016, DOE has not yet implemented our recommendations. Notably, after we issued our report, DOE announced in December 2016 that the cost estimate for

[23]As noted above, the Program Management Improvement Accountability Act may help NNSA address some of its challenges in program management.

[24]The WTP is DOE's current planned approach to treating some of Hanford's radioactive tank waste. See: GAO, *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).

one portion of the WTP—the part needed to treat a fraction of the low-activity waste—had increased to nearly $17 billion. This cost estimate does not include the costs for a majority of the WTP's waste treatment scope, including high-level waste treatment. In light of longstanding challenges with major projects, such as with the WTP, we believe DOE must begin to apply project management reforms to the projects that need them the most.[25]

Whistleblower Protections

Having the right people and resources is necessary to mitigate risks, but it is not always sufficient to ensure that risks are identified and appropriately addressed. As we have previously reported, management must foster a culture in which staff are encouraged to identify risks and use their expertise to proactively mitigate them. In July 2016, we examined DOE's effort to evaluate the environment for raising concerns without fear of reprisal.[26] We found, among other things, that DOE used flawed and inconsistent methodologies to evaluate the environment for raising safety and other concerns and therefore could not reliably judge its openness or ensure that appropriate action was taken in response to evaluation results. We noted that several factors may limit the use and effectiveness of mechanisms for contractor employees to raise concerns and seek whistleblower protections. We also found that DOE infrequently used its enforcement authority to hold contractors accountable for unlawful retaliation against whistleblowers, issuing just two violation notices in the past 20 years. Additionally, in 2013, DOE determined that it did not have the authority to enforce a key aspect of policies that prohibit retaliation for nuclear safety-related issues—despite having taken such enforcement actions in the past.[27] In response to our recommendations, DOE has

[25]We have ongoing work examining the Mixed Oxide Fuel Fabrication Facility, the Uranium Processing Facility, and the Waste Treatment and Immobilization Plant.

[26]GAO, *Department of Energy: Whistleblower Protections Need Strengthening*, GAO-16-618 (Washington, D.C.: July 11, 2016).

[27]We made several recommendations, including that DOE independently assess the environment for raising concerns, evaluate whether the whistleblower pilot program will mitigate challenges with the existing program, expedite time frames for clarifying regulations, and clarify policies to hold contractors accountable. DOE concurred with most of these recommendations. In December 2016, DOE issued a rule to change DOE's nuclear safety rules to clarify its authority to assess civil penalties against certain contractors and subcontractors for violating the prohibition against retaliating against whistleblowers. In addition, In September 2016, DOE updated its Order 221.1B that establishes the requirements and responsibilities for reporting fraud, waste, and abuse. The revised order provides some additional specificity to its Office of Inspector General's role in processing employee allegations and provides additional language intended to prohibit contractors from deterring or dissuading employees from reporting concerns.

started the process of updating its Integrated Safety Management policies and guidance, but it is too early to tell whether the updated regulation will address the concerns we raised in our July 2016 report.

DOE Annually Spends Billions on Environmental Cleanup, but the Cost of Its Liabilities Continues to Increase

