S. HRG. 112–618

# NATIONAL NUCLEAR SECURITY ADMINISTRATION MANAGEMENT OF ITS NATIONAL SECURITY LABORATORIES

## HEARING

BEFORE THE

SUBCOMMITTEE ON STRATEGIC FORCES

OF THE

## COMMITTEE ON ARMED SERVICES
## UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

SECOND SESSION

APRIL 18, 2012

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# NATIONAL NUCLEAR SECURITY ADMINISTRATION MANAGEMENT OF ITS NATIONAL SECURITY LABORATORIES

**WEDNESDAY, APRIL 18, 2012**

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC FORCES,
COMMITTEE ON ARMED SERVICES,
*Washington, DC.*

The subcommittee met, pursuant to notice, at 2:29 p.m. in room SR–222, Russell Senate Office Building, Senator E. Benjamin Nelson (chairman of the subcommittee) presiding.

Committee members present: Senators Nelson, Inhofe, and Vitter.

Majority staff member present: Jonathan S. Epstein, counsel.

Minority staff member present: Daniel Lerner, professional staff member.

Staff assistant present: Hannah I. Lloyd.

Committee members' assistants present: Ryan Ehly, assistant to Senator Nelson; Anthony Lazarski, assistant to Senator Inhofe; and Charles Brittingham, assistant to Senator Vitter.

## OPENING STATEMENT OF SENATOR E. BENJAMIN NELSON, CHAIRMAN

Senator NELSON. Let me today call the hearing to order.

Senator Sessions is in a budget hearing at the moment, so he is not going to be able to join us, but Senator Inhofe is a member of the subcommittee and he will be joining us shortly. In the meantime, I thought we might get started.

I have two cans of pop here. I do not intend to drink both of them, but when there is only one and you run out, you do not have a successor. So it might be a two-drink hearing. [Laughter.]

The purpose of today's hearing is to examine the relationship between the National Nuclear Security Agency (NNSA), and its national security laboratories. We had a similar hearing on this topic on March 14 with the NNSA, and today it is the national security laboratories' turn to comment on this relationship.

We also have as a witness the Chairman and Vice Chairman of the National Academies of Science panel that examined how this relationship is affecting the quality of science and engineering at the labs.

Let me thank all of you for agreeing to testify today. It is an exceptionally important hearing but also one whose time has come and is due.

This hearing will examine five issues that have been highlighted in part by the recent National Academies of Science report on laboratory management.

First, how can the relationship between the NNSA and its laboratories be streamlined to avoid the layers of bureaucracy as it currently exists?

Second, how can the NNSA and its laboratories restore a relationship of trust to minimize the detailed reporting requirements that have resulted from a lack of trust?

Third, how can the NNSA be aligned within the Department of Energy (DOE) to achieve independence as originally envisioned when it was created 12 years ago?

Fourth, how can your laboratories be viewed as national security assets to the U.S. Government as a whole?

Fifth, can your laboratories, as currently configured and funded, meet the current Department of Defense (DOD) nuclear stockpile requirements?

Those are the questions.

The New Strategic Arms Reduction Treaty (START) brought great attention to modernizing the laboratories' infrastructure which in many cases dates over 60 years to the Manhattan Project. The Budget Control Act has put constraints on the rate at which much of this modernization can be achieved, but its importance has not been lost on this Congress. That in order to safely reduce the number of nuclear weapons deployed, we must at a minimum ensure that our infrastructure can maintain these fewer numbers of weapons so they are safe, secure, and militarily effective.

Many experts such as former Secretaries Bill Perry and Jim Schlesinger have stated the importance of this issue, and as recently as last month, General Kehler, the Commander in Chief of U.S. Strategic Command (STRATCOM), said before the full committee that, "of all the elements of the nuclear enterprise, I am most concerned with the potential for declining or inadequate investment in the nuclear weapons enterprise that would result in our inability to sustain the deterrent force." These are very serious words from the combatant commander that is charged with ensuring our nuclear deterrent and that it is capable of meeting the requirements levied on it by the President and the Secretary of Defense.

As we examine the needs of each of your laboratories and the large investments that they require to modernize, we in Congress are worried and concerned that these investments will not be used to the maximum extent possible if the relationship between the NNSA and its laboratories is, as described by our National Academies witnesses, "dysfunctional."

I look forward to hearing from each of you in the most candid manner possible. We are emphasizing candor, not that we would expect anything else, but I want to make sure that it is clear that we are really pushing hard because this is your chance to inform this subcommittee on the issues we must be concerned with to help fix a broken relationship between the NNSA and its laboratories as we begin to draft our annual authorization bill for DOD and DOE.

I also have the white paper endorsed by the three laboratory directors, and I would like to ask unanimous consent that it be entered into the record.

[The information referred to follows:]

Lawrence Livermore National Laboratory | Los Alamos NATIONAL LABORATORY | Sandia National Laboratories

# The Model for the National Nuclear Security Administration and its Laboratories: Recommendations for Moving Forward

## The Mission

The National Nuclear Security Administration (NNSA) laboratories have a core mission of nuclear weapons. This unique, demanding, and solemn mission is central to US national security and comes with an obligation that the laboratories have science and engineering capabilities that are second-to-none. Because of the distinctive capabilities developed and sustained at the laboratories for nuclear weapons, other elements of NNSA, DOE, and other federal agencies depend on the labs to perform work for a wide spectrum of critical national security missions. This work outside the nuclear weapons program (referred to as interagency work in the remainder of this document) has been accomplished by the labs since the 1960s and has expanded in scope as national security threats increased in complexity and urgency. Today the integrated skills and knowledge this interagency work generates and the technical challenge it creates for the laboratories' staff has become an essential element in sustaining the core nuclear weapons mission, and the present and future technical vitality of the labs. It is no longer imaginable that the laboratories could deliver consistently on the commitments to the nuclear weapons program without the synergistic interagency work that attracts top talent, hones our skills, and provides stability through the nuclear weapons program cycles. Government commitment for the broad national security work of the laboratories is essential for the US to ensure the preeminence of our nuclear weapons and to enable multidisciplinary technical solutions to other complex and high-risk national security challenges.

Today the interagency work conducted at the NNSA produces critical national security solutions *and* strengthens the core nuclear weapons program. However, the interagency work is not codified in statutory language of the labs' missions, and the processes to manage the broader national security missions into the future are not optimized. To advance this broad national security model it is critical that discussions on strategic support of enabling research, development, test and evaluation occur between the laboratories, NNSA, and other federal agencies. A new comprehensive set of reduced requirements is also needed, tailored specifically to address how federal agencies access the capabilities of NNSA's laboratories for national security related work.

*Recommendation #1: Include statutory language codifying the broad national security mission of the NNSA laboratories in legislation. In addition, establish a streamlined statutory and regulatory framework for the NNSA laboratories to accept and perform national security work for other US federal agencies. NNSA oversight of other agency work should focus on the portfolio of work rather than individual projects.*

## The Federally Funded Research and Development Center Construct

The construct of Federally Funded Research and Development Centers (FFRDC) has been robust for 70 years. Today, the core tenets of FFRDCs (from FAR Title 48CRF35.017) remain relevant to the NNSA Labs:

- An FFRDC meets a special long-term research or development need
- An 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
- The long-term relationships between the Government and FFRDCs should provide the continuity that helps attract high-quality personnel to the FFRDC. This relationship should also be of a type to encourage the FFRDC to maintain currency in its field(s) of expertise, retain objectivity and independence, preserve familiarity with the needs of its sponsor(s), and provide a quick response capability.

While it remains clear the FFRDC construct is appropriate for the national security challenges the NNSA laboratories support, practical application of some of the intent of the construct has atrophied. Returning to the founding principles of FFRDCs across the national security enterprise will help create a more efficient and impactful future for the ultimate benefit of the US public. Specifically, the Government should use the laboratories as mission partners, free from conflict of interest, to help define strategic direction and provide innovative approaches. A strategic dialog between executive leaders of the NNSA FFRDCs and Government sponsors needs to be restored. Part of the dialog should include the laboratories' Directors' assessment of the health of the laboratories.

*Recommendation #2: Support a return to a strong partnership between the Government and the NNSA FFRDCs exemplified by active engagement of the National laboratories' leaders in collaborative strategic discussion with the Government sponsors regarding currency of expertise, health of the laboratories, and mission priorities. Restore the role of the laboratories to contribute meaningfully to annual and long-term budget and program planning.*

## Government-Owned, Contractor-Operated Model

The Government-Owned, Contractor-Operated (GOCO) model remains well suited for the unique, core mission of the NNSA laboratories for nuclear weapons and the highly specialized facilities and associated liabilities needed to conduct that mission. The GOCO model allows the Government to make the substantial investments needed for the unique mission, and the private sector to provide best practices. In addition, the reachback of FFRDCs to their respective parent companies and/or universities provide important ties to the larger science and engineering communities.

However, the Management and Operating (M&O) contracts have become very complex and overly prescriptive. The amount and level of detail in the contracts, supporting measurement vehicles (Performance Evaluation Plans - PEPs), and resultant oversight exercised by NNSA and DOE headquarters and site offices, as well as third party groups, are redundant and costly. The burden the NNSA oversight model imposes appears to be significantly higher than the models used by FFRDCs operated by other federal agencies such as the DoD and NASA. Many independent studies have come to this conclusion and recommended modifications, yet changes in the NNSA oversight model and M&O contracts have not occurred, and in fact the oversight has continually increased.

The lack of progress in achieving cost-effective oversight is hampered by (1) the complexity associated with accurately assessing the costs of oversight versus risks, and (2) the general lack of trust between the DOE/NNSA and the labs. Within the DOE/NNSA, there are overhead costs

well beyond the number of people who have direct oversight responsibilities, many resulting from lack of clarity and duplication of roles, responsibilities, authorities, and accountabilities among DOE, NNSA, NNSA site offices, and the FFRDCs.

It is critical to improve the current oversight practices now, and to begin to envision oversight practices for the future that include risk and performance evaluation sharing with other Government agencies.

*Recommendation #3: Implement improved contracting and oversight models based on best practices from other FFRDCs and FFRDC-like institutions (e.g. DOE Office of Science, DoD, NASA) that would drive a cultural change in the way NNSA manages the labs – moving toward an efficient approach consistent with the original FFRDC intent. Provide greater flexibility to the laboratories to execute mission, sustain capability, and manage risk within an approved operating envelope, with roles, responsibilities, authorities, and accountability defined at a higher-level and with greater autonomy. Implement a risk management framework model to balance responsibilities between laboratories and NNSA to improve trust and increase effectiveness.*

*Recommendation #4: Limit the funding the NNSA uses for oversight to a percentage of the total agency budget consistent with best practices from other FFRDCs or the private sector. Reinvest resulting cost savings in the laboratories' infrastructure to ensure the unique facilities required for the broad national security missions are supported. Eliminate duplicative assessments and oversight, with a preference for internal and third party assessments integrated into the contractor performance management system.*

## Managing the Health of Science and Engineering

The decreased flexibility within mission-driven programs and increased oversight on Laboratory-Directed R&D (LDRD) funds has led to a strain on the ability to sustain long-term excellence of science and engineering. Increasingly, mission work has become more milestone-driven, with short-term drivers that do not allow for supporting long-term capability needed to respond to future, and unanticipated, national security needs. No other institutions maintain this reservoir of talent for the nation, available as needed when urgent national needs arise. The recently completed National Academy of Sciences (NAS) study has a section devoted to recommendations to restore the flexibility of Lab Directors to manage capability with a multi-year horizon.

*Recommendation #5: Incentivize a longer-term perspective in managing the health of the laboratories by increasing flexibility for laboratories to invest in core science and engineering capabilities. Rebalance fee incentives to value mission execution and strategic management of capability relative to compliance and operational oversight. Emphasize the importance of LDRD as an investment that benefits all current and future programs. Provide for approval of LDRD as a portfolio rather than project-by-project, designate a single approval office, and focus oversight on high-risk projects. Restore programmatic investments in supporting science needed for long-term mission delivery and unanticipated national security challenges.*

## NNSA Laboratories' Governance

Many reports by independent committees have found the micromanagement of the NNSA labs is debilitating and costly, and other reports have called for increased oversight. While these finding appear to be in opposition, one conclusion is clear -the governance of the NNSA labs is broken and must be changed.

From the laboratories' perspective, the NNSA involvement with the details of how the mission is accomplished is excessive and expensive, is not risk-based, and does not represent best practices. The governance is in urgent need of transformation.

The 2002 "Report to Congress on the Organization and Operations of the NNSA" contains a strong set of organizational principles that, if followed, would move the institution to a more streamlined operational model. Since the current structure has now been in place for about twelve years and the original organizational principles not adhered to, the only practical way of achieving the kind of change needed is to institute a structural change, even though structure alone will not ensure better governance.

Options for structural changes have been reviewed by many and are nicely summarized in "America's Strategic Posture – The Final Report of the Congressional Commission on the Strategic Posture of the United States" published in 2009. The options for a new structure range from strengthen NNSA autonomy within DOE to move all or some of the NNSA enterprise to DoD to more complete independence of NNSA with more attention from the President. In that report the Commission recommends creating NNSA as an independent agency reporting to the President through the Secretary of Energy. The Commission also states the preferred state is NNSA as an independent agency reporting to the President with a "Board of Directors" composed of the Secretaries of Energy, Defense, State, Homeland Security, and the Director of National Intelligence.

We believe the time to act on a change in governance is now, although the desired end-state may take time to achieve. If governance changes are reinforced by structural changes, the changes are more likely to be effective over the long-range. Any changes should decrease costs and also result in increased effectiveness of Government and laboratories' management systems.

*Recommendation #6: Congress and the Administration should take immediate action to improve governance of the NNSA laboratories.*

Dr. Penrose C. Albright
Director, Lawrence Livermore National Lab

Dr. Charles F. McMillan
Director, Los Alamos National Laboratory

Dr. Paul J. Hommert
Director, Sandia National Laboratories

Senator NELSON. When Senator Inhofe gets here—my good friend and colleague—we will ask him for any opening remarks that he may make.

Now it is an opportunity, if we might just start with Dr. Patel and go down the line. I am going to emphasize brevity but, on the other hand, not at the risk of candor. Dr. Patel?

**STATEMENT OF DR. C. KUMAR N. PATEL, PRESIDENT AND CHIEF EXECUTIVE OFFICER, PRANALYTICA, INC.; CO–CHAIR, NATIONAL RESEARCH COUNCIL COMMITTEE ON REVIEW OF THE QUALITY OF THE MANAGEMENT AND OF THE SCIENCE AND ENGINEERING RESEARCH AT THE DEPARTMENT OF ENERGY'S NATIONAL SECURITY LABORATORIES–PHASE 1**

Dr. PATEL. Thank you, Mr. Chairman. As you so well pointed out the importance of the three national laboratories, this study dealt with the present state looking at the management of science and engineering and how it affects the long-term sustainability of these activities while these activities, science and engineering, are very important for maintaining the nuclear stockpile safety, security, and its reliance.

Overall, we find that the status of management of science and engineering at the laboratories is in good shape, in good hands. However, there are a number of issues that need immediate attention, and these include, first of all, blurring of the responsibilities between NNSA and the laboratory managers, undue emphasis on formalities, and management by transaction rather than by oversight. The issue of management and oversight is not the same. Management at the microscopic level slows down individual's capability to be creative. It slows down the amount of work that gets done and overall it turns out to be less cost-effective than what it should be.

Yes, there were some problems earlier with respect to safety and security, but those are well under control. Now the time has come to carry out the management and oversight not by transaction but by having the proper systems in place because that, as we see from industrial experience, turns out to be the most cost-effective way of spending funds which are allocated, in this case public monies.

Mr. Chairman, thank you very much for allowing me to open the hearing.

[The joint prepared statement of Dr. Shank and Dr. Patel follows:]

JOINT PREPARED STATEMENT BY DR. CHARLES V. SHANK AND DR. C. KUMAR N. PATEL

Good afternoon Mr. Chairman, Ranking Member Sessions, and members of the Strategic Forces Subcommittee of the Senate Armed Services Committee:

My name is C. Kumar N. Patel. I am the President and Chief Executive Officer (CEO) of Pranalytica, a company located in Santa Monica, CA. Concurrently, I am also a Professor of Physics and Astronomy at UCLA. I had the privilege of co-chairing with Dr. Shank the Committee on Review of the Quality of the Management and of the Science and Engineering Research at the Department of Energy's (DOE) National Security Laboratories at the National Research Council. Dr. Shank and I will provide the highlights of the committee's findings and are available to respond to your questions.

The National Research Council is the operating arm of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine of the

National Academies, chartered by Congress in 1863 to advise the government on matters of science and technology.

STUDY TASK

The National Defense Authorization Act for Fiscal Year 2010 identified concerns regarding the quality and management of Science and Engineering at the three National Security Labs and in turn mandated that NNSA task the National Research Council (NRC) to study the quality and management of Science and Engineering (S&E) at these Laboratories: Los Alamos National Laboratory (LANL), Lawrence Livermore Laboratory (LLNL), and Sandia National Laboratories (SNL). The study is being conducted in two phases. Phase one, which is completed, concerns management of S&E. The second phase will look in detail at selected S&E subject areas.

Health and vitality of science and engineering is critical for the long term viability of the National Security Laboratories and their ability to support the national defense and security needs, especially as they concern our nuclear weapons. The primary mission of these laboratories, assuring the safety and reliability of our nuclear stockpile, requires that the science and engineering that forms the underpinning of the needed technical capability, remain at the forefront by having the best possible scientists and engineers and by having the best management practices that maximizes the productivity of the available resources.

Our report today addresses the management of the three NNSA laboratories with specific emphasis on how management affects the quality of the science and engineering needed to fulfill the charter of these laboratories. "Quality of S&E" for the purposes of the report measures the expertise and accomplishments in those areas of science and engineering that are necessary to accomplish the laboratories' missions. "Quality of the management of S&E" measures management's capability to build, maintain and nurture S&E personnel and expertise for current and future mission needs. Management includes government (primarily NNSA and its three site offices), operations (M&O) contractors, and onsite laboratory management.

Our overall conclusion is that the laboratory management is aware of the importance of S&E for accomplishing their primary mission and that the management is committed to assuring the long term health and vitality of S&E. However, we have discerned a number of issues that need early, if not immediate, attention to meet the long-term goals of excellence of S&E. These include the blurring of the responsibilities of NNSA and the laboratory managers, undue emphasis on formalities of management, often as a result of congressional reporting requirements, an apparent loss of trust between NNSA and the Laboratories and last but not the least enormous pressure on the financial resources available for carrying out the S&E mission. We recognize that some of the onerous reporting requirements arose from serious lapses of safety and security matters. But we have also concluded that most if not all of the safety and security issues are under control and that it is appropriate now to transfer the responsibility for these activities to the local management. We have provided a number of recommendations, which if implemented would help the laboratory management in carrying out their task in a cost effective manner.

CONDUCT OF THE STUDY

To conduct the first phase, the NRC formed a study committee whose membership was carefully chosen to provide broad and deep applicable expertise and experience in the management of science and engineering at major research and development laboratories. The committee members include former directors of major government and industry laboratories, current and former laboratory executives, and others with relevant experience and expertise. The primary mode of gathering information was through presentations and testimony from, and discussions with, a substantial number of experts. These included current and former managers and technical staff associated with the NNSA, the DOE, and the laboratories, and the site offices. The study committee's meetings included visits to each of the three laboratories for extensive discussions with laboratory staff, as well as open public comment sessions at which current and former laboratory employees, union representatives, and others were given the opportunity to share their views and experiences. The committee also examined the most recent available management and operations (M&O) contracts, performance evaluation plans (PEP), performance evaluation reports (PER), contract management plans, parent organization oversight plans, and other similar documents for each of the three laboratories.

