Statement of Dr. Paul J. Hommert
President and Director
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Committee on Armed Services
Subcommittee on Strategic Forces
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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 United States 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 complex, Sandia is uniquely responsible for the systems engineering and integration of the nuclear weapons in the stockpile and for the design, development, and qualification of nonnuclear components of nuclear weapons. While nuclear weapons remain 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 July 15, 2010, before the Senate Armed Services Committee. Starting from an overall perspective of the nuclear weapons program and the challenges facing us since the beginning of the Cold War, I will refer to the following major issues: (1) the U.S. nuclear stockpile assessment, (2) the life extension programs (LEPs) with emphasis on the B61 LEP, and (3) the status of the capability base needed to support our mission. All these issues will be viewed within the context of the Administration's request to Congress for the FY 2012 budget.

Major Points of This Testimony

1. It is my view that we are now entering a new era for the U.S. nuclear deterrent. The nuclear weapons enterprise must address for the first time the following three imperatives: continuing to further the tools of stewardship, upgrading production infrastructure, and importantly, modernizing the nuclear stockpile. Such an environment creates funding demands not seen in recent decades, and it will require rebalancing the program, along with continued emphasis on strong program management.

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

2. The most immediate stockpile challenge is the B61 life extension. In the context of my responsibilities, it is my judgment that the full nonnuclear scope of the B61 must be executed on the proposed schedule. Both the current scope and the schedule are demanding and can be achieved only by continuing the accelerating effort called for by the current program.
3. Our nuclear weapons competencies impact our broader national security work. In turn, to sustain and sharpen those competencies, Sandia relies on this broader work. The symbiotic relationship between the nuclear weapons 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.

Perspective of the Nuclear Weapons Program

It is my view that we are now entering a new era for the U.S. nuclear deterrent. The nuclear weapons enterprise must address for the first time the following three imperatives: continuing to further the tools of stewardship, upgrading production infrastructure, and importantly, modernizing the nuclear stockpile. Such an environment creates funding demands not seen in recent decades, and it will require rebalancing the program, along with continued emphasis on strong program management. Our nation has been and continues to be fully committed to the U.S. nuclear deterrent as reflected by the near- and long-term nuclear weapons policy outlined in the *National Posture Review* (April 2010). The contribution of Sandia National Laboratories is crucial to the success of the next era of the U.S. nuclear deterrent.

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. For the first 15 years of this program, creating the scientific tools and knowledge required in the absence of underground nuclear testing was a compelling grand challenge for the U.S. nuclear weapons program. At Sandia, the primary challenge following the moratorium was to find best solutions for sustaining, assessing, and certifying the stockpile against a full range of environments—most notably, the numerous radiation environments our products must survive. The advanced tools and deeper scientific understanding we developed 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 life extension program. Science-based stockpile stewardship has been immensely successful in generating the required scientific competencies and resources, but it was not accompanied by a broad-based effort to extend the lifetime of the nuclear arsenal.

Now, some 20 years since the end of the Cold War, we have a stockpile that has become significantly smaller and older. Considering our insights into and the average age of the stockpile, we have clearly reached a point at which we must conduct full-scale engineering development and related production activities to extend the service life of 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 further stewardship, address production infrastructure, and importantly, modernize the stockpile.

As we enter the new era of the nuclear deterrent, I am pleased to see that a clear strategic direction has been outlined for U.S. nuclear weapons policy in the *Nuclear Posture Review* and that a

collective guidance for implementation has been provided through the *Stockpile Stewardship and Management Plan*, the updated *Section 1251 Report*, and the Administration's *FY 2012 Budget Request to Congress*. The strategic direction for the nuclear weapons policy is also consistent with the New START, which was ratified by the U.S. Senate in December 2010 and the Russian Federation Duma in January 2011. In this context, we are actively positioning Sandia to fulfill its responsibilities in support of the nation's nuclear deterrent. We are confident in our ability to do so.