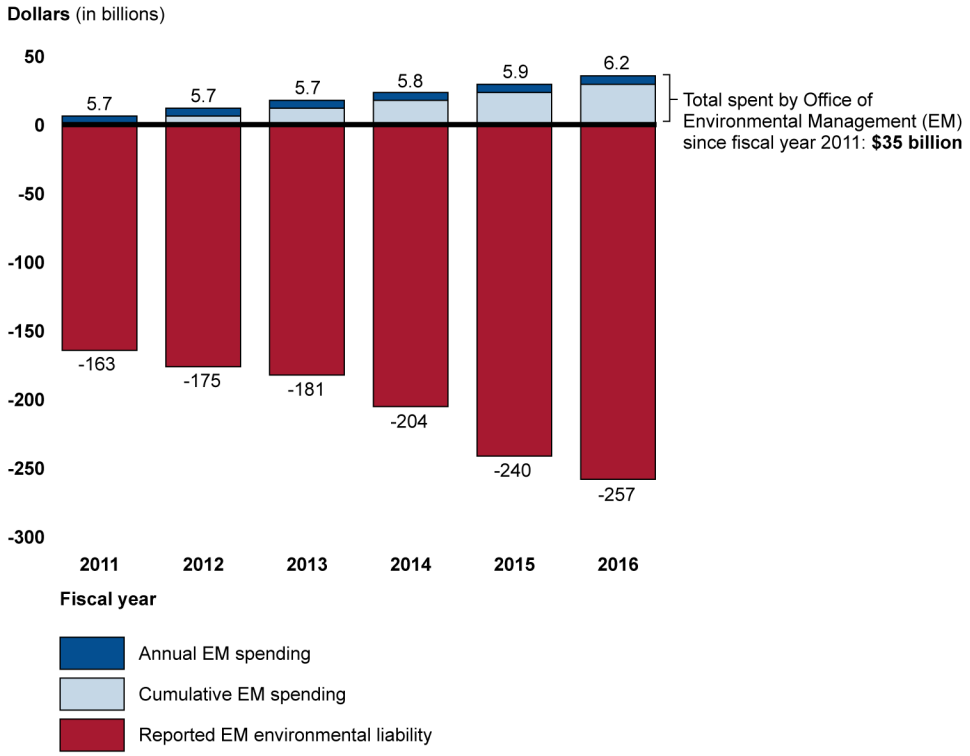
DOE also faces challenges with addressing its environmental liabilities. In February 2017, we added the federal government's environmental liabilities to our High-Risk List. Specifically, we found that the federal government's environmental liability has been growing for the past 20 years—and is likely to continue to increase—and that DOE is responsible for over 80 percent ($372 billion) of the nearly $450 billion reported environmental liability.[28] Notably, this estimate does not reflect all of the future cleanup responsibilities that DOE may face. In addition, DOE has not consistently taken a risk-informed approach to decision-making for environmental cleanup, and DOE may therefore be missing opportunities to reduce costs while also reducing environmental risks more quickly. Our recent work in this area has also identified opportunities where DOE may be able to save tens of billions of dollars. [29]

DOE's total reported environmental liability has generally increased over time. Since 1989, EM has spent over $164 billion to retrieve, treat, and dispose of nuclear and hazardous waste and to date has completed cleanup at 91 of 107 sites across the country (the 91 sites were generally viewed by DOE as the smallest and least contaminated sites to address). Despite billions spent on environmental cleanup, DOE's environmental liability has roughly doubled from a low of $176 billion in fiscal year 1997 to the fiscal year 2016 estimate of $372 billion. In the last 6 years alone, EM has spent $35 billion, primarily to treat and dispose of nuclear and hazardous waste and construct capital asset projects to treat the waste (see figure 3 for EM's annual spending and growing environmental liability). According to documents related to DOE's fiscal year 2016 financial statements, 50 percent of DOE's environmental liability resides at two cleanup sites: the Hanford Site in Washington State and the Savannah River Site in South Carolina.

[28]The majority of DOE's annual environmental cleanup funding—over 80 percent in fiscal year 2016—comes from annual defense authorization spending.

[29]Federal accounting standards require agencies responsible for cleaning up contamination to estimate future cleanup and waste disposal costs and to report such costs in their annual financial statements as environmental liabilities. Per federal accounting standards, federal agencies' environmental liability estimates are to include probable and reasonably estimable costs of cleanup work.

Figure 3: Department of Energy's Office of Environmental Management's Annual Spending and Growing Environmental Liability



Source: GAO analysis of Department of Energy budget data. | GAO-17-651T

Note: EM is the organization within the Department of Energy responsible for managing environmental cleanup and is responsible for cleaning up 107 sites across the country. To date, EM has completed cleanup at 91 of these sites. EM spending includes money to treat and dispose of nuclear and hazardous waste and to construct capital asset projects to treat the waste. We did not adjust environmental liability estimates for inflation because information about the amount of the liability applicable to each future fiscal year was not available.

In its fiscal year 2016 financial statement, DOE attributed recent environmental liability increases to (1) inflation adjustments 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 for cleanup activities; and (4) regulatory and legal changes. Notably, in recent annual financial reports, DOE has cited other significant causes for increases in its liability. Other causes have included the lack of a disposal path for high-level radioactive waste—because of the termination of the Yucca Mountain repository

program —and delays and scope changes for major construction projects at the Hanford and Savannah River sites.[30]

We also reported in February 2017 that DOE's estimated liability does not include billions in expected costs.[31] According to federal accounting standards, environmental liability estimates should include costs that are probable and reasonably estimable, meaning that costs that cannot yet be reasonably estimated should not be included in total environmental liability.[32] Examples of costs that DOE cannot yet estimate include the following:

- DOE has not yet developed a cleanup plan or cost estimate for the Nevada National Security Site and, as a result, the cost of future cleanup of this site was not included in DOE's fiscal year 2015 reported environmental liability. The nearly 1,400-square-mile site has been used for hundreds of nuclear weapons tests since 1951. These activities have resulted in more than 45 million cubic feet of radioactive waste at the site. According to DOE's financial statement, since DOE is not yet required to establish a plan to clean up the site, the costs for this work are excluded from DOE's annually reported environmental liability.
- DOE's reported environmental liability includes an estimate for the cost of a permanent nuclear waste repository, but these estimates are highly uncertain and likely to increase. In March 2015, in response to the termination of the Yucca Mountain repository program, DOE proposed separate repositories for defense high-level and commercial waste. In January 2017, we reported that the cost estimate for DOE's

