U.S. DEPARTMENT OF ENERGY

Evolving the Nuclear Security Enterprise

A Report of the Enhanced Mission Delivery Initiative

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Introduction and Scope

Given Russia's recent invasion of Ukraine and its irresponsible nuclear saber-rattling, the enduring mission of the National Nuclear Security Administration (NNSA) is even more relevant and present in the minds of our nation's leaders and citizens than it has been in decades.

NNSA faces daunting tasks that present both challenges and opportunities. The Enhanced Mission Delivery Initiative (EMDI) was launched based on two premises: that NNSA is being asked to do more than ever to support the strategic nuclear deterrence mission, which must be delivered; and that a window exists to partially readjust NNSA's approach by refining our enterprise-wide processes and relationships. The EMDI builds upon prior successive internal and external reviews, evaluations, and governance reform efforts to provide substantive actionable recommendations by senior leadership and subject matter experts from across the Nuclear Security Enterprise (NSE)[i].

Sponsored by the Associate Principal Deputy Administrator, the EMDI team consists of three NNSA senior executives, two senior federal procurement officials (one each from NNSA and the Office of Science), and one coordinator. The EMDI team's scope is to identify obstacles to agility and responsiveness across the NSE, and to assess the state of relationships between the federal and the management and operations workforce given the unique management and operating (M&O) contract for all NNSA sites and Federally Funded Research and Development Center (FFRDC) models at NNSA's laboratories. The team's goal is to develop actionable solutions and determine which Departmental authorities should implement them, enhancing NNSA's ability to meet near and mid-term deliverables and ensure the long-term sustainability of the NSE. These recommended actions should be viewed as the starting point for multiple activities and initiatives to implement meaningful change in the NSE.

The team's methodology to produce this EMDI report primarily included expert-based elicitation using a consistent set of questions to frame the initial interviews. The team conducted over 250 interviews with federal and M&O senior leaders and subject matter experts from across the NSE.[ii] The team also interviewed select Department of Defense FFRDC program leaders and former or retired NNSA and national laboratory leaders.[iii]

The EDMI team greatly appreciates the time, thought, and responses from all the participants in this review, including the candid nature of the conversations. The issues the team identified and the recommended actions would not have been possible without the participants' input. Any errors or omissions in this report are solely on the part of the authors.

Steven Ho and Jay Tilden, EMDI co-chairs

Executive Summary

It is vital to recognize that NNSA and its laboratory, production plant, and site partners are entering a new era in the nuclear security enterprise, and we collectively have an opportunity to determine the operating environment and direction of the enterprise for the next several decades. In the past twenty years, the enterprise created the highly successful stockpile stewardship program, oversaw the completion of one life extension program, the W76-1, and began constructing two major projects, the Uranium Processing Facility at the Y-12 National Security Complex and the Chemistry and Metallurgy Research Replacement Facility at the Los Alamos National Laboratory. Cost was an overriding concern and NNSA responded by implementing cost controls, award fee incentives on M&O contracts, and detailed program management controls to monitor cost and schedule. In the next twenty years, NNSA plans to complete five warhead modernization programs, build no less than six major construction projects, and rebuild numerous facilities and capabilities across the sites. Delivery of mission is becoming paramount while the fiscal environment is evolving from being cost-constrained to being cost-conscious.

During the team's site visits, most respondents agreed that the current operating environment will not get the enterprise to where it needs to be to meet mission. On the current path, warhead modernization programs, facility construction, and capability recapitalization will continue to slip and, even worse, we may not be able to attract and retain the needed workforce. In this new era, the contractual arrangements, processes, and relationship between the federal staff and the M&O workforce must change if we are to position the enterprise for the next 20 years or more.

After conducting exhaustive site visits and interviews, the EMDI team developed six major findings and twenty-one recommendations to aid the enterprise in changing its direction. The six findings are:

1. The existing M&O contracts, with a focus on award fee and one year contract extensions, are not appropriate for the special long-term relationship between the Government and an M&O contract which operates in the public interest, as envisioned by NNSA's FFRDC model. NNSA should evaluate transitioning back to the fixed fee contract model with five-year (or longer) extensions and review its contract and performance review processes to ensure transparency and agreement with the laboratories, plants, and sites.

2. The NSE is experiencing tremendous workforce attraction and retention issues, and NNSA controls and reviews on salaries and benefits are hurting, not helping, this situation. NNSA should allow the M&Os greater authority over salaries, benefits, and management of its workforce, while NNSA commits more resources to improving workspaces and to work with the M&Os to incentivize retired NSE staff to continue mentoring and advising the current workforce.

3. Reviews and risk acceptance have migrated from the site (M&O and field office) to NNSA headquarters, with an emphasis on compliance instead of risk-based approaches, leading to risk aversion at multiple levels within NNSA and the M&Os. Centralizing authority to NNSA HQ, combined with overlapping roles and responsibilities among HQ, the field offices, and M&Os, has created confusion and delay. Decision authority should be delegated to the field office manager and M&O as much as possible, particularly for operational and execution issues, along with commensurate accountability. NNSA should explore whether certain categories of decisions require any federal review and if they could be delegated to the M&Os. A risk-based approach should also be applied to procurement packages and commercial-like construction, with the application of suitable audits or waivers. Finally, appropriate risk- taking and associated risk management should be rewarded with various incentives.

4. The enterprise has a priorities alignment and personnel integration issue. The sites receive different priorities from each program office, which are often misaligned and/or in conflict. Headquarters staff often do not recognize the realities of competing program execution requirements in the field, and site staff (M&O and field office) can be unaware of the pressures driving headquarters data calls and decisions. The Administrator should issue a concise NNSA annual priority list that aligns with NNSA's strategic goals. Headquarters federal staff should participate in rotations or regular temporary duty to the field sites and simplify the interpersonal agreement process for M&O staff to aid integration and alignment.