In their totality, the documents describing the future of the U.S. nuclear deterrent represent a well-founded, achievable path forward, which I understand and support. However, we must recognize that a significant body of work is required to sustain a strong nuclear deterrent into the next two decades, and we must ensure that the resources are commensurate with the requirements and expectations. Specifically, I can be confident that, as an institution, we are positioned to execute stockpile management and deterrence policy to the priorities delineated in the policy documents referred above if the FY 2011 budget is appropriated at the level of the Administration's request. Furthermore, the overall FY 2012 weapons activities budget, if authorized and fully appropriated as requested by the President, will provide the basis for continuing the program consistent with national policy. This level of funding reflects a national commitment to strengthening the security of our country and allies by sustaining a smaller nuclear stockpile that is safe, secure, effective, and reliable. Deviation from this funding, however, will impact the scope and/or schedule of the life extension programs.

The U.S. Nuclear Stockpile Assessment

Mission and Product Space

Sandia is responsible for the systems engineering and integration of the nuclear weapons in the U.S. stockpile, and it is the nonnuclear component design agency for NNSA. The components that we design ensure that the weapons will perform as intended when authorized through the U.S. command and control structure, and that they remain safe and secure otherwise. These critical functions are provided through our core products of arming, fuzing, and firing systems (AF&Fs), neutron generators, gas transfer systems, and surety systems. As we prepare to execute these responsibilities for 21st century strategic deterrence, we are facing new challenges.

While many critical tools were developed in the stewardship era, full-scale engineering development was almost entirely absent during this period. In addition, since we last put a system such as the B61 into the stockpile, the technologies on which nonnuclear components rely have changed dramatically. Thus we must ensure that a new generation of component and system engineers is prepared to work to the exacting standards of nuclear weapons and that we can fully adapt to and take advantage of new technologies. I am confident that Sandia is prepared to meet these challenges due in no small measure to the fact that, over the past twenty years, work we have done in other national security arenas has allowed us to attract and train the talent that will bring new technology to high-consequence high-reliability engineering applications. In the decade since we began design on the W76-1 LEP, one additional challenge has grown in complexity. Sandia's products must also be robust against cyber risk. We believe it is vital to assess cyber risk and develop technologies to manage this risk for the next generation of life extension programs. All these realities bear directly and significantly on Sandia's responsibilities as we embark on the next era of the nuclear deterrent.

Stockpile Surveillance and Assessment

Stockpile surveillance and assessment play a crucial role in assuring the nuclear deterrent. Through these activities, we develop knowledge about the safety, security, and reliability of the

stockpile. This knowledge provides the technical basis for our annual assessment findings and is reported to the President through the annual assessment process. Through this process, we have been, and remain, able to assess the nation's stockpile as safe, secure, and reliable. The *Department of Energy FY 2011 Congressional Budget Request* places high priority on stockpile surveillance. I strongly agree with this emphasis, but there is important further work to be done. Specifically, the surveillance transformation plan was established to better align our surveillance program with the challenges of an aging and smaller stockpile. My FY 2010 stockpile assessment letter to the secretaries of energy and defense and to the chairman of the Nuclear Weapons Council noted the need for a strong focus to complete surveillance transformation, which aims to shift the program from being reactive to becoming predictive and thus allowing us to better anticipate stockpile performance degradation and to schedule required actions.

Today we are surveilling a stockpile for which most of the weapons were designed at a time when long design life was not typically a high-priority design requirement. The radar for the first B61 bomb, for example, was originally designed for a 5-year lifetime; today there are B61s in the stockpile with components manufactured in the late 1960s. It is a credit to our stockpile stewardship program that we have the technical knowledge base to support continued confidence in these weapon systems as they age. However, our surveillance efforts, coupled with the fact of the age of the stockpile, indicate that it is imperative that we begin to execute on replacing the aging components as the lead time for these activities will be 5 to 10 years on a system-by-system basis.

The Life Extension Programs

The B61 Life Extension Program

The most immediate stockpile challenge for sustaining the deterrent is to extend the service life of the B61 bomb under expansive product requirements and a demanding schedule. The primary driver for the schedule of the B61 LEP is the fact that critical nonnuclear components are exhibiting age-related performance degradation. Another driver for the schedule is the deployment of the F35 Joint Strike Fighter, which requires a new digital interface for the B61. Specific component issues, as well as the overall age of the system, lead me to conclude that we need to approach this LEP with a resolute commitment to address end of life, degradation, and technology obsolescence to ensure long-term safety, security, and effectiveness.