The issue of management of these three laboratories is complex, and has a long history. Within the mandated terms of reference of the study, the committee concluded that the basic questions before it are: (1) how well does the current management system support the conduct of quality science and engineering now and into

the future? (2) are there significant management problems that need to be solved? (3) to what extent are these problems the result of the change in contractors at LANL and LLNL? (4) what are the most important problems, and what does the committee recommend to resolve those problems? The committee set as its goal the production of a short report that focuses on what it found to be most important. Accordingly, our report addresses four topics: the contracts; research base and the evolution of the mission; the broken relationship; and management of S&E at the laboratories. We will speak to these, and then conclude with our observations concerning the future.

## STUDY FINDINGS

*Contracts*

The contracting relationships between the DOE and its laboratories have in some cases endured for many decades. In 2004, Congress mandated that the longstanding contracts with the University of California to manage Lawrence Livermore and Los Alamos national laboratories (LLNL and LANL) be re-competed. As a result, these two contracts were awarded to two independent limited liability corporations (LLCs) that both include Bechtel Corporation and the University of California in their parent organizations. Subsequently, Congress developed concerns about the quality of science and engineering at the Laboratories, including whether changes in contracts and contractors may have had a deleterious effect on the quality of science and engineering.

The study committee heard testimony that LLNL and LANL were having morale crises as a consequence of the change of management from a public entity to a for-profit contractor. A number of current and former employees of these laboratories expressed concerns about deterioration of morale at the laboratories along with ongoing or potential declines in the quality of science and engineering. Many attributed those inferred trends to the new M&O contracts and contractors. While it is true that all three labs have been under cost and funding pressure, we did not find a morale crisis related to actions of the new contractors. The costs of the recompeted contracts are significantly greater than the previous contracting arrangements; this is due primarily to the changes in contractor fees, state taxes, and pensions. Some have been concerned that contractors pursuing fee might not act in the public interest. The laboratory directors stated that while fee is important, their primary objective remains to manage the laboratories in the public interest. This concern is an important one and constant vigilance will be required.

*Evolution of the Mission*

An evolution of the laboratory missions to "National Security Laboratories" is well underway. Deputy NNSA Administrator Don Cook presented to the Committee a vision for the laboratories, including a governance charter among four agencies (the Departments of Energy, Homeland Security, and Defense, plus the Office of the Director of National Intelligence) to take advantage of the S&E capabilities of these three laboratories. In a time of constrained budgets, broadening the mandate to a national security mission helps preserve S&E expertise by working on problems posed by partner agencies. Access to this problem set helps the NNSA laboratories to recruit and retain S&E capabilities beyond what could be achieved solely with available funds in the stockpile stewardship program. While such work for others is very important for the future of S&E at the laboratories, all three of the laboratory directors were very clear that maintenance of the stockpile remains the core mission of the labs.

The committee recommends that Congress recognize that maintenance of the stockpile remains the core mission of the labs and that other national security mission work contributes to the accomplishment of that mission and in that context Congress should consider endorsing and supporting in some way the evolution of the NNSA laboratories to National Security Laboratories as described in the July 2010 four-agency Governance Charter for an Interagency Council on the Strategic Capability of DOE National Laboratories.

A crucial part of the laboratories' ability to conduct their missions is derived from Laboratory Directed Research and Development (LDRD), the primary source for internally directed R&D funding. Among its other benefits, LDRD provides a major resource for attracting, supporting and training staff at each laboratory.

The committee recommends that Congress and NNSA maintain strong support of the LDRD program as it is an essential component of enabling the long-term viability of the laboratories.

Historically, the laboratories had another source of discretionary research spending.

The weapons program (at each laboratory) had the flexibility to use part of its budget to fund a robust research program, in support of the core weapons mission. Currently, the weapons program budget is subdivided into so many categories with so many restrictions that this important flexibility is effectively lost. This loss in funding flexibility has significantly reduced the amount of core program research being performed at the laboratories. This lessens the appeal of the laboratories when recruiting.

The committee recommends that Congress reduce the number of restrictive budget reporting categories in the Nuclear Weapons Program and permit the use of such funds to support a robust core weapons research program and further develop necessary S&E capability.

*Relationship Between the Labs and NNSA Oversight*

We observe that the relationship between NNSA and its National Security Laboratories is broken. This very seriously degrades the ability to manage for quality S&E. Both NNSA and the laboratories recognize the importance of quality S&E, and each believes it is working to achieve that goal, but their dysfunctional relationship seriously threatens that common goal. This is not a new observation, as it has been discussed in previous reports. There has been a breakdown of trust and an erosion of the partnering between the laboratories and NNSA to solve complex S&E problems.

The basic substantive relationship between NNSA and the laboratories is a Federally Funded Research and Development Center (FFRDC) partnership. The management relationship is a Government Owned, Contractor Operated relationship. The FFRDC relationship is based on a partnership between the government and the laboratory in which the government decides what problems need to be addressed, and the contractor determines how best to address those problems. There is a perception among staff at the three laboratories that NNSA has moved from partnering with the laboratories to solve scientific and engineering problems to assigning tasks and specific S&E solutions with detailed implementation instructions. This approach precludes taking full advantage of the intellectual and management skills that taxpayer dollars have purchased. Similar issues are found in transactional oversight of safety, business, security, and operations. Science and engineering quality is at risk when laboratory scientists and engineers are not encouraged to bring forth their creative ideas in partnership with NNSA to solve problems vital to our national security.

There is conflict and confusion over management roles and responsibilities of organizations and individuals. For example, the committee heard reports of mid-level issues being elevated to the laboratory director level because there was no clarity about how to resolve disputes between a laboratory and an NNSA Site Office. These factors do not encourage the stable management that is necessary to ensure success of long-term investment and planning. Another example was a recent instance in which NNSA HQ tried to overrule a Laboratory's best scientific judgment about how to carry out a scientific task. Subsequently, language appeared in a congressional report opposing that NNSA instruction. A better mechanism should be established for resolving technical disputes, and they should definitely not be elevated to top NNSA management and congressional levels. A technical advisory committee, established at the NNSA level, would be a helpful mechanism for filling this gap in S&E management. More generally, such an advisory committee could monitor progress on other aspects of roles and responsibilities.

This erosion of the trust relationship is especially prominent with respect to Los Alamos, where past failures in safety, security, and business practices attracted much national attention and public criticism. But it has also spilled over to Lawrence Livermore and Sandia National Laboratories. The loss of trust in the ability of the laboratories to maintain operational goals such as safety, security, environmental responsibility and fiscal integrity has produced detailed scrutiny by NNSA HQ and site offices and increased aversion to risk. A major byproduct of this has been to create a bias against experimental work. The bias is problematic because experimental science is at the very heart of the scientific method.

The committee recommends that NNSA and each of the Laboratories commit to the goal of rebalancing the zmanagerial and governance relationship to build in a higher level of trust in program execution and laboratory operations in general.

The committee recommends that NNSA and the Laboratories agree on a set of principles that clearly lay out the boundaries and roles of each management structure, and also that program managers at headquarters, the Site Offices, and in the laboratories be directed to abide by these principles.

For example, the committee suggests that, among other measures, the Site Manager and the Director and/or Deputy Director of each laboratory apply a team-based

process to identify and agree on eliminating certain oversight procedures that are simply not necessary or related to the overall goals of the Laboratory. Similarly, some mechanism should be established to filter program tasks at both the headquarters level and at the laboratory senior management level to assure that each tasking is necessary and consistent with the agreed management principles.

The committee recommends that the goal of rebalancing the relationship and the set of principles laying out the boundaries and roles of each management structure be memorialized in memoranda of understanding between NNSA and its Laboratories. Performance against these understandings should be assessed on an annual basis over a 5-year period and reported to Congress.

THE FUTURE

A key to ongoing laboratory success has been a strong focus on the long-term and on maintaining deep technical capability. Looking forward, the new management structure of the Laboratories, which relies on the introduction of industrial and other private sector partners, must assure that this long-term focus is maintained in words and in deeds.

A great deal of work that has been accomplished over the years in safety and security has required extensive effort by the NNSA and the laboratories. We believe these efforts have been strengthened to the point where they no longer need the current level special attention to assure high quality results in laboratory operations.

The committee recommends that NNSA, Congress, and top management of the laboratories recognize that the safety and security systems at the Laboratories have been strengthened to the point where they no longer need special attention. NNSA and Laboratory management should explore ways by which the administrative, safety, and security costs can be reduced over time consistent with maintaining high quality efforts in these areas, so that they not impose an excessive burden on essential S&E activities.

The committee recognizes that this cannot happen unless the broken relationship is fixed, but the committee also recognizes that these operational problems contributed to the broken relationship.

Senator NELSON. My colleague and friend has arrived. In case you have any opening remarks, Senator Inhofe, the floor is yours.

## STATEMENT OF SENATOR JAMES M. INHOFE

Senator INHOFE. Thank you.

I am anxious to pursue this with this panel that we have, and I think we have the right people that are here right now. The Perry/Schlesinger Commission stated it was alarmed by the disrepair and neglect of our nuclear weapons stockpile and our complex. Vice President Biden has said maintaining our nuclear stockpile and modernization is essential. President Obama had said back in December 2010, I recognize that nuclear modernization requires investment in the long term. He goes on, making the commitment to do what is necessary.

However, at the same time, we hear from Dr. Michael Anastasio of Los Alamos National Lab. He said, I am very concerned about that budget profile. That profile delays many of the issues that are a concern to us today especially in the science and engineering area. Much of the planned funding increases for weapons and activities do not come to fruition until the second half of a 10-year period. Now, we are seeing a lot of that nowadays. They say, yes, we are going to do it and the amount is going to be same. However, it is not going to happen for 5 more years. I think we can read in there what we want to.

Secretary Gates talked about it. He said, no way can we maintain a credible deterrent and reduce the number of weapons in our stockpile without either resorting to testing our stockpile or pursuing a modernization program. I think we all understand. One or the other is necessary. After the New START program, we were

promised by the administration to have robust resources backing behind it, and yet that has not happened.

So, I think in the full committee, we heard testimony from General Kehler, the Commander of STRATCOM, who informed us of his concern with the budget and its failure to demonstrate a viable, long-term modernization strategy. Our witnesses today provide yet another opportunity to assess the adequacy of the request. I look forward to hearing from them, our national nuclear weapons labs, to better understand the impact of the NNSA's budget, what it will have on their ability to certify our existing stockpile.

So I say this and I am anxious to hear the truth from you. Can we really do all these reductions? Can we not keep the commitment that we made at one time and carry out what you have an obligation, in terms of certification?

So those are my concerns. Have we had one witness' testimony so far?

Senator NELSON. Yes, Dr. Patel.

Senator INHOFE. Okay, continue and thank you, Mr. Chairman.

Senator NELSON. Thank you, Senator Inhofe. We stress how we have a working relationship, and I look forward to the questions here shortly.

Dr. Shank?

**STATEMENT OF DR. CHARLES V. SHANK, SENIOR FELLOW, HOWARD HUGHES MEDICAL INSTITUTE; CO–CHAIR, NATIONAL RESEARCH COUNCIL COMMITTEE ON REVIEW OF THE QUALITY OF THE MANAGEMENT AND OF THE SCIENCE AND ENGINEERING RESEARCH AT THE DEPARTMENT OF ENERGY'S NATIONAL SECURITY LABORATORIES–PHASE 1**

Dr. SHANK. Thank you for the opportunity to describe the results of our report on science and engineering management at the three national security laboratories.

I wanted to emphasize in my remarks some of the recommendations that we made as a result of our deliberations of our committee. We visited all three laboratories. We heard from management and staff at all levels.

First is the evolution of the mission. We heard a compelling discussion from the Deputy NNSA Administrator Don Cook talking about a new governance charter among four agencies, the DOE, the Department of Homeland Security (DHS), DOD, and the Office of the Director of National Intelligence (ODNI), that would allow the laboratories to make a transition from weapons laboratories, to more broadly national security laboratories and that these laboratories would use their capabilities to tackle problems of importance to all four agencies. We think that in a time of constrained budgets and the complexity of the Stockpile Stewardship Program (SSP), the opportunity to maintain capabilities by working on problems for other agencies is a win-win and it is something that we hope that this expertise can be taken advantage and it is something that is encouraged by Congress.

Second, I want to spend some time discussing the relationship between the laboratories and oversight. We think that oversight is an extremely important responsibility of the NNSA. However, we observed that the relationship between the NNSA and the national

security labs appears be broken. We think that this seriously degrades the ability to manage quality science and engineering, and we recognize having that high quality in science and engineering is very important to achieve the mission ends, but a dysfunctional relationship seriously threatens that goal.

This is not a new observation. It has been discussed in previous reports. We see what appears to be a breakdown of trust, an erosion of partnering between the labs and the NNSA to solve complex problems. As you are well aware, the basic elements of this relationship between NNSA and its laboratories are a Federally Funded Research and Development Center (FFRDC) relationship. We have seen an evolution of NNSA moving from partnering with the laboratories to solve scientific and engineering problems to assigning tasks with specific solutions and implementation instructions. This approach precludes taking full advantage of the intellectual and management skills that have been purchased to manage these laboratories under contract. In addition, we see issues in transactional oversight of safety, business, security, and operations.

We think that there is a conflict and confusion over management roles and responsibility. We think this sometimes leads to scientific disputes. We have seen an example, a recent instance, in which NNSA headquarters tried to overrule a laboratory's best scientific judgment on how to carry out a task and subsequently language appeared in a congressional report opposing the NNSA instruction. We think a better mechanism needs to be made to resolve scientific and technical issues. We are recommending that a technical advisory committee be established at the NNSA level. That would be a helpful mechanism in being able to resolve disputes and look at more broadly how the operations of the laboratories can be most effectively accomplished.

The erosion of trust is especially prominent with respect to Los Alamos, where past affairs and safety and security and business practices have attracted much national attention. But it has also spilled over to the other laboratories as well. This loss of trust and emphasis on transactional management has created an environment in which there has been a bias against experimental work. We think that this is a very important issue and one that needs to be dealt with.

We have heard from NNSA and all parties that Los Alamos has greatly improved its performance, and we think that it is time to recognize that this has occurred and that the laboratories have strengthened to the point where they no longer need clear, special attention. We are hoping that the relationship between DOE and the NNSA can be rationalized and renormalized in a way that will make the laboratories both effective and successful in their future missions.

Senator NELSON. Thank you very much.

Dr. McMillan.

**STATEMENT OF DR. CHARLES F. MCMILLAN, DIRECTOR, LOS ALAMOS NATIONAL LABORATORY**

Dr. MCMILLAN. Thank you, Chairman Nelson. Ranking Member Inhofe, thank you. I appreciate the opportunity to speak here today.

I am Charlie McMillan. I am the Director at Los Alamos. I bring to this discussion 29 years of experience in the weapons program. Nearly 2 decades of that was with my colleagues at Livermore. The last 6 years have been at Los Alamos, and for about the last year I have been the Director.

I am proud of the incredible staff at Los Alamos, especially during today's budget challenges and the recent workforce actions I have had to take at the laboratory. Their service to the Nation has been unwavering as it has been for the last 70 years.

Mr. Chairman, the 2010 Nuclear Posture Review (NPR), coupled with the 1251 report, set a course for the deterrent that in my view was credible and consistent. Now, because of budget pressure, I am concerned that we do not yet have a path forward for meeting all of our commitments. We continue to work closely with our colleagues at both DOE and DOD to find the best path forward.

NNSA governance will inevitably play a key role as we address mission and budget challenges.

The recent National Academy of Sciences report described the NNSA laboratory relationship as broken. Those were the words you used. It described a lack of trust, burdensome oversight, and structural flaws.

The weapons laboratories have served as trusted technical advisors to the government. Today, we are often managed as traditional contractors rather than as partners who can provide expertise to solve technical issues. Trust has been replaced by reliance on operational formality. As the Academy said, this approach is a mismatch. It stifles the innovation we must have to address challenging issues in our nuclear deterrent. It is the ability to innovate that drives the staff, that I have responsibility for at Los Alamos, to produce at the highest levels for our Nation. I believe that a governance model must include the ability to work within a risk framework to accomplish goals and priorities set by Congress and the administration.

Mr. Chairman, there are other issues in the nuclear enterprise. I am concerned that we are shifting the balance of priorities too far toward the near-term at the expense of longer-term science needed to address future problems that will affect the stockpile. Deferring the construction of the Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR–NF) leaves the country with no known capability to meet the current expectation. Those expectations are something like 50 to 80 pits per year. Furthermore, because of limited and aging infrastructure, it will take significant investments to produce even 20 or 30 pits per year.

With appropriate infrastructure investments, we can sustain a limited pit manufacturing capability. However, we will need to augment new pit production with a pit reuse strategy that is still in development. We have available legacy pits that are candidates for reuse. I am cautiously optimistic that we can reuse some of these pits, but we must do the scientific work to further understand the effects of aging and to provide modern safety, safety that starts within sensitive high explosive systems. If we choose this path, it will require an investment over the next 5 to 10 years.

Let me offer an analogy for you. It is a little bit like taking an engine out of a 1965 Ford Mustang and putting it into a 2012 Mus-

tang and continuing to meet 2012 emission standards. You can probably do it but not without a lot of work.

Mr. Chairman, we succeed today because of the investments our Nation has made over the last 20 years, investments that have produced capabilities and insights that are already addressing today's challenges. Two examples would be the Dual-Axis Radiographic Hydrodynamic Test Facility, as well as our modern high-performance computing capabilities. We must prepare today for the challenges we will inevitably face in the future.

In closing, I am increasingly concerned. Today, I cannot say with confidence that we are on a path to a healthy program. The laboratories that we serve are among the greatest, supporting the deterrence with knowledge second to none. The country needs to decide whether it is willing to maintain this level into the future. If so, balanced investments must be made in life extension today, as well as in our abilities to solve the problems that we will inevitably face in the future. If not, we risk both the future of the deterrent and the ability of the laboratory to solve issues as they arise.

Thank you and I look forward to your questions.

[The prepared statement of Dr. McMillan follows:]

PREPARED STATEMENT BY DR. CHARLES F. MCMILLAN

Chairman Nelson, Ranking Member Sessions, and members of the subcommittee, thank you for the opportunity to appear before you today.

I am Dr. Charles McMillan, Director of Los Alamos National Laboratory (LANL). My 29-year commitment to America's nuclear weapons program encompasses over two decades of service at Lawrence Livermore National Laboratory (LLNL) and 6 years at Los Alamos. Following the moratorium on nuclear testing, I participated in the discussions that helped establish Stockpile Stewardship.

Since I assumed leadership at Los Alamos almost a year ago, it has become clear that our Nation faces a difficult budget situation, and hard choices must be made. I am proud of the way that the men and women of Los Alamos have played their role in helping to meet these challenges with professionalism and innovation. Through difficult times, they are maintaining a focus that is delivering on the Laboratory's mission. I look forward to working with you as we continue delivering national security science in both the present and the future by making challenging investment decisions—while keeping faith with a workforce that has demonstrated career-long dedication to the service of our Nation.

I continue to believe that the direction laid out in the Nuclear Posture Review (NPR) and the 1251 Report provides an appropriate and technically sound course. These documents outline a consistent plan that, if implemented, would do the work necessary to support the Nation's stockpile through modernization of our nuclear infrastructure and a warhead life extension program (LEP).

Now, because of changes in budget and policy priorities, I am concerned that we do not yet have a clear path forward for meeting all of our commitments to the stockpile.

The National Nuclear Security Agency (NNSA) governance will play a key role in determining both our efficiency and effectiveness as we address looming mission and budget challenges. In my view, a strong partnership between NNSA and the laboratories, building on the full opportunities afforded by our status as Federally Funded Research and Development Centers (FFRDC), can serve to reestablish the trust that has been a source of solutions in previous challenges.

GOVERNANCE

The National Academy of Sciences (NAS) report on oversight of the NNSA labs is the latest in a series of reports that has highlighted governance issues for the laboratories: governance that is characterized by a lack of trust, burdensome oversight, and structural flaws. The issues they identified in their report ring true in my experience at the Laboratory.