5. Forty percent or more of M&O staff and a large percentage of federal workforce have less than five years of experience in the nuclear enterprise. This lack of experience has resulted in a loss of understanding of how the federal and M&O staff historically interact in NNSA's FFRDC model. This, combined with the exponentially increasing workload and unyielding schedule demands, has led to a dramatic increase in federal program controls and low-level technical direction from the federal program managers. At the same time, the laboratory, plant, and site staff have constricted or deferred their traditional roles as the long-term technical experts for the government and have not effectively integrated across the enterprise. The solution is not more controls, but less federal management at the lower levels, and more senior level agreement overseen by federal managers. The design agent and production agent relationship should also be rebalanced to give each more equal authority, and both the design and production agents should be jointly accountable for product delivery to a production schedule.

6. There is no integrated plan to recapitalize the science, technology, and engineering base. NNSA should work with all M&Os to develop an integrated plan with time-phased investments to recapitalize facilities and create new capabilities and technologies while revitalizing the workforce.

The EMDI team acknowledges some of these recommendations are not new and that significant work is already underway by various working groups to address aspects of these issues. The team's goal is that this report forms a strategic foundation to synchronize these different efforts and to prevent various initiatives from being at cross-purposes. Time is short to evolve our mindset and to allow NNSA to both deliver on its commitments to the nation and remain an enduring and responsive enterprise for decades to come.

Section 1 - Restoring Stability in the FFRDC and Nuclear Production Base: Contracting

Restoring stability will require intertwined structural efforts that reinforce evolving cultural behaviors identified in previous reports and assessments. The core of NNSA's operating model is stewarding and guiding an array of FFRDCs (NNSA's national laboratories) and M&O entities (the laboratories, production plants, and Nevada site) to sustain the fundamentally governmental duties as ensconced in the nuclear weapons enterprise. While a review would indicate that NNSA's plants and site do not technically meet the FFRDC definition, a plain language reading of the Federal Acquisition Regulation (FAR) shows substantive descriptive overlap of the laboratories, plants, and site. This report will therefore make little distinction between the M&Os (all sites) and the FFRDCs (laboratories only), particularly as the same special long-term relationship exists between all M&Os and the Government. This relationship will be referred throughout this report as the "FFRDC model."

Below is an extract of FAR, Part 35, subpart 017. The underlined portions are those areas that may not be in alignment with the current NNSA FFRDC model:

> *"An FFRDC meets some special long-term research or development need which cannot be met as effectively by existing in-house or contractor resources. FFRDC's enable agencies to use private sector resources to accomplish tasks that are integral to the mission and operation of the sponsoring agency.*
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> *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. The FFRDC is required to conduct its business in a manner befitting its special relationship with the Government, to operate in the public interest with objectivity and independence, to be free from organizational conflicts of interest, and to have full disclosure of its affairs to the sponsoring agency. It is not the Government's intent that an FFRDC use its privileged information or access to installations equipment and real property to compete with the private sector. However, an FFRDC may perform work for other than the sponsoring agency under the Economy Act, or other applicable legislation, when the work is not otherwise available from the private sector.*
>
> *FFRDC's are operated, managed, and/or administered by either a university or consortium of universities, other not-for-profit or nonprofit organization, or an industrial firm, as an autonomous organization or as an identifiable separate operating unit of a parent organization.*
>
> *Long-term relationships between the Government and FFRDC's are encouraged in order to provide the continuity that will attract high-quality personnel to the FFRDC. This relationship should be of a type to encourage the FFRDC to maintain currency in its*

field(s) of expertise, maintain its objectivity and independence, preserve its familiarity with the needs of its sponsor(s), and provide a quick response capability."

The two underlined statements are related and point to potential conflicts of interest given NNSA's movement to an award fee contracting model. This model introduces potential conflicts of priorities between the parent companies, their boards' goals, and the separately organized M&O entity. These clashing goals can play out in odd ways as they execute work among the various (and sometimes jointly owned) NSE entities and when they prepare to compete for upcoming contracts. Throughout our numerous interviews, two main themes against continuing the award fee model were repeated. First, the award/performance fee was not a motivator for the vast majority of workforce across the enterprise and the award fee was not motivating to the highest levels of the laboratory and plant/site leadership. The award/performance fee often led to a misalignment of the senior leadership and the corporate board in their desires to score well. Second, save one NSE entity, the remaining NSE senior leadership were unanimous that the parent companies did not provide substantive or lasting benefit to the NSE entities. The singular positive outcome of the award fee structure was provided by the acquisition office in that the number of corporations competing/bidding for the contracts was dramatically increased. The value of continuing this model is unclear if substantial cost savings are not realized and if the corporate parents are not delivering a substantive benefit.

Given the baseline of similar attributes of the FFRDC model across our M&O partners, this mix of award and fixed fee model is the main anomaly in how NNSA executes its M&O contracts[iv]. The interviews we conducted reflected what previous evaluations and reports had said about the award fee model, namely that it had a detrimental effect on the relationship between the federal and M&O workforce, that it undermined the long-term relationship and diminished the public interest aspects of this unique nuclear deterrent mission. The award fee should be dramatically reduced and attached to only those tangible and high priority areas within the contract, as reflected in the Performance Evaluation and Measurement Plan (PEMP) or eliminated and replaced with a fixed fee. Another incentive option to investigate is the use of performance-based contract extensions in lieu of award fee. Award fee structures for more complex construction projects are entirely appropriate and should be retained. It is only the use of award fee incentives in M&O contracts, not construction contracts, that has caused unintended negative consequences. The team's first recommendation is that NNSA should fully evaluate the long-term benefits of discontinuing the award fee approach to contracting.

Recommendation 1 – NNSA should develop a plan to discontinue the award fee contracting model, returning to intent of the FFRDC concept.

Another fundamental step toward restoring balance in the NSE's long-term relationships and sustaining an expert workforce is to revise the current contracting approach by moving to initial base years and subsequent option years. Field office, Headquarters, and M&O interviewees

were nearly unanimous in their view that the current paradigm of a five-year base period plus one or two-year extensions sends the implicit signal that NNSA intends to recompete the contract at its conclusion. Given its recent history of recompetes, NNSA appears to default toward recompeting contracts without regard to contractor performance or impact on ongoing Life Extension Programs or weapons technology development activities. All field office and M&O interviewees, and select Headquarters interviewees, stated that the recompete process absorbs leadership attention for about two years, the year before the competition and the year of the transition. Contract competitions and transition periods also disrupt procurement processes and line programs. Additionally, given the high number of at-risk senior leaders who must leave at the end of the contract, plus those who must recompete for their current positions (roughly 70-120 employees per location), the perceived threat of contract competition is arresting career development as those professionals just below the "at-risk" level are passing on promotions, especially after year four of the initial five-year period.