Notably, the scale and complexity of this LEP will be much larger than that of the W76 Trident II SLBM warhead LEP, which is now in production. To extend the lifetime of the B61 with a first production unit in 2017, full appropriation of the FY 2011 funding requested by the Administration is critical. We must complete the design definition in FY 2011 to create a firm understanding of system requirements and thus fully establish future-year funding needs. Total cost estimates for the B61 LEP are subject to change until the design definition and requirements are finalized at the end of FY 2011.

To overcome technology obsolescence, it is important that we develop new technologies to insert into the B61. That is why we are conducting considerable technology maturation work in FY 2011. Technology maturation is a rigorous approach Sandia applies to developing new technologies, from the earliest conceptual designs through full-scale product realization and ultimately to insertion into the stockpile. We use a construct of technology readiness levels, first implemented at the Department of Defense and then NASA, and we implement a series of technical and programmatic reviews to ensure that the maturity level of new technologies is understood and associated risks are effectively managed before the new technologies are used in a life extension baseline design. For the B61 LEP, we have more than 40 product realization teams designing

components and subsystems and maturing technologies. We are aggressively staffing this program to accomplish our objectives on the current schedule. In July 2010, we had a core of approximately 80 staff on the B61 project. Staffing levels are now more than 3 times that number and will continue to increase. We are planning to have a core of 400 staff on the project by the end of FY 2011. These staffing levels are enabled by FY 2011 funding provided through the continuing resolutions. However, should FY 2011 funding deviate significantly from the current levels, we will not be able to sustain staffing levels, and the scope and/or schedule of the project will have to be adjusted.

The B61 LEP schedule and scope are also, of course, heavily dependent on the appropriated funding in FY 2012 and beyond; multiyear sustained funding is required to bring this program to successful completion. 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.

Other Life Extension Programs

The B61 LEP is one in a series of programs with timelines extending to 2035 that have been documented in the *Stockpile Stewardship and Management Plan*. Among them are the W88 ALT, the W78 LEP, and likely a weapon system associated with long-range stand-off delivery vehicles.

Funding for the W88 ALT has been identified in the updated *Section 1251 Report*. Sandia is pursuing work on the W88 ALT, which involves replacing the AF&F system and the neutron generators.

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). Although the *Department of Energy FY 2011 Congressional Budget Request* includes funding for a W78 LEP with completion of a first production unit in 2021, work for this program has not been authorized by the continuing resolution under which we are operating. Should the W78 LEP be authorized, Sandia is ready to support the warhead systems engineering and integration effort and to fully leverage the work done on the recently completed feasibility study for a common integrated AF&F system. Using an envelope of the requirements for the W78 and the W88, and even the W87 and the U.K. system, our study concluded that this approach was technically feasible, including improvements in safety and security enabled 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 study results have been briefed to the Nuclear Weapons Council and are being used to inform decisions regarding the scope, schedule, and interplay between the W78 and W88 life extensions. Such an approach offers the potential for significant cost savings for the overall Department of Defense and Department of Energy nuclear weapons enterprise.

Our Capability Base Supports the Mission

Over the next 25 years, we will rise to meet the challenges of a demanding program described in the *Stockpile Stewardship and Management Plan*, but we also must establish the basis for long-term stability. For Sandia, stability should be viewed in the context of three pillars: infrastructure, broad national security work, and workforce.

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) twenty test facilities at Sandia-New Mexico; (2) the Tonopah Test Range in Nevada; and (3) the Weapon Evaluation Test Laboratory in Amarillo, Texas. 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 Test Capabilities Revitalization Phase 2 funding has been requested in the FY 2012 weapons activities budget. This funding will enable us to renovate our suite of mechanical environment test facilities, many of which were commissioned in the 1950s and 1960s. These facilities are essential to support the design and qualification of the B61 life extension and subsequent LEPs.