> "An erosion of trust on both sides of the relationship shapes the oversight and operation of the laboratories. This in turn has resulted in an excessive

reliance on operational formality in important aspects of Laboratory operations, including the conduct of science and engineering . . . " (NAS report, page 23, emphasis added)

In my view, we have become so focused on operational formality that we risk losing sight of the reasons why the government-owned, contractor-operated business arrangements were created in the first place. Our common objective is to safely maintain the stockpile using best business practices; operational formality is a means to that end. As the NAS report states, this formality can be a mismatch when applied to creative activities such as science and engineering (report, page 24).

I agree with the report's statements on oversight:

" . . . the NNSA, Congress, and top management of the Laboratories recognize that safety and security systems at the Laboratories have been strengthened to the point where they no longer need special attention. NNSA and Laboratory management should explore ways by which the administrative, safety, and security costs can be reduced, so that they not impose an excessive burden on essential S&E activities." (NAS recommendation 5–1, page 31, emphasis added)

While NNSA had an auspicious beginning, the promise of semi-autonomy has not yet been fulfilled. Duplication and overlap remain between the Department of Energy (DOE) and NNSA regulations and guidance. As an example, the DOE Office of Health, Safety, and Security still plays a significant role in NNSA—despite NNSA having its own regulations and guidance.

Structural issues continue to be a challenge for NNSA:

"The 2001 Foster Panel report reiterated the points it made in its previous report, emphasizing that the Secretary of Energy must remove the unnecessary duplication of staff in such areas as security, environmental oversight, safety, and resource management." (NAS report, page 51)

The weapons laboratories are FFRDCs that serve as trusted, independent advisers to the government on complex technical issues—foremost among these being nuclear weapons. For much of the last decade, I have seen a trend within NNSA toward treating the laboratories more like traditional contractors rather than fully employing the capabilities they offer the government through the special FFRDC relationship (FAR 35.017).

A maturing model between the labs and NNSA would include the ability to work within a framework to accomplish goals established by policies set by Congress and the administration. Changing the type of oversight from transactional to strategic can lead to a smaller bureaucracy, and thus reduce the size of the infrastructure needed to respond to that bureaucracy.

In the last few months, the NNSA leadership has begun to reengage the lab directors in substantive dialogue on program priorities. This is a first step toward reestablishing the type of trust that was necessary to create the stewardship program. Many steps remain if we are to meet the challenge of the next decade: modernizing the stockpile at a pace that exceeds our past experience.

There are examples of increasing burden and in other cases where there is a glimmer of hope. I mention two of the latter.

- The Office of Defense Nuclear Security (DNS) has worked to balance the need for robust security with the reality of shrinking Federal security budgets. The DNS engages individual sites to understand programmatic needs and then develops a solid approach that allows work to be accomplished within a well-defined risk envelope.
- In recent months, we have worked with our colleagues at the Los Alamos Site Office to develop a risk-based framework for evaluating computer system security and streamlining documentation required to operate these systems. This framework may reduce a bookshelf of documentation to a single binder.

While these examples illustrate positive steps to reduce administrative costs, they remain the exception in a system that has become moribund over many years. Studies such as those cited above have examined structural options for NNSA; all have merit, none are perfect. Whichever path we adopt for the future governance of the laboratories, it is essential that all relevant branches of government are aligned to ensure its success.

## NUCLEAR INFRASTRUCTURE

The existing Chemistry and Metallurgy Research (CMR) facility at Los Alamos is 60 years old, sits on a seismic fault, and, as the Congressional Commission on the Strategic Posture of the United States said in 2009, "is already well past the end

of its planned life." The facility is unable to meet the high-volume analysis needed to meet the Department of Defense (DOD) expectation of 50 to 80 newly manufactured pits per year. Three wings of CMR's six have been closed because of their location over the fault and to reduce risk. At the direction of NNSA, we are preparing to retire the facility in 2019.

The decision to defer construction of the Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR–NF) leaves the United States with no known capability to make 50 to 80 newly-produced pits on the timescales planned for stockpile modernization. This will affect our path forward on the W78 LEP.

Let me be very clear: CMRR–NF is not a manufacturing facility for pits. It fulfills a critical mission in supporting the analytical chemistry and metallurgy needed to certify that the plutonium used in the stockpile meets basic material requirements. The ability at CMRR–NF to quickly analyze and characterize special nuclear materials—to know where they were made, their purity, and their chemical and mechanical properties—also underpins our work for the Nation in nonproliferation, counterterrorism, and treaty verification missions. Pit production occurs and will continue in Building PF–4 at Los Alamos. CMRR–NF was designed to provide needed capacity for materials characterization, waste staging and shipment, non-destructive assay, and vault storage. In the absence of CMRR–NF, the limited floor space in PF–4 must be used to address these functions, albeit at reduced levels.

At the direction of NNSA, we are in the process of completing a 60-day analysis of existing plutonium capabilities within the Radiation Laboratory Utility Office Building (RLUOB) at Los Alamos, Superblock at Livermore, and other sites. Because of our limited plutonium infrastructure, investments that are not in the current plan will be required to produce even 20 to 30 pits per year using all of these facilities. In this study, LANL is examining accelerating the removal of material from the vault in PF–4, expanding the capability of RLUOB, and constructing a system to transport materials between PF–4 and RLUOB. The not-yet-budgeted costs associated with these changes are expected to extend over 5 to 8 years.

## PIT REUSE

Pit reuse has been suggested as a way to bridge the shortfall in newly-produced pits caused by delaying CMRR–NF construction. The nation has pits that are not needed in current systems. These are candidates for use in a modernized stockpile. While I am cautiously optimistic that some of these pits can be reused, two important issues must be addressed before certification for stockpile use:

- First, continued progress in understanding the effects of pit aging.
- Second, the system modifications necessary to ensure that pits designed for use with conventional explosives can be reused in modern, insensitive high explosive systems.

Both are challenging scientific problems.

In 2006, the JASON issued a report on plutonium aging based on studies conducted by LANL and LLNL. In a letter responding to this report to then-chairman John Warner of the Senate Armed Services Committee, NNSA said that it "is imperative that we continue to assess plutonium aging through vigilant surveillance and scientific evaluation, since the plutonium-aging database only extends to approximately 48 years for naturally aged material and 60 years for the accelerated aged material. The primary performance database from underground testing is even more limited." Unfortunately, since this letter was written, work in this area has been constrained by funding; much work remains to be done.

The pits that are available for reuse were not designed to provide the safety of a modernized stockpile using insensitive high explosives. While we have concepts for using these pits in a modernized stockpile, the extensive work required to convert these concepts to systems that could be certified is yet to be done.

Consider the following analogy: using old pits in a modernized stockpile would be like taking an engine from a 1965 Mustang and installing it in a 2012 model while continuing to meet 2012 emission requirements. It might be possible, but not without a lot of work, not to mention impacts to the other parts under the hood. Furthermore, certifying that it would work without ever driving the car would be challenging.

## LIFE EXTENSION PROGRAMS

As our systems age, LEPs have become necessary to continue confidence in the safety, security, and reliability of the stockpile. It is in LEPs that we see a return on investments made in long term science.

I am pleased to report that Los Alamos Life Extension activities on the W76–1 continue smoothly at the plants with Los Alamos providing technical support as

needed. We will continue our engagement to monitor product quality and ensure that design intent is maintained.

As you are aware, the Nuclear Weapons Council (NWC) authorized Phase 6.3 for the B61 LEP with a first production unit (FPU) in 2019. At Los Alamos, we are on a path to meet this deliverable because of investments that have been made over many years in the science and engineering campaigns. Tools such as the Dual Axis Radiographic Hydro-Test (DARHT) Facility, high performance computing and the Advanced Simulation and Computing (ASC) Program codes that we use to predict weapons performance are being applied today to the B61 LEP. We have used the investments in these campaigns to develop the technologies for gas transfer systems (GTS) so that we can quickly and cost-effectively implement specific designs for the B61. Given stable, predictable funding at levels consistent with the 6.2A study, I am confident that LANL will deliver on its responsibility for the B61.

LONG-TERM SCIENCE

Science is the base that allows LANL to address challenging issues that face the stockpile. At LANL we have a scientific workforce that includes approximately 2,500 PhDs. They form the core of our scientific base. The weapons program directly benefits when these scientists work on challenging technical problems using tools such as DARHT, the Los Alamos Neutron Science Center (LANSCE), and the ASC Program. Our ability to do stockpile work today is the product of these investments. Our science and engineering campaigns produced mature technology that was ready when needed. Similar investments are needed today to ensure that the Laboratory has tools and technologies to be ready for tomorrow's challenges.

In addition to benefiting the Lab's weapons program, we are able to leverage these capabilities for broader national interests. They, in turn, feed valuable technical insights directly back into the nuclear weapons program, including LEPs. Our work in nuclear forensics and medical isotope production illustrates these points.

- Nuclear forensics and attribution: Los Alamos delivered a suite of models and databases for National Technical Nuclear Forensics applications, such as modeling debris signatures and other nuclear security applications. LANL's capabilities in this area are a direct outgrowth of the former nuclear weapons testing program where scientists had to study the detailed chemistry of soil samples to determine various characteristics of detonation. Our experts in this area not only help with the current nuclear forensics, they also support the weapons program by helping to reinterpret data from previous underground tests. This information is then used to validate our weapons codes.
- Thanks to the Isotope Production Facility at LANSCE, LANL is a national leader in producing strontium-82 for cardiac imaging and germanium-68 for calibrating proton emission tomography (PET) scanners. Other isotopes, such as aluminum-26 and silicon-32, are unique to Los Alamos and are not produced anywhere else in the world. With the demand for short-half-lived medical isotopes being one of the fastest-growing needs of health care providers, the industry and medical researchers are looking to Los Alamos to provide a stable supply of these isotopes. Providing these isotopes as a service to the Nation maintains the skills at Los Alamos for producing and handling exotic isotopes.

Despite difficult and uncertain budgetary scenarios, a careful balance between LEPs and science, technology, and engineering must be maintained.

LOOKING AHEAD

Just as training and equipping prepare our Armed Forces to fight in battle, the science done at the national laboratories prepares our employees with the knowledge and tools needed to sustain the stockpile. While the balance must shift as we apply our knowledge and tools to LEPs, we cannot abandon preparation for the future any more than the military can abandon training and equipping, even in the midst of fighting a war.

In general, the budget for Directed Stockpile Work Services has seen successive cuts that have hampered progress toward goals set in the NPR, especially in the Component Maturation Framework, more sustainable hydrotest capability, nuclear safety research and development, and Plutonium Sustainment.

Over the last few months, I have been asked to estimate the budget impacts of pit reuse as a way to bridge our manufacturing gap. We are still in the early phases of work that would allow pits designed for conventional-high-explosive systems to be used in systems using insensitive explosives. Should the Nation choose to pursue this path, we believe that approximately $50 million per year will be needed for the

next 5 to 10 years beyond already-planned investments before we could certify systems using these pits. Because this work must start now if this concept is to be viable for coming LEPs, we are planning experiments this summer to gain insight into system behavior. While we believe this a promising direction for innovation to meet a national challenge, we cannot confidently predict the outcome. There is risk.

Whether the ultimate decision is to move forward with an alternative plutonium approach, or to continue with CMRR construction, every day that we do not address the issue is a day in which our risks increase. At a minimum, we need access to the $120 million appropriated in fiscal year 2012 that will remain after placing CMRR–NF in a stable state to make investments supporting a path forward. Furthermore, the $35 million already in the budget request for fiscal year 2013 will be needed to accelerate PF–4 vault clean-out. Access to these funds will allow us to continue making wise investments in our plutonium capability. This includes studying a transportation system between PF–4 and RLUOB, expanded use of RLUOB, and a migration of processes from CMR to PF–4. If we are to support the LEPs necessary over the next decade, we cannot afford to postpone action to address the Nation's plutonium capability.

## FUNDING ISSUES

When looking at funding, we must address the issues we see today as well as the investments needed to meet challenges in an uncertain future. Today, the stockpile requires action—action to address changes that we see occurring in the stockpile on timescales that are dictated by nature. Chemistry and physics take an unrelenting toll on the aging stockpile. As we work to modernize the stockpile, the balance is shifting toward today's issues as it must. However, I am concerned that short term stockpile needs may be shifting the balance too far to the present—putting our ability to care for the stockpile in the future at risk.

I must speak about the difficult budget issues facing LANL this fiscal year. While planning in fiscal year 2011 for the increases outlined in the 1251 report, LANL was prudent in hiring. Nevertheless, as fiscal year 2012 began it seemed unlikely that we would see the full planned increase. In November 2011, I established the Laboratory Integrated Stewardship Council to ensure that we manage our resources in a consistent, conservative manner across the Laboratory. This council is chartered with making financial decisions to keep Laboratory spending in line with a highly constrained budget.

For fiscal year 2012, LANL funding across our national security accounts is some $300 million lower than it was in fiscal year 2011. In the fiscal year 2013 budget request, funding at LANL appears to be down another $100 million.

These cuts made it necessary for me to make the difficult decision to move forward with a voluntary separation program to reduce our workforce. Just over a week ago more than 550 employees left the Lab. Many had decades of experience in the Weapons Program. Despite succession planning, we are losing valued employees sooner than expected.

## PENSION RELIEF

In 2006. Los Alamos made major changes in its pension system. New employees are no longer able to enroll in a defined benefits pension system. Rather, they are part of a defined contribution plan. While this system no longer provides the incentive to remain at the Laboratory until retirement, it also relieves LANL of the long-term liabilities associated with a defined benefits program.

The Laboratory remains committed to the benefits promised to employees who have, for many years, been participants in the defined benefits program—a program that has been closed since 2006. However, historically low interest rates coupled with the actuarial rules of the Pension Protection Act (PPA) have caused estimates of future liabilities to balloon. As a result, the Laboratory has been making contributions to the pension plan out of program funds for the last few years at well above the $100 million level. While we have increased employee contributions, they are only a partial offset to the contributions required by the PPA. If interest rates return to levels that have been typical over the last 25 years, it will not be long before our plan appears to be over-funded.

Mr. Chairman, I urge Congress to pass the proposed changes to the Pension Protection Act (PPA) that include a permanent "funding stabilization" provision. Today's unusually low interest rates, combined with existing pension funding legislation, have artificially increased our pension liabilities in the short term. This has reduced and will continue to reduce the funding available for the mission by tens of millions of dollars per year at a time when mission needs are growing and budgets are severely constrained.

In summary, I believe the proposed "funding stabilization" relief would provide a substantial amount of funding back to weapons program activities without incurring undue risk in pension funding over the long term.

CLOSING

The fundamental premise of Stockpile Stewardship is that a healthy program can sustain a workforce able to make technically sound decisions supporting the stockpile, using the scientific tools they have developed. Today we are well-positioned to make these decisions because of the investments the country has made over the last two decades. However, I'm increasingly concerned that we may no longer be on a healthy path. As our budgets at LANL are reduced, our risks increase. Some risks may be acceptable, but I am sure that there will be a point at which those risks become unacceptable.

Thank you, Mr. Chairman, for the opportunity to testify today.

Senator NELSON. Thank you.

Dr. Albright?

## STATEMENT OF DR. PENROSE C. ALBRIGHT, DIRECTOR, LAWRENCE LIVERMORE NATIONAL LABORATORY

Dr. ALBRIGHT. Mr. Chairman and Senator Inhofe, thank you for the opportunity to testify before the subcommittee.

I have submitted my full statement to the subcommittee, which I ask be made part of the hearing record.

Senator NELSON. Without objection.

Dr. ALBRIGHT. If I may, I will now make a brief opening statement.

This is a challenging period for the Federal Government with many priorities that require attention at a time of budget austerity. This is also the case for the Nation's SSP, including those activities at Lawrence Livermore National Laboratory.

I think it is worth reminding ourselves why we have a SSP. It was formally begun in the 1990s and it is really an ambitious experiment. It is founded on the premise that the expertise of a workforce and the judgments that they make that results from a detailed understanding of the fundamental science of how nuclear weapons work can serve as a substitute for the expertise and judgment that we historically developed back in the days when we had multiple and frequent design efforts and we did testing in the desert.

It is important to note that at the time we stopped nuclear testing, we really did not think we understood well enough how weapons work. It is why we had the tests. There were a great number of empirical factors and approximations that were built into the weapons design process that allowed efforts to proceed, but there was also a landscape of test failures that had, over time, indicated our lack of understanding of the basic underlying science. Hence, for stockpile stewardship to work, we needed to learn far more about the physical processes that transpire in the functioning of a weapon.

We have actually been quite successful in developing many of those science tools, in fact, probably more successful than many of the proponents, when the program started, would have imagined. But developing those tools remains extremely challenging. Our knowledge of the basic underlying physics is embodied ultimately in computer models. These models utilize scientifically justified approximations, and they are rendered more and more accurate by

improvements in computing power and by controlled experiments that we do at Livermore and other laboratories at Los Alamos to determine some of the important needed parameters. The idea here is to represent what we believe to be reality.

However, the thing you have to always worry about with these models is that they cannot become holy writ. It is absolutely crucial that they be tested repeatedly against experiments conducted at relevant physical conditions so that the assumptions and approximations embedded in the models can be verified and corrected as needed. To do otherwise is to invite disaster.

Hence, the pillars of the SSP have included both the development of independent analytical capabilities utilizing the world's most capable computing platforms at Lawrence Livermore, at Los Alamos, at Sandia, but also the development of experimental facilities to collect data on the conditions that are relevant to the operation of a nuclear weapon. It is worth noting that every nuclear state that has abjured testing is following the same approach to maintaining their stockpile.

Of course, the scientific understanding of nuclear weapons is not an end all by itself. It is rather a process that underlies our capability to maintain the stockpile. It informs our annual assessments. It informs how we react to issues that are raised during the surveillance program, and it informs how we conduct our life extension programs (LEP).

We are very excited about the recent accomplishments that we have made in this program, and I highlight many of these in my written testimony. But we are also very concerned about impediments to current programs and the long-term success of stockpile stewardship. So let me stress four points.

First, without sustained support for nuclear weapons science, stockpile stewardship will eventually fail.

Second, provided that support is sustained, we do remain optimistic about the prospects for long-term success of this science-based stockpile stewardship. The skills that we derive from the science base, as I said earlier, enable the Nation to maintain a safe, secure, and effective deterrent and deliver on very challenging LEPs.

Third, recognition and support of the NNSA laboratories serving as national security laboratories is actually very, very important to that nuclear stockpile mission. It complements and enhances the workforce. It adds depth and breadth and strength to the laboratories' capabilities.

Then finally, the NNSA laboratories would perform their vital national security mission far more effectively if they were managed as trusted partners of the Federal Government and governed in a more streamlined and cost-effective way consistent with the original intent of the FFRDC construct.

Thank you for your attention, and I will be pleased to answer your questions during the hearing.

[The prepared statement of Dr. Albright follows:]

## PREPARED STATEMENT BY DR. PENROSE C. ALBRIGHT

### OPENING REMARKS AND SUMMARY

Mr. Chairman and members of the subcommittee, thank you for the opportunity to testify today on the National Nuclear Security Administration Management of its National Security Laboratories. I am Parney Albright, Director of the Lawrence Livermore National Laboratory (LLNL).

LLNL is one of the Department of Energy's (DOE) National Nuclear Security Administration (NNSA) nuclear design laboratories responsible for helping sustain the safety, security, and effectiveness of our Nation's strategic deterrent. In addition to our stockpile stewardship efforts, we also leverage our capabilities to develop innovative solutions to major 21st century challenges in nuclear security, defense and international security, and energy and environmental security. I thank the committee for your continuing support for the important work we do.

