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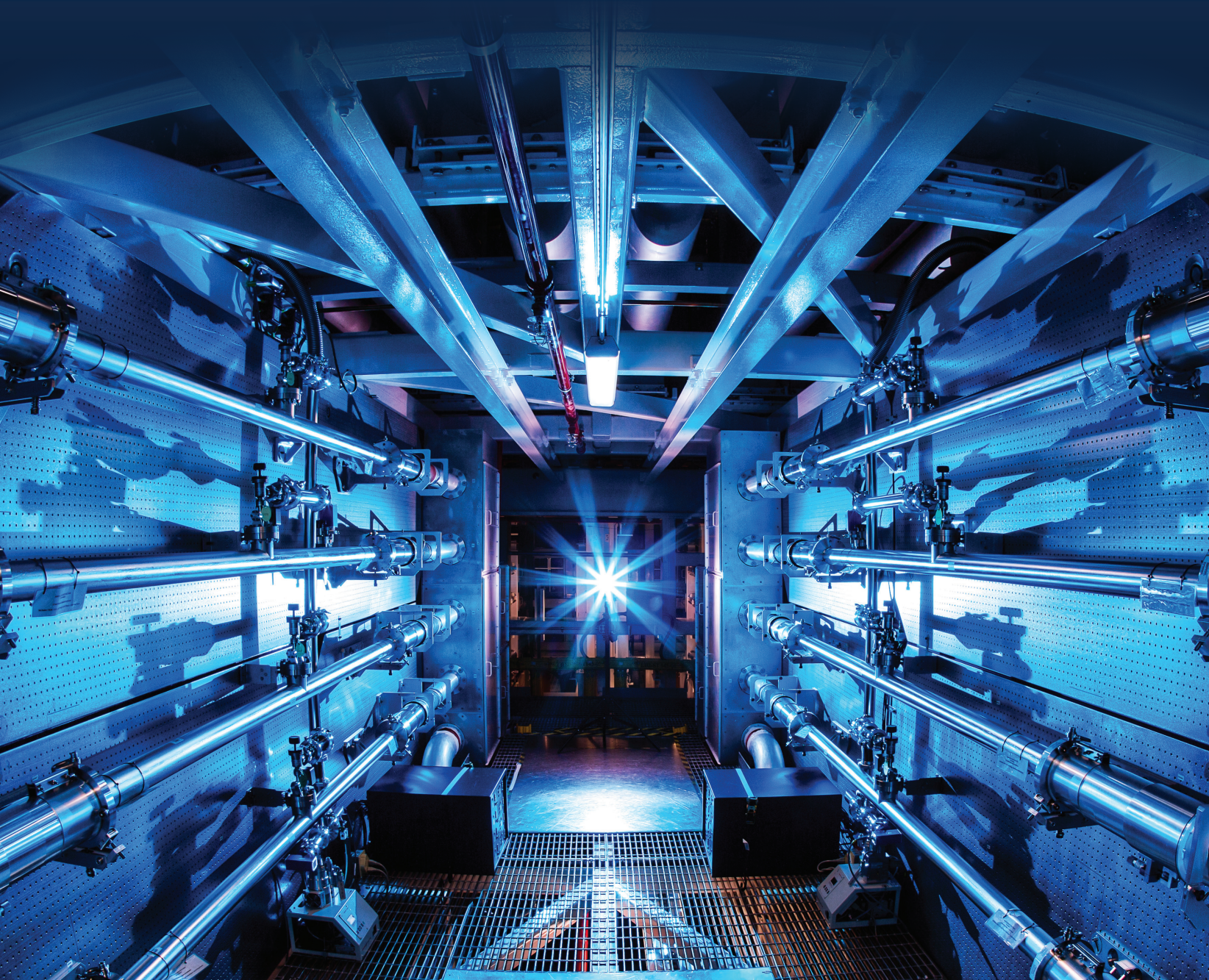
CONSENSUS STUDY REPORT

Governance and Management of the NUCLEAR SECURITY ENTERPRISE



Governance and Management of the
NUCLEAR SECURITY ENTERPRISE

Panel to Track and Assess Governance and Management Reform
in the Nuclear Security Enterprise

Laboratory Assessments Board

Division on Engineering and Physical Sciences

A Consensus Study Report of

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Preface

The Panel to Track and Assess Governance and Management Reform in the Nuclear Security Enterprise was jointly established by the National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration to carry out a 4.5-year assessment of the National Nuclear Security Administration's (NNSA's) responses to long-standing governance and management problems affecting the nuclear security enterprise. This is the panel's final report.

We are pleased to report that progress has been made and are grateful for all the hard work that staff members across the enterprise have devoted to improving governance and management. We are also very aware of the burden that a lengthy external evaluation imposes on such an enterprise. We wish to thank the many individuals in NNSA and the laboratories, sites, and plants that comprise the nuclear security enterprise for their cooperation and assistance in carrying out the panel's charge. Administrator Lisa Gordon-Hagerty, Administrator Frank Klotz, and numerous senior officials from all elements of the enterprise generously met multiple times with the whole panel and/or participated in individual interviews. NNSA leadership provided the panel with access to many employees for useful information-gathering and general discussions. And the panel was hosted by most of the laboratories, production plants, and other sites for interesting and fruitful visits that featured discussions with large numbers of staff members. We appreciate that so many individuals spoke candidly to us and view that as a testament to their dedication to the mission of the enterprise and their commitment to its long-term excellence. We wish to extend special thanks to NNSA's Office of Policy and Strategic Planning, our point of coordination, for working with us on this endeavor.

We thank NNSA and the Department of Energy for their generous assistance and openness in helping the panel conduct its study. The value of this study results from the work of our fellow panel members, who devoted an extraordinary amount of personal time and energy to this task, and we are very grateful. We also thank the panel staff for all of their contributions to this study.

Jonathan Breul and Donald Levy, *Co-Chairs*
Panel to Track and Assess Governance and
Management Reform in the Nuclear
Security Enterprise

Acknowledgment of Reviewers

This Consensus Study Report was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the National Academies of Sciences, Engineering, and Medicine in making each published report as sound as possible and to ensure that it meets the institutional standards for quality, objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

We thank the following individuals for their review of this report:

David S.C. Chu, NAPA,[1] Institute for Defense Analyses (retired)
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Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations of this report nor did they see the final draft before its release. The review of this report was overseen by Robert F. Sproull, NAE, University of Massachusetts, Amherst. He was responsible for making certain that an independent examination of this report was carried out in accordance with the standards of the National Academies and that all review comments were carefully considered. Responsibility for the final content rests entirely with the authoring committee and the National Academies and National Academy of Public Administration.

[1] Fellow, National Academy of Public Administration.
[2] Member, National Academy of Engineering.
[3] Member, National Academy of Sciences.

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Summary

The governance and management of the national nuclear security enterprise has improved in the years since the publication in 2014 of the congressionally mandated report *A New Foundation for the Nuclear Enterprise* (the Augustine-Mies report).[1] However, that progress is fragile, and there is still more work to be done. Maintaining the progress to date and continuing the positive trajectory will not be easy and will require diligence by the National Nuclear Security Administration (NNSA) and the Department of Energy (DOE) and support from Congress and the Administration.

Many studies over several decades—more than 50 by one count—have identified long-standing management problems in the nuclear security enterprise. While the enterprise has met critical mission needs, including especially stewardship of the nation's nuclear stockpile, management deficiencies contributed to performance problems, including cost overruns and schedule delays. More generally, better management will enable the enterprise to overcome the stresses and surprises that are inevitable for any challenging and complex activity. The Augustine-Mies report concluded, "The existing governance structures and many of the practices of the [nuclear security] enterprise are inefficient and ineffective, thereby putting the entire enterprise at risk over the long term."[2]

Since that time, NNSA has taken a number of steps to address governance and management concerns raised by the Augustine-Mies report and others like it. The Panel to Track and Assess Governance and Management Reform in the Nuclear Security Enterprise was established by congressional direction in 2016 to monitor progress by carrying out the charge presented in Appendix A. This report presents the panel's review of progress since the release of the Augustine-Mies report.

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

[2] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. ix.

Over the past 5 years, NNSA has improved the governance and management of the nuclear security enterprise.

Over the course of 2016–2020, the panel has seen progress in reforming governance and management of the nuclear security enterprise. Through many interviews, site visits, and discussion groups, the panel has observed improved levels of trust, mission focus, and unity of purpose across the enterprise. Important examples of improvements include the following:

- While the 2014 Augustine-Mies report described the relationship between NNSA and its management and operating (M&O) contractors as "dysfunctional," the current panel's interviews with individuals at all levels of both NNSA and the M&O partners depict relationships that are less adversarial and tending toward more trust.
- The Augustine-Mies report found that NNSA and the Department of Defense (DoD) were not collaborating well, but more recently most DoD and NNSA personnel interviewed by the panel characterized the overall DoD-NNSA relationship as "good" and sometimes used even more positive terms.
- The Augustine-Mies study cited a lack of clarity about roles and responsibilities among DOE, NNSA headquarters, NNSA field offices, and the M&Os. However, NNSA and DOE have implemented new formal directives that redefine those roles and responsibilities, and processes to implement them, and interviewees report progress.
- On the issues of cost and schedule management, NNSA has created new offices and formal policies that may have contributed to some improvement in performance, although it is too early to assess their full impact.

In 2019, NNSA issued three important guidance documents related to governance and management:

- *Strategic Vision: Strengthening Our Nation Through Nuclear Security*;
- *Governance & Management Framework*; and
- *Strategic Integrated Roadmap 2020–2044*.[3]

In addition to clearly articulating the mission priorities and their major milestones, these documents lay out a vision for the shared values and expected behaviors, strategic management challenges, and governance and management expectations for the enterprise. They therefore provide an important step toward addressing many of the concerns identified in the Augustine-Mies report.

The three guidance documents listed above do not constitute the Implementation Plan called for by Congress when it requested the panel's study (see Appendix A). NNSA did create such a plan late in 2016, but the panel did not find it to be a useful tool for tracking and assessing NNSA's progress to reform governance and management, and NNSA has not relied on it. As this report was being finalized, the panel was told that NNSA is developing an action plan to operationalize the three guidance documents

[3] National Nuclear Security Administration, 2019, *Strategic Vision: Strengthening Our Nation Through Nuclear Security*, Washington, D.C.; National Nuclear Security Administration, 2019, *Governance & Management Framework,* Washington, D.C.; and National Nuclear Security Administration, 2019, *NNSA Strategic Integrated Roadmap 2020–2044*, Washington, D.C.

listed above. In its third interim report, the panel listed seven elements desired in such a plan,[4] which are reprinted in Chapter 1 of this report. Absent a clear plan for reforming governance and management, the panel has relied to a large extent on its own data collection and analysis during this study, relying on its members' collective experience to assess the promise of actions taken.

NNSA needs to build on progress made and ensure that improvements to date in governance and management percolate throughout the enterprise and become ingrained.

NNSA needs to work on remaining problems and must ensure that improvements to date in governance and management, now largely felt in the upper levels of management, percolate throughout the enterprise and become ingrained. The panel is cautiously optimistic that if NNSA continues to drive the messages of those 2019 guidance documents throughout the agency and builds on its initial steps of improvements as noted in this report—while also measuring and institutionalizing progress made—it will be in a strong position to navigate current and future challenges. This report offers suggestions to help NNSA maintain its current momentum for reforming the governance and management of the nuclear security enterprise and steering the associated culture change.

Continued success for NNSA and the nuclear security enterprise requires all parts of the enterprise to work together with mutual trust and respect, putting aside their local allegiances to focus on the overall mission. The erosion of mission focus began decades ago, and building on the NNSA Administrator's message of "One NNSA," NNSA must continue a conscious, persistent, and urgent push to reestablish the needed emphasis on unity of purpose.

NNSA must continue a conscious, persistent, and urgent push.

A continuous improvement strategy is an essential element for future success. The current NNSA Administrator has been promoting such a vision, which requires openness and cooperation across the federal headquarters team, the NNSA field offices, and the laboratories, plants, and sites. Openness and cooperation are also essential in the enterprise's dealings with DoD and other partners.

In this final report, the panel makes 16 recommendations, falling into four major themes:

- Solidify leadership and support for the mission across DOE and DoD—within the current statutory structure (the focus of Chapter 2);
- Reinforce the healthy management practices emerging within NNSA (the focus of Chapter 3);
- Take additional steps to maximize the contributions of the M&O partners (the focus of Chapter 4); and
- Establish mechanisms and culture for continuous improvement in governance and management (the focus of Chapter 5).

[4] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2019, *Report 3 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., p. 32.

Each of the 16 recommendations is intended to address specific issues identified in the panel's 5-year review and contribute momentum to NNSA's ongoing improvement efforts. The specific recommendations are provided in Table S.1, below.

MAJOR RECOMMENDATIONS FOR NNSA

Four issues of focus are key to NNSA being successful in its reform of governance and management, as follows.

First, in order to ensure that improved governance and management produce the bottom-line results needed by the nation, it is especially important that NNSA continues to strengthen its management policies and practices for cost and schedule control of major programs and capital projects (see Table S.1, Recommendation 3.3). Successful performance in the long run will always require disciplined compliance with best management practices and continued support from the Administrator and others in top management to offset any resistance that can naturally arise. NNSA and DOE must sustain and continually improve the organizations and processes they have established for rigorous technical and cost analyses of projects and programs. Examples include NNSA's Offices of Cost Estimating and Program Evaluation (CEPE) and Acquisition and Project Management (NA-APM), DOE's process 413 governing Program and Project Management for the Acquisition of Capital Assets, and NNSA's 6.x process for governing the Nuclear Weapons Life Cycle. It is especially critical that the enterprise continue to carry out open, thorough "analyses of alternatives" and peer reviews of key projects and programs. The value of these processes over the past 5 years can be seen in the redesign of significant projects, such as the Uranium Processing Facility at the Y-12 site in Tennessee and the Chemistry and Metallurgy Research Replacement Facility at Los Alamos National Laboratory (LANL) in New Mexico, which has saved billions of dollars and improved rates of progress.

Second, in order to learn more about NNSA's management of large-scale programs, the panel examined the program for plutonium pit production, which led to Recommendation 3.4 in Table S.1. This program is one of the largest and most critical of NNSA's current challenges. Some aspects of the management structure are quite encouraging, particularly the degree to which a team at LANL has been empowered by the program manager to take responsibility for defining how the process can be built up at that site. The amount of management control that is vested in the Office of Defense Programs also strengthens the management structure. However, the panel also learned of several instances in which decision making was slowed because the pit program office was not given the final authority for making management decisions related to technical aspects of the pit production program; the program manager lacks the authority and stature to resolve all the issues that come up. As a result, it is not uncommon for disagreements to arise that require elevation to higher levels in NNSA for resolution. It appears to the panel that NNSA needs to strengthen the authority of this program manager, and lessons learned from this program's management structure might have relevance to other major programs within NNSA.

Third, to meet the demanding workload, be prepared for the dynamic geopolitical landscape, and continue to improve its overall effectiveness, NNSA must leverage all the scientific and technical capability of the enterprise and ensure that objective and independent expertise is and remains readily available. The panel delved into the state of health of the science and engineering (S&E) environment at the three NNSA laboratories, and the state of the relationships between NNSA and its laboratories. Recommendation 4.4 in Table S.1 is in response to the panel finding that the S&E workforce, which is the crucial foundation for the scientific and technical capability now and in the future, is feeling stressed. That stress is driven by administrative burden, funding uncertainties, and other factors, and it did not appear

TABLE S.1 Complete Set of Recommendations

Theme: SOLIDIFY LEADERSHIP AND SUPPORT FOR THE MISSION ACROSS DOE AND DoD—WITHIN THE CURRENT STATUTORY STRUCTURE

Recommendation 2.1: The statutory relationship between the Department of Energy (DOE) and the National Nuclear Security Administration (NNSA) should not be restructured. The Secretary of Energy's ownership of DOE's nuclear deterrence mission should be reemphasized through the Senate confirmation process and annual administration and congressional reporting and oversight activities. Both DOE and NNSA should diligently enforce assigned roles and responsibilities throughout both organizations in order to maintain a healthy and effective enterprise.

Recommendation 2.2: The National Nuclear Security Administration (NNSA) Administrator, in collaboration with the Undersecretary of Defense (Acquisition and Sustainment), should continue to implement and institutionalize practices that promote the transparent exchange of information and a strong, collaborative working relationship between the Department of Defense (DoD) and NNSA. The Administrator and Undersecretary should particularly emphasize coordination of the agencies' budgets for the stockpile and weapons delivery systems.

Recommendation 2.3: Congress should amend the National Nuclear Security Act to modify the position of National Nuclear Security Administration (NNSA) Administrator so that it has a fixed term but is still filled by presidential appointment subject to Senate confirmation. To eliminate leadership gaps, the Administrator should be authorized to stay in office until a replacement is confirmed by the Senate, even beyond the formal completion of his or her term.

Recommendation 2.4: To reduce gaps in other key leadership positions, the requirement for Senate confirmation of the Principal Deputy Administrator, Deputy Administrator for Defense Programs, and Deputy Administrator for Defense Nonproliferation should be removed. These positions should continue to be filled with political appointees to provide appropriate stature.

Theme: REINFORCE THE HEALTHY MANAGEMENT PRACTICES EMERGING WITHIN NNSA

Recommendation 3.1: National Nuclear Security Administration (NNSA) leadership should build on progress made on clarifying roles, responsibilities, authorities, and accountability by improving its communications about and enforcement of the relevant policies.

- To clarify the roles of functional support offices vis-à-vis mission execution, NNSA leadership should promulgate policies that engage support-office personnel early in mission-related planning in order to smooth the process of "Getting to Yes," thereby enabling mission accomplishment.
- To increase the shared understanding of roles and responsibilities throughout the enterprise, NNSA leadership should expand programs for rotation of personnel between federal and nonfederal positions, as well as between headquarters and field offices. This expansion should take the form of making such opportunities more widely available and of longer duration. Consideration should be given to requiring rotational assignments prior to promotion to senior NNSA positions.

Recommendation 3.2: The National Nuclear Security Administration (NNSA) should gain a better understanding of attitudes and engagement of the entire enterprise workforce. It should require all of its management and operating (M&O) partners to conduct regular employee surveys, preferably including some questions that are found on the Federal Employee Viewpoint Survey (FEVS). NNSA should require the M&O partners to provide it with the responses, properly anonymized, to at least those latter questions.

continued

TABLE S.1 Continued

Recommendation 3.3: The National Nuclear Security Administration (NNSA) should enforce its policies for estimating and controlling budget, cost, and schedule for major programs and capital projects. To enhance the credibility of program plans and budget estimates, NNSA should improve its process for addressing differences in cost estimates from Cost Estimating and Program Evaluation (CEPE) and program offices to include providing accessible documentation that reconciles the differences and makes clear the provenance of the estimate used in the budget.

Recommendation 3.4: The National Nuclear Security Administration (NNSA) should ensure that the management structures for its major programs provide a high level of authorities and capabilities to one strong program manager so that program managers can serve as the focal point for anticipating and resolving issues in the execution of the program. As an example, the manager of the pit production program should be transitioned to have even stronger authorities and capabilities in order to maximize the program's chances of success.

Recommendation 3.5: The National Nuclear Security Administration (NNSA) Administrator should promptly designate a career senior executive service member as the accountable change management leader to provide intensive and sustained attention to the challenges of institutionalizing governance and management reform. This leader should support the Administrator in developing continuous improvement strategies and implementation plans, leading continuous improvement processes, and ensuring that management metrics are developed and employed.

Theme: TAKE ADDITIONAL STEPS TO MAXIMIZE THE CONTRIBUTIONS OF THE M&O PARTNERS

Recommendation 4.1: The National Nuclear Security Administration (NNSA) and management and operating (M&O) management should expand their existing processes to identify and mitigate burdensome processes and requirements, instituting a process of continuous improvement. Those in a position to develop and promulgate improvements, and those affected by the improvements, should work collaboratively on these efforts. At least five elements are needed:

- The burdens identified in the 2019 survey and analysis carried out by NNSA's Operations and Efficiencies Board should be addressed to the extent that they are within the control of NNSA or the Department of Energy (DOE).
- Surveillance and mitigation analogous to the 2019 survey should be conducted annually, with results made available throughout the enterprise.
- NNSA should consider expanding the site governance peer reviews to contribute to revealing and removing burdensome practices and sharing improvements.
- NNSA and laboratory management should improve their monitoring of administrative inefficiencies that hinder the technical staff at the NNSA laboratories, and develop a simple process whereby significant inefficiencies can be identified, analyzed, and prioritized for possible mitigation.
- NNSA should proactively work with the laboratories, plants, and sites to identify where the M&O processes might be more risk averse than appropriate.

Recommendation 4.2: The National Nuclear Security Administration (NNSA) should establish management practices that derive the maximum value from the established principles for federally funded research and development centers (FFRDCs). To achieve this, the Administrator should convene a working group whose members are knowledgeable about successful FFRDC relationships and some of whom are outside the current nuclear security enterprise to assist NNSA in developing a conceptual model for the relationship it seeks to have with its FFRDCs. NNSA should then take the necessary steps to put the model in place for all three FFRDCs so that their ability to act as trusted, independent, expert contributors is maximized.

TABLE S.1 Continued

Recommendation 4.3: The National Nuclear Security Administration (NNSA) should identify a more effective contract model for its federally funded research and development centers (FFRDCs). The Administrator should convene a working group to develop an FFRDC contract model to better enable the desired FFRDC relationships, which are to be closer than normal contractual relationships. The working group should include staff within NNSA and its laboratories as well as experts from other agencies with a large number of FFRDCs, such as DoD.

Recommendation 4.4: In addition to the elements included in Recommendation 4.1, the National Nuclear Security Administration (NNSA) and management at its laboratories should take steps to improve the environment for science and engineering (S&E) research and development (R&D) to include the following:

- A clear articulation of how the S&E core capabilities will be supported at the laboratories, perhaps including funding lines that would complement laboratory directed research and development (LDRD);
- Enhanced onboarding processes to help new scientists and engineers become highly productive by emphasizing the laboratories' strengths, expertise, organization, past accomplishments of service in the national interest, and roles and responsibilities as federally funded research and development centers (FFRDCs).

Theme: ESTABLISH MECHANISMS AND CULTURE FOR CONTINUOUS IMPROVEMENT IN GOVERNANCE AND MANAGEMENT

Recommendation 5.1: National Nuclear Security Administration (NNSA) leadership themes such as "One NNSA" and "Getting to Yes" have established the tone for needed management improvements. These themes need to be reinforced through systematic efforts to instill these desired behaviors and values throughout the enterprise.

Recommendation 5.2: National Nuclear Security Administration (NNSA) next steps to steer governance and management reform should specify the actions to be taken—by whom and when, with associated budget and metrics—to a degree that allows progress to be tracked and changes made as necessary. Metrics should be specific enough to support data-driven, continuous management improvement and be suitable for informing periodic external reviews into the effectiveness of governance and management of the nuclear security enterprise.

Recommendation 5.3: The panel encourages the relevant committees of Congress, especially the Armed Services Committees and the Appropriations Subcommittees, to follow up on the recommendations in this report. The panel recommends that Congress convene a small group of knowledgeable experts, perhaps three to five, approximately every 3 years, to conduct a brief review of the status of the National Nuclear Security Administration (NNSA) governance and management.

to be fully appreciated by the laboratory leadership. Improvements could also be made in the onboarding of new hires into the S&E workforce. The panel recommends attention to key aspects of S&E health.

Fourth, the Augustine-Mies study observed a breakdown in the relationship between NNSA and its laboratories, which were set up as federally funded research and development centers (FFRDCs), a special category that is meant to be different from typical government contractors. The panel therefore reexamined this topic and found that while some in NNSA have an understanding of how those differences can be incorporated into governance to produce effective FFRDC relationships, that understanding is not shared by all. This has led to conflicting perspectives on how laboratory governance should be approached. Recommendations 4.2 and 4.3 in Table S.1 address this. Because the breakdown of these FFRDC relationships dates back to the 1990s, reinvigorating the relationships will take a focused effort that would benefit from drawing on experience elsewhere in government where the FFRDC model is effectively applied. In addition to the absence of an enterprise-wide understanding, NNSA's implementation of the FFRDC model lacks a clear contract strategy that is consistent with maximizing the FFRDC relationships. The panel recommends steps to reinvigorate these relationships so as to increase the value of these laboratories to the nation.

RECOMMENDATIONS FOR CONGRESS

At the time of the Augustine-Mies study, there was widespread concern that NNSA's position as a semiautonomous agency within DOE was contributing to NNSA's performance problems. That report evaluated several possible organizational arrangements and decided that the nuclear security mission should remain in DOE, concluding that "an autonomous organization to replace some or all of the functions of NNSA [is] a clearly inferior choice."[5]

The panel examined the overlaps between NNSA and DOE, especially with respect to functional (support) offices handling decisions connected with finances, contracting, legal, environment, health, safety, and security. It found that roles, responsibilities, accountability, and authorities have in many cases been clarified since 2014. While the panel heard a few lingering concerns, in general NNSA's functional staffs find that their interactions with DOE generally work well and have improved over the past several years; the dysfunctional overlaps that concerned the Augustine-Mies panel have been mitigated notably.

Because NNSA's placement within DOE has the clear benefit of placing the nuclear security mission in the hands of a Cabinet official, and DOE-NNSA interactions have improved, the panel sees no compelling reason for changing this structure, as reflected in Recommendation 2.1 of Table S.1. Despite the structural overlaps and ambiguities identified in the Augustine-Mies report, the maturation of working relationships has progressed to the point where the risks from any statutory restructuring—disruptions to staff and operations, plus the chance of unintended consequences—substantially outweigh the potential benefit. Still, the Secretary of Energy and NNSA Administrator should continue to pursue improvements that can be made to strengthen the way the organizations work together to accomplish the mission.

As noted above, NNSA's reform of governance and management has been ongoing for 5 years, and more remains to be done. Ensuring that the desired behaviors are embedded throughout the organization—so that today's progress is not lost as leaders move on—requires a long-term effort to change habits and presumptions throughout the agency's staff. Continuing the reform of governance and management while maintaining a steady hand on NNSA's critical, long-term missions requires continuity among the senior leadership. Those leaders also must hold office long enough to carry out reforms, which often take multiple years, and Recommendations 2.3 and 2.4 in Table S.1 address this.

Since the creation of NNSA in 2000, there have been four periods without a confirmed Administrator. Those gaps averaged 247 days between the vacancy and Senate confirmation of the next Administrator, and they would have been even longer if the previous Administrators had not stayed on into a new administration (for an average of 1.6 years). In order to foster greater continuity in this highly specialized position, the panel echoes the Augustine-Mies report in calling for the NNSA Administrator position to become fixed-term. The panel also calls for some changes to improve the continuity of the leadership at the Principal Deputy and Deputy Administrator levels.

Last, because this report was requested by Congress, it is logical to ask what else that body might do to support the steps recommended herein, and to follow up in the future; Recommendation 5.3 in Table S.1 is the result. The national security mission of NNSA and the overall nuclear security enterprise is critically important to the nation and needs to be carried out in the most effective way possible. The recommendations in this report will be embraced by some—perhaps many—of the leaders within DOE and NNSA and its partners, but there will also be inertia, and possibly resistance, within the system, thus requiring periodic assessments.

In order to enable the "brief reviews" envisioned in Recommendation 5.3, it is critical that NNSA develop and track clearly interpretable and readily measurable indicators of improved management practices (per Recommendation 5.2). Those measures will provide a snapshot of the quality of governance and management of the nuclear security enterprise.

[5] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. xiv.

1

Introduction

The National Nuclear Security Administration (NNSA), established in 2000 by Congress as a semiautonomous agency within the U.S. Department of Energy (DOE), traces its history back to the Manhattan Project in the 1940s. Today, NNSA leads a nuclear security enterprise that includes three national laboratories, several production facilities, and an experimental test site. NNSA's mission is "to protect the American people by maintaining a safe, secure, and effective nuclear weapons stockpile; by reducing global nuclear threats; and by providing the U.S. Navy with safe, militarily effective naval nuclear propulsion plants."[1] The threats to U.S. national security have evolved significantly since the end of World War II, but the importance of nuclear security and thus NNSA's role in protecting the country's national security remains critical.

NNSA must accomplish its mission, which includes ensuring the availability of many unique intellectual and physical resources, while navigating the political winds that surround nuclear weapons issues and the accompanying variations in budget. The year 2020 brought with it the new challenge of continuing operations—which include major surges in requirements, deliverables, and personnel needed to respond to the 2018 *Nuclear Posture Review* (*NPR*)—amid a global pandemic. These circumstances heighten the need for a nuclear security enterprise that is "adaptive, agile, responsive, and resilient."[2]

This report is the result of a study to evaluate the progress that DOE and NNSA have made over the years 2015–2020 in response to the 2014 final report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise. That panel was co-chaired by Norman Augustine and Admiral Richard Mies and is often referred to as the "Augustine-Mies report." The bottom line of that report was

[1] National Nuclear Security Administration, 2019, *Strategic Vision: Strengthening Our Nation Through Nuclear Security*, Washington, D.C., http://www.energy.gov/sites/prod/files/2019/05/f62/2019-05-06%20NNSA%20Strategic%20Vision.pdf; National Nuclear Security Administration, 2020, *NNSA Strategic Integrated Roadmap FY 2020–FY 2045*, Washington, D.C., front cover.