The perceived assurance of major M&O contract competition, combined with small extension periods, is counter to the spirit and intent of the FFRDC model. This instability in contract vehicles breeds instability in the workforce, in long-term programmatic efforts, and undermines the long-term relationships between the scientific and production workforces and NNSA. The team's second recommendation is that NNSA should immediately transition to using M&O contracts with a base period of five years and performance-based extension options in five-year increments.

Recommendation 2 – NNSA should transition all M&O contracts at our national laboratories, plants, and sites to a five-year base period with performance-based five-year extensions.

The transition from a contracting model tailored to cost control for discrete programs or projects, such as large capital construction, to a "cost conscious" long-term relationship of the FFRDC and M&O model, presents an opportunity to review and revise the contracts in detail so both the federal and laboratory/plant/site leadership understand what elements are helpful or detrimental to the FFRDC/M&O model, and to streamline the contract. The Office of Science conducted a similar review and revised its contract at the SLAC National Accelerator Laboratory under the "Revolutionary Working Group," and found it provided great benefits. The Office of Science discovered that value centered on the process to get to a streamlined contract, as it brought the federal and laboratory leadership and staff in alignment on what precisely was in the contract and the minimum required regulations and policies. This process took a year and involved 10- 12 smaller working groups. The result was SLAC could use the Stanford University human resources system to enable greater hiring flexibility, did not require a detailed Compensation Increase Plan, and certain DOE Orders were excluded from the contract.

Recommendation 3 – NNSA and the M&Os should review the existing NNSA contracts, using the Office of Science "Revolutionary Working Group" model, to streamline the contracts and gain alignment on the contract scope and requirements.

The last steps toward restoring balance in the relationship between the NNSA and the M&O workforces, along with improving mission delivery, are adjustments to the current Performance Evaluation and Management Plan (PEMP) and the Performance Evaluation Review (PER) process. The preponderance of our interviewees, regardless of status (federal, M&O, field, or Headquarters) believed the PEMP was not strategic (i.e., not clear in priorities that matter), was too opaque in the drafting/development process, and was too time consuming. The PER was seen by the M&Os uniformly, as well as many federal interviewees, as too subjective and too attenuated to the most recent "incident" or project delay, versus incidents or project delays that had a strategic or major impact. Headquarters views in evaluating the site/M&O performance often differed substantially from the field office, leading to periodic field office feedback to M&O leadership that did not represent the final evaluation review language and score. Further, the M&O interviewees were near unanimous that the lack of transparency in both the PEMP and PER led to surprises in evaluation language and little recourse to comment, rebut, or address factual inaccuracies or subjective evaluations with other perspectives. Often, negative feedback was not timely and did not allow the M&O to address the issue before a final PER was released. This "one way" evaluation process does not reflect the shared fates of NNSA, the M&O workforce, and our national mission. The lack of transparency is also corrosive to the trust in the long-term relationship between the leadership cadres of the federal and M&O entities.

As concluded in a recent "listening session" with M&O leadership, many of these issues can be easily resolved. First, the PEMP should be drafted and shared across Headquarters program offices with substantial equities, and then shared with the field offices and the M&O partners to allow for review and feedback, especially on those strategic outcomes that must be delivered (see also Recommendation 12). Once approved, this type of transparent approach will strengthen the focus of the M&O and the PER process in the periodic and final reviews. A similar approach with the PER is also recommended. While the federal programs are the ultimate arbiter of the qualitative evaluation, the periodic and final language (sans final score) should be shared in draft with the M&O to allow for any additional considerations, clarifications, or corrections. Federal staff should receive some PEMP/PER training to ensure objective writing that minimizes over-personalization of a given issue. The team recommends a more transparent approach for both PEMP development and PER draft language to allow for

greater alignment of NNSA's strategic goals across sites and for meaningful feedback from the M&O leadership reflecting workforce achievements and constraints.

Recommendation 4 – NNSA should adjust the PEMP development and PER feedback process to be more transparent, allowing for meaningful feedback prior to finalization.

Section 2 - Restoring Stability in the FFRDC and Nuclear Production Base: Workforce

The expert workforce is the central enabling tool of the FFRDC model. It allows for the execution of the unique mission inherent in the governmental nuclear weapons enterprise. Without the ability to "attract high-quality personnel to the FFRDC" the nuclear weapons enterprise may be at risk. Attracting scientific, technical, and trades personnel, while challenging, is not the most significant current issue. The M&O organizations must be able to retain those specialists "to maintain currency in its field(s) of expertise, maintain its objectivity and independence, preserve its familiarity with the needs of its sponsor(s), and provide a quick response capability."[v]

One overarching theme from virtually all interviewees is the challenge of remaining competitive in the current job market, and the difficulties in both attracting and retaining qualified personnel. The largest single workforce demographic (in terms of years of NSE experience in 5-year groups, e.g., 1 – 5 years, 6 – 10 years, 11 – 15 years, etc.) across all NSE organizations was that of employees with five years or fewer in the enterprise, averaging roughly 40 percent (some locations being much higher). Some recruitment and retention factors cannot be completely changed, such as moral dilemmas about nuclear weapons, desires to transition to full-time remote or work-from-home status, the complications of acquiring or maintaining security clearances, and specific locality preferences. Aside from the above situations, there are many tools to mitigate the current recruitment and retention challenges. Some tools include direct compensation, an improved approach to initial salary offers that reflect a "best in class" workforce as opposed to salary adjustments that are just above the market average. Other tools include indirect or variable compensation like the ability to adjust paid days of leave to meet highly qualified candidate expectations, educational loan forgiveness, relocation or signing bonuses, and authorization to allow for hybrid work agreements. Interviewees also mentioned more difficult tools including a type of portable defined benefit pension 401(k) with vesting that could transfer across multiple M&O entities. This would allow an employee to transfer across locations without penalty and with an incentive to stay within the NSE.