This is a challenging period for the Federal Government, with many priorities that require attention at a time of budget austerity. This is also the case for the Nation's Stockpile Stewardship Program (SSP), including the activities at Livermore. We are very excited about recent and prospective major accomplishments, which I will highlight, but we are also very concerned about impediments to current programs and long-term success in stockpile stewardship. In particular, I stress four points:

- Without sustained support for nuclear weapons science, stockpile stewardship will eventually fail.
- We remain optimistic about the prospect of long-term success of "science-based" stockpile stewardship provided that support is sustained. The skills deriving from a solid science base will enable stockpile stewards to maintain a safe, secure, and effective deterrent and deliver on challenging life-extension programs.
- Recognition of and support for the NNSA laboratories serving as "national security laboratories" will better help the United States meet a broad set of 21st century security challenges. These broader activities complement our nuclear weapons responsibilities, adding depth, breadth, and strength to the laboratories' capabilities.
- The NNSA laboratories would perform their vital national security mission much more effectively if they were managed as trusted partners of the Federal Government and governed in a more streamlined/cost-effective way, consistent with the original intent of the Federally-Funded Research and Development Center (FFRDC) construct.

### NUCLEAR WEAPONS SCIENCE

The SSP, which formally began in the 1990s with the decision to enter into a moratorium on nuclear testing, is an ambitious experiment. It is founded on the premise that the expertise of a workforce (and the judgments they make) that results from a detailed understanding of the fundamental science of how nuclear weapons work can serve as a substitute for the expertise (and judgment) developed historically through multiple and frequent design efforts—efforts that ultimately had to be proven in nuclear tests. To add to the complexity of this enterprise, this new workforce must deal with weapons that will be deployed well beyond their initially intended service lifetimes, and over time upgraded with the (highly desirable) safety and security features called for by the recent Nuclear Posture Review—features that represent changes to previously tested configurations of those weapons.

It is important to note that at the time we stopped nuclear testing, we did not understand well enough how weapons worked (which is why we had to test); there were a great number of empirical factors and approximations built in to the weapons design process that allowed efforts to proceed, but with that there was a landscape of test failures that indicated our lack of understanding of the basic underlying science. Hence, for stockpile stewardship to work, we needed to learn far more about the physical processes that transpire in the functioning of a weapon. When the SSP was initiated, the nuclear stockpile was in good shape, which meant that we had a window of time to develop necessary nuclear weapons science tools and knowledge before more difficult-to-deal-with problems would likely arise.

Developing these science tools has been—and remains—extremely challenging. Our knowledge of the underlying basic physics is ultimately embodied in computer models. These models utilize scientifically justified approximations—rendered more and more accurate by improvements in computing power, and by controlled experiments that determine needed parameters—to represent what we believe to be reality. However, these models cannot become "holy writ;" it is crucial that they be

tested repeatedly against experiments conducted at relevant physical conditions, so that the assumptions and approximations embedded in the models can be verified and corrected as needed. To do otherwise is to invite disaster. Hence, the pillars of the SSP have included both the development of independent analytic capabilities—utilizing the world's most capable computing platforms—at Lawrence Livermore and Los Alamos national laboratories (each laboratory with differing approaches to modeling the underlying physics); but also the development of experimental facilities to collect data at the conditions relevant to the operation of a nuclear weapon. It is worth noting that every acknowledged nuclear state that has abjured testing is following the same approach to maintaining their stockpile.

Of course, the scientific understanding of nuclear weapons is not an end, but rather, as noted above, a process that underlies our capability to maintain the stockpile. First, each laboratory director provides an annual assessment of the stockpile. Hence, a crucial component to the SSP is the ongoing surveillance of the stockpile and the development of better surveillance methods. Again, here, the underlying premise of the SSP—that developing a detailed understanding of fundamental weapons science will lead to a workforce with the judgment and intuition heretofore developed through new weapons design and testing—is critical. If an issue is identified in a stockpile weapon, we as a nation need to know whether it can be ignored, fixed in the field, or is critical enough to call into question the reliability of a portion of the deterrent.

Finally, that judgment and experience must be turned toward Life Extension Programs (LEPs) that both sustain the extant stockpile and also allow for critical improvements in its safety and security. These advancements will in some cases result in deviations from fully tested configurations, and hence rely heavily on improvements in our understanding of fundamental weapons science. Furthermore, even if a weapon system were to have its lifetime extended without any deviations from the prior design, the reality is that component manufacturing processes change with time, some materials are no longer available, and no "blueprint" is sufficiently detailed to fill in all the decisions made historically on the production line. Certifying any weapon requires a workforce that understands the fundamental scientific aspects of nuclear weapons.

The full spectrum of SSP activities—a fundamental understanding of weapons science (based on theory and, crucially, experiments); its application to assessments; stockpile surveillance and development of better surveillance methods; dealing with significant findings and fixes; and LEPs—all serve to sustain the stockpile, exercise the skills and judgments of stockpile stewards, and, importantly, train the next generation of stewards. When the next round of LEPs for the extant stockpile is expected to begin in the 2030s, the people executing those LEPs will have been trained by people who themselves have never engaged in the development of a new design, nor executed a full nuclear test.

SSP depends on stockpile stewards being fully capable of identifying issues that arise in stockpiled weapons; resolving those issues through minor fixes or LEPs; and certifying the safety, security, and performance of the modified weapon without conducting a nuclear test. Strong support of all aspects of the SSP is required, because questions about safety, security, and performance will arise as long as the United States has nuclear weapons. Laboratory scientists and engineers must have the wherewithal to find and address problems, and the Nation must have confidence in their ability to do so.

We have made remarkable progress in developing the necessary computational and experimental tools and in using them to gain knowledge about key issues. We are attending to the immediate needs of the stockpile. Today, however, the hard challenges are now much closer as weapons age beyond their intended service life and important work to resolve key issues in nuclear weapons science remains to be done.

As noted briefly above, the simulation codes must have much higher fidelity than those originally used in the design of the weapon. Evaluating the performance of a weapon "as designed" is one issue; evaluating it when materials have aged and anomalies are present is much harder. Materials age at an accelerated rate when confined for years in the radioactive environment inside a nuclear weapon. The improved physics models required for science-based SSP are very complex (e.g., turbulence and the interaction of intense radiation with matter) and necessitate powerful computers. However, these codes—which embody our state of knowledge—must be tested against data.

Data collection about nuclear weapons performance falls into two broad categories: information pertaining to dynamics of the primary implosion and information pertaining to the nuclear explosion itself.

We collect data about the hydrodynamics of a weapon primary implosion at LLNL's Contained Firing Facility (CFF) and at the Dual Axis Radiographic Hydrodynamics Test (DARHT) Facility at Los Alamos National Laboratory (LANL). For example, in fiscal year 2010, one of our large-scale tests explored advance safety and security concepts that could be used in future LEPs; another demonstrated advanced capabilities for assuring weapon performance. Through marked improvements in diagnostics, we are obtaining greater amounts of higher fidelity data about implosion dynamics. These data are compared to pre-shot predictions of results—performed with our most advanced computers—and gauge how well our physics models work.

Other key experimental facilities managed by Livermore that provide information about non-nuclear performance include the High Explosives Applications Facility (HEAF), where state-of-the-art diagnostics are used to study the performance of aging high explosives in nuclear weapons, and the Joint Actinide Shock Physics Experimental Research (JASPER) Facility at the Nevada National Security Site. A two-stage gas gun, JASPER is used to produce an extremely high-pressure shock wave in plutonium and collect material properties data critical to the simulation codes. JASPER completed mandated upgrades in fiscal year 2011 and now operates as a Hazard Category 3 nuclear facility. Since JASPER returned to operation, five plutonium shots so far have collected vital data for LLNL and LANL.

A critical gap in our understanding of nuclear weapons science is the need for experimental data pertaining to the behavior of materials at the extreme conditions of a functioning nuclear weapon (100 million degrees temperature and 10 billion atmospheres pressure). With the National Ignition Facility (NIF) (and lesser but complementary capabilities in the Omega laser at University of Rochester's Laboratory for Laser Energetics and the Z-machine at Sandia National Laboratories (SNL)), it is now possible to gather high-energy-density (HED) science data at a precision and experimental rate that simply would not be possible by other means. Crucially, the NIF holds the promise of probing experimentally the conditions in a nuclear weapon that occur during the initial detonation—in particular, the boost process that determines the performance of the primary, which, in turn, drives the overall performance of the weapon. The ability to anchor the simulation codes with ignition data is pivotal to any discussion of design margins and performance.

## STOCKPILE STEWARDSHIP PROGRAM SUCCESSES AND CHALLENGES

My discussion of recent successes and challenges in the SSP will largely focus on NIF, high-performance computing, and the W78 LEP, which are crucial to long-term success.

### *The National Ignition Facility (NIF)*

NIF was commissioned at LLNL in 2009, and since then, the 192-beam laser has been performing very reliably as a high-precision experimental tool. During fiscal year 2011, a total of 286 shots were fired on NIF, with 62 shots for the National Ignition Campaign (NIC) and 50 shots for stockpile stewardship and HED science applications. Over 100 shots were fired in January and February of 2012—a record performance for complex shots. The demands for experimental time are high. Even with NIF operating 24 hours a day, 7 days a week, the requests for shots in fiscal year 2012 total more than 500 days.

Researchers are executing the program to achieve fusion ignition and energy gain, and the wide range of record breaking experiments results to date demonstrate the enormous utility of NIF as a users' facility for nuclear weapon science, broader national security applications, frontier science, and pursuit of fusion power for energy security. We are making excellent progress toward transforming NIF into a users' facility in fiscal year 2013.

#### *NIF Laser Performance*

In March 2012, NIF delivered a record-setting 1.875 million joules (MJ) of ultraviolet laser light to the center of the facility's target chamber. NIF generates nearly 100 times more energy than any other laser. This shot met a major milestone and exceeded NIF's design specification of 1.8 MJ. NIF is now able to conduct routine operations at full power. Very importantly, the recordsetting event was also one of the most precise shots ever fired at NIF. The laser's precision and enormous flexibility in how to use the beams make possible the fielding of many different types of ignition and HED science experiments for which more than 50 different types of diagnostic instruments, many developed specifically for NIF, are providing exceptional data for a wide range of types of experiments.

*Support of Stockpile Stewardship*

NIF has already made a pivotal contribution to stockpile stewardship with resolution of the "energy balance" issue after a series of experiments performed last year. The issue was originally identified during the era of nuclear testing and it has remained a significant anomaly for 40 years—an anomaly that in the past was an important reason for full nuclear testing. Over the last decade, experiments on a variety of experimental facilities contributed to improving the understanding of this anomaly and pointed to its likely source. LLNL researchers developed a sophisticated computational model that better simulated nuclear weapons performance and, in particular the specific aspects of performance that could possibly explain the anomaly. The unique capabilities of NIF were required to validate simulation results. With resolution of the energy balance anomaly, LLNL and LANL will have more confidence in assessments of the current weapons, which continue to change with age, and will be able to make better-informed choices in upcoming LEPs.

Additional SSP-supportive experiments were conducted in fiscal year 2011–2012 to study how materials that are normally solids behave when subjected to unprecedented pressures—in this case tantalum and carbon. These experiments are important stepping stones toward understanding the more complex material behavior of substances like plutonium. fiscal year 2013 is projected to be a very busy year for SSP experiments at NIF. Future plans call for a wide range of types of experiments to be performed by LLNL and LANL to better understand the physics of boost (thermonuclear burn in the primary explosion) and answer questions crucial to stockpile assessments, investigation of significant findings, and certification of LEPs.

*The National Ignition Campaign*

The goal of the National Ignition Campaign (NIC) is to compress and heat a millimeter-size target filled with deuterium and tritium to achieve fusion ignition and energy gain (at least as much energy output as input). The NIC team is also transitioning NIF to routine operations as a highly flexible HED science experimental facility. NIC, which concludes at the end of fiscal year 2012, is managed for NNSA by the Laboratory and includes many national and international partners, representing national laboratories, academia, and industry.

NIC is making substantial progress in the quest to achieve fusion ignition and burn. Activities are progressing through a series of milestones with ignition and burn as a major milestone scheduled for the fourth quarter of fiscal year 2012. The goal is to compress the cryogenically-cooled fusion fuel to a very small volume (compressed by more than a factor of 10,000 in density) and create a central "hot spot" that ignites and consumes a larger amount of surrounding hydrogen fuel. The goal is to turn mass into energy. A series of four shocks that must be precisely shaped and timed are used to implode the capsule and ignite the fuel.

NIC researchers are conducting a series of experiments to optimize the target implosion following the standard scientific approach of interweaving experiments and theory. These experiments occur at energies, temperatures, and pressures that have never before been probed, and hence that are well outside of the domain where our simulation models have been anchored—a domain that approaches the conditions inside a nuclear weapon. Through the iterative process of pre-shot prediction, experiment, and post-shot data analysis, new ground is being broken on the path to ignition. We are learning new physics and gaining a more fundamental understanding of thermonuclear reactions. This information is being used to continue improving our models as we move through the program, which in itself is testimony to the need for anchoring data and skepticism of models that are based solely on theory or are validated outside the domain of interest.

NIC (and more generally, the SSP) is a grand challenge with many scientific and engineering obstacles that test the skills and ingenuity of NNSA laboratory researchers. So far, we have overcome many obstacles and I have confidence that the NIC team will reach its objective of fusion ignition and burn. Others around the world see great value in having NIF-like capabilities and share confidence that the goal is within reach. China, Russia, and France are all committing to build (or have started to build) large laser systems for inertial confinement fusion (ICF); the United Kingdom works closely with NIF; and Japan and Korea are making substantial investments in ICF.

*High-Performance Computing (HPC)*

HPC is and always has been a defining strength of our Laboratory. SSP advances have required continuously pushing the envelope in HPC. As part of NNSA's Advanced Strategic Computing (ASC) program, we work closely with U.S. computer manufacturers to improve capabilities, and every generation of state-of-the-art computers pioneered at LLNL or LANL has later found broad application in making

U.S. industry able to develop better products more quickly. Livermore is currently bringing into operation two highly capable machines: "Sequoia" and "Zin".

*Sequoia*

In January 2012, the IBM technical team began installation of the first four racks of Sequoia, the next leap forward in computing capability; the last of the 96 racks arrive this month. This next generation "BlueGene/Q" technology operates at an order of magnitude faster than previously deployed systems. Sequoia, which includes 1.5 million processors and 6 million threads, is capable of record-setting 20 petaflops (20 quadrillion, or a million billion, floating point operations per second). Sequoia is also record-breaking in power efficiency—at over 2 billion calculations per watt, it is nearly 50 percent more power efficient than any competing technology. Our goal is to have the machine fully performing science simulations before the end of 2012 and dedicated to classified computing in mid-2013.

Sequoia is an important step toward even larger computers that are needed to run predictive models of boost physics and thermonuclear burn processes in nuclear weapons. Equally importantly, considerable effort has gone into development of improved methods to efficiently characterize and bound margin to failure and its uncertainties. Quantification of Margin and Uncertainty (QMU) provides the underpinning of our assessment and certification processes. Rigorous implementation of QMU requires running many thousands of high fidelity simulations to map out the impact of uncertainties on weapon performance, which, in turn, requires more powerful computers.

*Zin*

In March 2012, LLNL completed installation and began classified computing on Zin, a machine with 1 petaflop performance. As part of the ASC Tri-Lab Capacity Cluster 2 (TLCC2) program, similar computers are being installed at LANL and SNL to increase computing capacity. LLNL led the vendor selection to procure standardized hardware and software environment through TLCC2 so that the laboratories would realize significantly reduced costs, increased efficiencies, and enhanced collaboration. Zin provides a substantial boost to classified computing at LLNL, and full deployment of TLCC2 will allow users from all three laboratories to begin preparing their codes on the actual architecture that they will experience when Sequoia goes into service.

High-Performance Computing as a National Security Imperative. To meet the demanding needs of SSP, we urge support for an initiative to reach the challenging milestone of exascale computing (a billion billion calculations per second) by 2020. LLNL is working with other NNSA and DOE laboratories to formulate a strategy for how to achieve this ambitious goal. Exascale computing is also critical to our role as a broad national security laboratory, with Livermore bringing to bear on critical problems HPC as one of our principal strengths. Modeling and simulation of complex systems to understand and predict their behavior is key to solving challenging problems in national security, energy security, and economic competitiveness. Other nations equally recognize the value of leadership in HPC to their futures. Sequoia puts the United States back in the lead (surpassing Japan and China) and it is critical that we sustain leadership by reaching exascale performance level before competitor nations.

*The W78 Life-Extension Program (LEP)*

In June 2011, LLNL and the U.S. Air Force launched a concept development study to extend the life of the W78 Minuteman III warhead. The W78, which is the dominant system for the ICBM leg of the Nation's nuclear deterrent, is well beyond its planned service life and will reach 40 years before the LEP production begins. We need to address concerns identified in the surveillance of W78 that do not now affect performance. The LEP process, which begins with concept development (Phase 6.1), will take at least a decade to complete. As the program is conceived, production would start in fiscal year 2023.

The concept development study is evaluating different LEP approaches including refurbishment, reuse, or replacement of weapon components. As required by the Department of Defense (DOD), the study encompasses options that improve safety and security features and that make the warhead adaptable for deployment on SLBMs as well as ICBMs. At the end of the study, which should conclude this year, the California team (LLNL and SNL–California) will report findings and recommendations to the DOD/NNSA Project Officers Group. A key issue is the manufacturability of LEP components and systems—cost-efficiency, waste reduction, and avoidance of use of hazardous materials are important factors.

In addition to meeting the critical need to extend the service life of the W78, the LEP serves the long-term need to work on the full spectrum of stockpile stewardship

activities—including warhead development from physics and engineering design through production engineering. This is an essential part of hands-on training to increase skills and expert judgment. The young scientists and engineers who worked on the W87 LEP in the 1990s are now the technical leaders for the W78 LEP, and they are training the next generation of leaders.

*Other Stockpile Stewardship Program Successes and Challenges.*

*Assessments and Directed Stockpile Work (DSW)*

LLNL completed Cycle 16 of the Annual Stockpile Assessment with support from the newly implemented Independent Nuclear Weapon Assessment Process to strengthen peer review. Cycle 16 benefited from reduced uncertainties and increased scientific rigor due to improved simulation models, results of recent plutonium aging experiments, and better fundamental nuclear data deriving from joint work with LANL. Livermore also effectively managed its Significant Finding Investigation workload and its stockpile surveillance activities. However, our weapon assessments and DSW support activities are funding constrained, and of the systems in the stockpile, the B83 bomb and W80 cruise missile warhead are the least supported. With the fiscal year 2013 proposed budget, we will likely have to curtail activities that impact our ability to assess the performance of these systems. Funding for technology development to improve certification and safety is also very constrained.

*Facilities*

LLNL sustained very nearly 100 percent availability of its mission-critical and mission-dependent facilities throughout fiscal year 2011 as part of its Readiness in Technical Base and Facilities (RTBF) effort. However, we have not been able to keep pace with the needs for reinvestment in the Laboratory's aging overall infrastructure. LLNL receives less RTBF funds (by a factor of greater than two) than any other site in the complex. RTBF activities include our ongoing effort to prepare for shipping from the site special nuclear material requiring the highest level of security protection. More than 93 percent of the material has been removed and the work is on schedule to be completed in 2012. Important programmatic activities continue at the Laboratory's Superblock Facility and this well-maintained facility stands ready to support NNSA's new plutonium strategy with the planned delay in construction of the Chemistry and Metallurgy Research Replacement–Nuclear Facility (CMRR–NF) at LANL.

*Additional Budget Burdens*

The Lawrence Livermore National Security (LLNS), LLC, Defined Benefit Pension Plan up to now has been sufficiently funded that contributions have not been legally required. However, with interest rates at an historic low, liabilities have grown dramatically since mid-2009. As a consequence, statutory requirements of the Pension Protection Act of 2006 are forcing LLNS to act, and NNSA has granted LLNS approval to begin employee and employer contributions in fiscal year 2012. By starting now, we save NNSA almost $200 million through fiscal year 2022. I urge Congress to examine whether the provisions of the Pension Protection Act, designed to protect private sector pension plans, are appropriate for the NNSA complex of laboratories and plants. If a Pension Protection Act waiver/exception/modification is not enacted, $88 million will have to be diverted from programmatic work in fiscal year 2013.