Across the nuclear weapons complex, there is a shortage of funding for infrastructure, maintenance, and operation upgrades included in the Readiness in the Technical Base of Facilities program. However, mentioned in the updated *Section 1251 Report* is the Tonopah Test Range in Nevada, one example that I want to highlight not so much as a funding issue but as an essential mission requirement. Starting in FY 2013, development flight tests must be conducted at the Tonopah Test Range for the B61 life extension.

Another capability that Sandia stewards for the nuclear weapons program and also for the Department of Energy's nonproliferation payloads is the microelectronics research and fabrication facility, where we design and fabricate an array of unique microelectronics, as well as specialty optical components and microelectromechanical system, or MEMS, devices. This capability includes a national "trusted foundry" for radiation-hardened microelectronics. We have been providing microelectronic components to the nuclear stockpile at the highest level of trust since 1978 and to the Department of Energy's nonproliferation payloads since 1982. In 2009, Sandia received Class 1A Trusted Accreditation (the highest level of accreditation) from the Department of Defense for Trusted Design and Foundry Services and is the only government entity with this accreditation for both design and foundry operations. We must 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. Recapitalization will ensure production of the radiation-hardened components required by the B61 LEP and W88 ALT; this facility is the only source for the key microelectronics required for the life extension work specified. Recapitalization must begin soon in order to eliminate the risk of running existing equipment to failure. Sandia is therefore working with NNSA on a 4-year funding plan to stage the retooling (starting in FY 2013). We have plans for meeting programmatic requirements with a staged funding profile.

I mentioned earlier the need to continue strengthening the tools of stewardship. Let me mention two such areas for Sandia. First, a stable funding position is essential for the material science that underpins the broad range of materials for nonnuclear components in order to move to a more predictive basis for an older, smaller stockpile and prepare for the life extensions. We continue to work with NNSA to ensure adequate prioritization for nonnuclear components material science in FY 2012 and out-year budgets. Second, I am pleased to see budget stability being brought to the area of radiation hardness. As I discussed in my July 2010 testimony, I believe this is an essential element of our strategic nuclear deterrent. We continue to advance the scientific basis for confidently certifying the stockpile to radiation hardness requirements in the absence of nuclear

testing. We are also pursuing intrinsically radiation-hardened designs for use in future life extensions such as the W88 ALT and W78 LEP.

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 *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 weapons 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 examples highlight the way in which this symbiotic relationship works.

Sandia developed synthetic aperture radar (SAR) technology, which was made possible by our extensive design and development work for radars for nuclear weapon fuzing. This technology has been enhanced and is currently used by the Department of Defense. The extensive SAR work has sharpened our radar design competencies and kept Sandia aligned with advances in radar technology, such as radar frequency integrated circuits. We are now applying these modern technologies to the design of the replacement radar for the B61 LEP.

Another example is our work in cyber security. Sandia's responsibilities for nuclear weapons include weapon system architectures and components to support the highest standards of command and control—U.S. nuclear weapons must always work when authorized by the President, and never work otherwise. Our technical expertise in this area was the foundation for contributions to broader national security problems associated with cyber threats. In turn, our life extension work will take advantage of the modern, state-of-the-art capabilities developed for broader national security.

A third example demonstrates how these synergies have worked within the NNSA family of programs. For the past ten years, Sandia has been leveraging the unique capabilities of our microelectronics research and fabrication facility for Defense Nuclear Nonproliferation. In this effort, we designed, developed, and deployed the next generation of satellite-based treaty monitoring technology, called the "enhanced optical sensor." In turn, we have used the advancements of the Defense Nuclear Nonproliferation satellite project in the nuclear weapons program.

Finally, I want to acknowledge an important step in institutionalizing the relationship between the nuclear weapons and broader national security missions. In July 2010, NNSA, the Department of Homeland Security, the Department of Defense, and the Office of the Director of National Intelligence have signed a governance charter, which provides a framework for the participating agencies to coordinate shared, long-term planning for the science, technology, and engineering capabilities of Department of Energy national laboratories that will contribute to the nation's broader national security missions.

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. 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.

Today we are facing a number of challenges. Currently, 37 percent of the experienced technical staff in Sandia's weapon system and component design organizations are over the age of 55. Their remaining careers will not span the upcoming life extension programs. This reality puts a premium going forward on stable commitment to the LEPs. The life extensions provide opportunities for our 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. Finally, 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 in my view, they can go no further without compromising our ability to attract and retain.