[2] National Nuclear Security Administration, 2019, *Strategic Vision: Strengthening Our Nation Through Nuclear Security,* Washington, D.C., p. 1.

that "the existing governance structures and many of the practices of the enterprise are inefficient and ineffective, thereby putting the entire enterprise at risk over the long term" and that NNSA's governance reform to that time "has failed to provide the effective, mission-focused enterprise that Congress intended."[3]

The panel has witnessed improvements in the governance and management of the nuclear security enterprise over the course of its study. It has also seen improvements in relationships among groups within NNSA, as well as between federal employees and their partners at the laboratories, plants, and sites, and improved relationships with the Department of Defense (DoD). The panel is cautiously optimistic that, if NNSA continues to drive its messages about governance and management throughout the agency and builds on the specific improvements noted in this report, while measuring and institutionalizing progress made, it will be in a strong position to navigate future challenges.

ORGANIZATION OF THE NUCLEAR SECURITY ENTERPRISE

The nuclear security enterprise is large, complex, and geographically dispersed. Its components are shown in Figure 1.1. NNSA has four mission offices: Defense Programs, Defense Nuclear Nonproliferation, the Office of Counterterrorism and Counterproliferation, and the Naval Nuclear Propulsion Program. Federal personnel are housed in 10 physical locations around the country including headquarters and seven field offices. NNSA has eight mission support offices, also referred to as "functional" offices.[4]

The bulk of the nuclear security enterprise, measured either by budget allocation or by the number of personnel assigned, comprises seven facilities run by management and operating (M&O) partners. Of these seven facilities, three are national laboratories that operate as federally funded research and development centers (FFRDCs): Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and Sandia National Laboratories (SNL, in Albuquerque, New Mexico, and Livermore, California). Three of the other facilities—Kansas City National Security Campus, the Pantex Plant, and the Y-12 National Security Complex—are highly technical production plants that do complex manufacturing and assembly/disassembly. The Savannah River Site produces tritium for warheads, and it will house one of two pit production facilities, the other being located at LANL. Also, the Nevada National Security Site serves multiple purposes, including as an experiment and test facility.[5]

The workforce of the nuclear security enterprise consists of about 1,900 federal employees and more than 55,000 employees of M&O partners. Most of the latter are employees of a laboratory, plant, or site where they work—that is, most staff continue to be employed even when the M&O contract is changed. The retention of much of the enterprise workforce across actual or possible changes of their M&O contracting organization has long been recognized as crucial to the success of the mission, because of the importance of long-term, firsthand experience in the highly technical, interdisciplinary activities undertaken. NNSA's budget in FY 2020 is $16.7 billion, and its request for FY 2021 is $19.8 billion, to support increased requirements assigned by the 2018 *NPR*.[6]

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[3] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, *A New Foundation for the Nuclear Enterprise: Report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise*, http://cdn.knoxblogs.com/atomiccity/wp-content/uploads/sites/11/2014/12/Governance.pdf, pp. ix–x.

[4] NNSA's eight functional offices are External Affairs; General Counsel; Acquisition and Project Management; Emergency Operations; Safety, Infrastructure, and Operations; Defense Nuclear Security; Management and Budget; and Information Management and Chief Information Officer.

[5] The plants and sites operated by M&O partners include Kansas City National Security Campus, Nevada National Security Site, Pantex Plant, Savannah River Site, and the Y-12 National Security Complex.

[6] Office of the Secretary of Defense, 2018, *Nuclear Posture Review*, https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF.

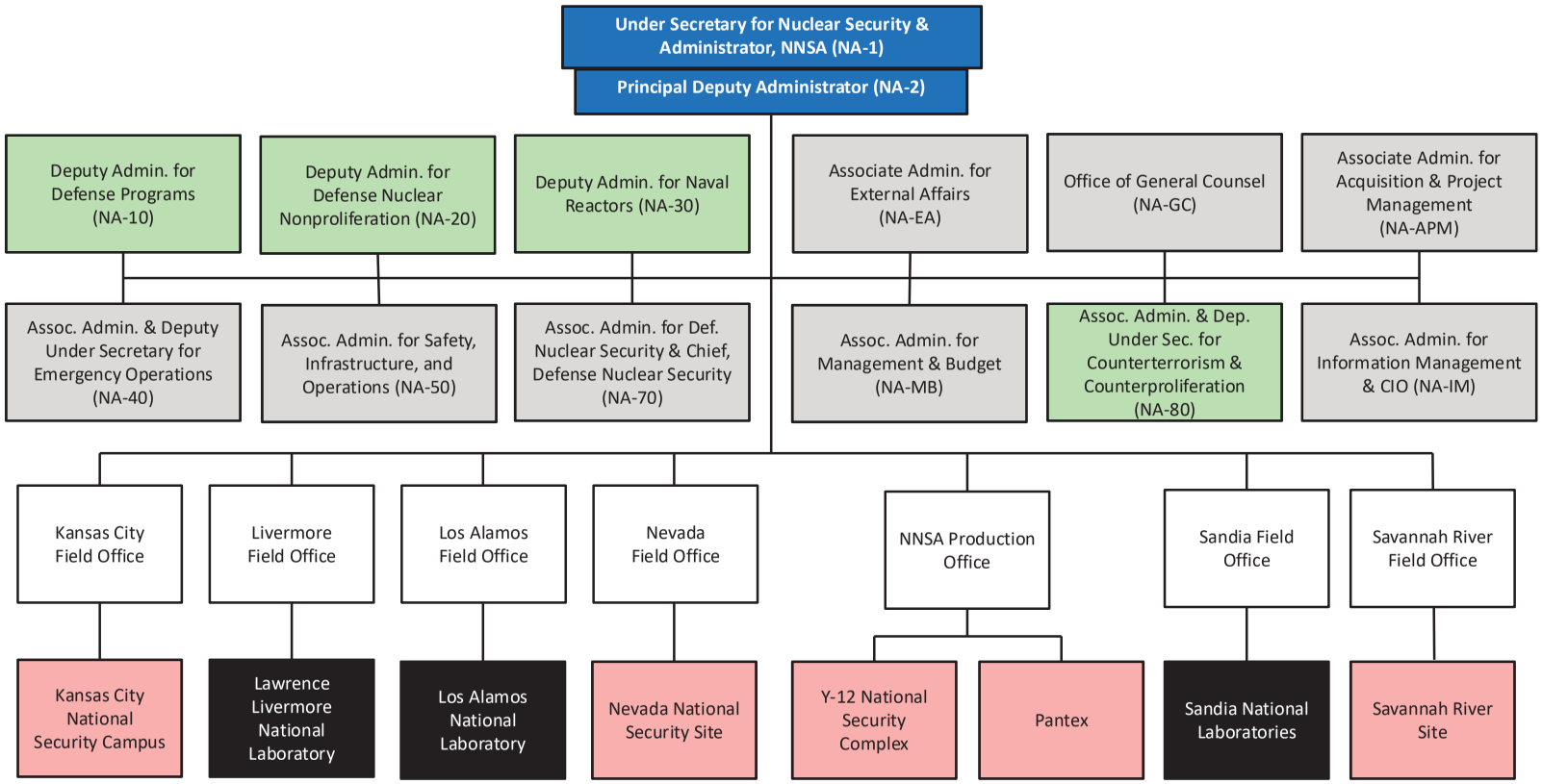

FIGURE 1.1 The nuclear security enterprise. NOTE: The Savannah River Site (SRS) additionally reports to the DOE Office of Emergency Management (DOE-EM). There is a partnership between NNSA's Savannah River Field Office and DOE-EM's Operations Office, and SRS is contracted with DOE-EM, under which it does some work for NNSA. Color code: green = NNSA mission office; gray = NNSA support office; white = NNSA field office; pink = M&O plant or site; black = NNSA laboratory. SOURCE: NNSA Organizational Chart: http://www.energy.gov/sites/prod/files/2020/06/f76/20200630%20-%20NNSA%20HQ%20Org%20Chart.pdf. DOE Office of Environmental Management Organizational Chart: http://www.energy.gov/sites/prod/files/2020/08/f77/EM-Org-Chart-8-3-20.pdf.

THE PANEL'S CHARGE

This report is the culmination of 4.5 years of work by the Panel to Track and Assess Governance and Management Reform in the Nuclear Security Enterprise. The panel was established jointly by the National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration (NAPA) in response to a congressional mandate to monitor and document DOE's and NNSA's response to the 2014 Augustine-Mies report. The panel was also asked to assess the effectiveness of the reform efforts and recommend what further action is needed. The congressional mandate, and the official charge to the panel, are included in Appendix A.

MANAGEMENT AND GOVERNANCE CONCERNS AND THEIR UNDERLYING FACTORS

Over multiple decades, Congress and the defense community have been frustrated about important aspects of the nuclear security enterprise's performance. Criticisms have included that the enterprise could not carry out major projects on budget and on schedule, and that the occurrence of safety and security incidents in the nuclear security enterprise was excessive. As a result, numerous studies and reviews of DOE and NNSA were carried out, many of them mandated by Congress. One of them, the Commission to Review the Effectiveness of the National Energy Laboratories (CRENEL), reported in September 2014 that its review of "over 50 past reports" about the DOE laboratories found "a strikingly consistent pattern of criticism with a repeating set of recommendations for improvements,"[7] making it clear that the studies and recommendations, by themselves, are not effective in resolving those issues. In creating the current panel, Congress sought a mechanism that—by providing sustained attention to, and monitoring of, NNSA's efforts to improve governance and management—would apply pressure for past recommendations to be addressed.

Studies conducted over the years have usually begun by framing the causes of poor performance of NNSA and its predecessor organizations in transactional terms. The FFRDC laboratories, for instance, have cited micromanagement by the government, excessive audits and inspections, limited span of authority to operate, and intrusive requirements for approval of decisions. The federal government, for its part, has complained about an inadequate concern in the laboratories about budgets and schedules, a lack of transparency about the work in the laboratories, an unwillingness to report "bad news" up the chain promptly, and efforts by the laboratories to go around NNSA and lobby Congress directly.

Throughout the many past studies, common concerns arose repeatedly, such as the need for "culture change," clearer definition of roles and responsibilities, means of instilling accountability into the system, and better management and control systems for both the government and the M&O partners. Many have pointed to an overemphasis on operational formality—prioritizing compliance with rules over accomplishment of the mission—which took root in the 1990s after the end of the Cold War. Multiple issues and challenges contributed to NNSA's persistent problems in meeting schedules, staying within cost, and maintaining safety, health, and security.

In the Augustine-Mies report, three major underlying issues were identified as factors in many of NNSA's performance problems.

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[7] Commission to Review the Effectiveness of the National Energy Laboratories, 2015, *Securing America's Future: Realizing the Potential of the Department of Energy's National Laboratories: Final Report of the Commission to Review the Effectiveness of the National Energy Laboratories, Volume 1: Executive Report*, http://www.energy.gov/sites/prod/files/2015/10/f27/Final%20Report%20Volume%201.pdf, p. vi.

1. *Competing priorities across the enterprise*. Rather than having a deep commitment and sense of urgency to the accomplishment of the mission, the report expressed concern that some within NNSA were too often focused on their own specialties and offices rather than the larger mission. They were willing to tolerate delays and extra costs in order to focus on their own area of responsibility. There was not a shared alignment around the mission of the larger organization. For example, the safety czar focused on safety in isolation even if that meant the mission was delayed, rather than on how to accomplish the mission safely.
2. *A lack of trust between the parts of the nuclear security enterprise*. This lack of trust was felt between the government and its M&O contractors, between different offices within NNSA, and between NNSA and its stakeholders at DoD and Congress. There was too little sharing of information, and parties sometimes took steps to protect themselves from blame if things could go wrong. In particular, NNSA's laboratories were unable to fully perform their role as FFRDCs because, instead of being seen as trusted partners, they were too often viewed and treated merely as "contractors."
3. *A pattern of risk avoidance in the course of pursuing the mission, rather than risk management.* Instead of empowering people to take responsibility, make decisions, and be accountable, personnel sometimes sought to avoid risk through multiple layers of review, data calls, and approval requirements. A preoccupation with not making mistakes slowed progress and resulted in micromanagement and second guessing.

The Augustine-Mies panel and other groups offered their assessments of these issues and provided a number of specific recommendations to improve the situation. Those recommendations were directed at various organizations, including the Secretary of Energy, agencies within the Office of the President, and the Congress, but they most specifically went to NNSA itself.

NNSA'S RESPONSE TO THE AUGUSTINE-MIES REPORT

In the first years following the Augustine-Mies report in late 2014, which was issued when General Frank Klotz was Administrator, a number of actions were taken quickly. Among these were the creation of the Office of Cost Estimating and Program Evaluation (CEPE) in January 2015 to improve the management of major capital projects; initiation of a strategic planning process for the laboratories modeled after that of DOE's Office of Science; and the establishment or revival of a number of boards, councils, and working groups to improve communication and coordination across the enterprise. New attention was paid to training and development for NNSA's federal staff. The Director of NNSA's Office of Policy took on a major leadership role, aligning the Augustine-Mies recommendations and those from other reports into "themes" and assigning responsibilities across various offices in NNSA to address them.

NNSA leadership began working to clarify roles, responsibilities, authorities, and accountability, issuing a new "NNSA Site Governance Directive" (SD 226.1B), which was published in summer 2016. The improvement in employee engagement for federal employees between 2015 and 2019 as documented in results from the Federal Employee Viewpoint Survey (FEVS) also is noteworthy (see Chapter 3).

In May 2019, NNSA released three strategic documents—*Strategic Vision*, *Governance & Management Framework*, and *Strategic Integrated Roadmap* (the latter updated in 2020)—that collectively lay out practical and valuable governance and management goals to guide the nuclear security enterprise. These documents specify shared values and expected behaviors, mission priorities, milestones, strategic management challenges, and governance and management expectations for the enterprise. They make the point that all components and levels of the enterprise have a responsibility to focus on the mission;

underscore the importance of efficient decision making; emphasize managing rather than avoiding risk; and call for clearly defined roles, responsibilities, authorities, and accountability to prevent redundancy and miscommunication. Release of these strategic documents was an important step in addressing many of the concerns identified in the Augustine-Mies report.

NNSA was responsible to Congress for developing a formal Implementation Plan for following up the recommendations of the Augustine-Mies report, which it submitted to Congress on December 30, 2016. That report documented numerous steps already taken or under way by NNSA to address specific issues identified in the Augustine-Mies report. The panel did not find this plan to be a useful tool for tracking and assessing NNSA's progress toward its self-identified governance and management goals. In its third interim report, the panel explained why it reached that conclusion and offered suggestions for what is needed in a helpful implementation plan:

> Rather than following a careful process of specifying goals and then articulating a plan to achieve them, NNSA has laid out actions it would take without linking them clearly to desired outcomes or explaining why the actions were selected. It does not consider how the various activities will interact to effect the needed changes nor does it convey how the activities will impact mission success. Of equal concern, it gives little indication of how change will be measured—there are no baselines—or how one would know that success has been attained. Furthermore, there is no plan for communicating and socializing the overall goals and progress throughout the enterprise. Such communication is necessary in order to promulgate changes, embed responsibilities for carrying out steps in the plan, and prepare for necessary adjustments to the culture across the enterprise.
>
> An adequate plan to steer governance and management reform should include the following elements:
>
> 1. A well-articulated statement of the intended concept of operations and goals (e.g., mission focus, simplicity, and clarity, as well as alignment of resources, organizations, and incentives) and what the intended result will be;
> 2. A plan for how to achieve the goals and intended results;
> 3. Active commitment to the goals and vision by senior-most leadership (at both NNSA and DOE);
> 4. A plan for how to accomplish the change, including centralized leadership and decentralized implementation;
> 5. Active involvement and engagement of personnel across the enterprise in planning and achieving the change;
> 6. Regularly scheduled reviews of progress against predetermined measures of effectiveness—with a visible cadence and a sense of urgency—that are conveyed across the enterprise and course corrections to be made as needed to accomplish the preset goals; and
> 7. A plan for communication and reinforcement of the desired attributes of the change through training, leadership activities, performance reviews, and ongoing continuous improvement programs.[8]

Hence, the panel has relied to a large extent on its own data collection and analysis in the course of this study.

[8] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2019, *Report 3 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., p. 32.

THE PANEL'S WORK LEADING TO THIS REPORT

Since 2016, the panel has studied NNSA's governance and management intensively, and also examined aspects of management in other components of the nuclear security enterprise. The panel's research and data collection methodology are described in Appendix B. The panel visited each of NNSA's laboratories and most of its plants and sites, with multiple visits in some cases. It interviewed a large number of management personnel at different levels at the M&Os and NNSA, at both field offices and headquarters. Numerous nonmanagement employees of NNSA and its M&O partners at different levels have also been interviewed in discussion or focus groups.

In accordance with congressional direction, the panel developed written annual interim reports that were submitted to Congress and NNSA starting in early 2017, and it held midyear updates as well to apprise key congressional staff members of its data collection progress and findings throughout the study.

- *The first interim report of this panel* was delivered in March 2017, a little over 2 years after the Augustine-Mies report was issued and approximately 1 year after the National Academies and NAPA were awarded their contracts for this study. One of the first themes the panel emphasized was that greater urgency should be demonstrated by NNSA in its implementation—both because of the lengthy time required for any culture change and to show staff across the enterprise that governance and management were receiving the priority they require.[9]

  Another observation from that first report was that NNSA was not conducting the kind of analysis needed to properly rectify management inefficiencies. For example, the panel found that, although "burdensome" practices for management and oversight had been for years identified as a vexation and a sign of low levels of trust, neither NNSA nor its M&O partners had precisely characterized the term nor catalogued the problems.
- *The second interim report of this panel* was released in February 2018, just as new leadership came to NNSA, with a new Administrator being confirmed by the Senate that month. Also, at about that same time, a new *NPR* was issued by the Administration that placed greater emphasis on the weapons modernization work of the enterprise and led to significant increases in workload, budget, and staffing. These developments brought renewed energy to the enterprise and likely contributed to a positive shift in morale and attitudes. While progress had been made in response to the Augustine-Mies concerns especially in improving NNSA's relationships with DoD, the panel's sense was that the response until that time had overall been limited and rather tactical.[10]

  In light of those developments, the panel's second report said, "NNSA is faced with an excellent opportunity—and challenge—to move from a tactical to a strategic approach for executing the critical mission of the enterprise. This report calls for NNSA to create two plans expeditiously: (1) an integrated strategic plan for the entire nuclear security enterprise, focused on mission execution, and (2) a more complete and better grounded plan to guide the ongoing

[9] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2017, *Report 1 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C.

[10] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2018, *Report 2 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C.

program of governance and management reform. The emphasis in both cases must be on creating a strategic vision that is clearly connected to mission."[11]

New NNSA leadership and the new *NPR* brought increased commitment by senior leadership to culture change, increased transparency and trust, and clearer lines of authority. The new Administrator signaled her deep commitment to changing from a risk-averse, compliance-based culture by highlighting throughout the enterprise—in town halls, site visits, and other presentations—the themes of "One NNSA" (encouraging all to focus on their shared mission) and "Getting to Yes" (collaboratively solving problems so as to achieve mission progress).

- *The third interim report of this panel*, issued in February 2019, remarked on many of those promising new actions. It noted, "The Administrator has taken a number of steps that appear to have placed NNSA on a promising path toward remedying the governance and management problems that have been flagged by so many reports. She has pushed energetically for partnership and mission focus throughout the enterprise, modeling healthy relationships between the government and its management and operating partners, which in turn may be reducing some transactional oversight. She has worked toward healthier relationships with the Department of Defense (DoD) and with the rest of the Department of Energy. In accordance with the panel's 2018 recommendation for better strategic planning, she is working to improve practices in that area. It now appears that the building blocks for essential change are slowly coming together."[12]

  Even so, the panel still expressed concern about the lack of a documented strategic vision and accompanying strategic planning document, urgency, metrics, and institutionalization, noting that the progress to date was heavily dependent on the individuals involved. Because the governance and management reforms being pursued require a change in culture across the enterprise, which requires consistent, sustained leadership, the panel recommended that NNSA quickly appoint "a senior executive as the accountable change management leader for the next few years. The change leader should drive management and governance reform with urgency and a cadence focused on mission success."[13]
- *The fourth interim report of this panel*, released in February 2020, again emphasized the need for institutionalizing the promising changes in governance and management that had been promulgated. It reiterated the recommendation that "a career senior executive [be designated] as the accountable change management leader for the next several years," and it suggested some important steps for that person to prioritize.[14]

  In May 2019, NNSA released three strategic documents: a new *Strategic Vision*, *Governance & Management Framework*, and *Strategic Integrated Roadmap* for the whole enterprise. Subsequent discussions between the panel and many staff members and executives across the enterprise, from both government and M&O partners, showed widespread appreciation for the reforms spearheaded by the Administrator and for efforts at culture change.

  To better understand matters affecting NNSA's FFRDCs, during 2019 panel members also held free-ranging conversations at SNL (Albuquerque and Livermore), LANL, and LLNL,

[11] *Report 2 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, p. 1.

[12] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2019, *Report 3 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., pp. 1–2.

[13] *Report 3 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, p. 2.

[14] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2020, *Report 4 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., p. 2.

meeting with more than 90 science and engineering (S&E) personnel to review the adequacy of the support those vital functions receive. Observations from these visits included that near-term demands and some administrative issues were stressing this work and these people, and that top leadership at the laboratories may not have been fully aware of these conditions.

During 2019, the panel observed multiple steps taken toward institutionalizing the desired governance and management changes. But at that time the panel felt that full operationalization—which requires "a multistep process of communication, codification (in some cases), and translation of general principles into guidance that is useful to the day-to-day actions of people at all levels throughout the enterprise"—was not being addressed systematically. The panel remained concerned "about the pace of progress and limited sense of urgency, the lack of metrics, and the remaining need for institutionalization. Progress is still heavily dependent on the top individuals who are pushing for change."[15]

STRUCTURE OF THIS REPORT

For this final report, the panel has followed the general structure of the Augustine-Mies report, beginning with a chapter on national leadership and relationships with other key governmental players, then following with chapters on NNSA's management practices and relationships with the M&O partners, and concluding with a chapter looking to the future, on institutionalizing and monitoring change.

Appendix C presents a case study of NNSA's plutonium pit production program, which is discussed in Chapter 3 of this report. The purpose of that case study was to examine how NNSA approaches the management of a high-priority program, given that the Augustine-Mies report had criticized some aspects of how NNSA managed projects and programs in 2014.

[15] *Report 4 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, p. 2.

2

National and Departmental Leadership and Coordination

IMPORTANCE OF NATIONAL LEADERSHIP

The Augustine-Mies report expressed concern that the nuclear security enterprise was at risk of eroding because it was no longer receiving the attention and leadership needed from the President and Congress. The introduction summarized the problem then (in 2014) as follows:

> At the root of the challenges faced by the nuclear enterprise is the loss of focus on the nuclear mission across the nation and within U.S. leadership as a whole since the end of the Cold War. Every aspect of the enterprise is colored by the fact that, bluntly stated, nuclear weapons have become orphans in both the Executive and Legislative branches. This has been reflected by the lack of an urgent and clear mission and lack of follow-through in assuring adequate performance to modernize the nuclear stockpile on schedule and on budget.[1]

That report explained that many of those working in the national security enterprise felt that they were in a declining career field and that the results produced by the enterprise were frequently unacceptable. The report assigned much of the blame for that situation to the lack of urgency and clarity of their mission, concluding that the only way the situation would improve was with "[s]ustained and focused national commitment."[2]

This study's panel has found that the situation has improved compared to that described by Augustine-Mies. The 2018 *Nuclear Posture Review* (*NPR*) emphasizes the need for a strong nuclear deterrent

[1] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, *A New Foundation for the Nuclear Enterprise: Report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise*, http://cdn.knoxblogs.com/atomiccity/wp-content/uploads/sites/11/2014/12/Governance.pdf, p. xi.

[2] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. xi.

and supports the development of new delivery platforms and continued upgrades and life extensions for nuclear weapons. Both the National Nuclear Security Administration (NNSA) Administrator and the Department of Defense (DoD) Secretary have stated that modernization of the strategic nuclear triad is the President's number-one priority.[3] While the nuclear triad is often thought of in terms of bombers, land-based missiles, and submarines, the warheads are an integral part. The President and Congress clearly recognized this in requesting a FY 2021 budget for NNSA with an increase of 25 percent over the FY 2020 budget, which itself had seen a significant increase from earlier years (see Figure 2.1).

In Congress, six different committees interact with the nuclear security enterprise—two authorizing committees in the Senate and two in the House, plus the Appropriations Committees in the Senate and the House.[4] The variation in interests across these committees has the potential to lead to differing guidance and directions.

Moreover, some in Congress and the public have advocated substantially different positions in terms of what the national policy should be to maintain the nuclear deterrent and how much funding should be provided for it. Under these circumstances, budget levels and mission requirements might not be stable from year to year, enactment of relevant legislation may be delayed, and mismatches might arise between mandated activities and funding levels and between schedules for weapons and delivery platforms. Under such uncertainty, strong governance and management is all the more important to ongoing operations and the transparency that helps to enable course corrections. For example, limited or unstable budgets can exacerbate tensions between NNSA and DoD or among components of NNSA and its operating partners, which reliable and transparent management practices can help mitigate. Likewise, in the face of uncertain budgetary resources, strong strategic and operational planning are all the more essential

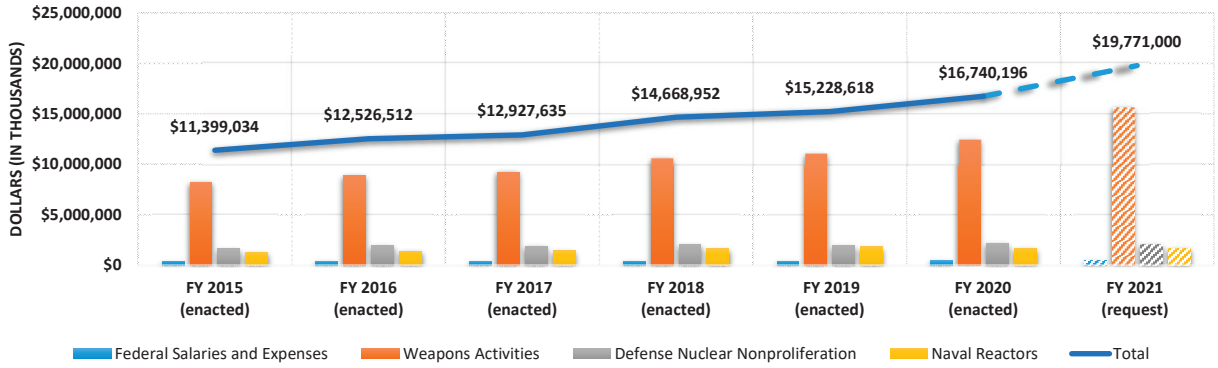

FIGURE 2.1 NNSA budget, FY 2015–2021. SOURCE: Department of Energy, Office of the Chief Financial Officer, "Budget (Justifications & Supporting Documents)," http://www.energy.gov/cfo/listings/budget-justification-supporting-documents.

[3] In recent congressional testimony, Administrator Gordon-Hagerty stated that "modernization of the nuclear triad is the President's number one priority" (House Energy Appropriations hearing, March 3, 2020). Likewise, Defense Secretary Esper recently stated, "The president was very clear to me, to the Pentagon, to the Hill, that modernization of our strategic nuclear forces is priority number one. So, we made it priority number one in our budget. And the numbers should show that" (February 19, 2020), https://www.defense.gov/Newsroom/Transcripts/Transcript/Article/2088918/secretary-of-defense-dr-mark-t-esper-media-availability-at-minot-afb/.

[4] Legislative authorization and congressional oversight are conducted by the House and the Senate Armed Services Committees and by the House Committee on Energy and Water Development and by the Senate Committee on Energy and Natural Resources. The Energy and Water Subcommittees of the House and Senate Appropriations Committees develop and legislate appropriations.

for anticipating and planning how to maintain critical physical infrastructure, human capital, and other aspects of the enterprise's capabilities. In such circumstances, active communication and outreach to all parties with timely and complete information can be particularly important to enable effective planning.