[30]In June 2008, DOE submitted a license application to the NRC seeking authorization to construct a high-level nuclear waste repository at Yucca Mountain. In the application, DOE stated that it planned to open the repository in 2017. DOE later delayed the date to 2020. In March 2009, however, the Secretary of Energy announced plans to terminate the Yucca Mountain repository program and instead study other nuclear waste options. The President's fiscal year 2011 budget proposal, released in February 2010, proposed eliminating all funding for the Yucca Mountain repository program. For more information, see GAO, *Commercial Nuclear Waste: Effects of a Termination of the Yucca Mountain Repository Program and Lessons Learned,* GAO-11-229 (Washington, D.C.: Apr. 8, 2011).

[31]GAO-17-317.

[32]Federal Accounting Standards Advisory Board, *FASAB Handbook of Federal Accounting Standards and Other Pronouncements, as Amended* (Washington, D.C.: June 30, 2016).

new approach excluded the costs and time frames for key activities.[33] As a result, the full cost of these activities is likely billions of dollars more than what is reflected in DOE's environmental liability. In our annual report on Fragmentation, Overlap, and Duplication in the federal government that we issued in May 2017, we reported that DOE may be able to save billions of dollars by reassessing the rationale for its March 2015 proposal.[34] In April 2017, the House of Representatives Committee on Energy and Commerce disseminated a discussion draft of legislation that could result in renewed efforts to open the Yucca Mountain repository.[35]

In addition, DOE may have insufficient controls in place to accurately account for its environmental liabilities. In January 2017, the DOE Inspector General reported a significant deficiency in internal controls related to the reconciliation of environmental liabilities.

Moreover, DOE does not consistently take a risk-informed decision-making approach to its environmental cleanup mission to more efficiently use resources. As our and other organizations' reports issued over the last 2 decades have found, DOE's environmental cleanup decisions have not been risk-based, and there have been inconsistencies in the regulatory approaches followed at different sites. We and others have pointed out that DOE needs to take a nation-wide, risk-based approach to cleaning up these sites, which could reduce costs while also reducing environmental risks more quickly.

- In 2006, the National Research Council reported that the nation's approach to cleaning up nuclear waste—primarily carried out by DOE—was complex, inconsistent, and not systematically risk-based.[36] For example, the National Research Council noted that the current regulatory structure for low-activity waste is based primarily on

[33]GAO, *Nuclear Waste: Benefits and Costs Should Be Better Understood Before DOE Commits to a Separate Repository for Defense Waste*, GAO-17-174 (Washington, D.C.: Jan. 31, 2017).

[34]GAO, *2017 Annual Report: Additional Opportunities to Reduce Fragmentation, Overlap, and Duplication and Achieve Other Financial Benefits*, GAO-17-491SP (Washington, D.C.: Apr. 26, 2017).

[35]Nuclear Waste Policy Amendments Act of 2017, H.R. ___, 115th Cong. (2017).

[36]National Research Council of the National Academies, *Improving the Regulation and Management of Low-Activity Radioactive Wastes*, (Washington, D.C.: National Academies Press, 2006).

the waste's origins rather than on its actual radiological risks. The National Research Council concluded that by working with regulators, public authorities, and local citizens to implement risk-informed practices, waste cleanup efforts can be done more cost-effectively. The report also suggested that statutory changes were likely needed.

- In 2015, a review organized by the Consortium for Risk Evaluation with Stakeholder Participation reported that DOE was not optimally using available resources to reduce risk.[37] According to the report, factors such as inconsistent regulatory approaches and certain requirements in federal facility agreements caused disproportionate resources to be directed at lower-priority risks. The report called for 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.
- In May 2017, we reported on DOE's efforts to treat a significant portion of the tank waste at the Hanford Site.[38] We found that DOE chose different approaches to treat the less radioactive portion of its tank waste—which DOE refers to as "low-activity waste" (LAW)—at the Hanford and Savannah River Sites. At the Savannah River Site, DOE has grouted about 4 million gallons of LAW since 2007. DOE plans to treat a portion of the Hanford Site's LAW with vitrification, but it has not has not yet treated any of Hanford's LAW and faces significant unresolved technical challenges in doing so.[39] In addition, we found that the best available information indicates that DOE's estimated costs to grout LAW at the Savannah River Site are substantially lower than its estimated costs to vitrify LAW at Hanford, and DOE may be able to save tens of billions of dollars by reconsidering its waste treatment approach for a portion of the LAW at Hanford. Moreover, according to the 21 experts that attended our

[37]The Consortium for Risk Evaluation with Stakeholder Participation is a multi-university consortium organized in 1995 that provides several types of independent, multi-disciplinary reviews of DOE documents, projects, and reports. See: Omnibus Risk Review Committee, *A Review of the Use of Risk-Informed Management in the Cleanup Program for Former Defense Nuclear Sites* (August 2015).