LLNL AS A NATIONAL SECURITY LABORATORY

For many years, LLNL employees have applied their very special capabilities to develop innovative technical solutions to help meet a broader set of national needs. Work for NNSA on nuclear nonproliferation and counterterrorism, the Office of Science and others in DOE, other Federal agencies, and additional sponsors (e.g., in U.S. industry), is very important and has long been integrated into our mission and contribution to national security in the broadest sense. Our notable accomplishments in fiscal year 2011–2012 include:

- Radiation Detection. LLNL researchers developed the first plastic material capable of identifying nuclear substances such as uranium and plutonium from benign radioactive sources. The new technology could be used in large, low-cost detectors for portals to reliably detect nuclear substances that might be used by terrorists.
- Emergency response. Operating around the clock for 22 days, LLNL's National Atmospheric Release Advisory Center provided up-to-date atmospheric dispersion predictions, plume projections, and radiation dose estimates to agencies in the United States and Japan responding to the Fukushima nuclear reactor disaster.

• Low-collateral-damage munition. The U.S. Air Force funded LLNL in May 2010 to rapidly develop the design for a new low-collateral damage munition (BLU–129/B). Fielding of the munition was approved in September 2011. The effective integration of experiments with HPC simulations enabled quick and effective optimization of munition performance while meeting demanding engineering requirements.
• Cyber security. LLNL has created new capabilities for cyber-security work sponsors to provide real-time situational awareness inside a large computer network using a distributed approach to monitoring for anomalous behavior.
• Space situational awareness. LLNL has developed detailed physics-based simulations to provide real-time analysis of space flight safety risks, and we are designing new prototype collision-warning mini-sensors for deployment in orbit.
• Rapid development of new pharmaceuticals. Working with an industrial partner, LLNL researchers applied sophisticated computer models to sift through a large range of possibilities and identify three efficacious drug candidates in 3 months (normally a 2- to 5-year process).
• Industrial partnering in HPC. In March 2012, LLNL selected six pilot projects to partner with industry to accelerate the development of energy technology using LLNL's (unclassified) HPC resources through the Livermore Valley Open Campus (adjoining LLNL and SNL-California).

It is widely appreciated that the NNSA laboratories are unique (in terms of capability, talent, scale, and dedication to mission) national resources that should be more broadly applied to address pressing 21st century needs in defense and international security, energy security, and innovations to enhance economic competitiveness. As a dual benefit, the activities crucially add depth, breadth, and strength to the laboratories' technical base, which is important to long-term success in stockpile stewardship. Managing for High-Quality Science and Engineering at the NNSA National Security Laboratories, recently prepared by a National Academy of Sciences (NAS) committee at the behest of Congress, recommended "that Congress recognize that maintenance of the stockpile remains the core mission of the Labs, and in that context consider endorsing and supporting in some way the evolution of the NNSA Laboratories to National Security Laboratories . . . " Formal recognition of our national security mission responsibility would be very beneficial—as would steps to help lower operating costs at the laboratories and simplify the processes for arranging interagency work.

THE LABORATORIES AS TRUSTED PARTNERS IN NATIONAL SECURITY

Employees at the NNSA laboratories and plants are dedicated to national service. At the laboratories, we take on careers because we believe we can "make a difference" working with outstanding colleagues at state-of-the-art facilities on nationally important problems. As Federally-Funded Research and Development Centers (FFRDCs), our management contracts in principle place the day-to-day responsibility for national security research in the hands of non-Federal employees in order to ensure that staff and infrastructure of the highest quality are available and dedicated to the missions of our government sponsors. In this model, the government decides "what" needs to be done and provides the funding, and the laboratories decide "how" to assure the needed capabilities are available, and then how best to accomplish those tasks within the federally defined constraints. This partnership with the government should indeed be a partnership

The national laboratories, along with the plants, are the sinew and muscle of the nuclear weapons enterprise; they are the corporate memory, the execution arm, and the infrastructure. In many ways, they fulfill the same role within NNSA as does the uniformed military within DOD. Such a relationship works well when there is mutual trust between the partners, a clear understanding of roles and responsibilities, and a shared vision and clear focus on mission.

The Managing for High-Quality Science and Engineering at the NNSA National Security Laboratories report by the NAS committee speaks of the broken relationship between NNSA and the laboratories, stemming from a fundamental lack of trust. We need to return to a strong partnership between the government and the laboratories with active engagement of the laboratory directors in collaborative strategic discussions with NNSA management about program direction, health of the laboratories, and mission priorities.

The NAS committee's findings are not new. America's Strategic Posture, issued in 2009 as the final report of the Congressional Commission on the Strategic Posture of the United States, is highly critical of the governance structure and "micro-

management and unnecessary and obtrusive oversight." An investigation of other FFRDC governance models should be able to provide alternatives and help affect a cultural change in the way the laboratories are managed. We need to move from a duplicative, multi-layered, and poorly aligned governance system to a more streamlined, cost-effective approach that would restore a focus on mission and a trusted partnership. An operational way to do this is to provide a level of funding for oversight that is consistent with best practices for other FFRDCs. The savings, which could be substantial—within the government and at the laboratories, which have to absorb the costs of transactional oversight—could be reinvested to make for stronger programs and healthier laboratories.

As an example of how other agencies approach FFRDC governance, the Jet Propulsion Laboratory (JPL) is an instructive (but by no means unique) example. There are significant differences between JPL and LLNL; even so, the contrast in the FFRDC relationship is striking. JPL is a $1.5 billion center with more than 5,000 employees, managed by the California Institute of Technology as an FFRDC for the National Aeronautics and Space Administration (NASA). NASA governs the agency with three-agency level councils and the center directors are members. The Site Office at JPL performs no assessments and Headquarters performs Mission and Environment, Health, and Safety reviews three times per year. In contrast, over 1,300 external audits were performed at LLNL in fiscal year 2011 as part of NNSA's transactional oversight.

NNSA monitors performance at LLNL using an annual Performance Evaluation Plan (PEP). In fiscal year 2011, the PEP had 11 Objectives, 42 Measures, 79 Targets, 5 Award Term Incentives, 12 Multi-site Targets (all but 2 applicable to LLNL), and a large number of supporting metrics to gauge performance. The DOE/NNSA Site Office at Livermore defines 324 elements in their management assessment plans. JPL and NASA dispensed with the PEP approach, deciding that it interfered with a focus on mission.

There is one area where we have seen improvement toward an effective partnership with NNSA: reform of security policy and procedures. The effort, which began about 2 years ago, is led by NNSA's Defense Nuclear Service (DNS) and is collaborative with NNSA sites and contractors. DNS formed combined teams (Federal and contractor) of subject matter experts (e.g., in Information Security and in Physical Protection). The goal was to review and replace DOE Office of Health, Safety and Security orders with a more streamlined set of NNSA policies (NAPs) that provide the security directors at NNSA sites greater flexibility to meet their particular needs. So far, two NAPs have been created, which is saving an estimated $37 million per year in operating costs at LLNL alone. Seven more NAPs are in the pipeline and expected to be released soon.

CLOSING REMARKS

My overall message is a "good news" story with a note of caution. With continuing investments in HPC and with NIF coming on-line as a unique experimental facility to gather necessary input and validation data for nuclear weapons science simulation codes, science-based stockpile stewardship is on the path to success. However, vigilance and strong partnerships are required to sustain program support so that there will be skilled and motivated stockpile stewards as long as the Nation relies on nuclear deterrence.

All of us at LLNL look forward to serving as a trusted partner in the Nation's national security enterprise and are proud to provide innovative science and technology to meet a broad set of national security needs. We thank you for your continuing support.

Senator NELSON. Thank you.

Dr. Hommert?

## STATEMENT OF DR. PAUL J. HOMMERT, DIRECTOR, SANDIA NATIONAL LABORATORIES

Dr. HOMMERT. Chairman Nelson, Ranking Member Inhofe, thank you for the opportunity to testify.

I would like to request that my full testimony be made part of the record.

Senator NELSON. Without objection.

Dr. HOMMERT. I am Paul Hommert, Director of Sandia National Laboratories, a multi-program national security laboratory.

I would like to begin by putting my testimony in an overall context. It is my view that we have entered a new era for the U.S. nuclear deterrent, a period when the nuclear weapons enterprise must address for the first time modernization of the stockpile, which depends critically on the use and continued advancement of the tools of stewardship; targeted upgrades to the production infrastructure; and maintenance of the current stockpile through a modernization transition period. Such imperatives create funding demands not seen in recent decades and will require risk-based prioritization of the program, along with continued emphasis on strong program management and cost-effectiveness.

With this background, now let me discuss the four major points of my testimony.

I am pleased to report that the appropriated fiscal year 2012 budget will allow Sandia to complete the 6.2A cost study for the B61 LEP and initiate full-scale engineering development at a pace consistent with fiscal year 2019 first production unit (FPU) with the scope agreed by the Nuclear Weapons Council.

Furthermore, the President's fiscal year 2013 budget request to Congress, if authorized and appropriated, does provide sufficient funds for Sandia to support the fiscal year 2019 FPU schedule for the B61–12.

However, I must emphasize that beginning now consistent and timely, multiyear is vital if the B61 LEP schedule is to be maintained.

Second, the schedule and scope of the B61 LEP relate to strong technical drivers, which are discussed in my classified September 2011 annual stockpile assessment letter. I recommend the members read the letter, and I welcome the opportunity to discuss it further.

Beyond the B61 program, as we move forward on modernization, we must have a clear understanding and broad agreement about the vision for our stockpile 20 years from now. That vision must be robust in the face of current and future treaty obligations, evolving policy direction, stockpile technical realities, our infrastructure capabilities, and fiscal constraints. I believe such a vision is possible and emerging and we are actively supporting DOD and NNSA as they work through this planning.

Finally, I am encouraged by the recent discussion concerning governance of the NNSA laboratories. In my view, reinvigorating the government-owned and contractor-operated model, which implies government oversight at the strategic rather than transactional level, offers the potential for improvements in operational performance, contractor accountability, and cost-effectiveness at the labs with attendant cost savings on the Federal side.

With respect to fiscal constraints, we recognize the funding required at Sandia for the B61–12 is significant. In my full testimony, I outline steps we have taken to control costs. These include changes to pension and medical benefits, leveraging the work we do for other Federal agencies, and the utilization of the tools of stewardship. Throughout this program, we will continue to see further cost efficiencies.

I just mentioned the work that we do for other Federal agencies. I strongly believe that today it is no longer possible for my labora-

tory to continue to deliver consistently on the commitments to the nuclear weapons program without the synergistic interagency work that attracts top talent, hones our skills, and provides stability through the nuclear weapons program cycles.

Regarding talent, I am pleased to tell you that we have been able to recruit to Sandia top talent to support the full range of our national security programs. Specifically since fiscal year 2010, we have hired about 300 outstanding advanced degreed scientists and engineers directly into the weapons program. Of these, well over one-half are recent graduates anxious to begin their careers working on the Nation's nuclear deterrent. It is very important that we provide them with a stable environment to pursue the multiyear learning it takes to technically steward the Nation's nuclear stockpile now and into the future. To enable their success, we must strive for a national commitment to the program, for in the end the Nation's deterrent rests on the strength of our people.

Let me close by summarizing the key points.

Authorization and appropriation of the fiscal year 2013 budget request and consistent, timely multiyear funding are critical to a fiscal year 2019 FPU for the B61.

The schedule and the scope for the B61–12 is based on strong technical drivers.

We need a broadly agreed, 20-year detailed vision for our nuclear deterrent.

We are staffed and ready to execute the B61–12.

Operational performance, productivity, and cost-effectiveness can be increased at the laboratories by improvements to the government construct under which we currently operate.

Thank you and I welcome your questions.

[The prepared statement of Dr. Hommert follows:]

PREPARED STATEMENT BY DR. PAUL J. HOMMERT

INTRODUCTION

Chairman Nelson, Ranking Member Sessions, and distinguished members of the Senate Armed Services Subcommittee on Strategic Forces, thank you for the opportunity to testify. I am Paul Hommert, President and Director of Sandia National Laboratories. Sandia is a multiprogram national security laboratory owned by the U.S. Government and operated by Sandia Corporation [1] for the National Nuclear Security Administration (NNSA).

Sandia is one of the three NNSA laboratories with responsibility for stockpile stewardship and annual assessment of the Nation's nuclear weapons. Within the U.S. nuclear weapons enterprise, Sandia is uniquely responsible for the systems engineering and integration of the nuclear weapons in the stockpile and for the design, development, qualification, sustainment, and retirement of nonnuclear components of nuclear weapons. While nuclear weapons represent Sandia's core mission, the science, technology, and engineering capabilities required to support this mission position us to support other aspects of national security as well. Indeed, there is natural, increasingly significant synergy between our core mission and our broader national security work. This broader role involves research and development in nonproliferation, counterterrorism, energy security, defense, and homeland security.

My statement today will provide an update since my testimony of March 30, 2011, before this subcommittee. Starting from an overall perspective of the nuclear weapons program and the challenges facing us since the end of the Cold War, I will refer to the following major issues:

[1] Sandia Corporation is a subsidiary of the Lockheed Martin Corporation under Department of Energy prime contract no. DE–AC04–94AL85000.

(1) modernization programs with emphasis on the B61 Life Extension Program (LEP),
(2) U.S. nuclear stockpile assessment,
(3) status of the capability base needed to support our mission,
(4) nonproliferation,
(5) broader national security work,
(6) workforce, and
(7) governance.

These issues will be viewed within the context of the administration's request to Congress for the fiscal year 2013 budget and of the appropriated fiscal year 2012 budget.

MAJOR POINTS OF THIS TESTIMONY

1. For the nuclear weapons enterprise to meet the B61 LEP scope and schedule as decided by the Nuclear Weapons Council in December 2011, it is essential that the funding levels in the President's fiscal year 2013 budget request to Congress be authorized and appropriated. In addition, funding disruptions that could result from a fiscal year 2013 continuing resolution would have an almost immediate impact on our ability to meet the fiscal year 2019 first production unit schedule for the LEP. Therefore, if the schedule is to be met, plans for uninterrupted execution under a possible continuing resolution will be needed.
2. The schedule and scope of the B61 LEP relate to strong technical drivers, which are discussed in my September 2011 annual stockpile assessment letter. I recommend that members read the letter, and I welcome the opportunity to discuss it in an appropriate venue.
3. Beyond the B61 LEP, further planning is needed to determine the details of the modernization activities consistent with the 2010 Nuclear Posture Review framework. The planning update needs to reflect the current plutonium strategy, improved understanding of modernization costs, and technical state of the stockpile; it also needs to be consistent with overall fiscal constraints. We are supporting Department of Defense (DOD) and NNSA planning efforts currently underway.
4. I am encouraged by the recent discussion concerning governance of the NNSA laboratories. In my view, reinvigorating the government-owned and contractor-operated model, which implies government oversight at the strategic rather than transactional level, offers the potential for improvements in operational performance, contractor accountability, and cost-effectiveness at the laboratories, with attendant cost savings on the Federal side.

PERSPECTIVE OF THE NUCLEAR WEAPONS PROGRAM

It is my view that we have entered a new era for the U.S. nuclear deterrent. The nuclear weapons enterprise must address for the first time the following imperatives: modernizing the nuclear weapons stockpile, which depends critically on the use and continued advancement of the tools of stewardship, upgrading production infrastructure in a targeted manner, and maintaining the current stockpile through a modernization transition period. Such an environment creates funding demands not seen in recent decades, and it will require risk-based prioritization of the program, along with continued emphasis on strong program management and cost-effectiveness.

The current nuclear stockpile was largely developed, produced, and tested in the 1970s and 1980s, during the Cold War. It was the time of the arms race, as new nuclear systems were frequently being developed and fielded.

After the 1992 moratorium on underground testing, the nuclear weapons program went into its next phase, science-based stockpile stewardship. The advanced tools and deeper scientific understanding we developed in that period have been applied to our annual assessment of the stockpile, to stockpile maintenance activities such as replacement of limited-life components, and to the qualification of the W76–1 LEP. Science-based stockpile stewardship has been successful in generating the required scientific competencies and resources and attracting talented staff, but it was not accompanied by a broad-based effort to modernize the nuclear arsenal.

Now, some 20 years after the end of the Cold War, we have a stockpile that has become significantly smaller and older. Considering the average age (27 years) of the stockpile and our insights into the stockpile, we have clearly reached a point at which we must conduct full-scale engineering development and related production activities to modernize the nuclear arsenal. This work can be accomplished only by relying on the tools of stewardship and a revitalized, appropriately sized production

capability. Let me restate that, in my view, the nuclear weapons enterprise has never before faced the combined need to modernize the stockpile, address production infrastructure, and further stewardship while sustaining major elements of the current stockpile.

The new era of the nuclear deterrent is guided by the strategic framework for U.S. nuclear weapons policy outlined in the 2010 Nuclear Posture Review and associated documents, such as the fiscal year 2012 Stockpile Stewardship and Management Plan. However, in the past year, several factors have required further detailed planning to confidently establish the basis for sustaining and modernizing our nuclear deterrent. These factors include changes in the plutonium strategy, a deeper understanding of modernization costs, and the technical state of the stockpile. As we move forward, we must have a clear understanding and broad agreement about the vision for our stockpile 20 years from now. That vision must be robust in the face of current and future treaty obligations, evolving policy direction, stockpile technical realities, our infrastructure capabilities, and fiscal constraints. I believe such a vision is emerging, and we are actively supporting the DOD and NNSA as they work through this planning. Simultaneously, we are ensuring that Sandia is positioned to fulfill its responsibilities in support of the Nation's nuclear deterrent. We are confident in our ability to do so.

BUDGET OVERVIEW

I am pleased to report that the appropriated fiscal year 2012 budget will allow Sandia to both complete the 6.2A cost study for the B61 LEP and initiate full-scale engineering development at a pace consistent with a fiscal year 2019 first production unit. In this context, I wish to extend my thanks to the key authorization and appropriation committees of Congress for having approved reprogramming of fiscal year 2012 funds to achieve the full budget level required to complete our work. Without reprogramming, staffing would have been impacted at a number of nuclear weapons enterprise sites, including Sandia. In my view, fiscal year 2013 is critical to sustaining modernization at the schedule and scope required by recent Nuclear Weapons Council decisions and the overall framework of the Nuclear Posture Review. Within this section, I will focus on key elements required for Sandia to execute its near- and long-term responsibilities and the manner in which the fiscal year 2013 budget request to Congress reflects those requirements.

*The B61 Life Extension Program*

Sandia supports the administration's fiscal year 2013 budget request to Congress, which addresses funding for the B61 life extension. If fully appropriated, the fiscal year 2013 site splits for Sandia provide the necessary budget growth that permits Sandia to meet program requirements. fiscal year 2013 is crucial for the B61 as all component designs must be brought to a level that ensures successful system qualification on the path to fiscal year 2019. We will complete detailed cost estimates for the required scope of the B61 program in June of this year; however, from work we completed in 2011, we know with high confidence that the level of funding included in the fiscal year 2013 budget request is commensurate with the technology maturation and integration that must be conducted in fiscal year 2013 in order to meet the required schedule.

Last year I testified that the B61 LEP would complete the cost estimation for the full-scope B61 LEP in fiscal year 2011. Indeed, a detailed cost study was completed on schedule that met all the DOD and NNSA objective requirements. As it became clear that the cost of meeting all objective requirements with delivery in fiscal year 2017 would exceed near-term resource availability, the B61 LEP system design team was directed to examine reduced-scope options, which meet a renegotiated set of threshold requirements that would represent acceptable risk for the weapon system going forward. This work led to the scope accepted by the Nuclear Weapons Council in December 2011, which reduces the cost of the program while ensuring a modernized B61 that meets military threshold requirements and addresses technical concerns expressed in my annual stockpile assessment letter from September 2011. While I strongly support this scope, it is important to recognize that the new program does have increased risk resulting from the partial reuse of components and the loss of schedule margin. The schedule is now driven tightly by technical realities in the current system. The reuse of certain components further heightens the importance of a robust surveillance program.