THE DEPARTMENT OF ENERGY'S ROLE WITH REGARD TO THE NUCLEAR SECURITY ENTERPRISE

The Augustine-Mies report found that, because of the way in which NNSA's statutory position within the Department of Energy (DOE) was then implemented, the ownership and accountability for NNSA's mission were blurred and the resulting arrangement "did not achieve the intended degree of clarity in enterprise roles and mission ownership. NNSA was not provided the line management authority necessary to execute NNSA's missions; nor was an effective policy implementation framework established."[5]

An aspect of the relationship between DOE and NNSA that the Augustine-Mies report found to be particularly concerning was the overlap of DOE's and NNSA's functional offices. The report explained that the NNSA Act had established NNSA as a "separately organized" component of DOE and provided the NNSA Administrator with headquarters functional staffs independent from those in DOE; yet, "[d]espite the creation of NNSA's parallel staff structure," DOE had established "management processes requiring that major NNSA decisions and initiatives would remain subject to myriad DOE headquarters staffing processes."[6] This confusion in roles and responsibilities of DOE's and NNSA's headquarters offices led to two damaging dynamics for the enterprise:

1. It was exceedingly difficult for personnel responsible for operations to get clear direction and decisions—there were "no clear lines of appeal or decision making and no integrated place for the cost benefit analysis to be done" (quoting a field representative at the time).[7]
2. Some DOE mission support organizations saw their role as a mission in itself, rather than as a support function. As Augustine-Mies described it, "some organizations responsible for mission support functions often operate[d] independently of line management."[8]

The consequence of this DOE-NNSA interaction was a "tendency to skew incentives toward delay and excessively conservative approaches at the DOE headquarters level."[9]

The Augustine-Mies panel considered whether there was a better organizational model for NNSA, specifically considering the options of it being either an independent agency or an element of DoD. Ultimately, they reached the unanimous conclusion that remaining within DOE, with some adjustments, was the best course. Their report recommended that the DOE Secretary be expected to take a more substantial role in leadership and in setting policy for the nuclear security enterprise, which represents more than half of DOE's budget. This change was intended both to provide Cabinet-level commitment to the mission and to evoke the Secretary's leadership in keeping the department's functional offices mission-focused when dealing with nuclear security matters. Some of the specific recommendations

[5] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. 21.
[6] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. 22.
[7] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. 23.
[8] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. 23.
[9] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. 23.

made by the Augustine-Mies panel would have required legislative revisions to the NNSA Act, which have not been taken up.[10]

Whereas the legislative steps recommended by Augustine-Mies to address overlapping staffs and blurred accountability have not been enacted, DOE and NNSA have worked together in other ways since 2014 to address the concerns that Augustine-Mies raised. For example,

- Steps have been taken to establish better working relations and coordination between offices within DOE and NNSA that are responsible for overlapping functional responsibilities, such as for financial management, environment, health, safety, and security.
- Certain organizations in NNSA have been assigned responsibilities to monitor how DOE's functional offices affect the nuclear security enterprise and to advocate on behalf of the enterprise. Specifically, NNSA's Office of Audits and Internal Affairs serves as the "front door" for coordinating, and sometimes negotiating with, external auditors, and NNSA's Operations and Efficiencies Board leads or participates in departmental Regulatory Reform Task Force working groups that review burdensome regulations.
- Line managers' ownership of mission, and functional offices' roles in support of the mission, have been clarified.

The Augustine-Mies report stated that, at the time of its study, "NNSA was not provided the line-management authority necessary to integrate safety, security, and environmental concerns into the decision making for executing NNSA's missions."[11] The Secretary's new policy on roles and responsibilities in 2016 changed that and specifically made line managers responsible for making integrated risk decisions on behalf of the department.[12] NNSA continues to pursue clarification and reinforcement that line managers within NNSA make integrated risk decisions and that functional offices serve in support of line managers' mission authority.

During its many interviews and discussion groups, the panel heard nothing to indicate that the current dynamic with DOE deprives the Administrator or others within NNSA of line-management authority as codified in formal documents.

On the other hand, the panel has heard from NNSA and management and operating (M&O) personnel about some interactions with DOE's functional offices that they found concerning. In the area of financial management, some NNSA officials and others have stated that reprogramming requests, which must go through the DOE Chief Financial Officer (CFO) on their way to the Office of Management and Budget (OMB), have been delayed or disapproved without clear rationale, and the DOE CFO was cited as a source of delay in some other cases. On the other hand, some DOE and NNSA officials defended these sorts of restrictions as representing the DOE CFO doing the necessary job of the office. In the area of nuclear safety, an NNSA official said that DOE auditors reviewing the handling of Special Nuclear Materials sometimes are not sufficiently knowledgeable or are unduly rigid—for example, they may

[10] To establish the Secretary's leadership role, the Augustine-Mies report recommended enactment of legislation to make the Secretary "the lead authority responsible and accountable to the President and the Congress for the Department's nuclear security mission" and to terminate the NNSA's status as a "separately organized agency," making it instead an "Office" in the department. The Director of the new office would execute the mission "consistent with the Secretary's policy." To avoid duplication of staffs and to establish the authority of the Director, the proposed legislation would require the Director to rely on matrix staff from the department's mission-support organizations to the extent practicable, and the Director would select, supervise, and evaluate the performance of those matrix staff (Augustine-Mies recommendation 3 and pp. xii, 113, 119, and 121).

[11] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. xii.

[12] DOE Policy P112.1, http://www.directives.doe.gov/directives-documents/100-series/0112.1-APolicy.

focus unduly on a process compliance issue, even if safety is not obviously compromised. The panel did hear, however, of at least one case in which NNSA's NA-70 office was able to get a particular DOE safety requirement adjusted to be more appropriate.

Notwithstanding those relatively limited concerns, the impression the panel received from NNSA's functional staffs is that their interactions with DOE generally work well and have, in important ways, improved over the past several years. What the panel has seen does not suggest the need for a disruptive change to the structural relationship between NNSA and DOE. The panel agrees with the Augustine-Mies report that there is no clear benefit to recasting NNSA as an independent agency or as an element of DoD. Moreover, the panel does not believe that the remaining challenges in governance and management at NNSA arise from being part of DOE or require a structural change.

Consistent with that view, both DOE Secretary Brouillette and NNSA Administrator Gordon-Hagerty were asked in hearings early in 2020 whether they favored NNSA staying in DOE, moving to DoD, or becoming an independent agency. Both replied that they favored NNSA remaining in DOE.[13] The panel agrees with the Augustine-Mies report that it is very important for the DOE Secretary to be responsible and accountable for success of the NNSA missions, and that both the Secretary and the Administrator continue to clarify, enforce, and institutionalize appropriate roles and responsibilities throughout their respective organizations.

Recommendation 2.1: The statutory relationship between the Department of Energy (DOE) and the National Nuclear Security Administration (NNSA) should not be restructured. The Secretary of Energy's ownership of DOE's nuclear deterrence mission should be reemphasized through the Senate confirmation process and annual administration and congressional reporting and oversight activities. Both DOE and NNSA should diligently enforce assigned roles and responsibilities throughout both organizations in order to maintain a healthy and effective enterprise.

STRENGTHENING DOD-NNSA RELATIONSHIPS AND COLLABORATION

The Augustine-Mies report discussed the need to adopt new mechanisms to improve consistency among the budgets, priorities, and program expectations of DOE-NNSA and other agencies, especially DoD. That report concluded that there was insufficient collaboration between DoD and NNSA. Given that DoD provides the delivery platforms for nuclear weapons and operates them, and that NNSA provides the science and builds and maintains (with DoD) the nuclear warheads, collaboration between the two agencies is essential for the United States to maintain effective nuclear security. At the time of the Augustine-Mies report, the inability of DoD and NNSA to agree on a viable plan for modernizing nuclear weapons and facilities strained their relationship. The reported perception was that NNSA could not be counted on for reliable planning and cost estimates, and that NNSA was not transparent in providing information. Further, NNSA's budget shortfalls and continued requests for added funding reportedly frustrated DoD leaders. Steps NNSA has taken to address these budget issues and improve credibility are discussed in Chapter 3.

After reviewing events since 2014 that influenced the DoD-NNSA relationship and conducting a series of interviews with DoD and NNSA leaders, the panel found significant improvements in the relationship in recent years. When DoD and NNSA interviewees characterized the overall DoD-NNSA

[13] Both hearings were before the House Committee on Appropriations, Subcommittee on Energy and Water Development. The Secretary's testimony was on February 27 and the Administrator's on March 4.

relationship, most called it "good" or even used more positive terms, and they were optimistic about the future of the DoD-NNSA relationship. However, the panel found that some issues remain, and some interviewees expressed caution that the DoD-NNSA relationship has not been seriously tested with major issues.

Several events have positively influenced these relationships since publication of the Augustine-Mies report:

- Notably, in February 2018, the Administration released a new *NPR*. Mandated by the President and signed by the Secretary of Defense, the review established goals for both DoD and NNSA and so provided an agreed-to plan for modernizing nuclear weapons and facilities.
- NNSA leaders have emphasized the importance of a strong relationship with the DoD. General Frank Klotz, the NNSA Administrator at the time the Augustine-Mies report was released, spoke of the close working relationship with DoD while testifying before Congress in 2017. In response to questions submitted prior to her confirmation hearing in 2018, Lisa Gordon-Hagerty—NNSA's current Administrator—indicated that she understood that the DoD-NNSA relationship could be improved and went on to state her intention to ensure that. Gordon-Hagerty reiterated that commitment during discussions with the panel.
- Administrator Gordon-Hagerty also emphasized the importance of improved communications with DoD. The Nuclear Weapons Council (NWC) is a key forum for communications and coordination between senior leaders in DoD and NNSA. The NWC meets monthly and addresses substantive issues. The panel has been told that, to stay coordinated, NNSA's Administrator and DoD's Undersecretary for Acquisition and Sustainment participate in NWC sessions and talk weekly.

While interviewees agreed that the relationship is better, some also noted that there is additional room for improvement.

- Interviewees noted that "transparency" remains an issue. For example, one DoD manager felt that there was a delay in informing DoD about the capacitor failure issue on the B61-12 Life Extension Program when it occurred in 2019.
- DoD interviewees also felt that budget alignment could improve. They said that because DoD and NNSA work toward common objectives, budget alignment is critical so that programs do not delay each other's work. To this end, the panel was told that DoD has begun issuing annual planning guidance to inform NNSA about its requirements and timing for nuclear weapons, which is a helpful step.
- NNSA personnel noted that budget "size" and organizational complexity differences between DoD and NNSA can complicate relationships. For example, a single NNSA person serving as a liaison to DoD for a particular portfolio or issue might have to interface with numerous DoD counterparts.
- Last, "cultural" differences were cited as sometimes posing problems, such as differences in the two organizations' approaches to using contractors. DoD generally uses contractors to provide support services and expects them to seek and accept direction on tasks. NNSA's relations with its M&O partners, especially the federally funded research and development center (FFRDC) national laboratories, includes the expectation that they will play active roles in helping to shape

the programs for NNSA to achieve its mission; these partners may thus have a role beyond the normal contractual relationship[14] with which many DoD staff are familiar.

The panel values the central role of the NWC in coordinating plans, resources, and activities across DOE and DoD and the importance of it meeting regularly to discuss and address substantive issues affecting the nation's nuclear defense, and to inform NNSA about DoD's requirements and priorities. It endorses—and encourages expansion of—collaboration between NNSA and DoD that has led to joint appearances at congressional hearings and at meetings with congressional staff. In addition to its potential to improve congressional relations, collaboration provides opportunities for personnel to increase their knowledge and understanding of each other's organizations as they prepare for such meetings.

Both external and internal factors—such as changes in congressional priorities, unexpected crises like the coronavirus pandemic, and shifts in perspective and funding that often accompany changes in Administration—can create new challenges for DoD-NNSA collaboration. Therefore, the panel encourages NNSA leadership to institutionalize channels for collaboration, communication, and coordination, particularly the working relationships with the NWC.

Recommendation 2.2: The National Nuclear Security Administration (NNSA) Administrator, in collaboration with the Undersecretary of Defense (Acquisition and Sustainment), should continue to implement and institutionalize practices that promote the transparent exchange of information and a strong, collaborative working relationship between the Department of Defense (DoD) and NNSA. The Administrator and Undersecretary should particularly emphasize coordination of the agencies' budgets for the stockpile and weapons delivery systems.

TERMS OF OFFICE FOR NNSA SENIOR LEADERS

Continuing the reform of governance and management—not to mention accomplishing NNSA's mission—requires senior leaders with skill and experience. Those leaders also must hold office long enough to carry out reforms, which often take multiple years. Figure 2.2 identifies the four positions in NNSA that are presidentially appointed and subject to Senate confirmation (PAS).

Administrator's Position

The Augustine-Mies report recommended that the Administrator remain as a PAS position but that the law be changed to provide the Administrator with a fixed term, with a minimum tenure of at least 6 years.[15] Since creation of the Administrator position in 2000, there have been four gaps when there was no confirmed Administrator leading NNSA. Those gaps averaged 247 days between the vacancy and Senate confirmation of the next Administrator (see Table 2.1). The gaps would have been even longer if those Administrators had not continued into the following Administrations, adding an average of 1.6 years to each of their tenures.

[14] Federal Acquisition Regulations, section 35.017: "An FFRDC, in order to discharge its responsibilities to the sponsoring agency, has access, beyond that which is common to the normal contractual relationship, to Government and supplier data, including sensitive and proprietary data, and to employees and installations, equipment and real property."

[15] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014.

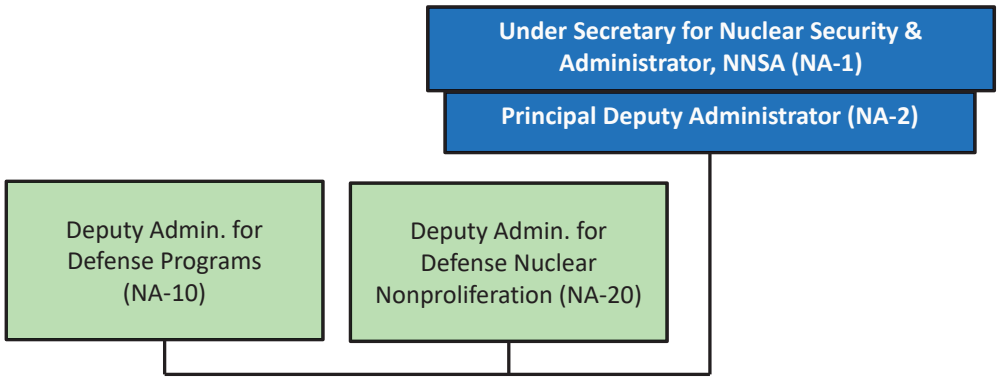

FIGURE 2.2 Presidentially appointed, Senate-confirmed positions within NNSA. SOURCE: Adapted from NNSA Organizational Chart, http://www.energy.gov/sites/prod/files/2020/06/f76/20200630%20-%20NNSA%20HQ%20Org%20Chart.pdf.

TABLE 2.1 Length of Time Between Senate-Approved Administrators at NNSA

Gaps Between Administrators	Dates Without a Senate-Confirmed Administrator (Position Was Unfilled or Filled by Someone in an Acting Capacity)	Days Elapsed (approximate)
Gordon to Brooks	7/8/2002–5/16/2003	313
Brooks to D'Agostino	1/19/2007–8/13/2007	208
D'Agostino to Klotz	1/16/2013–4/8/2014	445
Klotz to Gordon-Hagerty	1/20/2018–2/15/2018	23
Average gap duration		247

SOURCE: Data from http://www.energy.gov/sites/prod/files/2020/06/f76/20200630%20-%20NNSA%20HQ%20Org%20Chart.pdf.

To prepare for a potential transition after the 2016 presidential election and before a new Administrator would be confirmed and in place, former Administrator Klotz appointed a senior NNSA civil servant to serve as acting Administrator during any gap periods, and ensured that that individual was fully informed and able to carry on leadership, if needed. The current Administrator has followed this practice, to be prepared if there is a transition and until a new Administrator can be confirmed, by identifying a member of the Senior Executive Service (SES) to serve in a similar role if needed. However, based on the experience of panel members, "acting" officials feel significantly less empowered to provide strong leadership and bring about significant change. An acting leader typically is also trying to fill his or her own job as well as the functions of the acting position, giving them less time.[16]

A fixed-term appointment may help to address these problems, and there is precedent elsewhere in government for fixed-term PAS appointments. The panel documented 12 examples of PAS appointees

[16] The panel also notes that over the past 20 years, the tenure of NNSA Administrators has averaged 3.7 years, which does not allow enough time for making major changes such as reform of governance and management.

with fixed terms in its fourth interim report.[17] Typically, these fixed-term PAS appointees manage organizations requiring technical knowledge and objectivity, such as the Internal Revenue Service or the Bureau of the Census. Ten of these 12 appointees had terms of 5 or 6 years.

After considering these data and talking with former NNSA leaders, and taking into account the Augustine-Mies proposal, the panel reiterates a recommendation made in its fourth interim report.

Recommendation 2.3: Congress should amend the National Nuclear Security Act to modify the position of National Nuclear Security Administration (NNSA) Administrator so that it has a fixed term but is still filled by presidential appointment subject to Senate confirmation. To eliminate leadership gaps, the Administrator should be authorized to stay in office until a replacement is confirmed by the Senate, even beyond the formal completion of his or her term.

NNSA's Other PAS Positions

The three other PAS positions in NNSA—the Principal Deputy Administrator, Deputy Administrator for Defense Programs, and Deputy Administrator for Defense Nonproliferation—have also experienced substantial periods when there was no confirmed incumbent. Not having a senior leadership team in place affects the Administrator's effectiveness and ability to carry out mission objectives. Average gaps for these positions have been longer than for the Administrator position, ranging from 386 days to 495 days. For reasons similar to those discussed above with respect to the Administrator position, acting officials filling these deputy positions will generally be less able to effectively exercise the functions of their office than confirmed officials.

The Augustine-Mies report recommended that these three positions be converted to Senior Executive Service or Excepted Civil Service, a shift that would surely reduce the gap periods substantially. However, during panel interviews, two former NNSA leaders felt that these positions require the stature associated with being a political appointee. This stature helps, for example, in their interactions with senior officials in DoD and also with international leaders. Panel members, based on their own experience in government and PAS positions, agree with this. However, steps are needed to reduce the long gap periods associated with these positions, which have been serious. Some options include expediting the process of nomination and confirmation, careful use of deputy positions, or conversion of the positions to other types of appointments such as "PA" positions, which are presidential appointees that do not require Senate confirmation. Any or all of these steps can be helpful, but the last option offers the most assured benefit.

Recommendation 2.4: To reduce gaps in other key leadership positions, the requirement for Senate confirmation of the Principal Deputy Administrator, Deputy Administrator for Defense Programs, and Deputy Administrator for Defense Nonproliferation should be removed. These positions should continue to be filled with political appointees to provide appropriate stature.

[17] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2020, *Report 4 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C.

3

Management Practices Within NNSA

Strong management practices, such as disciplined planning and budgeting and a clear line-management structure and decision making, are foundational to the National Nuclear Security Administration's (NNSA's) success now and into the future. Thus, these practices constituted a large focus of this panel's work. Further, the panel is convinced that NNSA's ability to achieve lasting improvements in governance and management also requires a change in the organization's culture. The panel focused on the following management activities, which largely align with the characteristics of "high-reliability" organizations identified in the Augustine-Mies report:

- Strategic planning,
- Integration of functional support with mission execution,
- Risk management,
- Workforce management,
- Planning and budgeting capabilities and processes,
- Budget and reporting classification codes, and
- Program management.

Although the Augustine-Mies panel found at the time of its study that NNSA lacked "effective management practices" in a number of areas, this panel has observed that NNSA has taken multiple actions since then to begin addressing these problem areas and to improve operations and administration across the enterprise. The following examples illustrate some of the efforts that have been completed or are currently under way:

- Three strategic documents issued in 2019 by the Administrator effectively set forth goals, objectives, and a vision for the future of the nuclear security enterprise. The documents emphasize

in several places that they pertain to the entire enterprise, and they make clear the aspiration of being a single team. Overall, the documents' language regarding culture (including values and behaviors) and the importance of governance and management is promising.

- The laboratory/plant/site strategic planning process contributes to progress on organizational and mission alignment. The timing of the process has been shifted to better align with the budget-building process, and the plans themselves align with NNSA's strategic documents.
- In 2017, in response to the Augustine-Mies report and other recommendations, NNSA developed and began to implement a site governance peer review process. These peer reviews are part of NNSA's effort to improve oversight of the laboratories, plants, and sites, with a focus on clarifying roles, responsibilities, and expectations, and increasing reliance on management and operating (M&O) contractor assurance systems for oversight. The peer reviews are generally viewed as a useful and successful process by both federal and M&O participants.
- Since 2017, NNSA has employed collaborative, data-driven processes to prioritize infrastructure investments based on a number of criteria, including importance to mission, safety, security, and cost. NNSA has catalogued its assets, evaluated their condition, and established a priority rating for needs to be addressed in its annual *Master Asset Plan*. In addition, an Infrastructure Modernization Initiative was launched in December 2017 with the purpose of reducing deferred maintenance and repair needs by 30 percent by 2025.
- In the first 2 years after the Augustine-Mies report, the Department of Energy (DOE) reestablished the Laboratory Operations Board, created a Laboratory Policy Council and Government Executive Steering Committee, and established a number of joint task forces of Chief Operations Officers, Chief Financial Officers, Chief Information Officers, and other leaders from headquarters and the M&O facilities to work together on common management challenges.
- NNSA has established an NNSA-wide team focused on employee empowerment. Decades of research have shown that federal employee engagement is linked to organizational health and performance.[1]
- Based on publicly available results from the annual Federal Employee Viewpoint Survey (FEVS), overall morale (satisfaction and engagement) among NNSA federal employees notably improved from 2015 to 2019, as shown in Figure 3.1.

These developments, and those detailed below, are examples of how NNSA has begun to take a strategic and comprehensive approach to the governance and management of the enterprise.

While NNSA has made substantial progress, the panel believes that the agency still has some organizational characteristics—such as lengthy decision-making processes, burdensome regulations, and risk aversion—that hamper its ability to meet its ambitious mission. For example, while most people the panel interviewed indicated that they or their office have the authority to make the decisions necessary to do their work, the panel also heard complaints about decisions at the headquarters level taking too long (e.g., in the pit production case study discussed in this chapter). This comes across as a lack of urgency and can impact schedules.

In addition, leadership commitment, measuring and communicating success, and institutionalizing change will be necessary to maintain momentum and sustain progress. Most importantly, NNSA needs to continue to make specific changes, such as those discussed in this chapter, as it continues its journey toward a workplace culture that emphasizes performance, credibility, and accountability.

[1] See, for example, National Academy of Public Administration, 2018, *Strengthening Organizational Health and Performance in Government*, Washington, D.C.

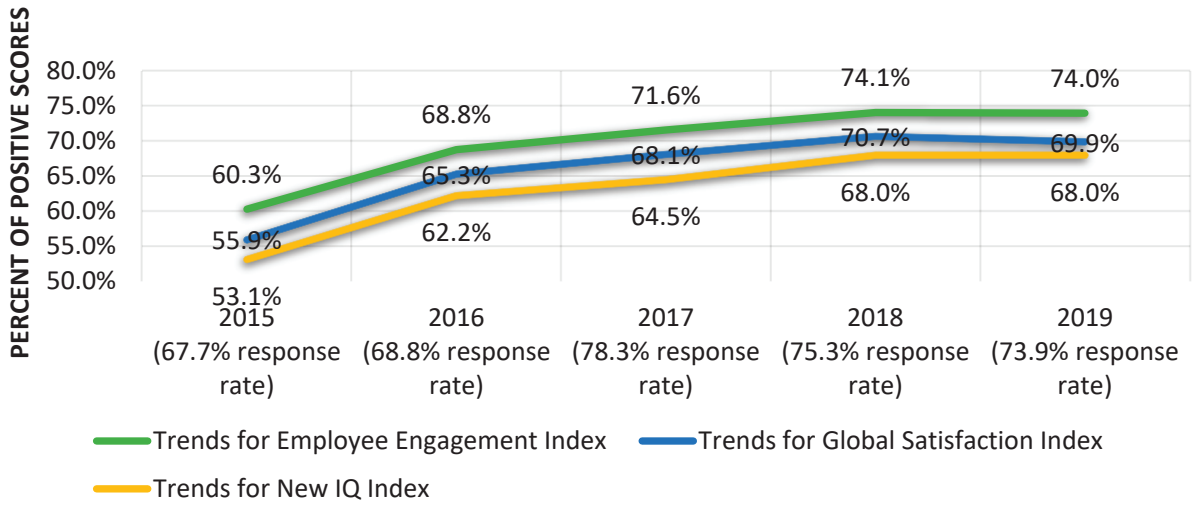

FIGURE 3.1 Selected NNSA results from the Federal Employee Viewpoint Survey, 2015-2019. NOTE: The new inclusion quotient (New IQ) is used to measure workplace inclusion, which contributes to employee engagement and organizational performance. SOURCE: Department of Energy, Office of the Chief Human Capital Officers, Organizational Management Report Summary, "2019 Federal Employee Viewpoint Survey (FEVS) Results."

STRATEGIC PLANNING

NNSA has been working to strengthen strategic planning both enterprise-wide and at the levels of laboratories, plants, and sites. It undertook a lengthy enterprise-wide strategic planning process in 2018–2019 that resulted in the three 2019 strategic documents mentioned earlier, the *Strategic Vision*, *Governance & Management Framework*, and *Strategic Integrated Roadmap 2020–2044*.[2]

Some specific aspects of those 2019 documents are particularly noteworthy. Placement of the agency's mission statement front and center on the *Strategic Vision* cover is an effective way to communicate leadership's focus on that mission. The "mission priorities" in the document are long-term and strategic, and each mission priority includes "mission milestones." The *Framework* effectively sets out the Administrator's governance and management priorities (e.g., clear roles and responsibilities and risk management) and includes an appendix detailing expectations. The *Roadmap* graphically presents mission priorities and goals through 2044. A number of leaders, midlevel managers, and staff from across the enterprise have told the panel that they are supportive of the documents—in particular, most who have seen it say that they can look at the *Roadmap* and see where their organization fits into it. As discussed below, these documents have the potential of serving as the basis for change and creating unity across NNSA and the enterprise.

The process for developing the documents was also a valuable step in governance and management reform. The *Strategic Vision* was developed with input from a variety of stakeholders; the panel understands that leaders from headquarters, NNSA field offices, and M&O partners had varying opportunities to provide input, and some Department of Defense (DoD) personnel were briefed on the *Strategic Vision* and given an opportunity to provide feedback before it was finalized. This inclusive process was

[2] National Nuclear Security Administration, 2019, *Strategic Vision: Strengthening Our Nation Through Nuclear Security*, Washington, D.C.; National Nuclear Security Administration, 2019, *Governance & Management Framework*, Washington, D.C.; and National Nuclear Security Administration, 2019, *NNSA Strategic Integrated Roadmap 2020–2044*, Washington, D.C.

at least as important as the documents themselves: it contributes to relationships and trust across the enterprise and created buy-in for change from key leaders and stakeholders, thus creating greater unity around the mission.

The challenge will be to identify and put in place specific actions that carry out the vision in these documents—to operationalize them. The recommendations in Chapters 3–5 of this report are intended to help in that. One of NNSA's initiatives to follow up on the release of the documents was to organize in fall 2019 almost 40 employee focus groups to solicit information and ideas related to improving NNSA governance and management. The focus groups were facilitated by an independent management consulting firm, and each consisted of a mix of individuals from across the enterprise. The participants had varying levels of seniority and lengths of tenure and were drawn from both programmatic offices and functional offices, and from NNSA and its M&O partners; none of them was a member of the Senior Executive Service (SES) or a political appointee. The results of the focus groups were presented to the heads and deputy heads of NNSA's offices at a governance and management workshop in late January 2020 and to senior staff members at a leadership retreat immediately following. The panel was told that focus group results and feedback from those top leaders are being combined with lessons learned from the site governance peer reviews conducted at each laboratory, plant, and site and input from the Governance Executive Steering Committee to guide next steps, including developing a Governance and Management Action Plan to implement principles in the *Strategic Vision* and *Governance & Management Framework*.

The panel was recently told that NNSA is beginning a Strategic Risks Study to improve enterprise-wide strategic planning. The purpose of the study is to identify and examine anticipated external threats (and opportunities) over the next 25 years and determine how they could impact NNSA's mission space. The initial focus is on emerging scientific capabilities and new and potentially disruptive technologies. The study will draw on ongoing and recent strategic planning, including at the program level, and results will feed back into the laboratory, plant, and site strategic planning cycle and the budget process. NNSA will also use the study to identify gaps in NNSA strategic planning and risk analysis.[3]

Starting in 2016, NNSA provided guidance for a strategic planning process for its laboratories that was adapted from the process used by DOE's Office of Science. The goal of the guidelines was to make the plans more strategic than had previously been the case and to reduce data reporting requirements. Each year since then, NNSA has improved on the guidelines and process with the goal of being more strategic and inclusive:

- Expanded the process to include plants and sites, as well as laboratories;
- Linked the process to NNSA's strategic documents by, for example, directing the laboratories, plants, and sites to describe how their unique capabilities further the priorities in the *Strategic Vision* and *Strategic Integrated Roadmap*;
- Updated and improved the guidance to be less operational;
- Included more key headquarters personnel and leadership from other sites when strategic plans are briefed to NNSA headquarters;
- Provided the leadership of each laboratory, plant, and site an opportunity to brief the Administrator in a separate meeting;

[3] National Nuclear Security Administration, 2019, *G&M Newsletter* 1(3), and interviews with the NNSA Office of Policy and Strategic Planning.

- Transitioned from an annual to an every-other-year process (which also helps to ensure that the plans are more strategic; planning that is done on an annual basis tends to be more tactical than strategic); and
- Lengthened the time frame of the plans from 10 to 25 years.

In addition, in 2020 a team of M&O leaders participated in the revision of the annual guidelines; in the recent past, the M&Os did not see the guidelines until they were issued. These developments have supported greater mission alignment and are helping to improve communication and build trust across the enterprise.