[38]About 90 percent of the waste at Hanford is considered to be low-activity, meaning that it is much less radioactive than high-level waste. See GAO, *Nuclear Waste: Opportunities Exist to Reduce Risks and Costs by Evaluating Different Waste Treatment Approaches at Hanford*, GAO-17-306 (Washington, D.C.: May 3, 2017).

[39]Grout immobilizes waste in a concrete-like mixture. Vitrification immobilizes waste in glass.

meeting convened by the National Academies of Sciences, Engineering, and Medicine, both vitrification and grout could effectively treat Hanford's LAW. Experts at our meeting also stated that developing updated information on the effectiveness of treating a portion of Hanford's waste, called supplemental LAW, with other methods, such as grout, may enable DOE to consider waste treatment approaches that would accelerate DOE's tank waste treatment mission, thereby potentially reducing certain risks and lifecycle treatment costs. We recommended that DOE (1) develop updated information on the performance of treating supplemental LAW with alternate methods, such as grout, before it selects an approach for treating supplemental LAW; and (2) have an independent entity develop updated information on the lifecycle costs of treating Hanford's supplemental LAW with alternate methods. DOE agreed with both recommendations.

Since 1994, we have made at least 28 recommendations related to addressing the federal government's environmental liability and 4 recommendations to Congress to consider changes to the laws governing cleanup activities. Of these, 13 recommendations remain unimplemented. If implemented, these steps would improve the completeness and reliability of the estimated costs of DOE's future cleanup responsibilities and lead to more risk-based management of the cleanup work. We believe these recommendations are as relevant, if not more so, today.[40]

[40]We have ongoing work examining the consistency of DOE's compliance agreements, looking specifically at the extent to which milestones within select compliance agreements are tailored to the environmental and human health risks that DOE is faced with addressing and the extent to which DOE's cleanup remedies are based on up-to-date assessments of conditions at sites and of DOE's technical capabilities.

NNSA Faces Nonproliferation Performance and Program Management Challenges

NNSA also faces challenges implementing its nonproliferation programs under its Office of Defense Nuclear Nonproliferation (DNN). Specifically, in recently completed reviews of DNN programs, we have identified several challenges NNSA faces in how it measures performance and conducts program management of these efforts.[41]

- As I testified last year,[42] NNSA proposed in its fiscal year 2017 congressional budget request to terminate its Mixed Oxide (MOX) Fuel Fabrication Facility, which has been under construction since 2007 and for which NNSA has already spent approximately $4.6 billion on design and construction.[43] NNSA's request stated that its MOX fuel approach for disposing 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 proposed to focus on a new alternative to dilute the surplus plutonium and dispose of the material in a geologic repository. We have ongoing work examining the MOX facility and the extent to which WIPP has sufficient capacity to dispose of this quantity of plutonium. Specifically, we are assessing the extent to which DOE's revised $17.2 billion cost estimate for completing construction of the MOX facility, and the $56 billion revised life-cycle estimate for completing the Plutonium Disposition Program using the MOX approach, met cost-estimating best practices. In addition, we are examining the status of NNSA's development of a life-cycle cost estimate for completing the Plutonium Disposition Program using the dilute and dispose approach. Our review will also assess the extent to which DOE has sufficient disposal space and statutory capacity at WIPP to dispose of all defense transuranic waste, including the diluted plutonium resulting from the dilute and dispose approach.
- In June 2016, we found that the Nuclear Smuggling Detection and Deterrence (NSDD) program had developed a program plan, but that

[41]We have ongoing work on DNN program management practices and policy. Under this review we have conducted a preliminary assessment of the extent to which four selected DNN programs have established cost and schedule estimates and are measuring performance against cost and schedule baselines.

[42]GAO, *Department of Energy: Observations on Efforts by NNSA and The Office of Environmental Management to Manage and Oversee the Nuclear Security Enterprise*, GAO-16-422T (Washington, D.C., Feb. 23, 2016).