I cannot emphasize enough the significance of timely funding authorization and appropriation. Consistent, predictable multiyear funding is vital for the fiscal year 2019 B61–12 first production unit as it allows for the seamless progression of development, qualification, and production and for development of the necessary workforce. Plans for uninterrupted execution under a possible continuing resolution in

fiscal year 2013 will be needed if the schedule is to be met. The success of the B61 LEP also requires the necessary support for the nuclear explosive package agency (Los Alamos National Laboratory) and the production complex.

The B61 LEP represents the largest nuclear weapon product development effort that the nuclear weapons complex has undertaken since the 1970s, an effort roughly three times that of the W76 Trident II SLBM warhead LEP, which is now in production. We recognize that the funding levels required at Sandia for this program are significant. Therefore, we are focused on efforts to reduce cost over the life of the program and to manage with full transparency and commitment to program rigor. Examples of our efforts include: (1) actions we have taken to reduce, by over $1 billion, labor costs associated with Laboratory-wide pension and medical care over the coming decade; (2) maximum leverage we have sought from other weapon development efforts and from the work we do for other Federal agencies; and (3) consistent use of the tools of stewardship to reduce the costs of weapon qualification by comparison with historical efforts. Throughout this program, we will continue to seek further cost efficiencies. For example, the governance reform efforts being considered also afford the opportunity for further savings.

My last comment on the B61 program has to do with staffing. For this life extension, we have now approximately 30 product realization teams working to complete the Weapon Development and Cost Report and being prepared to initiate full-scale engineering design of components and subsystems upon entry into Phase 6.3. We aggressively staffed this program in fiscal year 2011 to accomplish our objectives on the current schedule. In July 2010, we had a core of approximately 80 staff on the B61 project. By the end of fiscal year 2011, we had staffed to more than 500. This group includes experienced weapon designers, individuals with design and program management experience from other large non-nuclear-weapon programs at Sandia, and many new professionals who represent the future intellectual base of our deterrent. It has been a challenge to assemble this team, but we have done so. Major instabilities in funding will make it difficult to keep this team stable and will lead to amplified schedule and cost impacts if we need to periodically reassemble the team.

*Further Modernization Efforts*

The B61 LEP is one in a series of programs with timelines extending to 2035 that have been documented in the fiscal year 2012 Stockpile Stewardship and Management Plan. Among them are the W88 Alteration (ALT), the modernization of elements of our ballistic missile capabilities, and a possible weapon system associated with long-range stand-off delivery vehicles.

Sandia is pursuing work on the W88 ALT, which involves replacing the Arming, Fuzing, and Firing (AF&F) system and other nonnuclear components. The W88 ALT is scheduled for first production unit in December 2018, driven by the overall Navy program and schedule, components reaching their end of life, the need for additional surveillance quantities, and alignment with the common fuze developed for the Air Force for the W87.

The Nuclear Posture Review recommended "initiating a study of LEP options for the W78 ICBM warhead, including the possibility of using the resulting warhead also on SLBMs to reduce the number of warhead types" (p. xiv). A larger vision of an interoperable set of ballistic warheads has matured since the release of the Nuclear Posture Review 2 years ago; this approach will support a more flexible, responsive, resilient stockpile for an uncertain future. Indeed, the Phase 6.1 concept assessment study for this modernization effort is nearing completion, and Sandia provided the warhead systems engineering and integration. We are fully leveraging the work we have done over the past several years on modular warhead architectures and adaptable nonnuclear components, including a recent study focused on a modular AF&F design.

By being adaptable to several weapon systems, our modular AF&F approach leads to significant cost savings. Using an envelope of the requirements for the W78, W88, and W87, our study concluded that the modular AF&F approach is technically feasible. While the modular AF&F cannot be identical in each weapon system because the nuclear explosive package is different, it can be designed to be adaptable, with many common components and common technologies. In each life extension, we will also make appropriate improvements in safety and security, which are enabled in part by miniaturization of electronics. Savings in weight and volume, at a premium in reentry systems, can be used for those additional safety and security features. The results of the W78 LEP Phase 6.1 concept assessment study are planned for briefing to the Nuclear Weapons Council Standing and Safety Committee later this year.

*Stockpile Surveillance and Assessment*

Stockpile surveillance and assessment play a crucial role in assuring the nuclear deterrent. Findings from conducting this program provide us with knowledge about the safety, security, and reliability of the stockpile, provide the technical basis for our annual stockpile assessment reported to the President of the United States through the annual assessment process, and inform decisions about required elements of the LEPs and their timelines.

Multiple drivers heighten the importance of the surveillance program. Among them are the following: an unprecedented age of the stockpile, which includes many subsystems that were not originally designed for extended life; smaller stockpile numbers; and for at least the next 20 years, surveillance of a stockpile that will contain simultaneously both our oldest weapons and life-extended weapons, which must be examined for possible birth defects and for further aging of reused components.

If fully appropriated, the fiscal year 2013 site splits for Sandia provide the resources to meet our highest priority surveillance needs, which include conducting planned system tests—both flight and laboratory tests—but they limit the pace at which we can implement additional component tests and develop new diagnostics needed to improve our predictive capabilities. These predictive capabilities, which provide a better understanding of margins, uncertainties, and trends, are needed to ensure lead times necessary to respond to aging issues that would have the potential to reduce stockpile safety, security, or reliability. To minimize the risk to the stockpile, given the realities of the current fiscal environment, we are implementing a risk-based prioritization of our surveillance activities. Success in this important area will require continued strong budget support in the out-years.

*Essential Infrastructure and Capabilities*

Sandia's capabilities are essential to its full life cycle responsibilities for the stockpile: from exploratory concept definition to design, development, qualification, testing, and ultimately to ongoing stockpile surveillance and assessment. Let me point out a few examples.

The NNSA complex transformation plan designated Sandia as the Major Environmental Test Center of Excellence for the entire nuclear weapons program. Our facilities and equipment in this area are extensive: (1) 20 test facilities at Sandia; (2) the Tonopah Test Range in Nevada; and (3) the Weapon Evaluation Test Laboratory in Amarillo, TX. We use environmental test capabilities to simulate the full range of mechanical, thermal, electrical, explosive, and radiation environments that nuclear weapons must withstand, including those associated with postulated accident scenarios. In addition to these experimental and test facilities, Sandia's high-performance computing capabilities are vital tools for our mission responsibilities in stockpile surveillance, certification, and qualification, and they have proved to be indispensable in our broader national security work.

I am very pleased that funding for the completion of the Test Capabilities Revitalization Phase 2 is included in the administration's fiscal year 2013 budget request for weapons activities. This funding will enable us to renovate our suite of mechanical environment test facilities, which are essential to support the design and qualification of the B61 life extension and subsequent life extensions.

The administration's fiscal year 2013 budget request also includes funding for the initial Tonopah Test Range upgrades in recognition of this facility being an essential mission requirement. However, sustained investment over multiple years is necessary to complete the required scope of the upgrades. Development flight tests will be conducted at the Tonopah Test Range for the B61 life extension.

I am equally pleased that the new budget request addresses the beginning of a recapitalization program for our silicon fabrication facility, the requirements for which I addressed in my testimony last year. I will restate that Sandia stewards for the nuclear weapons program, as well as for the Department of Energy's (DOE) nonproliferation payloads, the microelectronics research and fabrication facility, where we design and fabricate an array of unique microelectronics, specialty optical components, and microelectromechanical system devices. The fiscal year 2013 budget request includes funding for the first year of a 4-year program that will recapitalize the tooling and equipment in our silicon fabrication facility, much of which dates back about 15 years in an industry where technology changes almost every 2 years. For completion of the program, commitment to multiyear funding is required. Recapitalization will reduce the risk for delivering the B61 LEP and ensure production of the radiation-hardened components required by the W88 ALT and all future reentry system LEPs. As we go forward on modernization, our microelectronics fabrication facilities, which form the basis of our trusted foundry, will be critical to ensuring the integrity of our supply chain.

*Nonproliferation*

Sandia's portfolio of nonproliferation activities contains a full array of programs aimed at combating the proliferation of weapons of mass destruction. Working collaboratively with Los Alamos and Lawrence Livermore national laboratories and several other DOE laboratories, we are:

- developing technologies to "convert, remove, and protect" nuclear and radiological materials that could be used in nuclear and radiological weapons,
- conducting international work for material protection,
- increasing effectiveness in large-scale field experimentation for nonproliferation test monitoring and arms control,
- ensuring that the on-orbit satellite program meets current requirements and adapts to future monitoring challenges,
- developing ground-based systems for more effective seismic monitoring;
- enabling other countries to develop nuclear security centers of excellence, and
- conducting international work in support of cooperative threat reduction programs.

In addition to working with other laboratories, we are engaging globally with international partners in more than 100 countries to reduce the threat of proliferation. Our primary customers for this work are the NNSA, Department of State, and DOD. As a general comment, I will state that nonproliferation funding has shown stability at Sandia. The administration's fiscal year 2013 Budget Request to Congress continues that trend, with budget increases in certain areas and reductions in others. I am pleased to see balanced increases both in the technologies that respond to immediate national security needs and in the R&D necessary to sustain the flexibility to meet future national security requirements. In particular, the long lead time for satellite monitoring systems requires a sustained commitment to leading-edge R&D. This budget demonstrates that commitment and will enable the national labs to attract "the best and the brightest," who are eager to participate in exciting R&D projects with an enduring impact on U.S. and global security.

*Synergy between Our Nuclear Weapons Mission and Broader National Security Work*

Today's national security challenges are highly diverse. The NNSA laboratories are contributing solutions to the complex national security challenges. Indeed, as mentioned in the fiscal year 2011 Stockpile Stewardship and Management Plan Summary, "while NNSA nuclear weapons activities are clearly focused on the strategic deterrence aspects of the NNSA mission, they also inform and support with critical capabilities other aspects of national security" (p. 7). In turn, to sustain and sharpen these competencies, Sandia relies on its broader national security work. The symbiotic relationship between the nuclear weapon mission and broader national security missions prevents insularity and creates a challenging, vigorous scientific and engineering environment that attracts and retains the new talent that we need. Such an environment is essential to succeed against the challenges we now face. The following example highlights the way in which this symbiotic relationship works.

Sandia has led the development of real-time processing and high performance-to-volume ratio technologies for synthetic aperture radar (SAR). Both technologies were made possible by our extensive design and development work for radars for nuclear weapon fuzing. The technologies have been leveraged and are currently used by the DOD. The extensive SAR work has sharpened our radar design competencies and kept Sandia aligned with advances in radar technology, such as radio-frequency integrated circuits. We are now applying these modern technologies to the design of the replacement radar for the B61 LEP and the W88 ALT.

This symbiotic relationship enables leveraging not only capabilities and technologies, but also engineering practices and processes. One of these areas with direct application across business areas and customers is cost management. A new cost management process was developed and successfully implemented during our work on fuze development for the U.S. Navy. Once work was delivered within the Navy's cost targets, many of the staff transitioned to work on the large satellite programs, where additional processes were developed for cost and change control. Once again, after delivery of expected results, many of those same staff transitioned onto NNSA's current LEPs, including the B61 LEP. This synergistic rotation of staff across business areas and the lessons learned from a diverse set of customers and programs have created an environment of cost control and provided a set of cost management processes and practices that are now being implemented on NNSA's current programs. In a climate of fiscal responsibility, Sandia is finding innovative solutions to control cost.

Today it is no longer imaginable that the laboratories could deliver consistently on the commitments to the nuclear weapons program without the synergistic interagency work that attracts top talent, hones our skills, and provides stability through the nuclear weapons program cycles. Government commitment for the broad national security work of the laboratories is essential for the United States to ensure the preeminence of our nuclear weapons and to enable multidisciplinary technical solutions to other complex and high-risk national security challenges.

*Workforce*

Our talented people are our most fundamental capability. Given the scope and nature of our work, it is mandatory to continue attracting, retaining, and training a highly capable workforce committed to "exceptional service in the national interest." To do so, we must: (1) ensure that our work is aligned with the national purpose; (2) create a climate of innovation and creativity that inspires our workforce; and (3) create a balanced work environment that is both responsive to the fiscal realities of our times and attractive to the talented staff we need in the future.

At Sandia, we have been proactive about hiring new staff into the weapons program, as experienced staff retired. The modernization program provides opportunities for the new technical staff to work closely with our experienced designers: from advanced concept development to component design and qualification, and ultimately to the production and fielding of nuclear weapon systems. Since the beginning of fiscal year 2010, we have hired approximately 300 outstanding advanced-degree scientists and engineers directly into the weapons program as we execute modernization. Of these, well over one-half are essentially new graduates anxious to begin their careers working on the Nation's nuclear deterrent. It is very important that we provide individuals such as these with an environment where they can undertake the multiyear learning it takes to technically steward the Nation's nuclear stockpile now and into the future. Indeed, in the end, the Nation's deterrent rests upon the strength of our people. We have a new generation of scientists and engineers prepared to take on that challenge now that we have entered the modernization era, but we must strive to provide the stability, focus, and national commitment that will enable their success.

As I testified last year before this subcommittee and as I stated above, fiscal realities have forced us to reduce costs by addressing the funding liabilities in our pension program, restructuring the healthcare benefits, and simplifying internal processes. All these actions were necessary, but they can go no further without compromising our ability to attract and retain.

*Governance*

Finally, I would like to state that I am much encouraged by the recent broad discussion around NNSA's oversight of the national security laboratories. Future improvements, as recommended by the National Academy of Sciences study "Observations on NNSA's Management and Oversight of the Nuclear Security Enterprise" will allow us to reinvest needed resources back into the mission.

A strategic oversight model is needed, which will bring to the forefront the need for such governance principles as mission clarity, commitment to using the robust construct of federally funded research and development centers, and commitment to the full use of the government-owned and contractor-operated model.

We understand that effective government oversight of our operations is essential. However, I am concerned that the magnitude and detailed level of our current oversight model can impede our efforts to continually improve our safety, security, environmental, and cost performance. It is also not evident that the oversight model under which the NNSA laboratories operate is comparable to that of other federally funded entities engaged in similar work. I encourage the administration and Congress to consider improvements in this area.

## CONCLUSIONS

As stated in the 2010 Nuclear Posture Review, "as long as nuclear weapons exist, the United States will maintain a safe, secure, and effective nuclear arsenal" (p. iii). Having embarked on the new era of the nuclear deterrent, we are guided by the strategic framework for U.S. nuclear weapons policy outlined in the 2010 Nuclear Posture Review and associated documents, such as the fiscal year 2012 Stockpile Stewardship and Management Plan. However, in the past year, several factors have required further detailed planning to confidently establish the basis for sustaining and modernizing our nuclear deterrent. Among these factors are changes in the plutonium strategy, a deeper understanding of modernization costs, and the technical state of the stockpile. As we move forward, we must have a clear understanding and broad agreement about the vision for our stockpile 20 years into the future. I believe

such a vision is emerging, and we are actively supporting the DOD and NNSA in their planning efforts. Simultaneously, we are ensuring that Sandia is positioned to fulfill its responsibilities in support of the Nation's nuclear deterrent. We are confident in our ability to do so.

Sandia supports the administration's fiscal year 2013 budget request to Congress. Seamless progression of development, qualification, and production on the B61 LEP requires funds appropriated in a timely manner in fiscal year 2013 and all subsequent years to meet the goal of a first production unit in fiscal year 2019. Our commitment to the demanding and solemn responsibility for stockpile modernization, stewardship, and annual assessment is unwavering. It also comes with an obligation to be second to none in science and engineering and to steward the Nation's resources efficiently. Sandia is committed to fulfilling its service to the Nation with excellence and judicious cost management. The fact that the three national security laboratory directors were invited to speak before you today and answer your questions is a clear indication of the leadership role of Congress in authorizing a sound path forward for U.S. nuclear deterrence.

Senator NELSON. Thank you.

We will do a 7-minute round. Senator Inhofe has to attend another hearing. So I will defer to him.

Senator INHOFE. I appreciate that.

I just returned from Afghanistan, and I will say the same thing to you that I said to some of the commanders there. There are a lot of things that we need that we are not getting. They are not adequately funded. This is true at the labs. This is not your fault. You did a great job. All three of you are doing a great job with the hand that you are dealt, but I think we need to deal you a better hand, if I have said that right, Mr. Chairman.

Let me just mention a couple of things that I would like to get on record. Then I do have to go to the Senate Foreign Relations Committee because I am actually the ranking member there.

The fiscal year 2013 budget for the NNSA makes a number of significant changes to the nuclear weapons complex modernization plan the President supported when he asked for the Senate to ratify the New START treaty. Some of you were not really involved on a lot of those discussions, but in attempting to get the votes necessary for the New START treaty, commitments were made that affect you.

By deferring a major construction project at Los Alamos, the NNSA effectively terminated a key enabler necessary to meet STRATCOM requirements as well as the confidence necessary to support the future reductions. During our hearing in March, General Robert Kehler, the head of STRATCOM, testified that he is concerned with the lack of a plan and strategy to meet STRATCOM requirements. According to General Kehler, he will be "concerned until somebody presents a plan that we can look at and be comfortable with and understand that it is being supported."

So, Dr. McMillan, Dr. Hommert, and Dr. Albright, if you would just answer these questions, I would like to get you on the record.

Do you share General Kehler's concerns?

Dr. MCMILLAN. Senator Inhofe, why don't I start since CMRR is my responsibility?

If I could, Mr. Chairman, I failed to ask to get my written comments into the record. So if they could please be included.

Senator NELSON. Without objection.

Dr. MCMILLAN. I would say we do not yet have a plan. In that I agree with General Kehler. However, from my perspective, I see a substantial amount of work going on both with DOD and with

DOE, and at the laboratory we have been involved with that work to develop a plan.

I mentioned elements of that development in my testimony which is to talk about the concept of pit reuse. In my view, a plan is more than a concept. A plan involves ideas, a project plan, and funding that is consistent with that, and we are not yet at that stage.

Senator INHOFE. Okay.

Comments, Dr. Albright? Basically do you agree with General Kehler?

Dr. ALBRIGHT. Yes, I would say I generally do agree with him. I would just make the caution that because of the deferral of CMRR, the technical solutions that we are looking at for our LEPs are constrained in a certain way that we are, I think, I would say, cautiously optimistic that we can accommodate those constraints, but it is by no means a done deal.

Senator INHOFE. Not with the current resources you have.

Dr. ALBRIGHT. With the current resources we have. The issue here gets around to pit reuse and how you can accommodate that pit reuse within the constraints of the NPR.

Senator INHOFE. Do you generally agree with that, Dr. Hommert?

Dr. HOMMERT. I would share General Kehler's view that right at this moment we do not have a plan, as I mentioned in my oral statement. It is very important that we can see what the stockpile we want to have 20 years from now because when you back up from that, we have to make technical choices or begin scientific work today that would position us to have that stockpile in the future. I am encouraged that I think such a plan can be developed, but we do not have that in hand today.

Senator INHOFE. The three of you heard me say in my opening statement that the commitment on behalf of the administration to modernize the nuclear weapons complex was a key element in the ratification of the New START treaty. Were you aware of that? Okay.

Do you agree that modernization is universally recognized as essential to the future viability of the nuclear weapons complex and the prerequisite for future reductions? You would generally agree with that statement?

Dr. HOMMERT. I would say that modernization from a technical standpoint is required for the U.S. stockpile, yes.

Senator INHOFE. Is it true that this budget would result in a—and I am going to name some delays here—the 2-year delay in the B61 LEP and also delay of the completion of the W76 LEP by 4 years and then by 3 years the W78, W88 LEP, those three extensions? This budget would result in those extensions?