INTEGRATION OF FUNCTIONAL SUPPORT WITH MISSION EXECUTION

The Augustine-Mies report noted a perceived lack of a mission-driven culture and unity around the mission across the nuclear security enterprise. Specifically, it mentioned a lack of understanding of roles and responsibilities among DOE, NNSA headquarters, the field offices, and the M&Os. In addition, functional support organizations often saw their role as enforcing compliance with rules and regulations rather than enabling the mission, resulting in them operating somewhat independently of mission execution offices.[4]

To clarify roles, responsibilities, authorities, and accountability, NNSA issued Supplemental Directive 226.1B on "NNSA Site Governance" in 2016.[5] The current Administrator has further clarified roles, responsibilities, authorities, and accountability through the revised NNSA Supplemental Directive 226.1C (issued in 2019) and in the "Corporate Expectations" appendix of the *Governance & Management Framework*.[6] In general, leaders and staff across the enterprise say that roles, responsibilities, authorities, and accountability are clearer now than 5 years ago.

SD 226.1C also promotes functional and mission execution integration. The directive explicitly states that functional managers are "mission enablers." Former Administrator Klotz changed the reporting relationship so that field office managers report directly to the Administrator. That arrangement, which continues, facilitates those managers' participation in program discussions, and in general the field office managers accept that their primary role is to support NNSA mission execution. Through SD 226.1C, the Administrator also established field office positions that are explicitly charged with serving as liaisons to certain NNSA programs, with the goal of promoting better integration across the enterprise. And as part of the Administrator's realignment initiative of 2019, the planning, programming, budgeting, and evaluation (PPBE) professionals in NNSA's Office of Management and Budget (OMB) are matrixed to NNSA's programs and field offices. Overall, the current NNSA Administrator has widely communicated the goal of "Getting to Yes," which signals to field and functional offices that they are expected to solve problems in furtherance of the mission (while also ensuring compliance with laws and regulations), rather than to strictly enforce compliance.

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[4] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, *A New Foundation for the Nuclear Enterprise: Report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise*, http://cdn.knoxblogs.com/atomiccity/wp-content/uploads/sites/11/2014/12/Governance.pdf, p. 23.

[5] See NNSA SD 226.1C, *NNSA Site Governance*, https://directives.nnsa.doe.gov/supplemental-directive/sd-0226-0001c/@@images/file.

[6] See NNSA SD 226.1C, *NNSA Site Governance*, https://directives.nnsa.doe.gov/supplemental-directive/sd-0226-0001c/@@images/file, and NNSA, 2019, *Governance & Management Framework*, Washington, D.C.

An example of how roles and responsibilities are being clarified, and functional support and mission are being integrated, is the Administrator's designation of the Office of Defense Programs as the account integrator for NNSA's weapons activities budget. In this role, the Office of Defense Programs coordinates and prioritizes the activities and projects necessary to complete program goals. The functional offices involved (Office of Safety, Infrastructure, and Operations and Defense Nuclear Security) embrace that their roles are to support those programmatic needs. To assist in this coordination, it is now common practice for functional office representatives to attend weekly staff and other program office meetings, helping to facilitate in their supportive roles.

Although M&O and field office personnel have told the panel that most of their relationships with functional offices are good or improving, the panel has heard mixed reactions about interactions with NNSA's Office of Acquisition and Project Management (NA-APM).[7] The concerns have included a lack of risk-based decision making and an overemphasis on compliance. While it is possible that such comments reflect an impatience by program offices to get their projects approved and under way, the panel sees this tension as indicating that more work is needed to improve the understanding of NA-APM's role and working relationships. The panel notes that rotational assignments are a helpful means of improving mutual understanding of roles and responsibilities.

In sum, NNSA has made significant changes and implemented initiatives to clarify roles and responsibilities and to improve functional support and mission execution integration, but this is a continuing challenge and it is too early to tell how effective some of the changes will be. It is also unclear whether some of the changes have been adequately institutionalized to be sustained over time.

Recommendation 3.1: National Nuclear Security Administration (NNSA) leadership should build on progress made on clarifying roles, responsibilities, authorities, and accountability by improving its communications about and enforcement of the relevant policies.

- **To clarify the roles of functional support offices vis-à-vis mission execution, NNSA leadership should promulgate policies that engage support-office personnel early in mission-related planning in order to smooth the process of "Getting to Yes," thereby enabling mission accomplishment.**
- **To increase the shared understanding of roles and responsibilities throughout the enterprise, NNSA leadership should expand programs for rotation of personnel between federal and nonfederal positions, as well as between headquarters and field offices. This expansion should take the form of making such opportunities more widely available and of longer duration. Consideration should be given to requiring rotational assignments prior to promotion to senior NNSA positions.**

RISK MANAGEMENT

In the *Governance & Management Framework*, NNSA signaled that improving risk management is a priority by describing policies and initiatives that have been completed or are under way:[8]

[7] The Office of Acquisition and Project Management is focused on construction project delivery and acquisition improvements and provides independent counsel to ensure that NNSA implements federal acquisition and construction project management policies and regulations.

[8] *Governance & Management Framework*, pp. 10–11.

- The *Quality Management System* policy[9] includes risk management expectations.
- Risk reduction programs and processes have been designed to identify, track, and remove or abate obstacles to achieving mission and improving mission success, while providing appropriate oversight.
- Best practices and lessons learned are shared through processes like the site governance peer reviews.
- An enterprise risk management approach based on risk management principles and best practices is being developed. It is intended to cover risk acceptance, risk acceptance roles and responsibilities, and how to appropriately balance the accomplishment of mission demands and satisfaction of safety and security requirements.

Unfortunately, these efforts have not yet changed a culture of risk aversion—evidenced, for example, by choices in how laboratory safety is monitored and controlled—that, to some leaders and personnel, appears deeply rooted. The panel heard a variety of perspectives on risk aversion at all levels and across the enterprise. Some staff members have seen examples of the enterprise becoming less risk averse and having improved risk management, while others believe there has been no change or that the enterprise has become even more risk averse. This mix of views persisted with little change over the course of the panel's study and were not dependent on type of personnel (federal or M&O) or location.

It is important to note that most M&O personnel who believe that the enterprise is overly risk averse are uncertain of the source, and some attributed it to the M&Os themselves. However, even in cases where this is true, NNSA has a strong influence on the overall environment, which could be encouraging the M&Os to be overly risk averse. Furthermore, expectations developed through years of compliance-focused oversight take a long time to undo. Many of those who placed the blame on NNSA indicated that the program offices were much more risk accepting than functional offices.

Those who view risk aversion as a persistent cultural problem believe that it creates obstacles to mission success as it

- Undermines trust, transparency, agility, and innovation;
- Leads to burdensome practices, like data calls and regulations;
- Pushes decision making higher up the chain than should be necessary, thereby lengthening the decision-making process; and
- Results in too many layers of oversight and requirements for a large number of signatures, slowing processes.

Actions that could contribute to addressing risk aversion by NNSA and its M&O partners are discussed in Chapter 4, both in Recommendation 4.1 on eliminating burdensome practices and in Recommendation 4.2 on maximizing value from the federally funded research and development center (FFRDC) relationships.

MANAGING THE FEDERAL WORKFORCE

The Augustine-Mies report stated that NNSA's federal workforce lacked some necessary technical and managerial skills, particularly in the areas of cost and resource analysis and program management. (See Chapter 4 for a discussion of M&O workforce issues.) Further, NNSA lacked the personnel pro-

[9] *NNSA Policy Letter*, NAP-26B, January 10, 2017.

grams, such as career development and rotational assignments, needed to build a skilled and experienced federal workforce. Creating and sustaining a personnel management system to build the needed culture, skills, and experience is a vital component of governance reform.

The panel has seen substantial activity related to these and other human capital areas, such as hiring, innovating to speed up the security clearance process, and increasing employee engagement. NNSA has established or expanded multiple programs and initiatives with the goal of having talent in the right numbers with the right skills in the right locations.

In recent years, NNSA has increased its emphasis on training and development for the federal workforce through the Learning and Career Management Center, which has become an active force in the organization. As shown in Figure 3.2, between FY 2013 and FY 2019, NNSA's training budget increased from $3.5 million (only 68 percent of which was used) to $5.8 million (of which 96 percent was used). In FY 2014, 40 percent of employees developed and got approval for their individual development plans, whereas in FY 2019, 90 percent developed and got individual development plans approved. And employee satisfaction with training, as reported in FEVS results, sharply rose from 45 percent in FY 2014 to 68 percent in FY 2019. Overall, since 2013, NNSA's training and development ranking across the federal government moved from the bottom 25 percent to the top 15 percent.[10]

The Learning Center also supports rotation assignments, which were somewhat limited in 2018: eight people completed 90-day rotations from headquarters to field office or vice versa. Given both the Augustine-Mies and this panel's findings that M&O leaders and staff, in particular, believe that

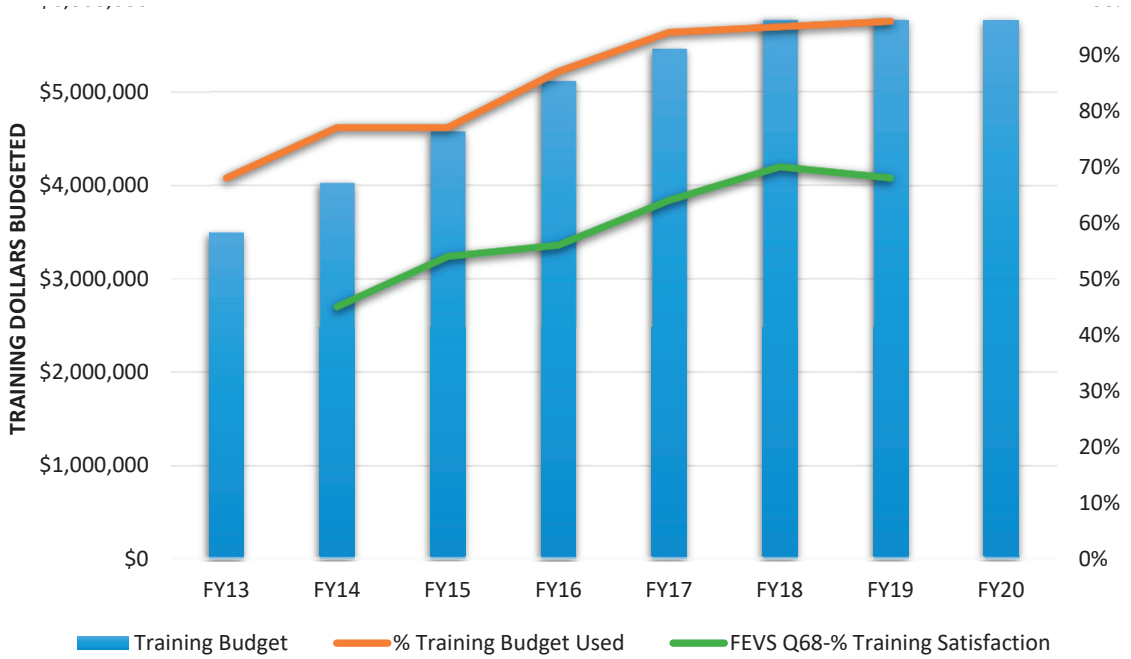

FIGURE 3.2 Growth in NNSA's staff training activities. SOURCE: Adapted from NNSA, "Learning and Career Management: 2019 Year in Review," National Nuclear Security Administration, Washington, D.C., p. 7.

[10] NNSA, "Learning and Career Management: 2019 Year in Review," National Nuclear Security Administration, Washington, D.C., p. 4.

headquarters staff do not fully understand the work and the challenges faced in the field, the panel supports NNSA's plans to expand the program of rotational assignments of NNSA personnel with the M&Os and vice versa. However, the panel also heard that M&O and field office personnel often do not understand the pressures faced by headquarters, and that 90 days is not enough time to learn a new organization and job (see Recommendation 3.1).

Learning Center plans for 2020 include clarifying competencies and career paths for multiple mission-critical occupations, including program managers, and developing a "talent development strategic plan" that aligns with overarching NNSA strategies.

In 2019, NNSA significantly ramped up its hiring. Early in her tenure, the Administrator determined that traditional hiring methods were not resulting in NNSA successfully filling its open slots, and in addition, NNSA was not using all of its allocated positions. One initiative to address this problem was to hold enterprise-wide job fairs. The first such fair was successfully held in January 2019 in Washington, D.C. Importantly, at these fairs individuals can apply for jobs with NNSA or submit resumes with any of NNSA's M&O partners. Two other such job fairs have been held since then, including a virtual job fair held during the coronavirus pandemic. Further, NNSA established the nuclear security enterprise Educational Partnership Consortium, which focuses on forming and sustaining strategic partnerships with educational institutions.

The length of time it took to get a security clearance was a long-standing problem for both NNSA and M&O personnel. NNSA's Office of Defense Nuclear Security worked with DOE and the Office of Personnel Management to reconfigure and streamline its own activities, cutting the length of the process in half, from 6–12 months to 3–6 months. NNSA leaders report that progress in expediting clearances has saved thousands of manpower days.

NNSA has also established a team focused on employee empowerment that monitors and responds to feedback received through the FEVS. There is a strong correlation between employee engagement and organizational health, including performance outcomes like productivity, safety, and quality.[11] By using the FEVS to identify areas on which to improve, NNSA has successfully increased FEVS scores since 2015. However, the FEVS surveys only federal employees, which represent just 3.3 percent of the total enterprise. The focus groups that NNSA held in 2019, which included M&O employees, were an invaluable opportunity for NNSA to collect data on M&O workforce satisfaction, engagement, and perspectives, and the panel encourages NNSA to continue this practice (M&Os might also benefit from holding focus groups). However, it is not feasible or practical for NNSA to hold enough focus groups to include a representative sample of the more than 55,000 M&O employees. Most M&O partners survey their employees (although not necessarily annually, and not with a standard set of questions), but it is unclear whether or how the questions compare with the FEVS, and the results are not shared with NNSA. As a result, NNSA does not have a full understanding of attitudes and engagement throughout the enterprise or insight about specific concerns. Because the M&O workforce is critical to the NNSA mission, a general understanding of M&O workforce perspectives and engagement can provide important input into governance and management decision making and priority setting.

The panel made a recommendation about this in its second report,[12] from 2018, and offers a variant here:

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[11] J.K. Harter, F.L. Schmidt, S. Agrawal, S.K. Plowman, and A. Blue, 2016, *The Relationship Between Engagement at Work and Organizational Outcomes: 2016 Q12® Meta-Analysis: Ninth Edition*, http://www.workcompprofessionals.com/advisory/2016L5/august/MetaAnalysis_Q12_ResearchPaper_0416_v5_sz.pdf, pp. 2–3.

[12] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2018, *Report 2 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., p. 3.

Recommendation 3.2: The National Nuclear Security Administration (NNSA) should gain a better understanding of attitudes and engagement of the entire enterprise workforce. It should require all of its management and operating (M&O) partners to conduct regular employee surveys, preferably including some questions that are found on the Federal Employee Viewpoint Survey (FEVS). NNSA should require the M&O partners to provide it with the responses, properly anonymized, to at least those latter questions.

BUDGET, COST, AND SCHEDULE CONTROL

The Augustine-Mies report as well as various Government Accountability Office (GAO) reports over the past decade have been highly critical of NNSA's ability to estimate costs and execute projects on budget and according to schedule. Problems cited include numerous instances of wildly inaccurate estimates involving not only construction of facilities, such as the Y-12 highly enriched uranium processing facility, but also for the costs for Life Extension Programs, such as the B61. Some cost estimates for major NNSA programs and projects were as low as half of an estimate produced using best practices; an outlier was low by a factor of 6. All too frequently, the discoveries of these misestimates were not communicated to either the Congress or to DoD customers in a timely fashion, severely undermining both trust and credibility.

In response to these criticisms, former Secretary of Energy Moniz in 2015 initiated major changes to project management policies under DOE Order 413.3B, which governs Program and Project Management for the Acquisition of Capital Assets.[13] Those changes were aimed at ensuring clear roles, responsibilities, and accountabilities among the various participants in the project-planning process and ensuring that an Analysis of Alternatives (AoA) be conducted independent of the organization responsible for managing the project. NNSA is implementing a new project delivery model that involves assigning a federal project director earlier in the program development process, with the ultimate goal of producing more reliable analyses of alternatives and baseline cost and schedule estimates. However, the GAO still lists NNSA contracts and major projects with budgets of $750 million or more on its 2019 high-risk list.[14]

NNSA's NA-APM was created in 2012 specifically to manage federal acquisition and project management processes for major construction projects. NA-APM has continued to build on the changes described above for all major projects within NNSA. In addition to managing the implementation of DOE Order 413.3B and its NNSA complement, NA-APM has led careful reexaminations of major projects that were experiencing significant cost and schedule problems, such as the Uranium Processing Facility at the Y-12 Plant and the Chemistry and Metallurgy Research Replacement Facility at the Los Alamos National Laboratory (LANL).

These reviews involved experts from across and outside the DOE complex in rigorous AoA examinations. The results often have been substantial restructuring of the original project concepts, leading to major redesigns, reuse of existing facilities, and resizing of new construction requirements. The re-scoping of such projects has significantly reduced the total budgets for those projects and increased the feasibility of successfully completing them. In the two instances cited above, the total budgets have been reduced by approximately 50 percent from the earlier levels and the projects have been managed on schedule and on budget for more than 6 years.

[13] See DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, http://www.directives.doe.gov/directives-documents/400-series/0413.3-BOrder-b/@@images/file.

[14] GAO, 2019, *High-Risk Series: Substantial Efforts Needed to Achieve Greater Progress on High-Risk Areas,* Government Accountability Office, Washington, D.C.

In addition to such high-profile cases, NA-APM oversees the application of the 413.3B process for many smaller projects every year. In interviews with experts from GAO and elsewhere, the panel gathered assessments that this management approach has led to some improvements in cost and schedule performance over the past 5 years. The improvements have been attributed to the use of independent cost estimates, peer reviews of designs, the AoA process, and the discipline of waiting until designs are 90 percent complete before beginning construction.

In 2014, NNSA established an Office of Cost Estimating and Program Evaluation (CEPE). This office was modeled after DoD's Cost Assessment and Program Evaluation office, which is charged with providing independent analytic advice to the Secretary of Defense on all aspects of DoD programs along with independent estimates of costs for major programs. CEPE's initial focus was on Life Extension Programs and the budget buildup process, although it has since expanded its coverage to include independent reviews of AoAs, which now comprise a significant portion of its workload. Its staff over the past 5 years has grown from 2 full-time employees and 3 contractors to 16 full-time employees and 7 contractors. These are cost estimators and program evaluation specialists, many from DoD. While CEPE is not the ultimate decision maker on costs, it is charged with reviewing and commenting on cost estimates of Life Extension Programs before each acquisition milestone. Most recently, it has also been put in charge of providing independent cost estimates of construction projects.

As CEPE's responsibilities have increased, the panel was told that it has developed a solid working relationship with NA-APM while reviewing the budget profile for construction projects and likewise with NNSA's Office for Safety, Infrastructure, and Operations with which it partners on some work for the annual budget build. The panel heard that CEPE has had some challenges in working with NNSA's cadre of PPBE specialists (established in 2019 within NNSA's Office of Management and Budget), particularly when dealing with the review of AoAs and the budget-build process.

While the Administrator and Congress are fully aware of CEPE's cost projections, the program offices' estimates are more often used when funding requests are made. The panel was told that those latter estimates may reflect the willingness of the Administrator and the head of Defense Programs to accept a higher level of risk.

For CEPE to be most useful, it will need to cement the relationships mentioned above as well as with the program offices, building trust such that offices throughout NNSA come to recognize the skills that it brings to the process and place increasing confidence in the accuracy of CEPE's projections.

The GAO in various reports has already noted improvements in NNSA's documentation of costs for construction projects and complimented NNSA on the cancellation of the Mixed-Oxide Program (MOX) at Savannah River (SRS). However, the panel is unclear about the handling of situations where CEPE's cost estimate differs materially from the estimate produced by the NNSA program offices. In at least one case of which the panel was told, cost estimates from a program office were adopted over a quite different CEPE estimate. More information about how differing estimates are reconciled would be helpful to external stakeholders.

Recommendation 3.3: The National Nuclear Security Administration (NNSA) should enforce its policies for estimating and controlling budget, cost, and schedule for major programs and capital projects. To enhance the credibility of program plans and budget estimates, NNSA should improve its process for addressing differences in cost estimates from Cost Estimating and Program Evaluation (CEPE) and program offices to include providing accessible documentation that reconciles the differences and makes clear the provenance of the estimate used in the budget.

The reorganization of NNSA's PPBE capabilities is another step designed to provide more disciplined planning and budgeting. As mentioned briefly above, some 56 individuals were reassigned in 2019 from disparate program and functional offices across NNSA to form a unit of PPBE specialists within NNSA's Office of Management and Budget. By assembling such a unit, the professionalism of PPBE specialists can be increased, and their shared insights make it more likely that cost estimates across NNSA will be comparable and that these specialists can be reassigned as workload shifts. Three internal NNSA policy documents were released in December 2019 to codify key elements of this reform.[15] This change is still too new for the panel to be able to assess its effects.

BUDGET AND REPORTING CLASSIFICATION CODES

Budget and reporting (B&R) classification codes are required by Congress and NNSA for tracking spending and levels of effort.[16] The Augustine-Mies and Commission to Review the Effectiveness of the National Energy Laboratories (CRENEL) reports both noted a proliferation of B&R codes at NNSA that imposed undue burdens and constraints on the ability of NNSA and its M&O partners to flexibly manage their work.[17] However, some of this compartmentalization may be needed to answer legitimate management or congressional questions or to otherwise gain transparency into the operations by capturing how funds are spent at some level of granularity. The additional detail can also help the enterprise evaluate its performance.

Table 3.1 displays how the number of budget controls has changed over the course of 5 years at two of NNSA's laboratories and two of its plants. The number of congressionally imposed control levels has increased little, if at all. However, at the two laboratories the number of budget control codes imposed by NNSA and the laboratories themselves has increased significantly, although generally in proportion to the increase in overall budgets. There has been a reduction in project and activity codes at the two M&O plants shown.

Table 3.1 shows that, contrary to what many in the enterprise believe, the number of budget control categories is not driven by Congress but rather is primarily the result of behavior within NNSA and at the laboratories, plants, and sites. (However, the panel was told recently by a senior official at NNSA that the agency maintains some budget categories to provide more transparency to Congress.) Some budget categories are for data and reporting purposes and therefore do not act as "control" points that constrain the work by requiring approvals for funding increments. Without further examination of that point, and of how these categories do or do not impact day-to-day management, it is not possible to determine whether they are unnecessarily burdensome.

NNSA is undertaking a multiyear financial integration project to develop and apply a cost-collection tool intended to enable direct and indirect costs to be determined and compared across all sites and

[15] NAP 130.1A, *Planning, Programming, Budgeting, and Evaluation (PPBE) Process*, https://directives.nnsa.doe.gov/nnsa-policy-documents/nap-0130-0001a; ACD 413.1, *Centralizing Cost Estimating Activities in the National Nuclear Security Administration (NNSA)*, https://directives.nnsa.doe.gov/advance-change-directives/400-series/acd-0413-0001; and ACD 413.2, *Centralizing Analyses of Alternatives Studies in the National Nuclear Security Administration (NNSA)*, https://directives.nnsa.doe.gov/advance-change-directives/400-series/acd-0413-0002.

[16] Budgetary categories and controls define blocks of appropriated funding and specify the purposes for which such funding may be used, such as for labor or construction under particular programs or at particular sites. Such controls may also limit use of the funds to particular fiscal years or other periods and may impose other limits on permissible use. Moreover, spending must be reported in terms of these categories.

[17] See Commission to Review the Effectiveness of the National Energy Laboratories, 2015, *Securing America's Future: Realizing the Potential of the Department of Energy's National Laboratories: Final Report of the Commission to Review the Effectiveness of the National Energy Laboratories, Volume 1: Executive Report*, http://www.energy.gov/sites/prod/files/2015/10/f27/Final%20Report%20Volume%201.pdf, pp. 31–34 and Recommendation 14. Also see Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, pp. 48–49.

TABLE 3.1 Growth of Budget Controls at Four Selected NNSA Facilities, 2014–2019

Los Alamos National Laboratory (LANL) Controls Example

Budget Control Type	Nov-14	Nov-19	(+/–)
Enacted Annual Budget (Dollars in Millions)	1,609	2,191	+582
Appropriations lines	4	4	0
Congressional-imposed controls	88	94	+6
NNSA-imposed B&R codes	270	302	+32
Project-level controls (mix of NNSA program management and contractor-imposed)	1,393	2,047	+654
Contract project/task controls (only contractor-imposed controls)	7,322	11,413	+4,091

Note from NNSA: *LANL does not receive funding in all NNSA congressional and B&R codes.*

Consolidated Nuclear Security Controls Example

Budget Control Type	Sep-14	Sep-19	(+/–)
Enacted Annual Budget (Dollars in Millions)	1,741	2,698	+957
Appropriations lines	4	3	–1
Congressional-imposed controls	64	88	+24
NNSA-imposed B&R codes	166	191	+25
Project-level controls (mix of NNSA program management and contractor-imposed)	1,880	1,401	–479
Contract project/task controls (only contractor-imposed controls)	6,860	7,968	+1,108

Note from NNSA: *For all data above, only codes with funding or costs are included.*

Kansas City National Security Campus (KCNSC) Controls Example

Budget Control Type	Sep-14	Sep-19	(+/–)
Enacted Annual Budget (Dollars in Millions)	564	754	+190
Appropriations lines	13	15	+2
Congressional-imposed controls	62	62	0
NNSA-imposed B&R codes	138	152	+14
Project-level controls (mix of NNSA program management and contractor-imposed)	2,241	2,942	+701
Contract project/task controls (only contractor-imposed controls)	10,204	7,947	–2,257

Note from NNSA: *For all data above, only codes with funding or costs are included. Projects and activities include counts within KCNSC's project system only (not production).*

Lawrence Livermore National Laboratory (LLNL) Controls Example

Budget Control Type	Sep-14	Sep-19	(+/–)
Enacted Annual Budget (Dollars in Millions)	1,063	1,485	+421
Appropriations lines	15	10	–5
Congressional-imposed controls	79	82	+3
NNSA-imposed B&R codes	220	254	+34
Project-level controls (mix of NNSA program management and contractor-imposed)	1,197	1,803	+606
Contract project/task controls (only contractor-imposed controls)	8,460	10,690	+2,230

Note from NNSA: *2014 data include 603 indirect contractor project controls and 4,290 indirect task controls. 2019 data include 856 indirect contractor project controls and 4,436 indirect task controls.*

SOURCE: Data provided by NNSA Office of Management and Budget, July 2, 2020.

programs.[18] According to some officials at both NNSA and its M&O partners, that initiative will provide greater transparency into how funds are spent and thereby enable NNSA to consolidate its reporting categories down to fewer B&R codes for each congressional control category.

MAJOR PROGRAM MANAGEMENT, AS EXEMPLIFIED IN THE PIT PRODUCTION PROGRAM

To gain greater insight about program management at NNSA, the panel conducted a case study of NNSA's very important and high-profile plutonium pit production program. Appendix C describes in detail the program management structures and processes—roles and responsibilities, coordinating bodies and councils, and management and budgetary authorities. The appendix also presents the program structures and processes by level: strategic-level management, operational-level management, and field-level management.[19] The panel evaluated this structure's capability for providing strong and effective management, using the attributes laid out in the Augustine-Mies report as a guide.

That report had the following to say about program management:

> An essential step toward creating a culture focused on mission performance and accountability is to establish program managers (PMs) for major programs and construction projects, who have *sufficient authority, resources, and accountability* to meet mission deliverable objectives. Delegating control to these PMs for relevant funding would serve to transform program managers from weak coordinators—who must negotiate for support from the campaigns and mission-support staffs—*to resource-owning managers*. These officials would serve as the focal point for planning and executing their programs, and become *the "go-to" individuals for solving problems and resolving issues. Program managers should also have approval authority for all personnel* assigned to their projects and be responsible for personnel evaluations. To exercise their authorities effectively, these PMs must have proven technical, managerial, and leadership skills.[20]

On the positive side, the panel found that several aspects of the management of the pit production program are working well:

- Strategic-level management
  - NNSA's top leadership is firmly committed to meeting the *Nuclear Posture Review* (*NPR*) pit production goals through active and ongoing engagement.
  - NNSA's management structure appears to be effective in fostering communications and coordination.
  - The Office of Defense Programs is now the account integrator for the Weapons Activity budget, which enables it to prioritize programs and projects and to identify and resolve disconnects between program and functional leadership.

[18] The Government Accountability Office recently issued a report about NNSA's financial integration effort: *National Nuclear Security Administration: Additional Actions Needed to Collect Common Financial Data*, January 2019, http://www.gao.gov/assets/700/696683.pdf.

[19] Strategic-level management is the internal strategic decision maker and priority setter, as well as the external liaison for the pit production mission (the Administrator and Deputy Administrator of Defense Programs). Operational-level management is where day-to-day managerial and technical decisions are made. Field-level management is where plutonium pit production happens.

[20] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, pp. 56–57; emphasis added.

- Operational-level management
  - — The program manager for the pit production program, who is within the Office of Defense Programs, controls most of the financial resources needed for that program, including not only the funding executed by Defense Programs but also most of the funding that is executed by NNSA's Office of Safety, Infrastructure, and Operations and Office of Security.
- Field-level management
  - — LANL has established an experienced leadership team with responsibility for producing pits at its facilities and has taken on the comprehensive responsibility to plan for and advise NNSA leadership on the execution of the overall pit production program.
  - — SRS is only 2 years into developing its pit production capacity. NNSA implemented a new project delivery model at SRS, establishing and involving a Federal Project Director earlier in the project planning process to improve program and project planning and coordination.
  - — Interviewees from NNSA, LANL, and SRS spoke highly about the cooperative, partnering relationship among themselves, as well as with Lawrence Livermore National Laboratory (LLNL).