At Sandia, we are focused on creating an environment that reflects our management's vision for success by coupling the experience acquired from our past work with new tools and modern technologies. Such an environment will foster innovation and provide foundational technical and scientific strength to support the stockpile over the long term. The multidisciplinary team we are assembling for the B61 LEP reflects this environment in which the powerful stewardship tools we acquired in the past are being adapted to meet future needs and the latest technologies and innovative designs are coupled with the rigor that comes from experience.

Conclusions

As stated in the *Nuclear Posture Review*, "as long as nuclear weapons exist, the United States will maintain a safe, secure, and effective nuclear arsenal" (p. iii). As we enter the new era of the nuclear deterrent, I am pleased to see that a clear strategic direction has been outlined for U.S. nuclear weapons policy in the *Nuclear Posture Review* and that a collective guidance for implementation has been provided through the *Stockpile Stewardship and Management Plan*, the updated *Section 1251 Report*, and the Administration's *FY 2012 Budget Request to Congress*. The strategic direction for the nuclear weapons policy is also consistent with the New START, which was ratified by the U.S. Senate in December 2010 and the Russian Federation Duma in January 2011. In this context, we are actively positioning Sandia to fulfill its responsibilities in support of the nation's nuclear deterrent. We are confident in our ability to do so.

The documents referenced above represent a well-founded, achievable path forward, which I understand and support. However, we must recognize that a significant body of work is required to sustain a strong nuclear deterrent into the next two decades, and we must ensure that the resources are commensurate with the requirements and expectations. Specifically, I can be confident that, as an institution, we are positioned to execute stockpile management and deterrence policy to the priorities delineated in the policy documents referred above if the FY 2011 budget is appropriated at the level of the Administration's request. Furthermore, the overall FY 2012 weapons activities budget, if authorized and fully appropriated as requested by the President, will provide the basis for continuing the program consistent with national policy. This level of funding reflects a national commitment to strengthening the security of our country and allies by sustaining a smaller nuclear stockpile that is safe, secure, effective, and reliable. Deviation from this funding, however, will impact the scope and/or schedule of the life extension programs. And 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 path forward for U.S. nuclear deterrence.

BIOGRAPHY

Dr. Paul Hommert

President and Laboratories Director
Sandia National Laboratories

Dr. Paul Hommert is the director of Sandia National Laboratories and president of Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, which operates Sandia for the U.S. Department of Energy's National Nuclear Security Administration. Sandia has principal sites in Albuquerque, N.M., and Livermore, Calif., an annual budget of $2.4 billion, and approximately 8,400 employees.

Dr. Hommert began his career with Sandia in 1976 and progressed from technical staff to holding positions of increased responsibility in a broad range of programs and management assignments. He initially led programs supporting energy research, and from the mid to late 1990s, he was director of engineering sciences.

From 2000 to March 2003, Dr. Hommert was the director of Research and Applied Science at the Atomic Weapons Establishment (AWE) in the United Kingdom, where he led the science and engineering organization responsible for the United Kingdom's nuclear deterrent.

From 2003 to 2006, Dr. Hommert led the Applied Physics Division at Los Alamos National Laboratories. The division was responsible for nuclear weapon design and assessment, weapon performance code development, and weapon science support.

In 2006, Dr. Hommert returned to Sandia to become vice president of Sandia's California site, a position he held until 2009. Dr. Hommert led Sandia's Homeland Security & Defense organization, which included mission assignments and long-term sponsorship agreements with the Department of Homeland Security.

In 2009, Dr. Hommert returned to Sandia's main site in Albuquerque, where he became executive vice president and deputy Laboratories director for the Nuclear Weapons Program.

Dr. Hommert earned a BS degree cum laude in mechanical engineering from Rensselaer Polytechnic Institute and MS and PhD degrees in mechanical engineering from Purdue University. He received an Outstanding Alumnus Award for Professional Excellence in 2003 from Purdue's School of Mechanical Engineering and a Distinguished Engineering Alumni Award in 2010 from Purdue's College of Engineering.

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