While the team could list additional and creative ideas for recruitment and retention that were provided by our interviews, the larger take away is NNSA should reconsider how it sets such boundary conditions on direct and variable compensation. These basic employment terms are

normally within full control of an employing organization, yet currently as structured, requires the M&O to engage in often lengthy negotiations and await written determinations from NNSA. This system is not responsive to the current marketplace. The team recommends that to attract and retain a world class workforce, NNSA should, in consultation with M&O leadership, reduce and/or remove certain controls on M&O employee compensation and transition to a more budget-based allocation within which the M&O human resources department can self-manage.

Recommendation 5 – NNSA should dramatically reduce or remove internal controls governing M&O employee direct and variable compensation and allow the M&O to manage their workforce within a given budget.

Two other important, but perhaps less obvious, tools exist to assist with workforce retention and satisfaction. One relates to improving the physical structures in which we place our workforce and the other relates to establishing a contractual vehicle for our retiring senior M&O personnel. Regarding our physical infrastructure, NNSA should redouble its ongoing and laudable efforts to fund both replacement and remodeling of the office spaces, light laboratories, and light industrial space for its federal, laboratory, plant, and site workforce. A well-kept, modern, and maintained workspace is an important aspect of pride and job satisfaction, especially when we are asking our employees to return from COVID-mandated telework. Classified spaces, as well as unclassified offices for those either awaiting clearances or not needing to work in cleared spaces should all be reflective of our state-of-the-art science and mission.

Recommendation 6 – NNSA should redouble its efforts to improve and modernize workforce offices (secure and unclassified), light laboratory, and light industrial spaces for its federal and M&O personnel.

During the teams' interviews, multiple M&O locations mentioned a lack of a flexible vehicle to retain veteran program managers and senior engineers/technical experts on critical weapons development and production work once they retired from the organization. The post-employment authorities covering pension-drawing retirees were considered too limited and restrictive to develop a reserve cadre of these much-needed M&O senior experts. Ironically, some of these individuals gravitate toward support service contractor companies that support NNSA Headquarters and field offices. While this practice does keep the expertise "in the

family," and aids the program offices with mitigating their own challenges due to brain-drain, it has two negative consequences. First, we are effectively robbing much needed experience from the laboratory, plant, or site main lines of effort and reallocating that experience to the overseeing or headquarters programmatic functions. The second negative effect is to further blur the defined relationships between the government (the "what to do") and the M&O organization (the "how to do it"). As a former M&O employee in a support service contractor position with the federal program manager, an expert who was the lead or senior member of a given M&O weapons effort last week could suddenly be on the other side of the table and speaking to former team members or subordinates from an ambiguous position of authority. While retaining this senior and experienced depth of knowledge is valued in either field or programmatic position, the team strongly believes that the default should be aligning this resource to support our primary mission, to deliver on that weapons-related program or production line. Acknowledging that individuals are free to determine their future employment status, the team recommends that NNSA work with the M&Os to develop some type of contracting vehicle for these senior retirees, to incentivize their support of the ongoing primary efforts of the M&O missions while de-incentivizing their migration to headquarters oversight roles as support service contractors. This would greatly aid in clarifying roles and responsibilities of headquarters and the M&Os.

Recommendation 7 – NNSA should work with the M&Os to develop a common plan to allow M&O annuitants and retirees to be compensated fairly for post-retirement service that contributes to the delivery of the primary NNSA missions. This plan should identify legal risks, internal M&O policies, and any DOE/NNSA policies that restrict direct service of annuitants/retirees to the M&O and avenues to address or accept the risk and any necessary policy changes.

Section 3 – Risk Aversion and Removing Obstacles

As many previous reviews, like the Mies-Augustine, NAS/NAPA, and CRENEL have reported, risk aversion has deeply penetrated NNSA Headquarters program offices, field offices, and the M&O leadership and workforce. Risk aversion can manifest itself in many forms but ultimately it is the belief and related behavior that risks must be eliminated instead of managed or accepted. One example is the conservative, narrow view of one's own area of responsibility, especially when there is a high degree of distance from the primary design or production work, in areas like safety, security, contracting, or management/oversight, and the desire to eliminate programmatic risk. In these important, but ultimately enabling and supporting lines of effort, the singular focus on the primacy of the supporting line of effort is often without due consideration of and out of proportion with the integrated view of the larger mission objective, the sustainment and modernization of the stockpile, or the global security deliverables. Security, safety, contracting, and oversight are not secondary missions, but rather how the NSE

accomplishes the mission objectives in accordance with statutory, regulatory, and policy requirements. The questions therefore are: what are the actual requirements in the supporting functions; and who determines the balance of those requirements against mission objectives?

A myopic process goal that ensures little to no risk to contracts, cost savings, security infractions of any kind, or de minimus safety incidents (i.e., a torn glove in an operating glovebox) can lead to deadlock without regard to actual risk to the larger or primary mission. Risk aversion is the accumulation and interpretation of requirements, procedures, and processes that must be completed before an action or decision is taken. Individually, each requirement, procedure, or process may not significantly impede progress and in fact was put in place to address previous deficiencies, but cumulatively they create what our interviewees termed "friction in the system." The net effect of this friction is implicit or delegated authorities to avoid risk is broad and dispersed to many functional, programmatic, and operational elements but actual explicit authority to accept risk is often unclear and restricted to very senior levels within the M&O or NNSA. As one interviewee put it, "Only in NNSA is 99 in favor and 1 opposed considered a tie." Additionally, numerous interviewees discussed how multiple reviews and concurrences consume much time, engender lots of debate, but seldom substantially change the original product or plan content. Finally, many interviewees discussed the challenges of meeting the tempo of changes to existing requirements as well as the implementation of newer requirements. In a few cases, some requirements were developed without any or only limited consideration of the operational impacts or the inherent nature of the activities and their associated facilities. The team recommends four actions to address risk aversion.