Dr. HOMMERT. Yes. The budget is consistent with the timeframe.

Senator INHOFE. Lastly, I would say, does your budget provide the resources necessary to meet the DOD requirements?

Here is what I am trying to get at. These are not trick questions or anything. I am very much concerned. It harms those of us who are trying to expand this program trying to meet the commitments that are out there that we should be meeting as a committee. We are on your side, but when we do not get you on record saying that

there are some inadequacies we do not have much to hang our hat on. I am concerned about this, about the requirements.

First of all, you talk about a letter that you sent. I am a little confused because I hear now and then the term "certification." Do you folks have to certify and is this in the form of a letter? How does that work?

Dr. HOMMERT. We are required annually to submit a letter to the Secretary of Energy and the Secretary of Defense, each individually stating our technical view of the annual assessment of the stockpile as to its safety and reliability.

Senator INHOFE. And modernization and——

Dr. HOMMERT. Requirements that might flow from that.

Senator INHOFE. That is good.

Dr. MCMILLAN. In addition, when a system first enters the stockpile system, Senator, we certify it at that point, and then we review it annually to make sure that things have not changed in a way that would cause us to have——

Senator INHOFE. You are actually certifying for that point in time, that snapshot.

Dr. MCMILLAN. That is right, and then we review that.

Senator INHOFE. All right. The subcommittee has been told that 1 or 2 years of additional funding will not be sufficient to put the U.S. nuclear weapons enterprise back on a sound footing. I believe, having visited with the STRATCOM people, that their requirement is for NNSA to generate up to 80 nuclear pits per year, and the NNSA will not be able to achieve that rate until a new CMRR facility is in operation.

How critical are the uranium processing facility and the chemistry and metallurgy research replacement nuclear facilities to our future stockpile?

Dr. MCMILLAN. Senator, I have responsibility for that facility, so let me start.

The purpose of that facility, just to make sure we are all on the same page, is that it provides the analytical capabilities to ensure the quality. It provides analytical capabilities that can serve in nonproliferation/counterproliferation missions. It is simply the ability to handle the number of samples that would be required when we produce pits in PF4 that we need that for. At this point, without CMRR, we do not have a way that I know of to be able to make as many as 50 to 80 pits.

Senator INHOFE. I see.

Dr. MCMILLAN. We can make, with investments that we do not yet have, we could make maybe 20 to 30 with the facilities we have.

Senator INHOFE. That is a very good answer, a good answer to the question. Any disagreement with that?

The last thing I want to mention, Mr. Chairman—I know my time expired and I do need to get back upstairs. But relating to these two $5 billion buildings, I do not quite understand. I have heard a lot of views on this that those funds and resources could be used elsewhere more effectively. Is there a reason that the two buildings have to be $5 billion buildings? Have you all looked into that and made recommendations?

Dr. MCMILLAN. Again, I have looked very hard at that because of my responsibilities, and I can assure you that I pressured my team substantially on that.

What you always have with buildings like this is you have a range of prices. Our current estimate at Los Alamos is something in the region of $3.7 billion, but I can tell you as delay occurs, we are moving toward the upper end of that range. The range that—your $5 billion is closer to the top end of that range.

But as a manager, I feel a deep responsibility for the taxpayers' dollars, to use those as efficiently as we can, and I can assure you I have worked closely with my teams to get the costs as low as we can while ensuring safety for the material that we handle.

Senator INHOFE. I appreciate your answer, and I think it is significant because a lot of the things that are happening there, delays, things that were not in my opinion agreed upon in advance when they signed the New START treaty, are budget-driven. So you look for places where the budget is on the other side of it. It just appears to me that some of that could be in better use.

I appreciate it, Mr. Chairman, your allowing me to do this so I can get back to my other committee.

Senator NELSON. Thank you very much, Senator. I appreciate very much your being here.

Dr. Shank, your recent study finds a lack of trust between the NNSA and its laboratories. I think you have outlined it as the relationship as oversight over transactions versus oversight over processes. Can you tell us a little bit how you determined that lack of trust to draw that conclusion?

Dr. SHANK. In our discussions, we visited all three laboratories. We talked to site managers. We talked to all parties involved. We looked at the core issue of how one does oversight and does oversight effectively. If you do oversight with a trusted organization, you create an overall system and you audit that system. If you do oversight where there is a lack of trust, you want to look at every transaction. You want to look every time something moves. You want to look at every safety activity.

We said, well, the really core problem is reestablishing trust so that one could put together a structure so that the laboratories could have very cost-effective oversight with fewer people more cost-effectively and begin to look how one does oversight in the industrial part of our society. We think it is eminently doable, but it means a very different way of going about doing this business.

Sandia has a model that they have attempted to put in place. It has been more than a decade in coming. It is not making progress. It seems to me, unless we do something different, we will be stuck with our current situation.

So, my view of this is there is a time now to think about not just doing oversight, but doing more effective oversight with less cost and that really is going to use some kind of national standards, taking advantage of other agencies that could do oversight, that do oversight more broadly and begin to make the laboratories look like not only other industry but even some other national laboratories in places outside NNSA.

Senator NELSON. You are not suggesting that there not be oversight. What you are saying is you just cannot have oversight over every transaction, every movement, everything every day.

Dr. SHANK. Correct. Oversight is absolutely essential to assure the American taxpayer that the dollars are being spent well. We are in no way saying that that should be in any way done with less intensity. It should be done more efficiently, and when you do not trust an organization, you look at every movement. When you have trust and the laboratories have qualified through a process to have a system—they do not just have a system. You have to go through a qualification process—then you monitor that system and it is a more effective way of doing business. It is the way industry does this kind of thing.

Senator NELSON. Monitoring and auditing.

Dr. SHANK. Through auditing.

Senator NELSON. I am going to ask each of the directors. Dr. McMillan, do you agree with what Dr. Shank has said?

Dr. MCMILLAN. I do. If I could just maybe add a little to what Dr. Shank said.

I think the operational issues of trust may be where things show up most for me, and by that, I do not just mean how people feel about it, but rather what shows up day-to-day at the laboratory. I firmly agree with the importance of oversight because we are in a government-owned/contractor-operated situation, there are substantial liabilities. So the government has, in my view, an important governmental function in ensuring that we who have the responsibility for managing those facilities are doing it well and carefully.

Senator NELSON. Do you agree that the current situation involves a lack of trust?

Dr. MCMILLAN. I certainly see that at the operational level, just as Dr. Shank described it, the evidence being that so many of the transactions are individually monitored. Yes.

Senator NELSON. Dr. Albright, do you agree that there is this lack of trust?

Dr. ALBRIGHT. Yes, I do, and let me elaborate just a little bit.

The real issue here, I think, is part of it is the unwillingness of the government to allow the people who they have actually hired to operate these facilities to make rational assessments of risk and operate the facilities and make the trades that they need to make in order to do the mission.

But I think the even larger issue is the idea that we at the national laboratories—we are the corporate memory. We are the sinews and muscle and the brains of the nuclear complex. We need to operate as partners with the Federal Government, not as suppliers or vendors in the kind of contractual model that, I think, really is a more pervasive attitude.

So I think we have to restore this idea that we are really linked arm-and-arm. We are here for the mission, both the government side and the laboratories. We each have a role and responsibility to play, and we ought to be allowed to do that.

Senator NELSON. Dr. Hommert?

Dr. HOMMERT. Yes, I would agree. I would just say that the terminology "lack of trust" to me equates to not functioning at the sys-

tem level. I actually believe that the model we operate today, even from the government perspective, is not a highly effective oversight model in achieving an integrated overall improvement in the operational performance, the cost-effectiveness, the productivity of the institutions, which I think at a system level we share the same goal. I think we are actually not progressing on that as effectively as we could because of the model we operate in.

Senator NELSON. If there were trust, then it would be much easier for the oversight to move away from transactional to more directional because you have been hired to do what now they do not trust you to do without their oversight. Right? Understandable. Thank you.

Senator Vitter, you have arrived. Do you have some opening comments you might like to make or would you like to go to some questions?

Senator VITTER. Mr. Chairman, I do not. I will wait until the questions and discussion, if that is appropriate now or a little later.

Senator NELSON. Okay, thank you. We are taking 7-minute rounds.

Dr. Patel, your study found that the autonomy in the laboratories has significantly declined as FFRDCs, a hallmark of DOE dating back to the Manhattan Project which has given rise to scientific excellence. Can you explain this perhaps in a little bit more detail?

Dr. PATEL. Yes. Thank you, Mr. Chairman.

What do I mean by autonomy? By autonomy, we mean a task is given and then it is monitored not on a transaction basis but on a performance basis, performance which is based on a system of checks and balances that, as the work is carried out, that are put in place.

What has happened and what we observed through our visits to the three laboratories, as well as discussions with a number of scientists, engineers, and mid-level managers, is that many of the decisionmaking capabilities no longer exist with them, resulting in a more short-term look at how science and engineering are carried out and much of the long-term planning often does not get done principally because of the transactional oversight that I just mentioned and we have heard about earlier.

So one issue is how do we go about getting to this issue of autonomy. I think especially in the science and engineering area where the work gets carried out not over a yearly period, but it is also over several years, and the importance of it cannot be minimized because that is what provides the underpinning of the primary responsibility of the three laboratories for the nuclear stockpile. In order to do that, what is required is a level of trust but, more than that, an understanding on the part of NNSA and other managers that the laboratory directors are the people who are closest to the real problems and should be given an opportunity to plan a program which assures the long-term reliability of the science and engineering, which then in turn impacts upon the long-term reliability of the nuclear stockpile.

The second issue with autonomy is an increasing amount of nonscientific and non-technical operational oversight of what gets done, and this very quickly results in some parts of the activity seem to be being discouraged. Especially experimental activities

where a young scientist or an engineer wants to carry out an experiment to assure that certain expectations, certain modeling calculations are right, those are often slowed down. The ultimate result is that the autonomy which should reside with the young people in deciding how to get things done is not there. It leads to, over the long-term, difficulty in hiring the kind of outstanding people the laboratories need.

I believe that a good example of an autonomous laboratory which produces a lot from my personal experience is Bell Laboratories where I managed all of their physics and material science activities for a fair period of time. We were given overall responsibility to ensure that the physics or material science that was needed by the company was there, but we were not told how to do each and every single experiment. Yes, we were audited at the end of the year. Yes, we were required to provide progress reports, but nobody second guessed us in terms of what we were doing. I think that level of autonomy should come back to the laboratory directors for us to assure that our taxpayers' dollars get us the biggest bang for the buck.

Senator NELSON. Thank you.

Dr. McMillan, do you agree that there has been pressure on the independence of your laboratory compared to prior years?

Dr. MCMILLAN. I think there are two areas for that, Mr. Chairman.

First, let me refer back to the annual assessment process, the annual assessment of certification. In that regard, I feel no pressure on the outcomes of our studies, and were there any pressure there, I would be deeply concerned.

However, in the types of activities that Dr. Patel described, I share his concern. In particular, he talked about the assignment of tasks and then monitoring to see that they are finished. I would add to that ensuring that that assignment is at the right level because if the assignment is at a very low level, it becomes do this, do that, do the other thing. On the other hand, if it accomplishes this goal, I think that draws on the laboratory's skills.

Finally, as Dr. Patel mentioned in Bell Labs, I think there are other examples that we need to look to today to understand relationships between the government and FFRDCs. Here, I think of places like the Jet Propulsion Laboratory, the Applied Physics Laboratory at Johns Hopkins, et cetera. We have examples, and I think looking at those examples for models could be very helpful.

Senator NELSON. Dr. Albright?

Dr. ALBRIGHT. I actually have nothing to add. I think Dr. McMillan hit the nail right on the head.

Senator NELSON. Thank you.

Dr. Hommert?

Dr. HOMMERT. Yes, I agree, Mr. Chairman. I would just add that I think this is a very pragmatic issue for us. As we approach modernization, it is very important that we can look to best leverage the funds. If we are tasked at a very fine level, we lose some of the ability to leverage and achieve overall cost-effectiveness and productivity as we try to accomplish modernization.

Senator NELSON. Senator Vitter?

Senator VITTER. Thank you, Mr. Chairman, and thanks to all of you for being here and, more importantly, for your work.

Like a lot of members on the subcommittee and otherwise, I have a single, very basic, fundamental concern which is funding for all this activity really being dramatically cut and changed since the New START treaty was passed in a way that is inconsistent with some of the fundamental discussions, including the section 1251 updated report that led to it being passed. That is my big, big concern here. There are plenty of other areas of concern, but that is my big concern.

So, Dr. Hommert, let me start with you because I think you signed onto a letter that is a clear example of the scenario I am talking about. In December you wrote Senators Kerry and Lugar as chairman and ranking member of the Senate Foreign Relations Committee with other national laboratory leadership saying that, "we are very pleased by the update to the section 1251 report as it would enable the laboratories to execute our requirements for ensuring a safe, secure, reliable, and effective stockpile," et cetera. Also, "it clearly responds to many of the concerns that we and others have voiced in the past about potential future year funding shortfalls and it substantially reduces risk to the overall program."

Since then, we passed New START and since then the budgets have suffered. So what is your current assessment of our staying on that promised section 1251 report path?

Dr. HOMMERT. It is clear that since that letter, which I think was probably late 2010, some of the conditions have changed. We have a different plutonium strategy that will require, as Dr. McMillan can speak to, a different approach. We have a better understanding of the costs of modernization, and I think that right now, as I mentioned earlier, we do not yet have a plan that is completely closed and by that I mean with an authorized and appropriated budget plan in multiyears that would lead me to believe the same level of confidence at that time. I believe we can get to that. Of course, in the intervening time, we have faced additional fiscal constraints overall which have clearly impacted the budget effort. So some further work is necessary to achieve that same level of confidence going forward at this point.

Senator VITTER. Today, as we speak, would you be prepared to sign the same type of letter and express the same level of confidence?

Dr. HOMMERT. I would not be able to do that today without seeing the details of the plan of how we would move the entirety of the stockpile through a modernization period given the current constraints we have.

Senator VITTER. The changes that have occurred, including strategy that affects spending—do any of those justify in your mind the level of budget cuts that we have seen in proposals since that assurance to Congress since the section 1251 report update?

Dr. HOMMERT. Let us see. I believe that we have pressure on both sides, downward pressure on the budget, also some cost estimates that in the intervening time both in the facility space and in the modernization effort require a new risk position on the program overall. We do not have that plan yet defined. So I guess I cannot quite answer that. What I can say is that clearly the budget

picture is more constrained from both the costs of the enterprise and also the overall fiscal constraints that you are dealing with. That requires a new plan which we do not have at this point fully developed.

Senator VITTER. Dr. McMillan, I would like to ask you the same general sorts of things. You say in your testimony today that you, "continue to believe that the direction laid out in the NPR and the 1251 report provides an appropriate and technically sound course."

Dr. MCMILLAN. That is correct.

Senator VITTER. Now, first of all, I assume when you say the 1251 report, you mean that update.

Dr. MCMILLAN. The updated report, yes. Thank you.

Senator VITTER. I agree that that is a sound course. My question is, are we on that course anymore?

Dr. MCMILLAN. No, we are not on that course.

In answer to elements of the other questions you had asked, I see us in a position where our risk is increasing. We are working very closely with our colleagues in DOD and DOE to develop the plan that my colleague, Dr. Hommert, talked about. However, I believe that is a plan that has higher risk than the plan that we had laid out in the 1251 updated report.

Senator VITTER. So I take it from what you just said, first of all, the budget cuts since December 2010 did not flow out of developing a new plan. They just happened and we are trying to get a new plan built around that now.

Dr. MCMILLAN. I cannot speak to all the details of how the budget occurred. That is not something I am an expert in. But I can tell you that in the current budget environment, which is understandably constrained with the overall budget that our Nation faces, that we are working now to say how can we move forward given the budget we have. It is a very difficult problem.

Senator VITTER. My only point is that these new numbers, these cuts happened first and we are trying to cope with it. It is not the natural outflow of a new, improved plan.

Dr. MCMILLAN. From my perspective, we do not yet have a plan because we do not have a budget that is associated with that plan that we understand yet.

Senator VITTER. I think also what you said a few minutes ago is that when we get there, you expect that new plan to put us at higher risk.

Dr. MCMILLAN. That is correct. This plan has more technical risk in it than the technical risk that we had in the plan that was laid out in 2010.

Senator VITTER. Mr. Chairman, that is my big concern, and I think it is a pretty simple story. The Senate, I think, paid great attention to this testimony from these experts in December 2010, and I think the 1251 updated report was pivotal in passing New START through the Senate. Now, I did not vote for it, but I think it was pivotal in getting the affirmative votes. Here we are a year and a half later and it is all out the window, and all bets are off, and I am gravely concerned about that.

Now, I know we are in a tough budget environment, but it is not like we were running surpluses in December 2010. It is not like we are in a very different budget environment. We knew all of that

then. I am real concerned about our collectively having passed New START based on these promises, this course, and now hardly a year and a half later, we are way off course. We are trying to get a plan to catch up with lower budget numbers, and the experts tell us when—and we are not there yet—we will be at higher risk.

Thank you.

Senator NELSON. Thank you, Senator Vitter.

Dr. Shank, your report stressed the importance of NNSA laboratories being national security laboratories for the government as a whole, and this was put forth in a governance charter signed by Secretaries Chu, Gates, Director of National Intelligence Blair, and Deputy Secretary of Homeland Security Lane.

Can you explain the importance of this charter? Do you see it as competition to other government agency laboratories, and if there is, is competition such a bad thing?

Dr. SHANK. I believe the governance charter gives the agencies who signed onto that charter an opportunity to utilize the unique skills of the laboratories that have been developed as a part of their weapons mission. The weapons mission is becoming much more complex and costly. We just heard about cost in discussing that. By having the core capabilities that allow one to execute the weapons mission, having those capabilities exercised in problems that are important to the Nation, I think that that is an extraordinary advantage and a cost-effective way for the laboratories to deliver on their mission.

I believe the capabilities are so unique that I do not see the issue of competition arising. I do not think that is an issue from my perspective. However, I must say we, as a committee, did not study competition. We looked at what were the unique capabilities in the lab, and those are the ones that are likely to be used.

Senator NELSON. Dr. McMillan, what is your view on the importance of this governance charter, and do you feel that it creates from your perspective competition with the other laboratories? Or do you, as Dr. Shank has indicated, feel that perhaps your approach is so unique that competition is not a factor?

Dr. MCMILLAN. Let me take the second question first, Mr. Chairman, if I may. I think, by and large, the reason that other organizations come to our laboratories is because we are able to offer unique capabilities to them. So we look very hard to say are the questions we are being asked, the problems we are being asked to solve by DOD, DHS—are they aligned with the capabilities we have from the nuclear weapons work that we do and do we bring uniqueness to that.

In answer to your first question, I think in many ways the memorandum of understanding really is aimed at formalizing something that has been happening over time. I think it is good in that regard because if there are important national security problems that the capabilities of the laboratories can be brought to bear on, particularly ones that then feed back in a positive way to our nuclear weapons mission, which, I think, almost all do, that it is very appropriate that these other organizations have better access to the laboratories.

Senator NELSON. Dr. Albright?

Dr. ALBRIGHT. The NNSA national laboratories have the world's fastest computers. We have the world's biggest lasers. We have 25,000 collectively among us of the world's smartest people, who work at the laboratory because they are dedicated to the mission of national security. To not put that into the service of the broader national security mission, in my view, would be a dereliction of duty for us. In fact, it is written into each one of the laboratory's charters. In fact, it is written into the NNSA charter that that is something that should happen.

Any government program manager, whether he is sitting in DOD or DHS or anywhere—certainly DOD, for example—they have the ability and have had for a long time to make a decision as to whether they are going to one of their organic laboratories or they are going to go to a NASA laboratory or to a DOE laboratory. Generally, they choose to come to the national laboratories precisely because we have these kinds of capabilities. We are not cheap. So if you are a subject-matter expert with a particular problem to solve, you come to the national laboratories because you are trying to tap into that core set of capabilities.