While the program benefits greatly from strong leadership priority and engagement, at the operational management level, where day-to-day managerial and technical decisions are made, many of the Augustine-Mies principles for effective program management have not been adopted by NNSA. The program manager works through a matrixed structure, for which several other offices within NNSA—including NA-APM, NA-50, and NA-70—have designated individuals as representatives, but NNSA's traditional matrix management approach does not give the program manager the greatest chance of success. The panel identified several specific weaknesses in the current approach:

- NNSA's pit production program manager resides several levels deep in the NA-10 organization and is often outranked by the representatives from the functional communities whose activities he is responsible to integrate.
- The program manager has not had the resources necessary to assemble a core team of experts to lead the program.
- The program manager also relies heavily on the laboratories and plants for essential technical expertise.
- While these matrixed participants view the program as their "customer," the pit production manager does not control the team responsible for the program, as the various functional representatives and experts do not report to him, nor does the pit production program manager participate in their employee performance reviews. Although considerable technical expertise resides at LANL (and LLNL), NNSA also relies on multiple external review boards for supplemental expertise, and consequently many decisions are made through a time-consuming consensus-building process, with the result that too many issues must be elevated to NA-10 for resolution.

For this program, NNSA has largely retained its traditional form of matrix management, which diffuses authority, slows decision making, and in NNSA has often proven unsuccessful in the past. Because of the way program authorities are distributed, decision making relies heavily on consensus building among major program stakeholders, as well as other external reviewers. When disagreements arise that cannot be resolved through negotiation, they sometimes need to be elevated. The panel heard of several instances in which the plutonium program office was not the final authority for making management decisions related to technical aspects of the pit production program, which slowed decision making.

All the participants in the pit production program with whom the panel interacted identified substantial risks in meeting the ambitious milestones and objectives for this program, and the panel believes that many of those risks could be better addressed by a program management structure providing stronger operational-level integration across the program. In agreement with the Augustine-Mies report, the panel advocates leveraging the proven attributes of successful program management structures.

Recommendation 3.4: The National Nuclear Security Administration (NNSA) should ensure that the management structures for its major programs provide a high level of authorities and capabilities to one strong program manager so that program managers can serve as the focal point for anticipating and resolving issues in the execution of the program. As an example, the manager of the pit production program should be transitioned to have even stronger authorities and capabilities in order to maximize the program's chances of success.

CULTURE CHANGE

Many of NNSA's efforts to improve management practices have been tied to efforts to change culture and attitudes, including creating unity of the enterprise around the purpose/mission. An organization's culture is defined as the shared values, assumptions, and beliefs that guide individual behavior and interactions. It is expected and appropriate for different organizations within the enterprise, especially the M&O partners, to retain their own cultures. However, there are broader enterprise attributes that should—or must—apply to all components of the enterprise and that govern how the different components behave and interact with each other. For example, a value being promoted by the Administrator is "One NNSA," which means "having an effective, unified team working toward serving our Nation and accomplishing our vital mission."[21] This is unity of the community coming together around the common purpose. Unity does not imply absence of disagreement or conflict, or uniformity; rather, it implies a community that embraces the benefit of coming together to achieve a common purpose.

While change began under Administrator Klotz, the focus on culture change and unity has received added energy and emphasis by Administrator Gordon-Hagerty. The *Strategic Vision*, *Governance & Management Framework*, and *Strategic Integrated Roadmap* serve as the basis for change, with senior NNSA leadership driving change through regular communication regarding the importance and goals of the change. NNSA has also made several efforts to successfully engage stakeholders, including leaders, managers, and staff from across NNSA and the M&O partners, in providing input into and implementing change. The planned Governance and Management Action Plan is meant to build on such engagements.

The combination of laying out the vision and priorities for the enterprise, demonstrating and reinforcing leadership commitment, and building stakeholder engagement indicates that NNSA's senior leadership recognizes that long-term success requires a commitment to changing the culture and attributes of NNSA to one that puts even greater value on performance, accountability, and credibility. Changing the culture creates an inherent preference toward those goals that positively affect how day-to-day decisions are made, and thus better enables the nuclear security enterprise to meet current and future challenges.

Leaders, managers, and staff across the enterprise indicated in interviews and discussion groups that they appreciate the Administrator's emphasis on mission and communication about roles individuals have in achieving the mission. The Administrator's insistence on always referring to the M&Os as "partners," and never as "contractors," is not only appreciated by M&O leaders and staff but also appears to be contributing to a shift in culture to one where NNSA and the M&Os have common goals and work in

[21] *Governance & Management Framework*, p. 7.

partnership to solve problems. Individuals at all levels of both NNSA and the M&Os describe a more trusting and less adversarial relationship than existed 5 years ago. Under the Administrator's leadership, senior leaders at headquarters, field offices, and the M&O partners recognize that they have a role in communicating about and implementing change, and they have begun to do so.

The challenge now is for change to penetrate below the upper management layers of the organization. Panel discussions revealed that M&O personnel below the most senior levels are much less likely to be aware of the strategic documents or NNSA's culture change initiatives. Few of the discussants involved have seen enough change in the behavior of NNSA midlevel managers and staff to conclude that prior relationships or practices have changed. Further, some NNSA employees report waiting for this change initiative to blow over, anticipating the all-too-real possibility of future leaders placing less emphasis on culture change and management reform—or even changing direction.

NNSA has not yet finalized and publicized measures (quantitative or qualitative) for monitoring progress in governance and management, or of cultural attitudes. It has not specified reliable methods to assess current steps, to identify what else is needed, or to determine whether current steps should be modified. Experience with large-scale change management has shown that developing and testing metrics is an iterative process that can extend over years.

NNSA has and is taking many specific steps that should help change its culture, as this chapter makes clear. However, while interviews with leaders and employees across the enterprise show progress, it is still too early to tell whether culture change will take hold and be "successful": culture change takes several years and sustained attention. Further, change must be institutionalized so that it can survive changes in leadership, including holding people (and leaders) accountable for change. Although achieving greater unity around purpose may be achievable sooner, it too will take time to fully penetrate the enterprise.

There is currently no one person with the time, institutional seniority, and stature to shepherd the change initiative. The time, authority, and resources needed to fulfill that responsibility should not be underestimated. Resources include staff or contractors experienced in change management, communication, employee engagement, developing metrics, and institutionalizing change. The Office of Policy and Strategic Planning, which is in the Administrator's front office, has led the effort to develop the strategic documents and has been tasked with spearheading communication about the documents and developing an action plan for their implementation. This small office has contracted with a management consulting firm that is providing support for governance and management reform. However, the office has experienced and continues to face fairly high turnover, potentially calling into question whether its focus and attention will be sustained. Therefore, the panel reiterates (with minor changes) a recommendation from its fourth report of early in 2020.[22]

Recommendation 3.5: The National Nuclear Security Administration (NNSA) Administrator should promptly designate a career senior executive service member as the accountable change management leader to provide intensive and sustained attention to the challenges of institutionalizing governance and management reform. This leader should support the Administrator in developing continuous improvement strategies and implementation plans, leading continuous improvement processes, and ensuring that management metrics are developed and employed.

[22] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2020, *Report 4 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C.

4

Maximizing the Contributions of NNSA's M&O Partners

The subject of this chapter is the efficacy of the National Nuclear Security Administration's (NNSA's) governance and management of its laboratories, plants, and sites, which directly carry out the mission of the nuclear security enterprise. These facilities engage in research, development, testing, production, fabrication, assembly, and disassembly of nuclear warheads; the support functions needed are also part of each facility. These government-owned, contractor-operated facilities, executing under management and operating (M&O) contracts, provide highly technical, specialized capabilities via a combined workforce of more than 55,000 employees.

The Augustine-Mies report was greatly concerned about the relationship between NNSA and its M&Os, terming it "dysfunctional."[1] The panel has found the relationship to be improved since that 2014 report. There are, however, remaining problems that need to be addressed.

WORKING RELATIONSHIPS BETWEEN NNSA AND ITS M&O PARTNERS

In response to the recommendations in the Augustine-Mies report, NNSA has taken a number of actions to improve the enterprise's unity of purpose and the working relationships between M&Os and the field offices, between M&Os and functional and program offices, and among M&Os themselves. Many of these steps were recounted in Chapters 1 and 3, with three of the most salient being the messages of the current Administrator, issuance of site governance special directives SD 226.1B and 226.1C, and execution of a site governance peer review at each facility. Since strong working relationships are critical for the enterprise and are about more than organizational structure, this subject requires ongoing attention at a granular level.

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

Other actions in recent years include the creation of Site Integrated Assessment Plans by each site's NNSA field office, to add coherence to the site's annual oversight activities, and the establishment or reinstatement of several committees and working groups that meet regularly to provide additional channels for communication and coordination between M&O and NNSA leadership. When the *Strategic Vision* and the *Governance & Management Framework* documents were issued in 2019, the Administrator issued clear statements that those documents applied to all parts of the enterprise.

In its many discussion groups (see Appendix B), the panel inquired about the status of the relationships between the different components and levels within the enterprise and found improvements over the course of its study. The improvement was noted most strongly at the top levels of management, but favorable observations arose from other levels as well. For example, some M&O staff members described their field office personnel as supportive and a helpful resource. Discussants mentioned activities such as joint training and team-building exercises, joint plan development, joint problem solving, and shared participation in activities on site and in Washington, D.C., as contributing to the improved relations. In the final set of site visits conducted in 2020, both leadership and most staff in the field offices, and leadership and some staff from the M&Os, reported a feeling of greater unity, a "shared fate," and expressed that one part of the enterprise cannot be successful unless all parts are.

There does, however, remain some ambiguity about the roles and responsibilities among the three key elements of each site's governance system (field office, M&O, and headquarters), and this problem becomes more acute as one drills down into the organization. For example, some bench scientists at the laboratories expressed frustration with regard to who exactly needs to be consulted to obtain approval for some specific actions.

Relationships between M&O personnel and headquarters were also described as improved in some areas. Most headquarters leaders seem to be on the path toward embracing the M&Os as "partners," mentioning increasing levels of trust. The panel has also heard continuing concern about the timeliness of decision making, with staff at the M&O facilities expressing a persistent impression that decisions handed off to headquarters will involve considerable delay.

Overall, however, the panel concludes that there have been noted improvements in the relations between federal employees and M&O partners, particularly at the leadership level. Today's relationship is clearly not the "dysfunctional" one described in the Augustine-Mies report. This improvement is a crucial step because of the key role M&Os play in the nuclear security enterprise, and more must be done.

PRINCIPLES UNDERPINNING THE USE OF M&O ENTITIES

The use of M&O entities enables NNSA to tap specialized workers who might not otherwise be recruited as federal employees. In order for that value to be realized, federal leadership must be used judiciously, steering the work to the nation's advantage and ensuring good value, but not undercutting the ability of the partners to carry out the specialized endeavors in which they are the true experts. That respectful and strategic relationship is even more important for NNSA's three laboratories, whose status as federally funded research and development centers (FFRDCs) gives them even more independence and expectation of objectivity.[2] This is discussed in greater detail later in this chapter.

[2] Federal Acquisition Regulations, section 35.017, stipulates that an FFRDC "meets some special long-term research or development need which cannot be met as effectively by existing in-house or contractor resources. FFRDCs enable agencies to use private sector resources to accomplish tasks that are integral to the mission and operation of the sponsoring agency. An FFRDC, in order to discharge its responsibilities to the sponsoring agency, has access, beyond that which is common to the normal contractual relationship, to Government and supplier data, including sensitive and proprietary data, and to employees and installations, equipment and real property."

NNSA chooses M&O partners in part because of the expertise that the partners' parent organizations are presumed to bring. Those advantages include not only attributes such as the caliber of staff and of researchers who can be attracted by academic parents but also the capabilities a corporate parent brings in functions such as managing human capital, finances, or projects. But the intended or unintended effect of imposing an outside culture or practice on an NNSA facility is complicated. Each laboratory and facility has its own role to play in the overall enterprise, and the culture of an M&O parent may or may not be appropriate to best fulfilling that role. The more similar the parent's operation is to the NNSA facility it is managing, the more likely that its culture will be appropriate.

An example of this risk, revealed during site visits, is one parent M&O that manages both a laboratory and a production facility. The parent company's own business is production, and the panel was very positively impressed with how well the corporate culture and practice worked at the production facility they were managing. However, the M&O parent did not have any substantial research laboratories of its own, and it was considerably less effective and appropriate in grafting its culture and practice onto a laboratory.

REDEFINING OVERSIGHT

Costly and ineffective transactional oversight was cited by the Augustine-Mies report and numerous other reports as a significant problem for the laboratories, plants, and sites. An emphasis on oversight beyond what is balanced by its benefits is both a symptom of, and a contributor to, two of the major problems identified by Augustine-Mies—the lack of trust throughout the enterprise, and a pattern of risk avoidance rather than risk management. Excessive data calls, audits, inspections, and the imposition of operational formality can erode the benefits of outsourcing to M&Os.

The nuclear security enterprise is still recovering from a prioritization of compliance that began in the early 1990s. At that time, the enterprise—along with all of the Department of Energy (DOE) laboratories—was subjected to intense scrutiny into its compliance with laws and policies governing environment, health, safety, security, and contracting. This lengthy and highly publicized investigation came at the same time that the purpose of the nuclear security enterprise was being questioned because of the end of the Cold War. The effect on the enterprise was a widespread culture shift from prioritization of the national security mission to emphasizing regulatory compliance; there was a consequent decline in morale. A corresponding shift toward risk avoidance was also felt, with it being favored over true management of risk.

One step taken in recent years by NNSA to reset the level of oversight has been to identify and limit unauthorized data requests to M&O partners. These efforts continue. The panel's discussions with M&O staff reveals, however, that few have felt a reduction in burden from this action. Perhaps more successful are the Site Integrated Assessment Plans mentioned earlier in this chapter. Even more benefit may accrue from the work of NNSA's Operations and Efficiencies Board, which is proactively seeking to improve operations. Some information about that board's work, and about NNSA's initiatives to address burdensome oversight, is found in the NNSA/DOE report to Congress, *Burdensome Regulatory Requirements*.[3]

That report to Congress identifies 91 burdensome regulations, catalogued with input from NNSA's M&Os, in the areas of security (33), safety (14), personnel management/HR (10), project management (7), environment/waste (6), emergency management (6), cyber/IT (6), real property (2), and other (7). Of these, 72 percent are driven by DOE-NNSA requirements and 28 percent by other federal or statutory requirements along with M&O contract reporting requirements. NNSA's Operations and Efficiencies

[3] Department of Energy and National Nuclear Security Administration, 2019, *Burdensome Regulatory Requirements*, Report NA-0088, Washington, D.C.

Board evaluated these 91 practices and committed to reviewing 16 of the regulations in 2019.[4] Thus collaborative work has begun, albeit at a relatively slow pace, to address some areas of unwelcome burden on M&O partners.

Burdensome requirements, rules, and practices affect technical personnel as well as administrative staff. The panel heard from staff at the three laboratories that the amount of time they have available to focus intently on their technical work is infringed on by the burden of so many requirements. Quite often, the staff members are not able to identify the source of such "administrivia," which includes processes such as those used to authorize travel, visitors, and laboratory experiments, or to purchase supplies and equipment. In some cases, perhaps many, such requirements are imposed by the M&O's own management—for example, see the discussion in Chapter 3 about budget and reporting (B&R) codes—although those decisions may well be in response to real or perceived pressure or influence from NNSA. Thus, NNSA and the M&O partners need to work together to examine local operations and determine whether they are unnecessarily contributing to administrative burdens faced by M&O employees.

Other requirements that have been characterized as burdensome practices stem from DOE or NNSA Directives and Orders. The Commission to Review the Effectiveness of the National Energy Laboratories (CRENEL) report recommended that plants and laboratories be allowed to utilize federal, state, and national standards instead of those DOE requirements in order to demonstrate compliance with various health, safety, and environmental standards for activities that are not high-hazard or nuclear. This has been the practice at the Kansas City plant for more than a decade—apparently with success. However, NNSA has not adopted this "Kansas City model" elsewhere.

The Administrator's initiative to encourage collaborative execution of mission—for example, "Getting to Yes"—is opening the door for M&O and NNSA personnel to look for ways to safely and efficiently achieve mission objectives. This includes raising questions about procedures, policies, and so on, that are burdensome, unnecessary, or do not support the mission. However, the panel was told by a number of M&O personnel that they still feel that repercussions from any problem will fall on their shoulders, and thus they have an incentive to avoid taking risks.

The panel endorses NNSA's efforts to create an environment in which all parties are openly empowered to reach mutual understanding, if not agreement, about how to progress and how to safely look for better ways to accomplish the work of the mission. These interactions can be complex, possibly involving NNSA program offices, functional offices at NNSA and sometimes at DOE, the cognizant NNSA field office, and staff from the M&O facility involved. The activities of the Operations and Efficiencies Board, coupled with the Administrator's messaging, set the stage for a transition from risk aversion toward risk management.

In addition, the governance peer reviews conducted under the direction of NNSA's Governance Executive Steering Committee have been widely reported to be a promising mechanism for examining and addressing such challenges as "right-sizing" oversight, the identification and resolution of common problems, and encouraging risk management. However, there is currently no mechanism for disseminating the major takeaways from those peer reviews to benefit the enterprise by enabling others to systematically build on lessons learned.

To date, NNSA has not announced whether or how it will build upon this apparently successful process, although indications are that it will be continued. The panel envisions the site governance peer reviews as a useful foundation for continuous improvement and suggests the following ideas for expanding the scope of that process:

[4] Department of Energy and National Nuclear Security Administration, 2019, *Burdensome Regulatory Requirements*, Report NA-0088, p. 7.

- Expand to also examine roles and responsibilities between the M&O partners and NNSA headquarters;
- Expand to examine practices and timeliness of decision making, especially when headquarters is involved;
- Expand to encompass information sharing and government oversight, providing an opportunity to identify means of reducing burden; and
- Expand to identify opportunities to move away from risk avoidance, particularly in M&O implementation of federal directives, orders, and contract provisions.

Recommendation 4.1: The National Nuclear Security Administration (NNSA) and management and operating (M&O) management should expand their existing processes to identify and mitigate burdensome processes and requirements, instituting a process of continuous improvement. Those in a position to develop and promulgate improvements, and those affected by the improvements, should work collaboratively on these efforts. At least five elements are needed:

- **The burdens identified in the 2019 survey and analysis carried out by NNSA's Operations and Efficiencies Board should be addressed to the extent that they are within the control of NNSA or the Department of Energy (DOE).**
- **Surveillance and mitigation analogous to the 2019 survey should be conducted annually, with results made available throughout the enterprise.**
- **NNSA should consider expanding the site governance peer reviews to contribute to revealing and removing burdensome practices and sharing improvements.**
- **NNSA and laboratory management should improve their monitoring of administrative inefficiencies that hinder the technical staff at the NNSA laboratories, and develop a simple process whereby significant inefficiencies can be identified, analyzed, and prioritized for possible mitigation.**
- **NNSA should proactively work with the laboratories, plants, and sites to identify where the M&O processes might be more risk averse than appropriate.**

ENABLING THE FFRDC LABORATORIES TO BE OBJECTIVE, HONEST BROKERS

The challenge of right-sizing the oversight of M&Os is particularly acute with NNSA's three laboratories because of their status as FFRDCs. Chapter 4 of the Augustine-Mies report opens with an apt quote from General George S. Patton:

> Don't tell people how to do things; tell them what to do and let them surprise you with their ingenuity.

In essence that is why the federal government relies on FFRDCs in selected circumstances. The FFRDC model gives the laboratory workforce the latitude to take charge of a set of tasks prescribed by the government—which defines the "what" and "when"—and to innovate with regard to "how" best to accomplish them. Because FFRDCs are by design objective and unbiased experts, they are also essential contributors in defining the "what."

The FFRDC relationship in federal contracting is a special one, requiring both the government agency and the FFRDC to work together in a way that is much more open, transparent, and trusting than with a normal government contract. In its discussions about that relationship with senior people in

NNSA and at the NNSA laboratories, the panel found inconsistent degrees of understanding and reflecting of this relationship in their work.

The Augustine-Mies report observed that FFRDCs are special in the following ways:

- Comprehensive knowledge of sponsor needs: mission, culture, expertise, and institutional memory regarding issues of enduring concern to the sponsor
- Adaptability: ability to respond to emerging needs of their sponsors and anticipate future critical issues
- Objectivity: ability to produce thorough, independent analyses to address complex technical and analytical problems
- Freedom from conflicts of interest and dedication to the public interest: independence from commercial, shareholder, political, or other associations
- Long-term continuity: uninterrupted, consistent support based on a continuing relationship
- Broad access to sensitive government and commercial proprietary information: absence of institutional interests that could lead to misuse of information or cause contractor reluctance to provide such information
- Quick response capability: ability to offer short-term assistance to help sponsors meet urgent and high-priority requirements.[5]

As a result of this special relationship, the intention is that NNSA and its laboratories will operate with a much more open, trusting partnership than is the case with other contractors. Accordingly, FFRDCs are often referred to as "trusted partners" for the government. In addition to executing programmatic tasks, NNSA's FFRDCs also take responsibility for defining and sustaining the long-term science and technology competencies required to ensure nuclear deterrence writ large. They attract, develop, and retain the unique scientific expertise that cannot be found in government. Successful FFRDCs address complex technical challenges that often require high-risk experiments and large facilities, such as supercomputers or light sources, which are beyond the scale or role of purely academic or commercial entities.

The Augustine-Mies report found that the FFRDC model for the three NNSA laboratories had been seriously impaired and urged actions to rebuild the strategic NNSA-FFRDC relationship. In its response to that report, DOE stated that it was "reestablishing the federally funded research and development center (FFRDC) principles originally established during World War II and applying them in the context of modern governance standards."[6]

The panel has seen a few encouraging steps in this direction. As mentioned in Chapter 3, Los Alamos National Laboratory (LANL) is contributing greatly to the establishment of pit production capabilities because its team is given clear latitude to develop the "how" for that program. The program management in NA-10 is relying on LANL's expertise and capabilities as an honest broker and paving the way for the LANL team to exert intellectual leadership to the benefit of the program. Another positive development is the increasing involvement of the laboratories (along with the plants and sites) in NNSA's strategic planning process and, more recently, in the annual budget building. And the panel was told late in 2018 that NNSA has reestablished a group called "The Navigators," consisting of the three laboratory direc-

[5] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. 68, with its footnote: "Definition taken from 'Federally Funded Research and Development Centers (FFRDC),' on the Defense Acquisition University website, https:dap.dau.mil/acquipedia, accessed 29 July 2014."

[6] Department of Energy, *Governance and Management of the Nuclear Security Enterprise—Report to Congress*. DOE, Washington, D.C., p. iii.

tors and the head of NA-10, who meet regularly regarding strategic directions for the nuclear security enterprise. These steps are healthier than the situation that existed at the time of the Augustine-Mies study and if sustained could lead to lasting improvements in some aspects of the FFRDC relations.

While the panel supports this improved relationship between NNSA and its laboratories, it believes that more could be done to extract the full value intended within the FFRDC concept. For example, while the laboratories play a primary role in defining the core science and engineering (S&E) competencies needed for the future of nuclear deterrence, the final decision is by necessity made by NNSA. In order for the enterprise to be prepared for future threats, the laboratories need the freedom, and the expectation, to think broadly and long term. This involves being able to take risks such as exploring directions that may not succeed or by executing basic science with no obvious results relevant to nuclear weapons. Although there will always be differences of opinion on such judgment calls, it is healthy to examine whether the laboratories' specialized insight as trusted brokers is being tapped fully.

Comparing today's reality with the desired attributes of FFRDCs (shown here in italics), the panel sees a mixed picture:

- *Closer relationship with sponsor than in normal contractual relationship.* FFRDCs provide research and development (R&D) support that is integral to the mission and operation of the agency. The current NNSA Administrator has worked to restore this relationship, which had been strong in the past, through her strategic directions to NNSA and her personal commitment, reinforced by regular meetings with laboratory directors and engagement with all M&Os in discussions, strategic planning, and building of budgets.
- *Ability to maintain scientific and engineering capabilities over a long period*. The panel has some concern about whether NNSA's recent contracting strategy is at odds with this goal. The Sandia National Laboratories (SNL) contract awarded in 2017 is for a 5-year period of performance, with options that can extend (in 1-year increments) to a 10-year maximum. While 5 to 10 years is a long duration for many standard contracts, the NNSA laboratories must plan their capabilities and research for decades in the future. Although most laboratory staff are retained when a contract is recompeted, all top managers were lost during the 2017 transition at SNL, and many midlevel managers were lost as well. Thus, the desired long-term relationship, as well as continuity in the knowledge of the sponsoring agency's (NNSA) needs, could be set back.
- *The flexibility to recruit and retain top talent in the field*. Talent is always in high demand, and great care must be applied to enable the laboratories to attract and keep the best people. To be able to do this, laboratories should have a fair amount of latitude regarding compensation, benefits, work environment, professional travel, and so on.
- *No conflicts of interest that hinder the FFRDC's ability to provide trusted, objective advice*. Because M&Os must work together, including via contractual agreements, NNSA must be mindful of navigating any potential conflicts of interest that might arise.

In some of its discussions with senior NNSA personnel, the panel found inconsistent understanding within NNSA of what is special about FFRDCs as "trusted partners" and how the special relationship is apparently perceived. The picture painted by these interviews is that either NNSA lacks a single concept of the desired FFRDC relationship, or that the concept has not been consistently implemented. In those discussions, the panel received conflicting impressions—with some interviewees depicting the laboratories as trusted advisors but others implying that they are not that distinct from other contractors in DOE or the Department of Defense (DoD). NNSA's concept for what FFRDCs should be, and thus how they are managed and leveraged, appears muddy. With a common model of what an FFRDC should and could be, day-to-day management decisions are more likely to help leverage value from the laboratories.

Recommendation 4.2: The National Nuclear Security Administration (NNSA) should establish management practices that derive the maximum value from the established principles for federally funded research and development centers (FFRDCs). To achieve this, the Administrator should convene a working group whose members are knowledgeable about successful FFRDC relationships and some of whom are outside the current nuclear security enterprise to assist NNSA in developing a conceptual model for the relationship it seeks to have with its FFRDCs. NNSA should then take the necessary steps to put the model in place for all three FFRDCs so that their ability to act as trusted, independent, expert contributors is maximized.

It is logical for the M&O contracts governing NNSA's laboratories to reflect the special FFRDC relationship, particularly the unique characteristics of FFRDCs as described in the Federal Acquisition Regulations. The sense of the panel is that the strategy behind NNSA's FFRDC contracts needs to be reassessed; this would be part of the call in Recommendation 4.2 for NNSA to "take the necessary steps to put the model in place for all three FFRDCs." The Augustine-Mies report recommended contract changes for all the M&Os to incentivize mission accomplishment over compliance with support functions, and to favor longer-term relationships, but few of those recommendations were adopted. The panel believes this needs to be reexamined for the laboratories because the contracts help effect, or impede, the reestablishment of healthy FFRDC relationships.

NNSA and DOE have studied contracts, particularly DoD general contracting, in recent years in a conscientious effort to understand the effects of different contract provisions, with the goal of better aligning contract terms with the performance the government seeks. However, top managers within NNSA have varied views of the kind of relationship that should exist between the laboratories and the agency. Absent a coherent push toward a single FFRDC relationship, the panel is concerned that today's laboratory contracts are built more on general contracting practices, and are not well aligned with that desired relationship, in particular with respect to supporting a closer relationship with the sponsor than in normal contractual relationships.

Following the Augustine-Mies report, DOE undertook an extensive effort to develop two model contracts for its national laboratories—one it labeled a "revolutionary contract" and the other it called an "evolutionary contract." The panel is aware that teams of people were involved in developing these models: from DOE they included people from program offices, site offices, procurement, and other functional offices, and from the national laboratories they included the chief operating officers, chief financial officers, program leaders, and other administrative staff. The goal of the new model contracts was to facilitate and incentivize the FFRDC role in which significant degrees of responsibility and accountability would be assigned to the laboratories, and responsibility for overall program direction (the "what") and oversight were assigned to the government. One such contract was successfully renegotiated and signed for DOE's SLAC National Accelerator Laboratory, but the panel was told that staff at DOE resisted the use of such contracts for other DOE laboratories. When NNSA issued a laboratory contract subsequently, it tried to incorporate some of the beneficial elements of those model contracts, but the panel was told that its changes were only incremental.

The panel believes that the contract-related recommendations from the Augustine-Mies report, and the spirit behind them, could lead to improved contracts for NNSA's FFRDCs. The FFRDCs are different from the other M&Os, and their contracts should certainly reflect and encourage those differences. Revisiting the Augustine-Mies report and the "evolutionary/revolutionary" exercise, drawing on perspectives from both within NNSA and external to it, would be fruitful. Aligning the contract mechanisms for the laboratories with the desired outcome of ensuring they function as trusted expert advisors could help strengthen the FFRDC relationships.

Recommendation 4.3: The National Nuclear Security Administration (NNSA) should identify a more effective contract model for its federally funded research and development centers (FFRDCs). The Administrator should convene a working group to develop an FFRDC contract model to better enable the desired FFRDC relationships, which are to be closer than normal contractual relationships. The working group should include staff within NNSA and its laboratories as well as experts from other agencies with a large number of FFRDCs, such as DoD.