Recommendation 8a – NNSA should review major processes and procedures to reduce complexity and standardize implementation of requirements across sites. NNSA should develop the criteria, including first the definition of roles and responsibilities, for delegation of approvals from the Headquarters program or functional offices heads to the cognizant Field Office Manager or lower level, particularly those involving operational and execution decisions.

Recommendation 8b – NNSA should explore giving M&Os greater approval and decision authority for operations and programmatic execution without a priori federal review. Federal roles would shift to evaluation of outcomes a posteriori to determine if additional direction is required.

Recommendation 8c – Where such delegation is not feasible, NNSA should explore establishing suspense date timelines for approval requests at Headquarters, with the default being request approval at the end of the timeline.

Recommendation 8d – NNSA should implement improvements in how new or changed directives/requirement sets are accepted by NNSA. Directives process improvements should focus on the need for more formal justifications, cost and mission impact determinations prior to their promulgation, and greater coordination with impacted Field Offices and M&O organizations.

Given that our current processes often lack a risk-based or systems approach to oversight, they have instead become compliance-based. For example, the team heard from multiple sites the same issue regarding inconsistencies in procurement package processes. Although the M&Os had NNSA-approved procurement policies and procedures in place, procurement packages valued less than $5 million were routinely reviewed at both the field and headquarters level, taking weeks "in process," then returned with few or minor edits. These reviews were regularly applied to procurements that were relatively routine and low risk. Each M&O organization is conducting hundreds of millions of dollars in procurements every year. This review process, vice a periodic audit of the completed procurement packages in accordance with their approved corporate procurement policies, defeats the delegated ceiling on procurements under which the M&O should be free to execute. Given that approved M&O procurement processes are in place, the team recommends terminating the current "review to approve" approach to procurement packages and a shift to sampling and auditing already approved and executed procurement packages.

Recommendation 9 - NNSA has developed and should enforce a risk-based audit process for contracting actions and procurement packages based on an approved M&O contracting system. Package approvals should cease unless audits reveal a systematic issue. NNSA should also uniformly raise procurement approval thresholds to a standard value, e.g., $20-25 million, and apply it to subcontracts as well. This threshold may be lowered at a site if the M&O contracting system fails multiple audits.

Another often repeated concern was the dueling nature of DOE order requirements and state or local construction codes. A risk-based approach would also serve NNSA well in executing commercial-like construction projects, such as office buildings or light manufacturing/ laboratory space. These buildings are required to follow the construction codes and standards of 10 CFR Part 851, *Worker Safety and Health Program*, instead of the commercial codes and state safety standards prescribed by OSHA or state-specific standards derived from OSHA. Additionally, if the project cost exceeds $50 million, the project must also follow the requirements of DOE Order 413.3B. While the Order is appropriate for moderate to high-risk, unique or "first of a kind" industrial facilities that deal with hazardous chemical or nuclear materials and processes, it should not apply to low complexity commercial buildings or light manufacturing spaces. The team strongly encourages NNSA, where possible, to reduce competing regulatory and DOE Order requirements from those that are adequately covered by overarching federal and state codes and standards.

Recommendation 10 – NNSA should use the existing exemption process to waive low risk commercial-like construction (e.g., office buildings, light manufacturing facilities) from DOE Order 413.3B requirements. Their construction should follow commercial building codes, and wherever possible, adopt approved OSHA and state safety standards, e.g., Cal/OSHA. NNSA should request Congressional approval to raise the threshold for minor construction/general plant projects from $25 million to $50 million or $100 million.

Many interviewees noted there is no reward for risk taking or risk acceptance, either by the M&O or federal staff. In fact, there is a general tendency to not accept risk at the sites. One common refrain was this is due, in part, to the collective lack of experience in the NSE at the sites given that roughly 40 percent of the workforce has less than 5 years of NSE experience. At some sites, new hires exceed 50 percent of the site workforce. This inexperience, particularly on the product realization teams (PRTs) supporting the warhead modernization programs, leads to the laboratory being very conservative in testing requirements and overly restrictive in design requirements, while continually striving for design perfection instead of simply meeting requirements. In some respects, the FFRDC model, whereby the M&O is the long-term institutional memory and provides technical expertise to the Government, is not where the enterprise is today (see recruitment and retention in Section 2). As one senior interviewee said, "The Labs today are not acting like FFRDCs of 15 years ago. They have forgotten how to manage risk."

If the enterprise is to deliver on its mission, the labs, plants, and site should be empowered to accept risk, manage it appropriately, and be held accountable for delivering on schedule. In practice, this means people must be rewarded for taking risks; processes and procedures should be risk-based and uniformly applied across the enterprise; approval authority should be delegated to the lowest level, ideally the field office manager; and commercial construction should be treated as low risk.

Recommendation 11 - NNSA should develop improved training for federal and contractor program managers that defines the special M&O and FFRDC relationship, identifies the unique role each side plays, and encourages the assessment of risk. NNSA should reward risk taking and associated risk management by M&O and federal staff that balances mission, security, safety, and other requirements. Rewards can be in the form of recognition, monetary, or career promotions.

As a related function of Recommendation 8a and 8b, NNSA and the M&O leadership should jointly determine what risk acceptance can be delegated, recognizing that NNSA will always own the risk. M&O leadership should also conduct an internal review of their risk acceptance levels to achieve a similar approach in delegating risk acceptance.

Section 4 – Restoring Trust and Innovation

Alignment

Restoring trust and innovation begins with recognizing there may be both minor and major priority misalignments among NNSA, the M&Os, the corporate boards overseeing the M&O organizations, and external stakeholders. In addition, within NNSA there is often misalignment on strategic and tactical priorities between the program, functional, and field offices. On the first issue, the goals of NNSA, the M&Os, corporate boards, and external regulators do not align because of the goals, incentives, and risk acceptance structures. For more than a decade, NNSA's goal has been largely to deliver systems (usually one at a time) to DOD, and NNSA has accepted great risk to meet mission schedule while receiving blunt criticism from DOD and Congress. The M&Os, meanwhile, must integrate mission priorities from disparate NNSA programs, other national security missions from external agencies, and maintain its workforce and unique capabilities while often being unable to accept major risks. From our interviews, almost all major operating locations stated the goals of the corporate boards are often to ensure the fee is not jeopardized, to protect the reputation of the corporate parent, and therefore to minimize risk exposure. Finally, external stakeholders such as the Defense Nuclear Facilities Safety Board or the Department's Office of Enterprise Assessments are focused on eliminating risk in a single area, like safety or security, without regard to the mission impact.