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

NSDD could not measure its progress towards activities and goals because its goals were not all measurable and performance measures were not aligned with its goals.[44] Under this program, NSDD may not be able to determine when it has fully accomplished its mission and risks continuing to deploy equipment past the point of diminishing returns. NSDD also faces challenges in performing its work that are outside of its control, such as the changing conditions in partner countries from conflict or political upheaval. We recommended that NSDD develop a more detailed program plan that articulates when and how it will achieve its goals, including completing key activities such as the deployment of radiation detection equipment to partner countries and having these countries fully fund the sustainment and maintenance of this equipment. NNSA agreed with this recommendation.

- In February 2017, we found that NNSA was unable to demonstrate the full results of its research and development technology for preventing nuclear proliferation.[45] Specifically, we reported that DNN's Research and Development program does not consistently track and document projects that result in technologies being transitioned or deployed. Furthermore, we found that DNN's Research and Development project performance is difficult to interpret because the program's performance measures do not define criteria or provide context justifying how the program determined that it met its targets. This, in turn, could hinder users' ability to determine the program's progress. NNSA officials said that final project reports do not document their assessment of performance against baseline targets and that there is no common template for final project reports. We noted that documenting assessments that compare final project performance results against baseline targets for scope of work and completion date could enhance NNSA's ability to manage its programs in accordance with these standards. More consistently tracking and documenting the transitioned and deployed technologies that result from DNN's projects could also facilitate knowledge sharing

[44]GAO, *Combating Nuclear Smuggling: NNSA's Detection and Deterrence Program is Addressing Challenges but Should Improve Its Program Plan*, GAO-16-460 (Washington, D.C.: Jun. 17, 2016).

[45]GAO, *Nuclear Nonproliferation: Better Information Needed on Results of National Nuclear Security Administration's Research and Technology Development Projects*, GAO-17-210, (Washington, D.C.: Feb. 3, 2017). A transitioned technology is provided to users outside of the project team for further development or deployment. A deployed technology is one that is being actively used in the field by a federal agency or foreign partner.

within DNN, and would provide a means by which to present valuable information to Congress and other decision makers about the programs' results and overall value. We recommended that NNSA consistently track and document results of DNN Research and Development projects and document assessments of final project results against baseline performance targets. NNSA agreed to take actions in response to both recommendations.

Chair Fischer, 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 Acknowledgements

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, Assistant Director; Allison Bawden; Natalie Block, Antoinette Capaccio; William Hoehn; Amanda Kolling; and Diane LoFaro.

Selected GAO Products

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

Nuclear Waste: Opportunities Exist to Reduce Risks and Costs by Evaluating Different Waste Treatment Approaches at Hanford. GAO-17-306. Washington, D.C.: May 3, 2017.

National Nuclear Security Administration: Action Needed to Address Affordability of Nuclear Modernization Programs. GAO-17-341. Washington, D.C.: April 26, 2017.

Department of Energy: Use of Leading Practices Could Help Manage the Risk of Fraud and Other Improper Payments. GAO-17-235. Washington, D.C.: March 30, 2017.

Nuclear Nonproliferation: Better Information Needed on Results of National Nuclear Security Administration's Research and Technology Development Projects. GAO-17-210. Washington, D.C.: February 3, 2017.

Nuclear Waste: Benefits and Costs Should Be Better Understood Before DOE Commits to a Separate Repository for Defense Waste. GAO-17-174,.Washington, D.C.: January 31, 2017.

National Nuclear Security Administration: A Plan Incorporating Leading Practices Is Needed to Guide Cost Reporting Improvement Effort. GAO-17-141. Washington, D.C.: January 19, 2017.

Program Management: DOE Needs to Develop a Comprehensive Policy and Training Program. GAO-17-51. Washington, D.C.: November 21, 2016.

Department of Energy: Actions Needed to Strengthen Acquisition Planning for Management and Operating Contracts. GAO-16-529. Washington, D.C.: August 9, 2016.

DOE Project Management: NNSA Needs to Clarify Requirements for Its Plutonium Analysis Project at Los Alamos. GAO-16-585. Washington, D.C.: August 9, 2016.

Nuclear Waste: Waste Isolation Pilot Plant Recovery Demonstrates Cost and Schedule Requirements Needed for DOE Cleanup Operations. GAO-16-608. Washington, D.C.: August 4, 2016.

Department of Energy: Whistleblower Protections Need Strengthening. GAO-16-618. Washington, D.C.: July 11, 2016.

Combating Nuclear Smuggling: NNSA's Detection and Deterrence Program is Addressing Challenges but Should Improve Its Program Plan. GAO-16-460. Washington, D.C.: June 17, 2016.

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.