SUSTAINMENT OF CORE S&E CAPABILITIES

As pointed out in the panel's fourth interim report, "A strong foundation of wide-ranging science and engineering research is essential to fulfilling the nuclear security mission, because the technical challenges of stockpile stewardship, and of nuclear security more generally, require deep and authoritative understanding of many areas of science and engineering."[7] This foundation provides not only the understanding of the phenomena, mechanisms, and materials underlying current and future nuclear materials and weapons systems but also the developing technologies for future threats and technical improvements required for a complete nuclear security enterprise. A high-quality and broad-based S&E workforce is essential to success of the nuclear security mission.

All three laboratories have clearly articulated strategies for their core S&E activities and how they relate to the NNSA mission—the seven research foundations for SNL, six laboratory pillars for LANL, and seven core competencies for Lawrence Livermore National Laboratory (LLNL). The laboratories' S&E base requires an engaged and dedicated high-quality set of individuals who understand and are committed to the mission and their critical role in it. Their importance to the mission and national service more broadly provides both a challenge and an opportunity for NNSA to recruit, hire, and engage such talent, including in very competitive fields like artificial intelligence, data science, and quantum information, devices, and materials.

Sustaining the S&E base is especially challenging now in light of the rapidly expanding portfolio of enterprise programs and projects that have required rapid expansion of the overall laboratories' workforce. In several key areas, the panel was told that more than 40 percent of the technical workforce has less than 5 years of experience at the laboratories. Salaries, benefits, and ease of entry at leading commercial, industrial, and even academic institutions can be more attractive to candidates than at the NNSA laboratories. So, it is critically important that the laboratories be strategically engaged in the external S&E communities and that they maintain healthy pipelines for bringing in and nurturing new talent from those communities.

The panel's laboratory visits and interviews in July and August 2019 revealed that some aspects of recruitment, onboarding, mentoring, mission integration, and administrative support of S&E staff are having a negative impact on the laboratory S&E work environment. The primary finding from the panel's fourth interim report (February 2020) is repeated here:

- Both product-focused work and sustainment of core S&E capabilities are essential to, and must be supported by, the nuclear security enterprise. That balance is essential to accomplishing the mission, and the laboratories' researchers are motivated by the dual challenge. This characteristic of NNSA labs benefits recruitment and retention and could be highlighted more prominently.

[7] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2020, *Report 4 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., p. 17.

- People are the essential resource, and they are under stress.
- The infrastructure needs attention and is essential to enable continued excellence in S&E.
- Bureaucracy is overly burdensome to the staff.
- M&O leaders do not seem fully aware of staff concerns.[8]

The panel was struck by the severe shortage of administrative support for scientists and engineers. Some senior scientists estimated that they must expend up to 20 percent of their time on administrative tasks that could be handled by much less costly support staff, whose numbers have dwindled for the purpose of reducing overhead costs. Many scientists and engineers thought that the laboratories should expand availability of administrative staff to S&E staff to increase the latter's efficiency.

Although each of the laboratories plan or have in place a process for onboarding new S&E staff, the panel felt that this could be enhanced. Most of the newer staff members had not received an overview of their laboratory's outstanding past achievements to illustrate the unique capabilities and solutions the laboratory has provided in the national interest. Because many of them expressed strong support for the opportunity to support the mission, this is a missed opportunity. More generally, a number of S&E employees found their NNSA laboratory to be an appealing place for R&D because of the diverse range of experts with whom they could collaborate, but their orientation missed the opportunity to explain the identities and organizations of the laboratory experts in various fields. Better onboarding could help new scientists and engineers learn how to find expertise and build their networks, and provide advice on how they can "market" and "sell" their ideas to project managers across the organization. Even prosaic matters like managing the administrative burdens were sometimes overlooked, necessitating new researchers to learn on the job.

A primary observation from the panel's site visits is that senior research management seemed to underestimate the amount of stress being felt by their S&E employees. That stress is driven by administrative burden, funding uncertainties, and other factors, and it did not appear to be fully appreciated by the laboratory leadership. The panel learned a great deal just by holding discussion groups for 1 day with perhaps two dozen people at each laboratory. Because of that, the panel included the following recommendation in its fourth interim report:

> The Directors of the three laboratories, with National Nuclear Security Administration (NNSA) assistance as needed, should periodically assess the environment for work that sustains the enterprise's core science and engineering (S&E) capabilities. This assessment should include input from the researchers engaged in that work, and identify steps needed to strengthen the environment.[9]

Last, the panel has been struck by how much the S&E core capabilities are dependent on Laboratory Directed Research and Development (LDRD) funds. For example, 24 percent of support for SNL's Materials Science Research Foundation comes from LDRD. While the total amount of LDRD available at each laboratory is a large pool of money (between 5 and 6 percent of the overall laboratory budget), it cannot support all of the S&E work needed to sustain each laboratory's core capabilities. The scientists and projects supported by LDRD provide essential interactions and relationships with the external S&E communities in universities and industry as well as the international community. Such relationships are important for maintaining the laboratories' ability to recruit, retain, and collaborate with the

[8] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2020, *Report 4 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, pp. 17–18.

[9] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2020, *Report 4 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, p. 3.

best talent. At the time of the Augustine-Mies report, LDRD funds were fully burdened by overhead charges, which significantly reduced the amount of research they could support. The Augustine-Mies and CRENEL reports both recommended the removal of overhead charges on LDRD, and Congress did so, which was a very helpful step.[10]

While the total amount of LDRD funding is decided by each national laboratory, subject to a cap set by Congress, at various times NNSA has provided other sources of support for supplemental purposes. That can be important because LDRD-supported research is meant to be basic, and additional steps might be needed in order for LDRD results to be applied. In fact, the panel was told of recent cases at the laboratories where the output from LDRD research, although of potential value to an NNSA program, was not used because the program staff did not have time to take the necessary transitional steps. Until the 1990s, there was a line of Weapons Related Research funding to support that kind of applied R&D. Analogously, there was once a Process Development Program at the plants that supported R&D specific to manufacturing and materials, providing another bridge between basic and applied research. As part of the laboratories' annual strategic planning reviews and discussions, it would be useful to consider how well the available funding supports the needed spectrum of R&D.

Recommendation 4.4: In addition to the elements included in Recommendation 4.1, the National Nuclear Security Administration (NNSA) and management at its laboratories should take steps to improve the environment for science and engineering (S&E) research and development (R&D) to include the following:

- **A clear articulation of how the S&E core capabilities will be supported at the laboratories, perhaps including funding lines that would complement laboratory directed research and development (LDRD); and**
- **Enhanced onboarding processes to help new scientists and engineers become highly productive by emphasizing the laboratories' strengths, expertise, organization, past accomplishments of service in the national interest, and roles and responsibilities as federally funded research and development centers (FFRDCs).**

[10] The removal has not yet been made permanent, but such a move is under consideration in the FY 2021 National Defense Authorization Act (NDAA).

5

Looking to the Future

The credibility and technical strengths of the nuclear security enterprise are essential to a strong nuclear deterrent. The Augustine-Mies report stated, "Demonstrated performance is … the foundation for credibility and trust,"[1] and effective governance and management are the lever to ensure that the enterprise performs well. Progress has been made, but no amount of progress would be sufficient for sustainment without ongoing organizational attention and a solid track record of aligning organizational actions and policies with stated goals and values. This chapter presents the panel's view on how the National Nuclear Security Administration (NNSA) can build on its improvements in governance and management of the nuclear security enterprise to fully embed a culture of mission focus, performance, accountability, and credibility.

NNSA's 2019 *Governance & Management Framework* echoes those same goals. Its preface "From the Administrator" says

> We will enhance mission awareness, break down stovepipes, continuously improve performance, and build enduring and trusting partnerships that will enable us to accomplish our mission. This Governance & Management Framework will minimize processes that are duplicative and push back against the unrealistic goal of zero risk.[2]

Those cited goals to "enhance mission awareness, break down stovepipes, … and build enduring and trusting partnerships" are, in the panel's view, the right steps to "embed a culture of mission focus,

[1] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, *A New Foundation for the Nuclear Enterprise: Report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise*, http://cdn.knoxblogs.com/atomiccity/wp-content/uploads/sites/11/2014/12/Governance.pdf, p. xviii.

[2] NNSA, 2019, *Strategic Vision: Strengthening Our Nation Through Nuclear Security*, http://www.energy.gov/sites/prod/files/2019/05/f62/2019-05-06%20NNSA%20Strategic%20Vision.pdf, unnumbered page.

performance, and credibility." The drive to "minimize processes that are duplicative and push back against the unrealistic goal of zero risk" is consistent with this report's urging to further reduce burdensome practices and emphasize risk management over risk avoidance. The *Framework*'s promise to "continuously improve performance" is therefore a necessary step to achieving all of these end states.

Much of what needs to be done to permit NNSA to continue to move toward a high-performing organization was spelled out in the Augustine-Mies report and others, but NNSA and the Department of Energy (DOE) have not always followed through with urgency. The Augustine-Mies report, for example, in its Recommendation 6, said, "To begin reforming the DOE & NS culture, the Secretary and Director [of NNSA] should develop within six months a plan for continuous learning and improvement," but that plan was not released by DOE-NNSA until December 30, 2016, 9 months later than was specified by Congress. The specific steps recommended for that plan were to include establishing metrics for assessing and improving enterprise management, routinely surveying personnel, aggressively communicating reform plans and objectives, establishing strong career and leadership development programs, and requiring rotational assignments. These steps have still not all been taken fully, and it is vital that they be pursued actively.

As of the writing of this report, the panel was told that NNSA is developing a Governance and Management Action Plan to further this effort. That plan is intended to build on NNSA's governance and management focus groups from late in 2019, governance peer reviews, leadership input, and Federal Employee Viewpoint Survey (FEVS) results. The panel has been told that the plan has been presented to and discussed with leaders across the enterprise as a means to create buy-in.

Given that these plans are still under development, the panel emphasizes the need to build on progress by continuing to focus on the following:

- *Creating a strategic culture*. The leadership of NNSA has made progress in recent years to alter the agency's culture to emphasize mission performance, shared priorities, better risk management, and other attributes consistent with the end state articulated in the Augustine-Mies report. Changes such as improved strategic thinking and collaborative planning, broader participation and communication across the enterprise, and adjustments to some reporting relationships have positioned NNSA well. Embedding that strategic approach through all levels of the workforce—setting as the norm a focus on achieving mission goals and proactively removing impediments—is a necessary step if NNSA is to continue the progress it has made and enable reliable performance into the future.
- *Adopting an enterprise-wide perspective*. The success of NNSA depends on good working relationships with and effective performance from its management and operating (M&O) partners. As a joint enterprise, effective performance is needed from each of the parts. That being the case, NNSA needs to cement unity about the mission, and an enterprise-wide perspective, in its planning and operations. This would mean that roles and authorities emphasize collaboration and working relationships for NNSA entities and M&O partners that reflect a shared fate—succeed or fail together.
- *Developing and utilizing performance metrics*. It is essential for NNSA and its M&O partners to develop goals and measures to assess performance and progress toward the desired state of governance and management. Recognizing that NNSA's Governance and Management Action Plan is currently under development, the panel emphasizes—as it has in previous reports—the need for specific and meaningful metrics that can be easily understood, communicated, and used to drive data-driven, continuous improvement. This topic is addressed in more detail below.

Monitoring progress and holding responsible organizations and individuals accountable are potential roles for the change management leader called for in Recommendation 3.5.

ATTRIBUTES OF THE DESIRED CULTURE

A concrete way to assess NNSA's governance and management is to benchmark the agency against other organizations facing similar challenges of partnership, engagement, and learning. Entities that are characterized as "learning organizations"[3] offer one possible set against which to benchmark, because those organizations are considered to embrace the shared vision, team orientation, and flexibility and adaptability in operations that the nuclear security enterprise needs. The basic concepts of a learning organization suggest that NNSA's prospects for successful long-term performance will be enhanced if it can incorporate the following practices:

1. *Solve problems systematically.* What is the frequency and ease with which the organization collects data to measure progress and uses a fact-based management approach to evaluate success or improvements?
2. *Experiment with new work approaches.* Is the organization looking for new work practices or technology as well as incremental gains in knowledge? Central to this approach is an incentive system that favors risk taking and does not unduly penalize staff for failures.
3. *Learn from past experience.* Does the organization learn from its history? Does the organization systematically review successes and failures with the notion that knowledge gained from failures is often instrumental in achieving subsequent success?
4. *Learn from other organizations and from customers.* Does the organization benchmark itself against other organizations and look for outside perspectives on how well it is doing? Does it look to its customers for their thoughts and insights, and is it open to constructive criticism?
5. *Transfer knowledge efficiently and effectively throughout the organization.* Is knowledge shared broadly throughout the organization, and does that knowledge sharing that is achieved through reports, site visits, or education and training programs lead to implementation of real change?

NNSA's governance and management have demonstrated some of these desired behaviors. But their adoption needs to be more widespread and methodical throughout the enterprise.

Creating a culture in NNSA that embraces such practices is the foundation that will help NNSA meet known and not-yet-known challenges. Certainly, the organization's response to the coronavirus pandemic has challenged the enterprise. What also is needed as NNSA and the M&O partners learn from this challenge is a governance and management esprit, what Augustine-Mies called the "management culture," that responds to stresses with agility and alacrity. That would be a management culture that comes together in the face of challenges with unity of purpose and that learns as it goes, embracing new methods and technologies and ideas to improve performance—which will lead to improved credibility and reputation for the enterprise.

Getting to such a state calls for changing not just individual practices and procedures, but for changing norms throughout the enterprise. Overall, the goal is to change not only processes but also the unwritten presumptions that influence priorities, judgments, and behaviors so that the enterprise is characterized by a culture of mission focus and high performance, trusting relationships and unity of

[3] See, for example, D.A. Garvin, 1993, Building a learning organization, *Harvard Business Review*, July–August, and P.M. Senge, 2006, *The Fifth Discipline: The Art & Practice of the Learning Organization*, Doubleday, New York.

purpose throughout the enterprise, and risk management rather than risk avoidance. Such characteristics are consistent with NNSA's *Strategic Vision*. Changes embraced in recent years can be seen as steps toward attaining such a state, but a conscious, persistent, and strategic effort is necessary. Such an effort will include continued leadership commitment and focus; frequent, coordinated communication of carefully crafted messages; using data to monitor what is working and what is not, and changing strategy as necessary; and holding people accountable for change.

While the leaders of NNSA play an important role in shaping the vision and culture of the organization, the staff throughout the agency must master solving problems systematically, collecting data to measure progress, and using a fact-based management approach to evaluate improvements. The 2019 *Strategic Vision* and *Governance & Management Framework* put NNSA in a good position to build on those stated values and goals and to reflect them in metrics or indicators to be monitored as NNSA moves toward fulfilling its objectives. A key consideration in establishing a culture of data-driven management is to identify the information to be collected, also specifying those responsible for carrying out this role and ensuring that the data are kept fresh.

Recommendation 5.1: National Nuclear Security Administration (NNSA) leadership themes such as "One NNSA" and "Getting to Yes" have established the tone for needed management improvements. These themes need to be reinforced through systematic efforts to instill these desired behaviors and values throughout the enterprise.

Especially when developing metrics for governance and management, it is important to recognize the need to rely on qualitative as well as quantitative data: employee experience is the most illustrative measure of what is happening and of progress being made. Data can be collected through focus groups and other feedback loops; the focus groups conducted by NNSA in fall 2019 produced a great deal of value, not only for NNSA but also to help coherence across the enterprise. Surveys, questionnaires, and interviews all become part of "learning audits" to assess cognitive and behavioral changes that typically precede improvements in performance. These are useful for checking whether concepts of self-direction and teamwork are truly understood. They also reveal the level of trust within the organization and how people in the enterprise relate to one another. Improvement in the quality of these relationships then leads to improvement in the quality of actions and ultimately in the quality of performance. For these reasons, assessing views throughout the enterprise—in both federal operations and the M&Os—is core to success.

The panel is not recommending that NNSA adopt any particular style of management or that it follow one specific model. In fact, that would clearly *not* be desirable. What is needed is not to move from one static state of governance and management to another but instead to build the capability for continuously identifying problems and opportunities for improvement throughout the enterprise, for methodically crafting steps to mitigate problems and seize opportunities, and for creating a culture that encourages and rewards such steps. The essence of any high-performing enterprise is its ability to self-assess, learn continuously, and adapt accordingly.

CHANGING THE CULTURE IN NNSA

Chapter 3 includes a discussion of how NNSA's management practices have improved and need to continue to improve, and that accomplishing continued, well-targeted change amounts to adjusting the culture throughout the agency. Norms and assumptions must change to foster a continuously improving mode of governance and management, one focused on achieving the mission reliably, accountably, responsively, transparently, and innovatively—nimbly adjusting as stresses and context evolve. Such an

organization assesses and tracks its success via metrics, and the new culture will tend to persist even through leadership turnover.

What remains to be done to ensure that the needed culture change continues into the future? The agency needs to flesh out the goals articulated in its *Strategic Vision* and its *Governance & Management Framework*. This need is largely unchanged from what was described in the panel's first interim report, from 2017:

> [NNSA change leaders have not] identified what success looks like for the many activities under way, do not have measures (quantitative or qualitative) for monitoring progress, and have not yet developed reliable methods for knowing whether the steps being taken are accomplishing what is intended, what else is needed, or whether those steps should be modified to be more successful. The use of appropriate metrics would enable NNSA to monitor its efforts to achieve and sustain change. Experience with large-scale change management has shown that developing and testing metrics is an iterative process that can extend over years, so it is important that this work begin soon. Sustained attention to managing a culture of engagement and collaboration is needed if NNSA is to be an adaptable, high performing, and accountable agency.[4]

The following challenges remain:

- Sustained attention—it is still too early to tell whether culture change will be successful, as culture change takes many years and sustained attention.
- Acceptance of the need for change below the senior management levels is not complete, and the initiative is not very visible to the M&O staffs that, while maintaining their unique cultures, will also be affected and must embrace a unity of purpose around the mission and its goals.
- The change effort must still be institutionalized so that it will continue when leadership transitions, so that progress is not dependent on individuals.
- Clear statements of the goals and measures of progress are needed.
- A systematic means of identifying and removing barriers to full implementation of the desired culture is needed.
- A single accountable person with both time and stature needs to shepherd the change initiative (see Recommendation 3.5).

Recommendation 5.2: National Nuclear Security Administration (NNSA) next steps to steer governance and management reform should specify the actions to be taken—by whom and when, with associated budget and metrics—to a degree that allows progress to be tracked and changes made as necessary. Metrics should be specific enough to support data-driven, continuous management improvement and be suitable for informing periodic external reviews into the effectiveness of governance and management of the nuclear security enterprise.

STEPS FOR CONSIDERATION BY CONGRESS

Last, as this report is delivered to Congress, the logical question is "What should Congress do now, to support the steps recommended in this report, and to follow up in the future?" The national security

[4] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2017, *Report 1 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., p. 33.

mission of NNSA and the overall nuclear security enterprise is critically important to the nation and needs to be carried out in the most effective way possible. The recommendations in this report will be embraced by some, perhaps many, of the leaders within DOE and NNSA and its partners, but there will also be inertia, and possibly resistance, within the system**.**

Recommendation 5.3: The panel encourages the relevant committees of Congress, especially the Armed Services Committees and the Appropriations Subcommittees, to follow up on the recommendations in this report. The panel recommends that Congress convene a small group of knowledgeable experts, perhaps three to five, approximately every 3 years, to conduct a brief review of the status of the National Nuclear Security Administration (NNSA) governance and management.

In order to enable the "brief reviews" envisioned in Recommendation 5.3, it is critical that NNSA identify and track key measures of its adoption of data-driven, continuous improvement management practices (per Recommendation 5.2). Those measures will provide a snapshot of the quality of governance and management of the nuclear security enterprise.

The nuclear security enterprise is critical to the nation, and NNSA needs to build on progress made to ensure that improvements in governance and management percolate throughout the enterprise and become ingrained. NNSA must maintain a conscious, persistent, and urgent drive to build a culture of continuous management improvement.

Appendixes

A

Study Charge Documents

EXTRACT FROM THE FISCAL YEAR 2016
NATIONAL DEFENSE AUTHORIZATION BILL

SEC. 3137
GOVERNANCE AND MANAGEMENT OF NUCLEAR SECURITY ENTERPRISE

(a) Sense of Congress
It is the sense of Congress that
(1) correcting the longstanding problems with the governance and management of the nuclear security enterprise will require robust, personal, and long-term engagement by the President, the Secretary of Energy, the Administrator for Nuclear Security, and leaders from the appropriate congressional committees;
(2) recent and past studies of the governance and management of the nuclear security enterprise have provided a list of reasonable, practical, and actionable steps that the Secretary and the Administrator should take to make the nuclear security enterprise more efficient and more effective; and
(3) lasting and effective change to the nuclear security enterprise will require personal engagement by senior leaders, a clear plan, and mechanisms for ensuring follow-through and accountability.

(b) Implementation Plan
(1) IMPLEMENTATION ACTION TEAM.
(A) The Secretary and the Administrator shall jointly establish a team of senior officials from the Department of Energy and the National Nuclear Security Administration to develop and carry out an implementation plan to reform the governance and management of the nuclear security enterprise to improve the effectiveness and efficiency of the nuclear security enterprise. Such plan shall be developed

and implemented in accordance with the National Nuclear Security Administration Act (50 U.S.C. 2401 et seq.), the Atomic Energy Defense Act (50 U.S.C. 2501 et seq.), and any other provision of law.
(B) The team established under paragraph (1) shall be co-chaired by the Deputy Secretary of Energy and the Administrator.
(C) In developing and carrying out the implementation plan, the team shall consult with the implementation assessment panel established under subsection (c)(1).

(2) ELEMENTS.—The implementation plan developed under paragraph (1)(A) shall address all recommendations contained in the covered study (except such recommendations that require legislative action to carry out) by identifying specific actions, milestones, timelines, and responsible personnel to implement such plan.

(3) SUBMISSION.—Not later than March 31, 2016, the Secretary and the Administrator shall jointly submit to the appropriate congressional committees the implementation plan developed under paragraph (1)(A).

(c) Implementation Assessment Panel
(1) AGREEMENT.—Not later than 60 days after the date of the enactment of this Act, the Administrator shall seek to enter into a joint agreement with the National Academy of Sciences and the National Academy of Public Administration to establish a panel of external, independent experts to evaluate the implementation plan developed under subsection (b)(1)(A) and the implementation of such plan.

(2) DUTIES.—The panel established under paragraph (1) shall
(A) provide guidance to the Secretary and the Administrator with respect to the implementation plan developed under subsection (b)(1)(A), including how such plan compares or contrasts with the covered study;
(B) track the implementation of such plan; and
(C) assess the effectiveness of such plan.

(3) REPORTS.
(A) Not later than July 1, 2016, the panel established under paragraph (1) shall submit to the appropriate congressional committees, the Secretary, and the Administrator an initial assessment of the implementation plan developed under subsection (b)(1)(A), including with respect to the completeness of the plan, how the plan aligns with the intent and recommendations made by the covered study, and the prospects for success for the plan.
(B) Beginning February 28, 2017, and semiannually thereafter through 2020, the panel established under paragraph (1) shall brief the appropriate congressional committees, the Secretary, and the Administrator on the efforts of the Secretary and the Administrator to implement the implementation plan developed under subsection (b)(1)(A).
(C) Not later than September 30, 2020, the panel established under paragraph (1) shall submit to the appropriate congressional committees, the Secretary, and the Administrator a final report on the efforts of the Secretary and the Administrator to implement the implementation plan developed under subsection (b)(1)(A), including an assessment of the effectiveness of the reform efforts under such plan and whether further action is needed.

(4) COOPERATION.—The Secretary and the Administrator shall provide to the panel established under paragraph (1) full and timely access to all information, personnel, and systems of the Department of Energy and the National Nuclear Security Administration that the panel determines necessary to carry out this subsection.

(d) Definitions

In this section:

(1) APPROPRIATE CONGRESSIONAL COMMITTEES.—The term "appropriate congressional committees" means (A) the Committee on Armed Services, the Committee on Appropriations, and the Committee on Energy and Natural Resources of the Senate; and (B) the Committee on Armed Services, the Committee on Appropriations, and the Committee on Energy and Commerce of the House of Representatives.

(2) COVERED STUDY.—The term "covered study" means the following: (A) The final report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise established by section 3166 of the National Defense Authorization Act for Fiscal Year 2013 (Public Law 112-239; 126 Stat. 2208); and (B) Any other study not conducted by the Secretary or the Administrator that the Secretary determines appropriate for purposes of this section.

(3) NUCLEAR SECURITY ENTERPRISE.—The term "nuclear security enterprise" has the meaning given that term in section 4002(6) of the Atomic Energy Defense Act (50 U.S.C. 2501(6)).

(e) Rules of Construction

Nothing in this section shall be construed to authorize any action (1) in contravention of section 3220 of the National Nuclear Security Administration Act (50 U.S.C. 2410); or (2) that would undermine or weaken health, safety, or security.

STUDY CHARGE ADOPTED BY THE NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE

In response to the congressional charge quoted above, the National Academies of Sciences, Engineering, and Medicine adopted the statement of task shown in Box A.1 for a study to be jointly undertaken with the National Academy of Public Administration.

BOX A.1
Statement of Task

[E]valuate the implementation plan developed by the National Nuclear Security Administration (NNSA) and DOE in response to the FY 2016 National Defense Authorization Act, and the subsequent implementation of such plan. The study will be carried out collaboratively with the National Academy of Public Administration (NAPA), as directed by the FY 2016 National Defense Authorization Act, and will follow [the National Academies'] procedures and policies. The committee will issue interim reports every 6–12 months to evaluate progress in implementing the plan. A final report will be issued at the end of the study to document the overall progress in executing the implementation plan, assess the effectiveness of the reform efforts under that plan, and recommend whether further action is needed.

B

Study Methodology and Data Collection

PANEL MEETINGS

To answer its charge, the National Academy of Public Administration and National Academies of Sciences, Engineering, and Medicine convened an expert panel of individuals with broad experience in the federal government, the national laboratories, academia, and the private sector, and with expertise in the areas of public administration, budgeting, policy, production, and nuclear security. The panel participated in data gathering, analysis, and drafting of reports and recommendations, as well as provided ongoing guidance to a study team conducting the day-to-day work of the assessment following a structured methodology.

The full panel met 15 times over the course of this study, usually in person but sometimes via conference call or videoconference. Panel meetings were structured so that members could hear presentations by the Administrator and other senior National Nuclear Security Administration (NNSA) and management and operating (M&O) officials, and could discuss relevant material and issues with these decision makers.

In addition, subsets of the full panel met several times as working groups to discuss research questions and data needs around specific topics. These working groups met several times per year via video or conference call.

INTERVIEWS AND OTHER MEETINGS

Information gathering for this report included formal individual and group interviews and meetings with senior-level officials within the NNSA, the greater Department of Energy (DOE), and the Department of Defense (DoD). Some of these interviews and meetings were fairly general, while others focused on specific topics, such as the Administrator's tenure, changes in financial and contracting processes, or the relationship between NNSA and DoD. Over the course of this study, the panel conducted more

than 140 interviews. In addition, the full panel or a subset of the panel (e.g., the co-chairs) met with the Administrator, the Deputy Administrator, and the Deputy Secretary of Energy.

Panel co-chairs and project staff also spoke frequently with the leadership and staff of NNSA's Office of Policy. The interviews and Office of Policy calls were structured to inform the panel and staff about initiatives, objectives, plans, accomplishments, and barriers in instituting governance and management reform, and to keep the Office of Policy staff current on the activities of the panel and project staff.

The panel also held longitudinal interviews to check the "pulse" of leaders across the enterprise at specified points in time on progress made and remaining challenges. The laboratory directors and the corresponding field office managers were interviewed in January 2017. All field office managers and M&O directors (sometimes joined by their deputies and other members of the senior leadership team) were interviewed in fall 2018 and again in winter/spring 2020. In winter 2019–2020, the panel interviewed 20 NNSA headquarters leaders of both functional and program offices. Each individual was a senior-level manager within his or her respective office; almost all held Senior Executive Service (SES) status.

Each pulse check interview was conducted using a semistructured interview guide. The comments made by interviewees were organized around predetermined topic areas covered during the interview. Panel staff performed a content analysis of meeting notes to identify patterns or themes, and results included major areas of disagreement when or if they occurred.

The panel also received briefings from and held discussions with external stakeholders and experts, such as Government Accountability Office (GAO) personnel; Norman R. Augustine and Admiral Richard W. Mies, co-chairs of the Augustine-Mies report; Victor H. Reis, former Assistant Secretary for Defense Programs and Senior Advisor to the DOE Office of the Secretary and Undersecretaries; DOE Office of Science officials; and leaders of federally funded research and development centers, such as the Lincoln Laboratory at the Massachusetts Institute of Technology and Pacific Northwest National Laboratory.

DISCUSSION GROUPS

The panel carried out 57 discussion groups to gather thoughts from personnel below senior leadership levels on governance and management challenges and the progress of reforms. A total of 459 individuals participated in the discussions, which were facilitated by panel members and/or staff. Participants were drawn from a mix of organizations, including those with functional and those with program responsibilities from NNSA headquarters and field offices, and from the M&Os. The levels of responsibility and years of experience varied greatly among the participants. The majority of the discussion groups were held during site visits (see below) or at NNSA headquarters, but seven groups were conducted via videoconference. The discussion groups differed from group interviews in that there were five to seven topics with a set of discussion prompts. The goal was for group participants to interact with each other and react to each other's perceptions and statements.