Internal to NNSA, inter-program integration and prioritization is lacking. Nearly every program office and many functional offices have an annual "Get the Job Done List" or similar priority list, aligned by major office or funding account. These lists are not integrated with other program or functional offices and do not always track with priorities as stated in the PEMP. Headquarters' lack of strategic integration leads to "prioritization collisions" at the sites between the various accounts (weapons, facilities & infrastructure, nonproliferation, incident & emergency response, SPP and SIPP work), leaving the M&Os to juggle resources. Adding to this complexity is the diffuse way communications flow to the site management (M&O or field office) about priorities, often driven by the Budget and Reporting (B&R) code owner. In alignment with Recommendation 4, the team recommends that the NNSA Administrator, via the Management Council, develop an integrated strategic priorities list that align and drive the PEMP process. This integration will help to align NNSA, the M&Os, corporate boards, and our position with external, non-NNSA key stakeholders.

Recommendation 12 – NNSA, as part of the revised PEMP process, shall develop and provide an integrated and prioritized NNSA mission deliverable list across all aspects of the NNSA portfolio to each operating location. This list should reflect the Administrator's highest priority mission deliverables for the year and align with the NNSA's strategic goals. The list should be developed during the planning phase of the annual planning, programming, budgeting, and execution process. "Get the Job Done" lists may supplement the strategic priorities but cannot obstruct them.

Once the administrator's priorities are set, further integration can be achieved by exposing more key staff to the actual project locations. Even with the recent advances in virtual workspaces and telework due to the COVID-19 pandemic, geographic distance matters. The team believes there is a lack of empathy between these disparate geographic workforces. The team believes members of the workforce need to "travel a mile in someone else's shoes" to gain a more balanced perspective of the challenges facing the agency. These onsite (and cross-site) "collisions," be they programmatic, technical, infrastructure, or regulatory, will come into greater focus to the federal staff in D.C. and Albuquerque through regular TDY or rotations to the sites. This direct knowledge, understanding, and even personal relationship-building may also lead to more creative and reduced decision-making timelines. The same is true of our laboratory, plant, and site personnel. Distance from D.C. removes context from many field employees' view. How Congress, the DOD, the combatant commands/Intelligence Community, state, and non-governmental organizations exert influence on the NNSA is often a mystery to our workforce. Improving our Intergovernmental Personnel Agreements (IPA) process and making TDY opportunities not financially challenging for national laboratory, plant, and site employees would increase the pool of potential candidates. These rotations expose them to the very real aspects of federal government conflicts and would enhance Headquarters

understanding of the field entities perspectives on the same issues. The team recommends two improvements in workforce rotations to better integrate the agency, recognizing that these are only the start of many initiatives required to maintain an overarching commitment to workforce development and sustained career management.

Recommendation 13 – NNSA should redouble efforts to rotate or send on regular/extended TDY headquarters program and functional staff with decision authority to the sites to work directly with the field office and M&O workforces in execution of programmatic work.

Recommendation 14 – NNSA should work with the department to develop a simplified approval process for IPAs and a financially neutral approach to extended TDY or rotations for M&O employees to encourage effective interaction between HQ and the field expertise.

Restoring Relationships

During the EMDI site visits it became apparent that, although the M&O and federal staff observe the same issues, there are differing perspectives and disagreement on the cause(s) of those issues, much less on how to fix the problems. The team has attempted to develop the recommendations thus far to balance these differing perspectives. We will use the specific example of the life extension programs (LEPs) to dive more deeply into these differing perspectives. Both parties agree that the number of data calls, reporting requirements, project controls, and reviews have dramatically increased on each program starting from the W76-1 LEP to the B61-12 LEP and W88 Alt 370 to the W80-4 LEP. The latest program, the W87-1 Mod, shows no sign of changing this trend with Sandia National Laboratories (SNL) estimating they will need four project controls departments on the W87-1 compared to a single project control staff member on the W87-0.

From the viewpoint of the national laboratories and plants, NNSA is focused on LEP process rather than technical execution. This focus is seen as burdensome and often does not add value. Over the course of the site visits, this became known as “the process becoming the product.” The laboratories pointed out that earned value management (EVM), which they did not view as useful during the development phase of the LEPs, required reporting out multiple times per month. The number of briefings to the Federal Program Managers (FPMs) and their staff, let alone the associated pre-brief meetings and even pre-pre-brief meetings have dramatically increased as the sites meet ever-increasing appetites for information/data so that the FPMs can attend “Government Only” meetings. Some sites estimated that up to 50 percent of their mid-level and senior-level managers time is spent “managing” the FPMs in Albuquerque or D.C. The level of federal change control has decreased to $250,000 while the number of

budget and reporting lines has grown from a handful to over 400. In addition, the number of milestones and "inchstones" reportable to federal staff has grown, with one production site reporting there were 23 Level 2 milestones, 130 Level 3 milestones, and 112 Level 4 milestones for one program alone.

The national laboratories collectively believe they are not being allowed the necessary freedom to operate as FFRDCs and due to inexperience in the federal ranks, are treated as typical defense contractors, like Boeing, Raytheon, or Lockheed Martin. The erosion of experience (in both the federal and M&O workforces) manifests itself in transactional ways, with the FPM giving what becomes technical direction and acts as the decision maker on technical issues instead deferring to the M&O partner as the technical lead. The laboratories also believe that the federal staff overly manage the PRTs and integration of the sites (Design Agencies/Production Agencies, DA/PA), which inhibits direct, frank, and transparent collaboration and identification/resolution of issues. As a result, risk is not being accepted by the sites but instead is either directly or indirectly accepted by the FPM. As one site put it, "We can't go fast unless the NNSA goes fast because the NNSA is intertwined in the decision process."