I think the Mission Executive Council and this memorandum of understanding that you are referring to, as Dr. McMillan pointed out, really just is aimed at trying to get rid of some of the viscosity associated with the ability of these other agencies to interact with the laboratories. All three of us have been part of the ecosystem within DOD for 50 years, and we have been within the ecosystem of the DHS from the day it was founded. So the real issue here is, how can we bring this to a more strategic plane, how can these other agencies have a bit more insight into what our capabilities are and our sustainment of those capabilities, so that they can make rational decisions.

Senator NELSON. Dr. Hommert?

Dr. HOMMERT. Yes, Mr. Chairman. I would just add to what my two colleagues have said. In my laboratory, we probably have the largest portfolio of work with other Federal agencies. To me, it is a very great example of win-win. For us to execute the nuclear weapons mission, you need a set of capabilities that we sustain over time. That means recruiting new talent, sustaining their competence, developing their competence. There is just no way to really do that practically without broadening that work. They also bring back skills that they learn on other problems that benefit the weapons program.

A very practical example. The radar engineers at my laboratory today designing the B61–12 radar 5 years ago were working on things that were deployed in theater that supported our warfighter, very unique applications. That is, in my view, a really synergistic value for our taxpayers in the investments you are making for us to accomplish our core mission.

Senator NELSON. Thank you.

We have already explored the problems and the challenges with funding. Is it true and my understanding is correct that unless something is done, additional funding, you cannot meet the expectations that we have in place for modernization of the weapons in accordance with what our expectations are for the New START

treaty? Dr. McMillan? If I have not stated the question properly, would you state it for me?

Dr. MCMILLAN. Let me try answering and see if I come close to the question.

On the B61 LEP, if we have stable, predictable funding, as we have laid out in what we call the 6.2A study, I believe we are positioned to deliver on that system by 2019.

Senator NELSON. Stable funding is what you are talking about.

Dr. MCMILLAN. Stable funding is a very big deal at the levels that we have laid out. Unpredictability makes it very difficult for us.

I am much more concerned in the areas of the W78 and the W88 because the delay in CMRR directly affects our plans there. As I mentioned earlier, we are working today with both DOD and DOE to develop a plan forward for the 78 and the 88 systems. So we do not yet have that plan, and until we have it, I cannot really answer your question.

Furthermore, there is a body of technical work—and I mentioned some of this in my written testimony—associated with pit reuse that we are working on with experiments coming this summer that could say that strategy looks like it is worth pursuing or that strategy may have serious problems. So there is a body of technical work that will have to be done. I think, in fact, it will stretch over about 5 years.

So I am not sure that answers your question, Mr. Chairman. I hope it comes close.

Senator NELSON. Dr. Albright?

Dr. ALBRIGHT. Let me first echo what Dr. McMillan said, that certainly in the near-term with some additional technical risk, we can execute, we believe, the LEPs that are over the near-term. But I will again reemphasize there is some technical risk associated with that.

My larger concern is not so much what happens next year or the year after that. It is what happens 5 or 10 years from now. If we do not continue to sustain funding of the overall effort, particularly in the areas of understanding the science of nuclear weapons, both experimentally and analytically, we run a huge risk ultimately in our ability to continue to do assessments and to conduct future LEPs. I think it is worth noting that there are LEPs on the books, on the schedule today, where the people executing them will have been trained by people who themselves have never conducted a nuclear test or designed a nuclear weapon from scratch.

So this idea that we have to continue to sustain the overall program—it is not just about LEPs, but the overall program—to assure that we have a workforce that is qualified to do these LEPs as they come up and is qualified to understand when an issue shows up during surveillance whether it is a minor problem or a major problem, that is where I worry, that over time, that sustained level of effort will be under huge pressures.

Senator NELSON. Dr. Hommert?

Dr. HOMMERT. Mr. Chairman, I think your question was very well-articulated. Let me emphasize an area of concern that I have, and that is on the B61. When we changed the schedule from 2017 to 2019, which I understood and agreed, we did, however, exhaust

the schedule margin that we had. The 2019 schedule is important for real technical reasons which we would discuss in a closed session. So that is putting a challenge to us overall as an enterprise, including Congress, that we have the consistent multiyear funding that is required. If we have significant breaks due to a continuing resolution or other changes that might occur that you all understand far better than I, that is going to put that schedule in a significant risk position. So I think that this is a near-term test for our national commitment to modernization in executing the B61–12.

Beyond that, I do believe that we can craft a plan to take the larger scope of our deterrent forward, but I would agree with what Dr. McMillan said, that that will involve some increased risk because of where we are at in our overall production capabilities.

Thank you.

Senator NELSON. Senator Vitter?

Senator VITTER. Yes, Mr. Chairman, if I can just try to clarify the same point because I think it is our big core concern. I do not mean to try to dumb down this question too much for our sake, but let me ask it in a very sort of real-world way.

On a scale of 0 to 10, how would you have described your comfort level, your level of confidence, with the plan overall in December 2010 based on the updated 1251 report, based on all of the commitments that were made at that time, and compared to that number, how would you peg your confidence level, your comfort level today?

Dr. HOMMERT. Since I am the one whose signature is on that 2010 letter, let me start. I never thought of it in quite those terms, Senator, but I would say that—it is hard, but let me try and use your scale.

I would say back then if everything that we anticipated—and recognize we did not have the detailed costing yet on some of these programs, but if we assumed that the costing was in alignment with what we expected in the 1251—and that confidence was probably 8, just down from technical issues we knew we would have to deal with, budget realities, and budget uncertainties.

If you look today, for my case, since my lab is so much on the hook with respect to the B61–12, I have confidence in what we have costed to execute that work and the plan we have laid out. We know exactly, I think, what we have to accomplish. If budgeted, I am at a 9 or 10 in our ability to do that.

When I look at the entirety of the modernization, then I am back at a lower level of confidence, 5 or 6, because we have not adjusted a plan to some of the boundary conditions that you articulated earlier and changes of funding and production capability.

I hope that is not too complicated an answer, but I do look at a near-term and long-term perspective of where I sit today.

Dr. ALBRIGHT. If you look at the situation that existed in 2010, the program that was in place in 2010 was adequately funded, given what we understood about the costs. At that point, you would have to give it something like a 9 or a 10. That was a pretty robust program.

Two things, of course, changed: the costs went up and the budgets came down. One of the impacts of that budget, as we have all pointed out, has been some additional technical risk which drives

you down to—I hate to put a number on these things, but a 6 or a 7 or a 5 or something in that ballpark because we have not done the work yet to know whether or not we can actually overcome some of those technical issues.

Senator VITTER. Okay.

Dr. McMillan?

Dr. MCMILLAN. Your scale is, of course, difficult to use but I will try anyway. It is interesting that we all are falling in the same range.

I was involved in the weapons program in 2010. So while my name is not on the document, I certainly had discussions about it.

I would say if 10 is a slam dunk, we know we can do it, the risks are very low, we were not there, but somewhere around an 8 or a 9 is probably right.

My reasons today for saying something more in the range of a 6 are that I see higher risks in our path forward. As I said in an earlier answer, and I am very concerned about the long-term because I see the pressures of doing things in the here and now, which we have to do—I fully agree—possibly shifting the balance so far that we then increase the risk in the future. So those are the reasons why I would back off today.

Senator VITTER. Thank you, Mr. Chairman.

Senator NELSON. Thank you, Senator Vitter.

We are all talking about how we are able to do more with less and how we can be more cost-effective in delivering the required mission expectations. Let me turn to what some perceive as at least one way to streamline oversight and move away from transactional oversight and at the same time save funding because that is a critical piece as well. If current oversight is getting in the way, that is not cost-effective. If we can find a way to streamline it, perhaps we can save funding in the process and also increase productivity by reducing the size of the NNSA's site offices that oversee the laboratories. It seems to me that now that the weapons design laboratories are operated by for-profit entities, that the site offices do feel obliged as civil servants to grade the approximately $200 million in fee that is awarded to the operators of the three design laboratories.

Now, I know that we are all interested in the savings. Let me start with you first, Dr. McMillan. Do you believe that the local site offices can be streamlined so that the oversight is not transactional, that it is more on the basis of trust and verified, to use an often used expression, the verification being operational as opposed to transactional?

Dr. MCMILLAN. I think you have hit on really the key point there, Mr. Chairman, that the amount of oversight depends on what type of oversight you do. At some level, for the kinds of oversight we have today, it is probably the case the site offices are sized in the right ball park to provide that kind of oversight.

Senator NELSON. Let me interrupt just for a second. How many positions are there at the local site?

Dr. MCMILLAN. At Los Alamos, it is a bit over 100.

So if we go to a different model for that oversight, I believe we could have smaller contingents both at the site, as well as possibly

at headquarters. The scale of the organization is determined by what it has to do, in my view.

Senator NELSON. Is there a potential of cost savings by not having—not just in terms of the personnel costs of the local site offices, but of the costs associated with having to respond to the oversight?

Dr. MCMILLAN. Yes. At the laboratory, I do not know for sure what the numbers are, but I know that I have people whose main job is responding to oversight issues. If we were able, in the way that our National Academies' colleagues have talked about, to change that model, I believe there would be efficiencies inside the laboratory as well.

Senator NELSON. I am going to get to our experts here in a second too.

Dr. Albright, how many are there located in your local site?

Dr. ALBRIGHT. I do not think I have the exact number, but there are roughly over 100 Feds and about 20 or 30 support contractors. It is about 130 people all together.

Just two points. First, the site offices are part of the oversight infrastructure in NNSA and DOE, but they are not the entire story.

Senator NELSON. Under any set of circumstances, you might have fewer if they are doing a different kind of oversight.

Dr. ALBRIGHT. I think to echo the point that Dr. McMillan made, you would have to ask yourself—so right now we have a transactional oversight model where everything is reviewed, everything is very hands-on. We have well over 1,000 audits that occur every year. If, on the other hand, you migrate to what the National Academies have been talking about, which is more of a set standards than audit model, then I think you have to ask yourself the question: what do I actually need to have physically located at the site in order to accomplish that?

This is for comparison sake. I would point out that if you look at the way DOD does this at a place like Hopkins, APL, or Lincoln Lab, the numbers of people they have are—you can count on the fingers of one hand or two, and they have a relatively small office in the Office of the Secretary of Defense that periodically conducts audits and does all the things that they need to do, safety audits, that sort of thing. So again, the question comes up what do you actually have to have physically on site. That is one point.

The other point again is that you have people—it is not just the site offices. In a lot of ways, they are responding to commands that come from headquarters. So you have a fairly large infrastructure, for example, Health, Safety, and Security Office within DOE. There are hundreds of people there. Then there are equivalent activities within NNSA itself.

Senator NELSON. Dr. Hommert?

Dr. HOMMERT. We have a similar size site office, order, 100 as well.

I can use this one metric. I think we all have a performance evaluation plan that we do. It is a contractual statement of performance on a yearly basis with NNSA. That document is, in our case, 60 to 65 pages of fairly detailed evaluation of performance against at, again, a somewhat overused term today, "transactional" level. We have talked with NNSA about this, about moving that to a

higher level to something leaner but still demanding upon our performance. I believe that that will allow cost savings on both sides of the equation very definitely. It will not happen overnight. We did not get to this position overnight, but it would allow us to change the direction of that, and I am encouraged that the dialogue is happening in that direction.

Senator NELSON. Dr. Shank and Dr. Patel, I know you have stated that streamlining the operations could save costs if there could be another way of doing it apart from a transactional analysis and oversight. Dr. Shank, what kinds of recommendations would you make to streamline the process, to change it so that you get the kind of oversight that is required that is cost-effective?

Dr. SHANK. I think if we are going to have the number of people we have in the site offices, we are going to have the current model. Unless we change the oversight model, we are not going to see change. Then there is a chance to have a sharply reduced number of people.

I think that just counting the number of people in the site offices is not correct. I think what was represented here by Dr. McMillan was he has people in his own lab each feeding each of these people in the site offices. It is also correct there is a large group of people in the Forrestal Building that also create work for all the people to do.

We have to fundamentally rethink about how we can do oversight cost effectively. There is always an argument to be made if we just spend a little more money, we can be a little more safe or a little more this or a little more that. At some point, that last increment of cost gives us a very little for a great deal of money. I think there is a chance for substantial operational savings if we take a different model, and the way to look for models that will work—their description was two other laboratories that do things differently, do not have the huge overhang of people doing oversight. We can also look to industry for those models.

I would say that in order to qualify a system, it is going to require some investment. I believe that over a period of time, a very short period of time, you would then get to reap the rewards of that and begin to wind the thing down into a more rational, understandable way that industry or other Federal FFRDCs would look—DOE would look similar to them. I think that we would have organizations within the laboratories also right-sized to be able to deal with a cost-effective approach.

Senator NELSON. Is it fair to say that the uniqueness of the labs does not drive the unique method of oversight, that other labs have a different standard of oversight, different methodology of oversight that works? Can you describe, for example, in other labs where you have outside sources coming in and checking out and inspecting for safety or security or the like?

Dr. SHANK. I think the example was given by Dr. Hommert that his laboratory, Mesa Laboratory, looks very much like an Intel Laboratory down the street. They have very similar safety records. The expenditure on the safety is much, much higher at the Mesa facility than it is at Intel. I think we can learn a great deal by looking at how Intel does this, and they do it in a way in which is done standard in industry. You have a system. You audit that system.

You keep track of where you are. It takes fewer people to do that if there is a system in place that you can recognize. Intel simply could not be in business if they did the level of transactional oversight that has been done in these laboratories.

Senator NELSON. Who would go to the Intel Laboratory to check out for worker safety?

Dr. SHANK. The Occupational Safety and Health Administration (OSHA). Other agencies that do these kinds of oversight for industry seem to me to be some of the ideal skill base, maybe even the exact people, to do that kind of thing at the laboratories. In the past, having external oversight has been investigated. It is one of those things that is very difficult. There are many different issues one way or another whether to do that.

I personally believe if the laboratories look like other institutions, they are better off because the people like OSHA who are investigating the laboratories do that in a way that would be most cost-effective. Industries have to operate. The laboratories have to operate. There is not an individual power base that says we do this, this, one kind of thing here regardless of cost. OSHA has the burden of making organizations safe, the safety and health of the workers, but it also has to do that in a way that it is actually possible to comply with cost-effectively.

Senator NELSON. Dr. Patel?

Dr. PATEL. I think almost everything that needs to be said has been said. But let me comment on two things.

Having the transactional oversight adds cost by having too many people both at site offices plus in the laboratories plus at NNSA. So that is one part of the cost.

The second part of the cost, which is hidden cost that is incurred by the laboratory because that oversight gets in the way of getting people to do the right things at the right time at the right cost. What we will accomplish if we change from a transactional oversight to a systems-based oversight is that we will empower the laboratory directors and empower the people who are there to deliver the right product at the right price.

Senator NELSON. Now I will ask the directors. Are you comfortable inviting OSHA into your operations versus having the site offices doing a similar sort of thing? There are probably other areas of oversight other than, let us say, worker safety or overall safety. Would there be, as in the case of any other lab, available outside inspection teams or agencies capable of doing the similar work? Dr. McMillan?

Dr. MCMILLAN. It is interesting that we are having this discussion today because just yesterday, as part of a discussion with DOE and NNSA, the issue of OSHA was on the table. I do not know enough at this point, Senator, to be able to answer your question definitively. I would say that I am optimistic because industry makes it work. Other laboratories make it work.

Senator NELSON. That is what I was going to say. If industry makes it work with other laboratories and if what they are looking for is similar to what they would be looking for within your laboratories, perhaps the one difference is nuclear?

Dr. MCMILLAN. That might be an area where we would treat that differently because that is not a normal part of most indus-

tries. It is different also than what happens in the nuclear power industry. So I think there may be some exceptions but I would say overall I am optimistic with a recommendation such as our National Academies' colleagues have suggested, in part because it puts the laboratories on a level playing field.

Senator NELSON. Dr. Albright? You do not have to agree.

Dr. ALBRIGHT. No, no, no. It is hard not to agree.

Let me just give you some information on that. Just in the environmental safety and health area, we have reviews that are conducted by the DOE Health, Safety, and Security Office, the NNSA Safety and Health Office, the Defense Nuclear Facilities Safety Board. We have two people on site, 22 environmental safety and health functional managers at our site office with staff, and then there are 30 annual reviews by State and local governments. We actually are in California, so we have Cal–OSHO which is more stringent than OSHA. Then, of course, we do our biannual reviews and International Standards Organization (ISO) 14001 and 1801 as well. So what you see is a lot of overlap, a lot of duplicative effort. We would be delighted to fit within the OSHA regulatory framework along with the safety culture that you get with the ISO standards.

Senator NELSON. Dr. Hommert?

Dr. HOMMERT. Yes. I will make two comments in this regard.

First of all, I think it is important to recognize that there is a difference from industry for us. These are government-owned facilities. So there is a very clear and appropriate role for effective government oversight.

What I do believe, though, is that we have a vast body of industry standards that we can work against and that then the government can utilize and benefit from the fact that that is largely in place whether it is ISO or it is OSHA or other standards and construction or the like. I think getting that model right that says, yes, there is a reason that the government has to look at facilities they own but let us take advantage of what is already in place.

The second thing I would like to say on this is, that as Dr. Albright has identified, while we deal with a model that has duplication in it—and that is true and we deal with a model that, I think, can be improved from a cost-effective standpoint, and I agree that that is true—the thing that concerns me the most in what we operate in today is that I actually believe the complexity of the model impedes the ability for me to advance the safety culture or the overall operational culture of my organization. While we have an outstanding safety record, we can be better. I believe the complexities of what we operate actually impede our ability to move to a higher level. In the end, since these are my coworkers, I care deeply about them. That is probably the strongest motivation I have to say, can we do something different.

Senator NELSON. Would it not be appropriate to expect NNSA to establish what the standard is to begin with, as in the case of the other nongovernmental laboratories? So if you do not have a standard, what do you measure it against? So if the standard is established, then others can come and measure against that or against their own standards which might even be higher. Is that fair, Dr. Hommert?

Dr. HOMMERT. I agree, Mr. Chairman. There has to be clarity. Again, the government has to be clear on what their expectations are and how they wish us to be measured. But again, there is a lot available for them to take advantage of. Then they have to find a way to verify and appropriately audit that in a way and ultimately trust that we will operate at the system level against those standards. I agree.

Senator NELSON. Dr. McMillan?

Dr. MCMILLAN. Yes, I agree.

Senator NELSON. Dr. Albright?

Dr. ALBRIGHT. I agree.

Senator NELSON. To other panelists here, from your own experience looking at other laboratories, a simple question. Does it work having these other entities come in and measure against standards?

Dr. SHANK. I have actually looked at that with respect to a lab that I used to manage compared to the Jet Propulsion Laboratory, and they have a more effective process than what we had then at DOE which is similar to what NNSA—it is actually more difficult today than in my days. But yes, they do have effective not only oversight of health and safety, but you also have financial oversight and there are systems for that and systems for oversight of human resources. There are, in fact, standards for all of these operational activities in laboratories that are standard throughout industry that could be brought in.

The worry that I would have is that we bring those standards in and keep all the site offices and all there together. That is my nightmare. I think that if you make a different model, it has to be clear that it is a different model. You do not have both models.

Senator NELSON. Dr. Patel, do you agree with that?

Dr. PATEL. Yes, I agree with that. Even though my experience has been limited to private industry, I can wholeheartedly say that having standards which are accepted by others being your guiding principles helps everybody.

Senator NELSON. Thank you. That is all the questions I have.

Now, what question did I not ask that I should have? I know what I know. I do not know what I do not know.

Thank you all for being here today, for being straightforward and candid in your remarks. We appreciate it very much. As we work toward finding some solutions here, your input is going to be extremely helpful. Thank you. We are adjourned.

[Whereupon, at 4:11 p.m., the subcommittee adjourned.]

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