The discussion topics evolved slightly as the study progressed and NNSA circumstances and initiatives changed, but they were consistent enough for the panel to get a sense of whether or not individuals below the senior management levels were aware of and experiencing change, as well as changes over time.

While the discussion groups provided insights about governance and management within the enterprise, information received through these should not be viewed as conclusive, owing to the small sample size. Nevertheless, an analysis of the discussions, particularly when taken in conjunction with the pulse checks and other interviews, illuminates where progress is being made and where challenges likely remain.

SITE VISITS

The full panel made 14 site visits between July 2017 and March 2020 (see Table B.1). During these visits, the panel met with senior leadership of the field offices and senior leadership and senior researchers of the M&Os. The panel also held discussion groups with midlevel managers and other field office and M&O staff.

In addition, a working group comprised of six panel members conducted site visits in 2019 to evaluate the science and engineering capabilities base at the three NNSA laboratories in four locations: Lawrence Livermore National Laboratory; Sandia National Laboratories, California; Sandia National Laboratories, New Mexico; and Los Alamos National Laboratory. The panel met with senior research leadership, senior researchers, mid-career researchers, and early-career researchers.

Another working group, focusing on pit production, held virtual site visits (owing to the coronavirus) in March 2020 with staff from Los Alamos National Laboratory and the Savannah River Site.

TABLE B.1 Panel Site Visits

Site	Date(s)
2017	
Lawrence Livermore National Laboratory	July 6–7
Y-12 National Security Complex	July 11–12
Sandia National Laboratories (virtual participation by fellows and senior scientists in Sandia, California)	October 3–4
2018	
Kansas City National Security Campus	July 10
2019	
Los Alamos National Laboratory	May 14–15
Site visits to examine the environment for science and engineering at the laboratories	
Lawrence Livermore National Laboratory	July 31
Sandia National Laboratories—California	July 31
Sandia National Laboratories—New Mexico	August 1
Los Alamos National Laboratory	August 2
2020	
Y-12 National Security Complex (virtual and in-person participation by Pantex Plant)	February 4
Sandia National Laboratories	February 21
Lawrence Livermore National Laboratory	March 4
2020 Special Visits to Focus on Pit Production	
Los Alamos National Laboratory (virtual)	March 23
Savannah River Site (virtual)	April 13, May 26

DOCUMENT REVIEW

The panel and staff performed extensive research and analysis of documents produced by NNSA and DOE, such as policies and plans; congressional hearings; and previous reports by the Augustine-Mies Commission, Commission to Review the Effectiveness of the National Energy Laboratories (CRENEL), GAO, and others. These documents provided a baseline and helped the panel to track implementation and institutionalization of governance and management reforms, and associated outcomes.

C

Pit Production Program Management Structures and Practices

This appendix provides a detailed description of the program management structure—organizational roles and responsibilities, coordinating bodies and councils, and managerial and budgetary authorities—that have been deployed for the pit production program. Plutonium pit production is a top National Nuclear Security Administration (NNSA) priority and, as such, the panel selected it as a case study to examine the degree to which the Augustine-Mies recommendations on program management are being applied for this program.

This appendix is referenced in Chapter 3 of this report, in the section titled "Major Program Management, as Exemplified in the Pit Production Program," which summarizes the panel's analysis of the management structure for the plutonium pit production program. This appendix presents underlying information.[1]

NNSA's priority focus on pit production is relatively recent, following from the 2018 *Nuclear Posture Review* (*NPR*), and the level of effort is rapidly rising. NNSA and the involved management and operating (M&O) sites are clear on the high priority of and the strategic objectives for the program: 30 pits per year at Los Alamos National Laboratory (LANL) by 2026, and 50 pits per year at Savannah River Site (SRS) by 2030. Pit production is very challenging owing to the unique metallurgical properties of plutonium and the environmental, health, and safety risks and certification requirements associated with pit production. This undertaking is further complicated by the lack of continuity in plutonium manufacturing operations over 3 decades, including a stop-work order in 2013 over criticality safety concerns at LANL.

NNSA's governance structure for the plutonium pit production program is wide-ranging and multilayered and involves many hundreds of individuals when those at all components of the enterprise

[1] The information in this appendix was assembled from interviews with NNSA and M&O personnel and from NNSA directives, policies, procedures, and similar documents.

(headquarters, field offices, and M&O facilities) are considered. At the strategic level, NNSA's Administrator and Deputy Administrator for Defense Programs are the primary drivers of strategic decision making and internal priority setting for the plutonium pit production mission, as well as being the external liaisons for the program. At the operational level, where day-to-day managerial and technical decisions are made, including matters referred from the field, the responsibility rests with NNSA's Plutonium Program Office. At the field level, the M&O sites work closely with their NNSA field office counterparts to execute the program.

Owing to the intensity of operations and the cross-enterprise nature of NNSA's pit production work, a network of councils and decision-making bodies is established and extensively deployed. This network requires many meetings and written status updates to document progress, establish decision points, and communicate both horizontally and vertically throughout the enterprise.

The following tables summarize (1) officials and offices and their organizational roles and responsibilities for plutonium pit production (Table C.1); (2) the network of coordinating bodies and councils involved in plutonium pit production (Table C.2); and (3) some of the management and budgetary authorities in place that empower NNSA's pit production program team (Table C.3). The summaries provided here are not exhaustive, but are intended to provide an overall picture of how this top-priority NNSA program is structured, layered, and operates.

TABLE C.1 Roles and Responsibilities

Strategic-Level Management
(internal strategic decision makers and priority setters; external liaison)

NNSA Administrator (NA-1)

- Adopts strategies and establishes overall priorities for the program.
- Approves any major changes in the pit production program, especially in terms of balancing competing NNSA priorities.
- Ensures that other NNSA organizations provide support to the Office of Defense Programs (NA-10).
- Arbitrates any major issues that cannot be resolved at the NA-10 level.

Deputy Administrator for Defense Programs (NA-10)

- Exercises responsibility and assumes accountability for executing the overall mission of producing weapon primaries, including managing mission/program risks across all subcomponents, including plutonium pits.
- Arbitrates matters that are escalated from operational management. In some cases, the Associate Administrator for Acquisition and Project Management (NA-APM) is called upon to lend acquisition and project management expertise and to present NA-APM's perspective during the decision-making process. (As appropriate, officials from other offices may have a comparable role in NA-10 decision making.)

Operational-Level Management
(where day-to-day managerial and technical decisions are made)

Office of Production Modernization (NA-19) within Defense Programs

- A recently reorganized office that centrally manages the broader portfolio of all strategic materials—plutonium, tritium, and domestic uranium enrichment—as well as high explosives and energetics and nonnuclear components.
- This office is led by two Senior Executive Service members:
  - Assistant Deputy Administrator for Production Modernization
  - Deputy Assistant Deputy Administrator of Production Modernization
- Plutonium Program Office (NA-191) within the Office of Production Modernization
  - This is one of five offices within the Production Modernization Office.
  - Led by NNSA's officially designated Plutonium Federal Program Manager (at the GS-15 level) who controls over 90 percent of the financial resources required for the plutonium sustainment program.
  - Manages the modernization of plutonium production and is therefore the lead NNSA office for getting LANL to 30 pits per year during 2026 and SRS to 50 pits per year during 2030.
  - The staff complement is roughly 10–15 employees, some of whom are full-time federal employees and others are contractors, graduate fellows, or rotational M&O employees from LANL and SRS.

continued

TABLE C.1 Continued

Mission-Support Functions
(organizations that support strategic-, operational-, and field-level management with functional-area expertise and activities)

Office of Acquisition and Project Management (NA-APM)

- NA-APM assists the Plutonium Program Office by leading the project construction effort for the Savannah River Plutonium Processing Facility (SRPPF) at SRS and the Chemistry and Metallurgy Research Replacement (CMRR) and Los Alamos Plutonium Pit Production Project (LAP4) at LANL.
  - NA-APM funding for major projects flows through dedicated project accounts, which are coordinated with pit production program priorities through NNSA's Weapons Activities Budget Summits.
  - NA-APM takes the requirements from, and reports progress to, the plutonium pit production program through various forums (described below).
  - NA-APM, in consultation with the Office of Defense Programs, assigns a Federal Project Director for each of these projects (SRPPF, CMRR, and LAP4), who leads the execution of these projects on behalf of the plutonium pit production program.
  - The Federal Project Director also provides other support, such as executing project reviews and supporting integrated project teams.
  - A few organizational conflicts (NA-10 versus NA-APM), which cannot be resolved at lower levels, are resolved by the Administrator.

Office of Safety, Infrastructure, and Operations (NA-50)

- Develops and executes infrastructure investment, maintenance, safety, and operations programs and policies in support of all NNSA programs and other operations, including those involving plutonium pit production. Provides advisory expertise to the Plutonium Program Office on infrastructure recapitalization, criticality safety, waste management, and safety basis development.

Office of Defense Nuclear Security (NA-70)

- Maintains security across all NNSA facilities and sites, executes several kinds of security measures, and administers security clearances in support of all NNSA programs and other operations, including those involving plutonium pit production. Provides advisory expertise to the Plutonium Program Office to help the program ensure that pit production infrastructure is secure.

Office of Management and Budget (NA-MB)

- Provides support to the Plutonium Program Office in a variety of human resources, administrative, financial, and budgeting areas for pit production.

Mission Support Functions' Participation in Coordinating Bodies to Maintaining Program Alignment

- Representatives of NA-APM, NA-50, NA-70, NA-MB, and other supporting functions are members of the Pit Production Matrixed Execution Team (MET).[a] The MET enables them and the pit production program to align the supporting functions' activities with program requirements.

TABLE C.1 Continued

Field-Level Management
(where plutonium pit production happens)

Los Alamos National Laboratory (LANL)

- Responsible for building on its existing capacity to produce plutonium pits, ramping up pit production on a specified schedule, and managing operations to balance other program activities in LANL's Plutonium Facility (PF-4) for pit production.
- In its traditional federally funded research and development center (FFRDC) role, and as NNSA's principal plutonium and pit production center of excellence, LANL advises NNSA's Plutonium Program Office on technical matters related to accomplishing its pit production objectives at both LANL and SRS. LANL also drafted an early integrated master schedule for all NNSA and M&O organizations involved in plutonium pit production.
- LANL maintains a strong relationship with the Plutonium Program Office, the Los Alamos Field Office, as well as Lawrence Livermore National Laboratory (LLNL), Kansas City National Security Campus (KCNSC), and SRS.

NNSA's Los Alamos Field Office (NA-LA)

- Provides daily federal oversight of LANL, issues Contracting Officer direction, and acts as the Safety Basis Approval Authority.
- Acts as a partner to the site, helping LANL navigate through the complex set of requirements placed on the laboratory.
- Maintains a "Program Liaison" that works closely with LANL and the Plutonium Program Office on a daily basis. In this role, NA-LA serves as an important intermediary between LANL and the Plutonium Program Office and is responsible for communicating program-specific issues as they arise.

Savannah River Site (SRS)

- Only 2 years into the pit production effort, its predominant immediate focus now is on the conceptual design of a conversion of the Mixed-Oxide Fuel Fabrication Facility (MOX) to the SRPPF.
- NNSA implemented a new NA-APM Project Delivery Model for the conversion of MOX to SRPPF, appointing and involving a Federal Project Director earlier than in previous projects.
- SRS is working closely with LANL and LLNL to ensure that SRPPF is functionally capable of pit manufacturing, including the process flow and certification issues.

Lawrence Livermore National Laboratory (LLNL)

- The responsible design agency for the first type of pit planned for production at LANL and SRS.
- Provides technical peer review and leads the certification efforts of plutonium pits.

Kansas City National Security Campus (KCNSC)

- Responsible for the construction and delivery of certain nonnuclear components for pit production.

NNSA's Savannah River Field Office (SRFO), Lawrence Livermore Field Office (NA-LL), and Kansas City Field Office (NA-KC)

- These field offices play roles analogous to those described for the Los Alamos Field Office for their respective sites.

[a] The MET is discussed in Table C.2, in the subsection on "Coordinating Bodies and Councils, Operational-Level Management."

TABLE C.2 Coordinating Bodies and Councils

Strategic-Level Management
(internal strategic decision makers and priority setters; external liaison)

NNSA Administrator Meets Monthly with the Production Modernization Office (NA-19)/Plutonium Program Office (NA-191)

- Monthly pit production reviews occur with the Administrator personally. The Deputy Administrator for Defense Programs (NA-10) participates in the meetings as well. Mission-support functions and the field offices attend as needed.

NNSA Administrator's Weekly Calls with Laboratory Directors

- The Administrator hosts weekly calls with all Laboratory Directors, which provide a forum at which LANL and LLNL can raise concerns and opportunities regarding the pit production mission.

Quarterly Program Reviews

- Led by the Deputy Administrator for Defense Programs (NA-10), this quarterly forum reviews the status of both the pit production program itself and a number of projects contained within the plutonium pit production program. The reviews are an opportunity for program and project staff to update senior leaders on the status and trends. These reviews include all relevant mission-support offices as well as M&O leaders and staff from the field.

Operational-Level Management
(where day-to-day managerial and technical decisions are made)

Pit Production Matrixed Execution Team (MET)

- This coordinating body is chaired by the Senior Executive Service lead of the Production Modernization Office (NA-19), and the GS-15 Plutonium Program Manager (NA-191) serves as an action officer. MET members include mission-support (NA-APM, NA-50, and NA-70) and the field organizations (LANL, NA-LA, LLNL, SRS, SRFO, KCNSC). (The representatives of the M&Os are designated as "associate members" of the MET.) The principal members meet monthly; action officers meet two times a month. The members of the MET are individuals selected by their home offices to serve the MET in advisory roles. The MET members do not report to the chair of the MET as a supervisor, nor does the chair of the MET participate in their employee performance evaluations.

Product Realization Team

- Working on an integrated/consolidated production schedule to get to the First Production Unit (FPU). The schedule will be used as a tool, including by the MET, to use around prioritizing competing demands on limited resources. Because LANL is the principal plutonium and pit production center of excellence, its experts drafted the early integrated/production schedule.

Federal Integrated Project Team

- Organized and chartered for the specific purpose of delivering a capital asset project of substantial size. In the case of the plutonium pit production program, a Federal Integrated Project Team is in place for any project with an appointed Federal Project Director—SRPPF, CMRR, and LAP4. Members include NNSA, M&O personnel, project owner representatives, design agent representatives, construction agent representatives, contractors, and other related personnel. The Federal Integrated Project Team ensures that necessary relationships among organizations with a stake in the project are identified, defined, and managed effectively through the completion of the project.

TABLE C.2 Continued

Field-Level Management
(where plutonium pit production happens)

Daily interactions Between Los Alamos Field Office's Pit Production Program Liaison and NNSA HQ and Other M&O Sites

- NNSA established the permanent position of pit production program liaison at the Los Alamos Field Office. This position reports directly to the Field Office Manager (FOM) and is empowered to act on the FOM's behalf. The field office program liaison maintains connections, awareness, and oversight at all levels of LANL and works across NNSA programs, mission-support functions, and with other field-level sites.

Product Realization Teams at LANL and SRS

- Groups of scientists, engineers, and subject-matter experts that perform ground-level work on plutonium pit production and are responsible for identifying risks. LANL reports that there are hundreds of LANL experts working behind the scenes.

TABLE C.3 Management and Budgetary Authorities

Strategic-Level Management
(internal strategic decision makers and priority setters; external liaison)

Weapons Activities Budget Summits

- The Deputy Administrator for Defense Programs (NA-10) is the Account Integrator for the Weapons Activities Account.[a] This involves coordinating and prioritizing the activities and projects necessary to complete program goals, including those of plutonium pit production, during the building of NNSA's budget request. The Deputy Administrator leads integration meetings—with program and functional leadership—"to identify and resolve disconnects between program elements within major appropriations" and to "establish priorities within their appropriation."[b]

Operational-Level Management
(where day-to-day managerial and technical decisions are made)

Plutonium Program Budget

- The Plutonium Program Office controls more than 90 percent of the financial resources for the plutonium pit production program. This does not include funding for environmental, safety, and health (NA-50) and Security (NA-70). Also outside of NA-10's direct control is the funding for major capital projects (particularly, initial design activities for LAP4 and SRPPF), which flows directly to the plutonium capital projects as budget line items. These funds are not within the program manager's budget but, instead, are in NA-APM's budget. In addition, NA-50 gets some funding that supports pit production, but that funding is rolled up into operations at a specific site or facility level and not explicitly tied to pit production activities.

Implementation Plans and Work Authorizations

- The Plutonium Program Office issues implementation plans and work authorizations, thereby controlling the work that the M&Os are authorized and required to do. NNSA's programs, including the plutonium pit production program, are responsible for producing and approving Program Implementation Plans that are the basis for producing work authorizations. Programs work jointly with mission-support organizations and field organizations to develop the scope of work, schedule, and cost for each work authorization. Each topic included in the implementation plan includes a person responsible for its achievement, as well as the frequency with which updates must be reported on the topic.

Integrated Pit Production Master Schedule

- LANL developed an initial draft. When completed by the pit production program, the integrated master schedule will serve as an integrated production schedule to get to the FPU. The schedule will be used as a tool, including by the MET, to help prioritize competing demands.

Interface Control Agreements

- Interface Control Agreements define expectations among NA-191 and other organizations in anticipation of the transfer of pit production responsibility from NA-191 to another organization in Defense Programs when full-scale production is reached.

TABLE C.3 Continued

Field-Level Management (where plutonium pit production happens)
FOMs Have Direct Line Authority over M&O Sites
• As NNSA's risk-accepting official overseeing each M&O site, the FOM is given direct line authority over his or her M&O site and therefore makes decisions on environmental, health, and safety, and is the Safety Basis Approval Authority. Program direction is also routed through the field office to ensure that the FOM and staff are always aware of the status and implementation of programs and projects. Official direction is given by an Administrative Contracting Officer who reports to the FOM.

[a] The Weapons Activities Account includes the three main defense programs accounts: (1) Directed Stockpile Work; (2) Research, Development, Test, and Evaluation Programs; and (3) Infrastructure and Operations.

[b] NNSA Policy 130.1A, Planning, Programming, Budgeting, and Evaluation (PPBE) Process, approved 12/9/2019, https://directives.nnsa.doe.gov/nnsa-policy-documents/nap-0130-0001a/@@images/file.

D

Summaries of the Study's Four Interim Reports

EXCERPT FROM THE SUMMARY OF THE STUDY'S FIRST REPORT[1]

Many previous reports have emphasized the importance of defining and implementing clear roles, responsibilities, authorities, and accountability within the nuclear security enterprise. Those studies found that overlapping and poorly defined functions and authorities have fostered inefficient and overly risk-averse procedures and cultures within DOE and NNSA. Furthermore, they noted that the lack of clear allocation of responsibilities between the M&O contractors and their federal sponsors has contributed to a significant deterioration in their relationship.

The existence of burdensome practices that limit the efficiency of work in the nuclear security enterprise has also been noted by many previous reports. Elements in the field are subject to oversight by a multiplicity of parties and policies—not only those of DOE and NNSA, but also those of the DOE Inspector General, DOE's Office of Enterprise Assessment, the relevant NNSA field office, program offices at NNSA, and other federal and nonfederal agencies, such as the Occupational Safety and Health Administration, the Government Accountability Office, the Department of Defense, state and local regulators, the Defense Nuclear Facilities Safety Board, and so on. The resulting excessive and uncoordinated oversight—through management processes and through inspections, audits, reviews, site visits, and data calls—fuels inefficiencies, per past reports. Balancing the burden and value of necessary oversight has not been approached systematically, and it could be.

At a higher level, addressing the issues noted in reports such as that from the Augustine-Mies study required the nuclear security enterprise to embark on a program of large-scale change. Experience with change in many organizations has shown that successfully achieving and sustaining improvements to

[1] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2017, *Report 1 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., pp. 2–4.

effectiveness, efficiency, and culture across the nuclear security enterprise will require sustained effort and an iterative process. Many management and governance changes have been recommended for DOE and NNSA over the years by many experts and committees, and yet sustained effective change has not been achieved. The FY 2016 NDAA noted that correcting the long-standing governance and management problems afflicting NNSA and the nuclear security enterprise would require "personal engagement by senior leaders, a clear plan, and mechanisms for ensuring follow-through and accountability."[2] Thus, an approach that explicitly prioritizes *sustainable* change is necessary to the accomplishment of NNSA's mission, especially in partnership with its M&O contractors.

In this beginning stage of its study, the panel was impressed to see that long-standing governance and management issues in the nuclear security enterprise have received focused attention over the past 1 to 2 years. The direct involvement of the DOE Secretary and NNSA Administrator has been very valuable and absolutely necessary for this endeavor. In particular, the establishment of an NNSA Office of Policy to serve as a nexus for change management is an important element. It is critical that this momentum be sustained—a challenging requirement given the transition in top leadership and future uncertainty regarding funding and priorities. In fact, for the purpose of clarifying roles, responsibilities, authorities, and accountability—a task that is foundational to addressing other governance and management challenges—the panel believes greater urgency should be demonstrated. For example, although the need for clarification was identified in 2014 or earlier, a new governance construct was not released until 2016, after which a working group was established to resolve implementation details, which is ongoing. Further, an important open question is whether these initial changes are having the desired effect. This first report can assess only the very beginning of what may be a long trajectory.

The panel arrived at the following findings and recommendations, which are numbered here as they are numbered in the full report:

Finding 2.1. Many of the reform efforts called for in the Augustine-Mies report and elsewhere (e.g., reductions in the burden associated with necessary oversight) are contingent on having clarity as to roles, responsibilities, authorities, and accountability. The communications and relationships between NNSA's M&O contractors and the agency appear to have improved in recent years, thanks in part to the creation of several crosscutting boards and advisory groups. However, there remains considerable ambiguity in roles, responsibilities, authorities, and accountability.

Finding 2.2. DOE and NNSA have issued several new documents and have undertaken other activities to address the recommendations for clarifying roles, responsibilities, authorities, and accountability, both among the officials and offices within DOE and NNSA and between the M&O contractors and their government sponsors. But the panel's information gathering to date is not yet sufficient to fairly assess the current articulation and implementation of roles, responsibilities, authorities, and accountability (although laboratory staff expressed concerns to the panel) or to ascertain whether the current articulation and implementation are yielding the intended results.

Recommendation 2.1. The NNSA Administrator should demonstrate urgency in efforts to clarify roles, responsibilities, authorities, and accountability, with particular emphasis on clarifying interactions and relationships between NNSA's management and operating contractors and their government sponsors. Future documents need to resolve ambiguity in several of the earlier policy documents.

[2] National Defense Authorization Act for Fiscal Year 2016, H.R. 1735, 114th Cong. (2015–2016).

Finding 3.1. The mix of burdensome practices affecting the nuclear security enterprise is not characterized precisely enough to lead to targeted interventions for all of them. It would be helpful to know, for example, what fraction of oversight activities are within NNSA's control, which burdensome practices are contributing the most to "burden" and why, which are associated with overlapping responsibilities, and so on. Such understanding is necessary before rational rebalancing is possible. The panel is not suggesting that a complete inventory of regular or ad hoc audits, investigations, and requests for data needs to be compiled.

Recommendation 3.1. The NNSA Administrator should develop and promulgate criteria to help the nuclear security enterprise understand when a process is adding burden that is not commensurate with its value and establish feedback loops so that burdensome practices are recognized. The nuclear security enterprise can then more rationally determine which practices to re-engineer through working groups that bring together the affected parties. In the long term, NNSA should strive to move away from a subjective debate over "burdensome practices" and seek to adopt a more systematic approach for defining oversight requirements.

Finding 4.1. NNSA has not defined what success looks like as it works toward implementing the recommendations from previous reports, and it lacks qualitative or quantitative metrics to identify and measure change.

Finding 4.2. The change management process in place within NNSA is promising—it has addressed many foundational elements, such as obtaining top-level direction and involving participants from across the subcultures of the nuclear security enterprise. But the first steps of change are not yet fully embedded.

Recommendation 4.1. The NNSA Administrator should define an effective mission-focused operating model as the vision for implementing the changes called for in reports of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise and the Commission to Review the Effectiveness of the National Energy Laboratories and elsewhere. NNSA should continue to embrace the concept that change is an iterative process, requiring the sustained attention of leadership and the institution of a mature change management process. NNSA and the management and operating contractors should identify meaningful metrics that can be used to facilitate the identification, measurement, and tracking of change. Results from early change successes should become the foundation for subsequent, iterative actions that support the enterprise in achieving its important mission.

EXCERPT FROM THE SUMMARY OF THE STUDY'S SECOND REPORT[3]

While the panel sees promise in several of the [NNSA] activities it reviewed, it strongly concludes that those activities are not rooted in an adequate foundation of strategic thinking. With the release of the 2018 *Nuclear Posture Review* and the appointment of a new NNSA Administrator, NNSA is faced with an excellent opportunity—and challenge—to move from a tactical to a strategic approach for executing

[3] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2018, *Report 2 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., pp. 1–3.

the critical mission of the enterprise. This report calls for NNSA to create two plans expeditiously: (1) an integrated strategic plan for the entire nuclear security enterprise, focused on mission execution, and (2) a more complete and better grounded plan to guide the ongoing program of governance and management reform. The emphasis in both cases must be on creating a strategic vision that is clearly connected to mission. This is not a call to develop new processes and reports per se, which should follow only once clear and well-rationalized direction has been set.

Recommendation 2.1. In response to the 2018 *Nuclear Posture Review* and other policy statements, the new NNSA Administrator should urgently and personally lead the development of a mission-focused enterprise strategic plan that defines where the nuclear security enterprise needs to be in 10 years and what will be needed to get there.

One of the goals of the strategy should be to ensure that the strategies of the various organizations in the enterprise are integrated and aligned. The strategy should focus on mission-related issues but should also address management issues such as those raised in the Augustine-Mies report. The Administrator should "own" the resulting strategy and take responsibility for promoting it throughout the enterprise by articulating what it means for each organization and encouraging discussions that lead to a shared vision and culture.

Ongoing governance and management improvements should continue while the enterprise strategic plan is being developed. The panel found, however, that the current implementation plan that is meant to steer governance and management reform is inadequate for that task:

Finding 3.1. The panel considers the December 2016 DOE-NNSA report to Congress, *Governance and Management of the Nuclear Security Enterprise*, to be inadequate in several dimensions. Rather than following a careful process of specifying goals and then articulating a plan to achieve them, NNSA has laid out actions it would take without linking them clearly to desired outcomes or explaining why the actions were selected. It does not consider how the various activities will interact to effect the needed changes nor does it convey how the activities will impact mission success. Of equal concern, it gives little indication of how change will be measured—there are no baselines—or how one would know that success has been attained. Furthermore, there is no plan for communicating and socializing the overall goals and progress throughout the enterprise. Such communication is necessary in order to promulgate changes, embed responsibilities for carrying out steps in the plan, and prepare for necessary adjustments to the culture across the enterprise.

An adequate plan to steer governance and management reform should include the following elements:

1. A well-articulated statement of the intended concept of operations and goals (e.g., mission focus, simplicity, and clarity, as well as alignment of resources, organizations, and incentives) and what the intended result will be;
2. A plan for how to achieve the goals and intended results;
3. Active commitment to the goals and vision by senior-most leadership (at both NNSA and DOE);
4. A plan for how to accomplish the change, including centralized leadership and decentralized implementation;
5. Active involvement and engagement of personnel across the enterprise in planning and achieving the change;

6. Regularly scheduled reviews of progress against predetermined measures of effectiveness—with a visible cadence and a sense of urgency—that are conveyed across the enterprise and course corrections to be made as needed to accomplish the preset goals; and
7. A plan for communication and reinforcement of the desired attributes of the change through training, leadership activities, performance reviews, and ongoing continuous improvement programs.

Recommendation 3.1. NNSA should expeditiously create an implementation plan to enable achievement of the governance and management changes driven by NNSA's enterprise-wide strategic goals. This new implementation plan should link proposed actions explicitly to specific goals, including a timeline associated with each action, specification of who is responsible for which parts of the execution and who is accountable for the outcome, and measures to be used to gauge progress and impact.

This implementation plan and the activities described in it will combine to create a path toward major change.

Of the many actions under way to improve governance and management, the new process to improve site governance appears quite promising:

Finding 3.2. Although measures of effectiveness have not yet been established to assess the benefits of the site-governance and management peer review process, the panel believes it represents a useful and promising approach that is already contributing to improved communication, better-defined roles and responsibilities at individual sites, and cross-enterprise learning.

Recommendation 3.2. The NNSA Administrator should ensure that measures of effectiveness are defined and tracked, and then use the site governance and management peer review process across NNSA as a mechanism for communicating and reinforcing shared values/behaviors, strengthening processes and relationships at each site, and improving the usefulness of the sites' contractor assurance systems.

However, overall the efforts to reform governance and management are greatly hampered by a lack of data and other objective evidence:

Finding 3.3. NNSA lacks systematic data collection—tailored to inform well-specified questions in order to assess the scope and severity of its governance and management challenges and the effectiveness of its improvement efforts.