The federal viewpoint is understandably different and primarily based to the M&O workforce inexperience and the collective loss of understanding by the laboratories and plants on how to act as FFRDCs, and how to integrate across the sites. The laboratories often do not provide options on technical issues and now default to asking for permission from the FPM to implement any given technical solution. In addition, the communication between the DA and PA and inter-site coordination are both lacking. As the laboratories and plants have not stepped into the integration void, the FPMs believe they need to step in to integrate all parties and focus on a solution quickly. Here, the FPM perceives they are the programmatic integrator of cost, scope, and schedule, while SNL acts as the engineering and technical integrator for requirements; with the caveat that technical issues are programmatic issues, so the federal team must understand the technical aspects as deeply as the laboratories. Since the LEP federal program offices are relatively lightly staffed (most have roughly a dozen federal staff), many service support contractors have been hired to do programmatic integration and are empowered to get data from the PRTs so the federal staff can integrate across the sites and prioritize activities. In most program offices, these support contractors outnumber federal staff by 2-to-1. Anecdotally, a number of these support contractors are former senior laboratory or plant staff who are now asking for data and answers to questions from the same PRT staff they once directly managed. Refer to Recommendation 7 for more on this problematic dynamic.

We all must recognize there has been a shared loss of understanding on how the M&O and federal partners have historically interacted in this unique FFRDC model. The FPMs, often with more D.C. context in mind (demands from the Nuclear Weapons Council, STRATCOM, NNSA Headquarters, OMB, Congress, etc.), have taken the lead in programmatic direction that often overlaps technical direction and are providing this direction more often and at a much lower level than before. Conversely, the national laboratories and plants have receded in or deferred their traditional roles as the long-term technical experts for the government and have not effectively integrated across the enterprise. The team believes the only way to reset the

relationship and meet the many deliverables is not through more process control, but through less process control by incrementally returning to the original intent of the FFRDC model. This would mean less federal management at the lower levels and more senior level agreement, overseen by federal managers. This emphasis on less direct or less transactional oversight does not mean the federal managers will become hands off, rather they will focus on the most important issues rather than the multitude of less important ones. This also means treating the FFRDC experts as full members of the team. Fewer "fed-only" meetings will result in less "train-up" of the federal staff and more direct involvement by the M&O experts. The team recommends an Office of Defense Programs led effort to streamline and reduce the years of accrued process and program controls and reviews that are consuming significant manpower. This streamlining effort should hold the sites accountable for the technical execution of the program and incentivize them to work as team while providing transparency to the federal program office.

Recommendation 15 - The federal program staff should rely upon a standard set of schedule and execution data that sites automatically generate and minimize specialized data calls requiring manual manipulation. The number of "Federal only" meetings should be held to a minimum and the M&O technical leads should be incorporated, where possible, to brief directly to internal and external groups, including the DOD, Congress, etc.

Recommendation 16 – To achieve the desired culture change, NNSA's Office of Defense Program should review and reduce process and program controls through a joint HQ, field, and M&O group with the goal of holding the sites accountable for technical execution of the program and incentivize cross-site teamwork while providing transparency and keeping federal managers informed of emergent issues with major cost and schedule impacts.

Another area that NNSA and the M&O partners can improve is clarity and balance in the Design and Production Agencies' (DA/PA) roles and responsibilities. The team heard similar issues but different perspectives between the DAs and the PAs, but ultimately assessed that a more balanced relationship is needed, with equal responsibility and accountability for final product delivery. This way, both the DAs and the PAs can focus on technical execution and provide early warning of issues with mitigation plans to each other and to the FPM. If they do not achieve the strategic overarching goals, or consistently fail to provide clear and sufficient warning, they should be held accountable per the PEMP/PER process and other means, including and up to change in M&O leadership. Finally, although this discussion has been

focused on the LEPs, these recommendations are equally applicable to many programmatic activities across NNSA missions.

Recommendation 17 – NNSA's Office of Defense Programs should lead a review to rebalance the DA and PA relationship so there is more equal authority and accountability, including a risk-based process for design and production acceptance. The DAs and PAs should have a shared fate so that they are jointly accountable to a production schedule for a product that meets threshold requirements. This review should also clarify the technical, engineering, and programmatic integration role between NNSA, SNL, and the rest of the nuclear security enterprise.

Innovation

The nuclear security enterprise is currently riding a wave of production modernization from the 2020s through the 2030s. Pit production facilities, strategic materials facilities, and high explosives and tritium production buildings are either being built or in the planning stages. The interviewees were clear that there is not an integrated, long-term plan across the NSE to recapitalize and revitalize the science and engineering capabilities and infrastructure that underpins our nuclear deterrent. NNSA may not be able to sustain or deliver the new science and predictive capabilities needed to meet emerging or future national security and nuclear challenges if we do not start investing now

Many of NNSA's premier high energy facilities, radiation, environmental test facilities, and subcritical nuclear test infrastructure are considered relatively new and well maintained but are often decades old. The signature facilities average is 20 years old, with Z Machine refurbished in 1996, DARHT opened in 2000, and NIF completed in 2009. In addition, while each laboratory and plant are investing in new science and engineering capabilities, it is hard to discern an NNSA-wide, strategic NSE plan, such as the ones published by the Office of Science. To avoid a wave of science and engineering modernization in the 2030s and 2040s or, worse yet, be in a situation in 2035-2040 where a needed capability has either atrophied or is not available because it was never planned, a strategic plan for S&T facilities and capabilities should be developed by the laboratories, plants, and site and approved by NNSA. Perhaps even more acute, a strategic plan including stable and predictable funding for the Nevada National Security Site is needed now as decades of underinvestment in basic infrastructure has put at great risk the ability to provide basic utilities and services for advanced testing, experimentation, and other national security activities at the site. The team recommends that NNSA, along with its M&O partners, embark upon a strategic plan for the maintenance and recapitalization of the RDT&E infrastructure, covering everything from light laboratory and general experimental infrastructure to major new science and engineering capabilities/facilities.

Recommendation 18 – NNSA should develop an integrated strategic plan among its M&O partners to revitalize the science, technology, and engineering base. To inform the annual planning and budget programming process, this plan would call for time-phased investments in new and recapitalized facilities, capabilities, and investments in the S&T workforce.