The panel makes one specific recommendation regarding data collection, both because knowledge of workforce attitudes is fundamental and because relevant survey information may already exist:

Recommendation 3.3. As a first step toward meeting the need for objective evidence and data, NNSA should begin surveying the entire workforce of the nuclear security enterprise (possibly by leveraging existing surveys) so as to gain understanding of attitudes and engagement throughout the enterprise and insight about specific worker concerns.

These recommendations should be acted on quickly and aggressively.

EXCERPT FROM THE EXECUTIVE SUMMARY OF THE STUDY'S THIRD REPORT[4]

The past year brought important changes to NNSA and the nuclear security enterprise. The 2018 release of the *Nuclear Posture Review* provided a renewed clarity of purpose, and ambitious goals and timelines, which in turn led to an increase in overall funding. A new Administrator was sworn in late in February 2018, as was a new Deputy Administrator for Defense Programs (NA-10) more recently. The Administrator has taken a number of steps that appear to have placed NNSA on a promising path toward remedying the governance and management problems that have been flagged by so many reports. She has pushed energetically for partnership and mission focus throughout the enterprise, modeling healthy relationships between the government and its management and operating partners, which in turn may be reducing some transactional oversight. She has worked toward healthier relationships with the Department of Defense (DoD) and with the rest of the Department of Energy. In accordance with the panel's 2018 recommendation for better strategic planning, she is working to improve practices in that area. It now appears that the building blocks for essential change are slowly coming together.

However, the panel remains concerned with the lack of urgency, metrics, and institutionalization; progress is heavily dependent on the individuals involved. NNSA leadership has yet to put in place the institutional structures needed for further progress and to sustain success, starting with documentation and directives. Some of this is in preparation but not available for the panel's examination. NNSA has yet to identify the metrics that will be needed to monitor and drive progress over time.

The management and governance reforms needed in NNSA constitute a culture change, and culture change requires consistent, sustained leadership in order to take root and to last. An appointed focal point for change management other than the Administrator is essential for NNSA.

The panel makes the following recommendations in this report:

Recommendation 1. DoD and NNSA leadership should continue to promote transparent exchange of information about program plans and operations and to encourage teamwork at all levels, and they should institutionalize the current practices that are contributing to a healthy relationship.

Recommendation 2. NNSA should quickly designate a senior executive as the accountable change management leader for the next few years. The change leader should drive management and governance reform with urgency and a cadence focused on mission success. The time, resources, and authority needed to fulfill that responsibility should be provided and not be underestimated.

In addition to these new recommendations, the panel's recommendations in its first two reports are still relevant and timely. The change management leader should revisit those recommendations and the panel's other guidance as a foundation for action.

[4] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2019, *Report 3 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., pp. 1–2.

EXCERPT FROM THE EXECUTIVE SUMMARY OF THE STUDY'S FOURTH REPORT[5]

As it approaches its conclusion later this year, the Panel to Track and Assess Governance and Management Reform in the Nuclear Security Enterprise, established by Congress in 2016, offers three recommendations to sustain the improvements seen to date across the enterprise … That enterprise consists of the National Nuclear Security Administration (NNSA) plus a large, distributed system of laboratories, production plants, and other sites that are staffed by personnel working under management and operating contracts.

The first two of these recommendations deal with leadership. As noted in a number of external studies over two decades—more than 50 by one count[6]—the nuclear security enterprise has long been criticized as being poorly governed and managed. For example, the congressionally mandated report *A New Foundation for the Nuclear Enterprise* (hereafter, the "Augustine-Mies report"), released in November 2014, concluded "The existing governance structures and many of the practices of the [nuclear security] enterprise are inefficient and ineffective, thereby putting the entire enterprise at risk over the long term."[7]

As noted in the panel's previous report (issued in February 2019), the release of the *Nuclear Posture Review* in 2018 and increasing budgets provided a renewed impetus to the enterprise, along with a heavy workload and ambitious timelines. The current NNSA Administrator was sworn in early that year, and she hit the ground running. Her strong leadership of the enterprise included an emphasis on improving governance and management. She has pushed for, and modeled, much of what is needed to change culture and ensure a well-managed enterprise.

However, the panel is well aware of the scale of this challenge and the multiyear timelines required for culture change such as the ongoing reform of governance and management. The panel worries that today's state of progress is fragile and very dependent on the top leadership team, the installment of which was a necessary precursor to change. The current NNSA Administrator has for 2 years pushed energetically to adjust NNSA's governance and management of the enterprise, but the panel is very conscious of the fact that the average tenure of NNSA Administrators over the past 20 years has been just 3.7 years. Recognizing the value of greater continuity of leadership in such a complex and technical organization, the Augustine-Mies report[8] recommended that the NNSA Administrator's position should be changed to a fixed-term position. After reviewing the rationale presented by the Augustine-Mies report, considering other positions in the federal government that have fixed terms, and discussing options with select individuals with knowledge of such positions, the panel agrees that a change in the position's term should be made.

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[5] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2020, *Report 4 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., pp. 1–3.

[6] Commission to Review the Effectiveness of the National Energy Laboratories, 2015*, Securing America's Future: Realizing the Potential of the Department of Energy's National Laboratories: Final Report of the Commission to Review the Effectiveness of the National Energy Laboratories*, https://energy.gov/labcommission/downloads/final-report-commission-review-effectiveness-national-energy-laboratories, p. vi.

[7] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, *A New Foundation for the Nuclear Enterprise: Report of the Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise*, http://cdn.knoxblogs.com/atomiccity/wp-content/uploads/sites/11/2014/12/Governance.pdf, p. ix.

[8] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, 2014, p. 28.

Recommendation. Congress should consider amending the National Nuclear Security Act to convert the position of National Nuclear Security Administration (NNSA) Administrator to a fixed term, still as a Presidential appointment subject to Senate confirmation.

This recommended action might also minimize gaps between confirmed Administrators (which have averaged 247 days over the past four transitions) by reducing the chance of those transitions occurring during the months following a Presidential Inauguration, when substantial delays are most likely to occur. Even though Acting Administrators provide leadership between confirmed Administrators, gaps are undesirable. The second recommendation regarding leadership involves steps the Administrator should take quickly to help ensure that current progress in government and management is institutionalized.

In 2019, NNSA released three strategic documents to guide its work, including a framework for governance and management. Subsequent discussions between the panel and at least two dozen senior NNSA leaders indicated their unanimous support for the Administrator's main messages about governance and management, and the associated culture that is desired. That culture will be characterized by a spirit of "One NNSA," in which all members of the enterprise understand their role in achieving the mission and working together with a shared purpose—their roles and responsibilities are clear, they practice risk management rather than risk avoidance, and the guiding principle for management will be "Getting to Yes," while ensuring the safety and security of the enterprise.

During 2019, multiple steps have been taken toward institutionalizing the desired governance and management changes, which is heartening. What has yet to occur—not surprisingly, given the magnitude of the desired culture change—is for the new principles to be fully operationalized. That is a multistep process of communication, codification (in some cases), and translation of general principles into guidance that is useful to the day-to-day actions of people at all levels throughout the enterprise. Given the fact mentioned above about the relatively short average tenure of NNSA Administrators, the panel remains concerned (as it was a year ago) about the pace of progress and limited sense of urgency, the lack of metrics, and the remaining need for institutionalization. Progress is still heavily dependent on the top individuals who are pushing for change.

Accordingly, the panel makes the following recommendation:

Recommendation. The National Nuclear Security Administration (NNSA) Administrator should promptly designate a career senior executive as the accountable change management leader for the next several years. That person's responsibilities should include development and dissemination of documents that operationalize and institutionalize the desired governance and management practices and culture change more generally. These documents should be released within 6 months. The change management leader should actively monitor progress toward institutionalization of these changes.

The panel envisions that the challenge of institutionalizing high-level governance and management changes—of driving those messages down into the entire enterprise workforce and adjusting processes and written guidance so that the desired culture becomes ingrained—will require effort from managers across the enterprise. So the role of the accountable change management leader is to motivate, delegate, and monitor, not to shoulder all the tasks. The change leader also needs to keep attention on attaining the desired culture; operationalizing and documenting new practices must not become ends in themselves.

Additional thoughts about the change management leader's responsibilities are found in the panel's third report.[9]

Following the 2018 release of the *Nuclear Posture Review*, there has been a rapid increase in workload across the nuclear security enterprise, especially in connection with life-extension programs and the development of plutonium pit production capabilities. The panel felt it was important to check whether these highly visible activities, with their ambitious timelines, are having undesirable effects on the ability of the nuclear security enterprise to carry out the long-term research that sustains and builds the more generic science and engineering (S&E) capabilities needed by the enterprise. That long-term research is not normally tied to a specific near-term deliverable, but strong S&E capabilities create new options for addressing near-term deliverables while also providing tools that will be important to the enterprise further in the future.

Through three site visits in 2019 to the NNSA laboratories, panel members participated in free-ranging and frank discussions with over 90 researchers at varying levels of seniority. These interactions overall showed that research to support those S&E capabilities continues to receive attention and priority, and that the laboratories' scientists and engineers continue to produce valuable work. However, a primary observation arising from these visits is that near-term demands and some administrative issues are stressing this work by severely limiting the time that researchers can devote to deep and sustained creative thinking. Moreover, top research leadership at the three laboratories did not seem to fully recognize the amount of stress felt by those researchers. Accordingly, the panel makes the following recommendation:

> **Recommendation.** The Directors of the three laboratories, with National Nuclear Security Administration (NNSA) assistance as needed, should periodically assess the environment for work that sustains the enterprise's core science and engineering (S&E) capabilities. This assessment should include input from the researchers engaged in that work, and identify steps needed to strengthen the environment.

In addition to these new recommendations, the panel's recommendations in its first three reports are still relevant and timely. The change management leader should revisit those recommendations and the panel's other past guidance as a foundation for action.

[9] National Academies of Sciences, Engineering, and Medicine and the National Academy of Public Administration, 2019, *Report 3 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise*, The National Academies Press, Washington, D.C., p. 24.

E

Biographical Information for Panel Members and Staff

PANEL MEMBERS

JONATHAN D. BREUL (Co-Chair) is a retired partner in IBM Global Business Services and executive director of the IBM Center for the Business of Government, which published independent academic research to improve government management. Mr. Breul taught for many years as an adjunct professor at Georgetown University's McCourt School of Public Policy. Prior to joining IBM, he served from 1993 to 2002 as Senior Advisor to the Deputy Director for Management in the White House Office of Management and Budget (OMB). Earlier, as OMB Chief of Evaluation and Planning, he developed and launched the Government Performance and Results Act (GPRA) and the legislative launch of the Chief Financial Officers (CFO) Act. He chaired the National Academy of Public Administration (NAPA) panel that produced the 2013 report *Positioning DOE's Labs for the Future: A Review of DOE's Management and Oversight of the National Laboratories*. Mr. Breul is a NAPA fellow.

DONALD LEVY (Co-Chair) is the Albert A. Michelson Distinguished Service Professor of Chemistry Emeritus at the University of Chicago and was senior advisor to the university president. For a decade ending in 2016, Dr. Levy was the university's vice president for national laboratories, with responsibility for the oversight of the Department of Energy's (DOE's) Fermi and Argonne National Laboratories. He earned a B.A. from Harvard University in 1961 and a Ph.D. from the University of California, Berkeley, in 1965. After 2 years at Cambridge University as a National Institutes of Health and then North Atlantic Treaty Organization postdoctoral fellow, he joined the University of Chicago in 1967 and has spent his entire career there. Among his many honors, Dr. Levy has served as editor of the *Journal of Chemical Physics* (1998–2007); chair of the American Institute of Physics Editors' Panel (2000–2002); CEO and board member of the UChicago Argonne, LLC (2007–2016); vice-chair of the Argonne National Laboratory Board of Governors and chair of its Science Policy Council (2007–2016); member of the Fermilab Board of Directors (2007–2016); and fellow of the American Physical Society, American Association

for the Advancement of Science, Optical Society of America, American Academy of Arts and Sciences, and American Chemical Society. Dr. Levy is an elected member of the National Academies of Sciences.

ALLAN V. BURMAN is president of Jefferson Solutions, the government consulting practice of the Jefferson Consulting Group. Under Dr. Burman's leadership, Jefferson Solutions provides analysis, evaluation, program management, and acquisition assistance and assessment services to many government departments and agencies. Dr. Burman had a lengthy career in the federal government, serving in policy positions in the Office of the Secretary of Defense and OMB as Administrator for Federal Procurement Policy under Presidents Reagan, Bush, and Clinton. Dr. Burman is the former chair of the Procurement Round Table, a fellow and member of the Board of Advisors of the National Contract Management Association, a member of the Partnership for Public Service, and an Honorary Member of the National Defense Industrial Association. He is a NAPA Fellow.

KEITH A. COLEMAN is a special project manager at Boeing Phantom Works working on advanced weapon development. Mr. Coleman has worked in the Boeing Military Aircraft production and Phantom Works advanced design organizations working production and prototype fighter and unmanned air vehicle aircraft and weapon systems for more than 31 years. He was previously assigned as the division chief engineer for Boeing's Cruise Missile Systems and Direct Attack weapons within Boeing Defense Systems. Mr. Coleman recently worked in Boeing's Special Pursuits Cell, designing and building a special-purpose Tier 2 class unmanned air vehicle. He was also the program manager for the Office of the Secretary of Defense Counter Electronics High-Powered Microwave Advanced Missile Project Joint Capability Technology Demonstration resulting in the world's first successful air-launched high-power microwave cruise missile.

DONA L. CRAWFORD retired as associate director for computation from the Lawrence Livermore National Laboratory (LLNL), where she led the laboratory's high-performance computing efforts, one of the premier computing centers in the world. In that capacity, Ms. Crawford was responsible for the development and deployment of an integrated computing environment for petascale simulations of complex physical phenomena. This environment includes high-performance computers, scientific visualization facilities, high-performance storage systems, network connectivity, multiresolution data analysis, mathematical models, scalable numerical algorithms, computer applications, and necessary services to enable laboratory mission goals and scientific discovery through simulation. Prior to her LLNL appointment in July 2001, Ms. Crawford had been with Sandia National Laboratories (SNL) since 1976, serving on many leadership projects, including the Accelerated Strategic Computing Initiative, the Nuclear Weapons Policy Board, and the Nuclear Weapons Strategic Business Unit. Ms. Crawford serves on several boards and advisory committees to advance scientific research, technology development, and educational endeavors.

MARTIN C. FAGA is a retired president and chief executive officer of the MITRE Corporation. As a federally funded research and development center (FFRDC), MITRE's governance has parallels with the governance of National Nuclear Security Administration (NNSA) facilities. Before joining MITRE, Mr. Faga served from 1989 until 1993 as Assistant Secretary of the Air Force for Space, where he was responsible for overall supervision of Air Force space matters. At the same time, he served as Director of the National Reconnaissance Office, responsible to the Secretary of Defense and the Director of Central Intelligence for the development, acquisition, and operation of all U.S. satellite reconnaissance programs. Mr. Faga is a member of several boards of directors. He served from 2006 to 2009 on the President's Intelligence Advisory Board. Mr. Faga is a NAPA Fellow.

PAUL A. FLEURY is the Frederick William Beinecke Professor Emeritus of Engineering and Applied Physics at Yale University. Dr. Fleury is the founding director of the Yale Institute for Nanoscience and Quantum Engineering. He served as dean of engineering at Yale from 2000 until 2008. Prior to joining Yale, Dr. Fleury was dean of the School of Engineering at the University of New Mexico starting in 1996, following 30 years at AT&T Bell Laboratories. At Bell Laboratories, Dr. Fleury was director of three different research divisions covering physics, materials, and materials processing research between 1979 and 1996. From 1992 to 1993, he was Vice President for Research and Exploratory Technology at Sandia National Laboratories. Dr. Fleury is a fellow of the American Physical Society, the American Association for the Advancement of Science, the American Academy of Arts and Sciences, and a member of both the National Academy of Sciences and the National Academy of Engineering.

T.J. GLAUTHIER is president and CEO of TJG Energy Associates, LLC. Mr. Glauthier also is an executive board member and advisor for public and private organizations in the energy sector. He currently serves on the board of two corporations: California Bioenergy, which produces renewable energy from the methane from dairies in California's Central Valley, and VIA Motors, manufacturer of electric-drive pickup trucks and vans. Mr. Glauthier advises Stem, an energy storage and management company headquartered in Silicon Valley, and Booz Allen Hamilton's energy practice, including its work for the DOE, National Nuclear Security Administration, the DOE national laboratories, and on innovative management approaches to government programs. He co-chaired the congressionally chartered Commission to Review the Effectiveness of the National Energy Laboratories (CRENEL), which produced the 2015 report *Securing America's Future: Realizing the Potential of the Department of Energy's National Laboratories*, and he was also a member of the congressionally chartered Advisory Panel on the Governance of the Nuclear Security Enterprise (the "Augustine-Mies panel") that produced the 2014 report *A New Foundation for the Nuclear Enterprise.* Mr. Glauthier is a graduate of Claremont McKenna College and the Harvard Business School.

DAVID GRAHAM is Deputy Division Director in the Strategy, Forces, and Resources Division at the Institute for Defense Analyses (IDA), an FFRDC. Since 1995, Dr. Graham has led several dozen studies addressing post–Cold War national security roles, responsibilities, and organizations for a variety of sponsors. His work on the DOE nuclear weapons complex includes co-authoring IDA's 1996 "120-Day Study" of the Organization and Management of the Nuclear Weapons Program; participating in Admiral Hank Chiles's 1999 Presidential Commission on Nuclear Expertise; co-authoring Chiles's studies of DOE security in the early 2000s; and serving as a member of the 2008 Defense Science Board Panel on nuclear deterrence skills. Dr. Graham served for 4 years (1999–2003) as the IDA study lead for the Panel to Assess the Reliability, Safety, and Security of the U.S. Nuclear Stockpile (the "Foster Panel"). In 2013–2014, he served as the executive director for the congressionally mandated Augustine-Mies Panel and assisted in preparing their 2014 report and testimony, which led to the current study. Most recently, Dr. Graham led a congressionally mandated study on the management of security operations at DOE's Category I nuclear sites.

WILLIAM C. GREENWALT is an advisor and consultant to a range of government and private sector clients on defense and government matters. Previously, Mr. Greenwalt served as a Professional Staff Member for the Senate Armed Services Committee focusing on issues related to acquisition, the industrial base, and management reform. Prior assignments included serving as the Deputy Undersecretary of Defense for Industrial Policy, Visiting Fellow at the American Enterprise Institute, Vice President for Acquisition Policy at the Aerospace Industries Association, Deputy Director for Surveys and Investiga-

tions for the House Appropriations Committee, and Federal Acquisition Policy Director at Lockheed Martin. He also served previously in professional staff positions with the U.S. Senate and the Government Accountability Office. Mr. Greenwalt is a NAPA Fellow.

ROBERT HALE is a senior executive advisor at Booz Allen Hamilton and senior fellow at the Center for a New American Security. Mr. Hale was previously Department of Defense Comptroller, and in that role he acted as principal advisor to three Secretaries of Defense on budgetary and financial matters. He also served as the Air Force Comptroller. Prior to service in the Department of Defense, Mr. Hale was the executive director of the American Society of Military Comptrollers. His career began as an active duty officer in the U.S. Navy. Mr. Hale received a master's degree in operations research from Stanford University. He has been involved in several NAPA activities, including contributing to the recent publication *Building a 21st Century SES: Ensuring Leadership Excellence in Our Federal Government*. Mr. Hale is a NAPA Fellow.

BARBARA ROMZEK is a former dean of American University's School of Public Affairs and a professor of public administration and policy. Before joining American University, Dr. Romzek held faculty and senior leadership positions at the University of Kansas, the last being interim senior vice provost for academic affairs. Dr. Romzek is recognized for her expertise in the area of public management and accountability, with emphases on government reform, contracting, and network service delivery. Building on her research on formal accountability structures and processes, her recent work focuses on informal accountability in collaborative network settings. Dr. Romzek's research has encompassed complex federal work settings, including the National Aeronautics and Space Administration (NASA), Congress, and the U.S. Air Force, as well as state agencies, local governments, and nonprofit agencies. Dr. Romzek has received research awards from the American Society for Public Administration and the American Political Science Association (APSA). Most recently, she received the John Gaus Award from APSA for lifetime achievement in political science and public administration. Dr. Romzek is a NAPA Fellow.

JOAN B. WOODARD is an independent consultant. Dr. Woodard retired in 2010 from Sandia National Laboratories as Executive Vice President and Deputy Director. She served as the Chief Operating Officer from 1999 to 2005. During her 36-year career at Sandia, Dr. Woodard led the energy technology development programs as well as the national security programs and was the executive with oversight for human resources and compensation as well as budget and finance. She oversaw Sandia's Defense, Homeland Security, and Energy programs, and she led several strategic initiatives, including strategies for energy, cybersecurity, and the future of science and technology. Dr. Woodard served as deputy lab director of nuclear weapons at Sandia Corporation. Dr. Woodard earned her doctorate degree in mechanical engineering from the University of California, Berkeley, and a master's degree in engineering economics from Stanford University.

MERRI WOOD-SCHULTZ is a retired fellow and guest scientist at Los Alamos National Laboratory (LANL). Dr. Wood-Schultz is currently a member of the Nuclear Forensics Science Panel (NFSP) for the Department of Homeland Security, and in that capacity she is a part-time consultant for Noblis. Her work at LANL included the physics design of thermonuclear weapons, nuclear weapons-related laboratory experiments (above ground experiments), the development of concepts and methods for certifying nuclear performance (the effects of code calibration on predictions and the quantification of margins and uncertainty), and nuclear intelligence. Before the end of nuclear testing, Dr. Wood-Schultz was responsible for the conceptual and physics design of numerous nuclear tests and add-on experiments. She holds a Ph.D. in physics from Georgia Institute of Technology.

STAFF

SARAH (SALLY) JAGGAR is co-project director on the congressionally mandated assessment of governance and management improvements at the NNSA. At NAPA, Ms. Jaggar has led or participated in multiple other studies, including serving as senior advisor on agile government initiatives. Prior to joining the Academy, Ms. Jaggar was a senior strategic advisor at the Partnership for Public Service, where she led numerous projects leading to reports on cybersecurity, civil service reform, innovation, performance management and improvement, and especially on successful recruiting, hiring, and retention for federal agencies. At the U.S. Government Accountability Office, Ms. Jaggar served as Managing Director for Mission Support in the Human Capital Office; Managing Director for Health Financing and Public Health Issues; and Director of Operations in the Accounting and Information Management Division, among others. She holds an M.A. from the American University and a B.A. from Duke University. Ms. Jaggar is a NAPA Fellow.

SCOTT WEIDMAN is co-project director and deputy executive director for the Division on Engineering and Physical Sciences at the National Academies of Sciences, Engineering, and Medicine. Prior to that, Dr. Weidman served as director of the National Academies Board on Mathematical Sciences and Analytics (BMSA). He joined the National Academies in 1989 with BMSA and moved to the Board on Chemical Sciences and Technology in 1992. In 1996, Dr. Weidman established a new board to conduct annual peer reviews of the Army Research Laboratory, which conducts a broad array of science, engineering, and human factors research and analysis, and he later also directed a similar board that reviews the work of the National Institute of Standards and Technology. He rejoined BMSA as its director in 1999 until moving to his current position. During his National Academies career, Dr. Weidman has staffed studies on a wide variety of topics related to mathematical, chemical, and materials sciences; laboratory assessments; the nuclear security enterprise; and science and technology policy. He holds bachelor's degrees in mathematics and materials science from Northwestern University and an M.S. and a Ph.D. in applied mathematics from the University of Virginia. Before joining the National Academies, Dr. Weidman held positions with General Electric, General Accident Insurance Company, Exxon Research and Engineering, and MRJ, Inc.

SHENAE BRADLEY is an administrative assistant at the Computer Science and Telecommunications Board of the National Academies of Sciences, Engineering, and Medicine, where she has worked since 2008. Prior to joining the National Academies, Ms. Bradley managed a number of apartment rental communities for Edgewood Management Corporation in the Maryland/D.C./Delaware metropolitan areas. Ms. Bradley attended the University of Maryland, College Park.

ADAM DARR is a research analyst at NAPA. Mr. Darr joined NAPA in 2015 as a research associate, having previously interned in the summer of 2013. He has served on numerous NAPA projects, including work for the National Science Foundation, Farm Service Agency, U.S. Secret Service, Federal Aviation Administration, and Federal Bureau of Prisons. His areas of emphasis are governance and management reform, organizational change, human capital, and project and acquisition management. Mr. Darr graduated (2015) from Virginia Commonwealth University with a B.A. in political science and homeland security/emergency management.

LAWRENCE B. NOVEY joined NAPA as a senior advisor in 2016 and has specialized in studies addressing governance and management reform, environmental and regulatory policy, and international anti-corruption and human rights initiatives. Before that, Mr. Novey served for 17 years with the Senate Committee on Homeland Security and Governmental Affairs, including as Chief Counsel for Governmental Affairs, where he managed legislation and oversight on governmental management and operations, focusing on civil service and human capital management, regulatory policy, and governmental transparency and ethics. Previously, at the U.S. Environmental Protection Agency (EPA), the Congressional Office of Compliance, and OMB, he developed regulations and procedures for pollution control, terms and conditions of employment, and expedited industrial permitting. Mr. Novey also practiced law, specializing in environmental compliance and in the resolution of disputes involving toxic-chemical exposure. He holds an A.B. from Harvard College and a J.D. from Columbia Law School.

MARIA RAPUANO is project staff member at NAPA, where she has served as a deputy project director for studies of the Department of Agriculture, the Department of Justice Civil Rights Division, and the Government Printing Office, and as a senior advisor for reviews of the Department of Homeland Security Science and Technology Directorate, the Defense Civilian Intelligence Personnel System, and the Federal Emergency Management Agency (FEMA) Flood Mapping Program, and for a project assisting the Indian Health Service in the development of its strategic plan. Prior to joining NAPA, Ms. Rapuano was a project director with the Alliance for Healthy Homes (formerly the Alliance to End Childhood Lead Poisoning) and helped found and direct the organization's international program. She served on the board of directors of the Trust for Lead Poisoning Prevention. Ms. Rapuano holds an M.A. in international affairs from the American University and a B.A. in government from the College of William and Mary.

MICHELLE SCHWALBE is director of the Board on Mathematical Sciences and Analytics (BMSA) at the National Academies of Sciences, Engineering, and Medicine. Dr. Schwalbe joined the National Academies in 2010 as a Christine Mirzayan Science and Technology Policy Fellow working in BMSA and then worked as an associate review officer with the Report Review Committee (RRC). Following her stint with the RRC, she returned to BMSA as an associate program officer, then as a program officer, and then as a senior program officer. Dr. Schwalbe directed the Committee on Theoretical and Applied Statistics (CATS) from 2011 to 2017. She has been involved in a variety of activities focused on the mathematical sciences, machine learning, reproducibility of scientific results, automotive fuel economy, electric vehicles, and additive manufacturing. Dr. Schwalbe previously held positions at Oak Ridge National Laboratory and LLNL. Her interests lie broadly in mathematics, statistics, and their many applications. She has a Ph.D. in mechanical engineering and an M.S. in engineering science and applied mathematics from Northwestern University, and a B.S. in applied mathematics specializing in computing from the University of California, Los Angeles.

SEAN SMOOKE has worked for NAPA as a research associate since August 2019. Mr. Smooke's first project completed was the *Montgomery County Council: Legislative Branch Operations Assessment*, concluding in November 2019. In addition to his work on this NNSA study, he supports a NAPA panel conducting an assessment of the National Park Service Museum Collections Storage Management. He provides additional support to NAPA's Quarterly Working Capital Fund Symposium. Mr. Smooke holds a B.A. from Claremont McKenna College in government and legal studies.

FORMER PARTICIPANTS

The following individuals served on the panel for a portion of its existence but had to resign, at varying times, because of other obligations: Jill Dahlburg (Co-Chair), Robert Shea (Co-Chair), Elizabeth Cantwell, William Madia, Kathleen Peroff, Elizabeth Robinson, Tammy Taylor, and Mitchell Wallerstein.

In addition, the following staff members worked on this study for a portion of its duration: Myra Howze Shiplett (Project Co-Director), Eric Christensen, Emily Fay, and Amanda Zink, from the National Academy of Public Administration; and Rodney Howard from the National Academies of Sciences, Engineering, and Medicine.

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Acronyms

AoA	Analysis of Alternatives
B&R	budget and reporting
CEPE	Cost Estimating and Program Evaluation
CRENEL	Commission to Review the Effectiveness of the National Energy Laboratories
DoD	Department of Defense
DOE	Department of Energy
DOE-EM	DOE Office of Environmental Management
FEVS	Federal Employee Viewpoint Survey
FFRDC	federally funded research and development center
GAO	Government Accountability Office
KCNSC	Kansas City National Security Campus
LANL	Los Alamos National Laboratory
LDRD	laboratory directed research and development
LLNL	Lawrence Livermore National Laboratory
M&O	management and operating
MOX	Mixed-Oxide Program

NA-APM	NNSA Office of Acquisition and Program Management
NAPA	National Academy of Public Administration
NNSA	National Nuclear Security Administration
NPR	*Nuclear Posture Review*
NWC	Nuclear Weapons Council
OMB	Office of Management and Budget
PAS	presidentially appointed and subject to Senate confirmation
PPBE	planning, programming, budgeting, and evaluation
R&D	research and development
S&E	science and engineering
SES	Senior Executive Service
SNL	Sandia National Laboratories
SRS	Savannah River Site

G

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