While this report and the team were focused on problems, barriers, and solutions, we were also struck by the dedication of the workforce, and their desire to meet the nation's needs and to deliver the mission. We stopped using the term "go faster" because our workforce is already moving quickly. The infrastructure and workforce set 10 years ago was based on a much smaller demand signal than the missions facing us now. Our people and our facilities are rising to the occasion. NNSA's Office of Infrastructure (NA-90) was lauded for its Master Asset Plan. Some of the innovative approaches to new technologies and facilities are a product of our workforce figuring our creative ways to beat the system. We should encourage more of this innovative thinking, more ways to "sidestep" what appears to be intractable processes and barriers. The Polymer Enclave is one of those stories worth sharing.

The new Polymer Production Enclave is a noteworthy example of restoring trust and innovation within the NSE complex. The Enclave concept is designed for the rapid development of polymer additive manufacturing materials and technology, including technology maturation, while supporting seamless transfer between Livermore DA and Kansas City PA partners. The explicit goal of the Polymer Enclave was to accelerate deployment of Direct Ink Write silicone extrusion technology for use in NNSA programs of record. Key elements include co-development of technologies based on equivalent deployed capabilities at both Livermore and Kansas City, accelerated design down select and reduced time to rate production. It also functions as a testbed for concepts which are intended to accelerate qualification such as digital twins and on-machine metrology.

This new approach towards rapid, collaborative product realization was possible thru enhanced DA/PA and NNSA partnerships. At Livermore, close partnerships with Laboratory and NNSA Program/Field Office organizations were required to enable the quick conversion of a facility already under construction to the new Polymer Enclave mission. At Kansas City, manufacturing floor space constraints were successfully addressed since like processes enable Livermore to produce development/certification test objects and future surge capabilities as needed. The Enclave approach is demonstrating how disruptive manufacturing technology can be accomplished thru innovative approaches and strong partnerships and should be explored for further applications within the NSE.

Conclusion

The significant expansion of work combined with the urgency to modernize our enterprise's aging infrastructure has created both weighty challenges and yet incredible opportunities. Engagement and discussion with over 250 senior leaders and subject matter experts across the sites (both federal and M&O) confirmed agreement that the current operating environment will not get the enterprise to where it needs to be to meet all mission needs. These engagements led to the identification of key obstacles, challenges, and many noteworthy ideas that the EMDI Team binned into the themes of restoring stability in the FFRDC and production base though contracting and workforce changes; reducing risk aversion and removing obstacles; and restoring trust and innovation.

Twenty-one recommendations for action were created to address the above themes. These individual recommendations are not all encompassing and specific follow-on implementation options will need to be further developed. In some cases, many current initiatives are already underway or new ones are being created that may overlap or are already consistent with the recommendations put forth by the EMDI Team. Some of these initiatives are managed by existing working groups or individuals. In other cases, new working groups or individuals will have to be established or assigned to address the remaining recommendations. We suggest the Administrator establish a governance element, either by way of a designated group of individuals (Fed and M&O), or possibly through use of the Governance Executive Steering Committee. This group would guide, track, and integrate the different initiatives to ensure coherence and synchronization between sub-level working groups. The goal of all working groups should be action and visible change within the next two years or less.

Despite the issues outlined in this report, we found the workforce remain highly dedicated to the national and global security mission and repeatedly affirmed their goal is the delivery of the best science, technology, engineering, and manufacturing in service of that mission. Our people and our facilities are rising to the occasion and numerous examples of this were observed. Many seek to continue to collaborate on innovative ways to improve the way the enterprise works and meet the mission. We need to give our workforce the tools, authority, and flexibility required to build the enduring, responsive, and healthy enterprise the nation needs and deserves.

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[i] Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise, A New Foundation for the Nuclear Security Enterprise, November 2014;
National Research Council. Aligning the Governance Structure of the NNSA Laboratories to Meet 21st Century National Security Challenges, 2015, Washington, DC: The National Academies Press;
Secretary of Energy Advisory Board National Laboratory Task Force, Report on DOE National Laboratories, June 2015;
Commission to Review the Effectiveness of the National Energy Laboratories, Securing America's Future: Realizing the Potential of the Department of Energy's National Laboratories, October 2015;
National Academies of Sciences, Engineering, and Medicine 2020. Governance and Management of the Nuclear Security Enterprise, 2020, Washington, DC: The National Academies Press

[ii] See attachment A for a listing of agendas and personnel interviewed.

[iii] Dr. Joan Fuller, 15 Feb 2022; Dr. Mark Lewis, 16 Feb 2022; Drs. William Goldstein, George Miller, Bruce Tarter, 9 Mar 2022; Ms. Lisa Gordon Hagerty, 13 May 2022.

[iv] The private sector entities that operate the NNSA sites are sponsored under agreements known at management and operating (M&O) contracts. The M&O contract model, which dates back to World War II and the Corps of Engineers' Manhattan Engineer District (MED), was designed to ensure the recruitment of world-leading scientific and technical talent, and the successful completion of the mission at hand—to win the War.

In recognition of the MED contractors' success in that endeavor, Congress, via the Atomic Energy Act of 1946, carried the M&O model forward into the organization of the Atomic Energy Commission and its successor agencies, including the DOE. The legislation "permits management contracts for the operation of Government-owned plants so as to gain the full advantage of the skill and experience of American industry." The unique M&O contract relationship enables the Government to establish objectives for the laboratories' research programs and plants production plans and to exercise controls necessary to assure security, safety, and the prudent use of public funds, while allowing private sector organizations selected for the technical ability and managerial expertise to carry out the sites' day-to-day operations.

M&O contracts are characterized by their special purpose and the close relationship they create between the DOE and the contractor. The work performed under M&O contracts is intimately related to DOE's mission, is of a long-term and continuing nature, and, among other things, includes special requirements for work direction, safety, security, cost controls, and site management. FFRDCs and production sites operate under the M&O contract agreement. The distinction between the FFRDC and M&O model is the FFRDC model applies solely to research and development while the M&O model applies to research, development, and production or operation.

[v] Extract of the Federal Acquisition Regulation, Part 35, subpart 017