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OPENING REMARKS

Mr. Chairman and Members of the Committee, thank you for the opportunity to provide my perspectives on the FY 2009 Budget Request as well as the health of the countryôs nuclear weapons stockpile and nonproliferation programs. I am the Director of the Lawrence Livermore National Laboratory (LLNL), a multidisciplinary national security laboratory with major responsibilities in nuclear weapons. My responsibilityð and todayôs critical challengeð is to help enable a nuclear weapons program that is sustainable into the future with the smallest number of weapons and the least costly weapons complex consistent with policy goals and that minimizes the risk of needing to return to nuclear testing.

Because this is a time of significant change for the National Nuclear Security Administrationôs (NNSAôs) nuclear weapons complex and our Laboratory, I open my statement with my perspective of the broad challenges we face. I then briefly highlight Livermoreôs accomplishments in NNSA programs and specific issues related to our activities. I conclude with summary remarks about my future vision for the Laboratory.

But first, I want to thank the Congress and especially this Committee for your continuing strong support of the Stockpile Stewardship Program and our important and technically demanding programs to reduce the dangers of proliferation of nuclear weapons. The Stockpile Stewardship Program continues to make excellent technical progress, but it is not yet complete and faces challenges in the years ahead. Critical decisions have to be made about the future of the U.S. nuclear stockpile and the weapons complex. Independent of specific choices made, it is clear that a strongly supported and sustained Stockpile Stewardship Program is necessary to ensure that this nation can maintain the safety, security, and reliability of its nuclear deterrent over the long term. I support NNSAôs goal of transforming the nuclear weapons complex to make it smaller, safer, more secure, and more cost effective. I recognize the realities that constrain the overall budget as we attempt to create a nuclear enterprise appropriate to the post-Cold War era.

CHALLENGES FACING THE NNSA WEAPONS COMPLEX AND LLNL

Lawrence Livermore National Laboratory serves NNSA and the nation by applying multidisciplinary science, engineering, and technology to meet urgent challenges to national security and global stability. Since the Laboratoryôs inception in 1952, a special national security responsibility has been ensuring that the nation has a safe, secure, and reliable nuclear weapons stockpile. In addition, Livermore provides advanced technologies, integrated analyses, and operational capabilities to prevent the spread and use of weapons of mass destruction and strengthen homeland security.

Our special multidisciplinary capabilities are also applied to strengthen global security through research and development for advanced defense systems, abundant energy and environmental quality, biotechnology to improve human health, U.S. industrial competitiveness, and basic science. These activitiesð many directed toward finding innovative solutions to the great challenges of the 21st centuryð both derive from and depend on the core nuclear weapons science and technology and also contribute to supporting the science and technology required for our nuclear weapons mission.

Livermore is an integral part of NNSAôs Stockpile Stewardship Program and committed to helping the nation transform the U.S. nuclear weapons complex and stockpile to meet 21st-century deterrence needs. We need an affordable nuclear weapons complex; the smallest nuclear deterrent force consistent with policy goals; and a sustainable nuclear weapons program that provides confidence in the safety, security, and reliability of stockpile and minimizes the risk of the need for nuclear testing.

The Stockpile Stewardship Program was a very ambitious undertaking when launched a little over a decade ago. To date it has been highly successful in its two major goals. First, we had to develop and use vastly improved tools to much better understand nuclear weapons performance. I am proud of our tremendous accomplishments in this area. Great progress has been made and even more will come with quadrillion-operations-per-second (petascale) computers and high-fidelity simulations and the capability, beginning in 2009, to conduct thermonuclear weapons physics experiments at the National Ignition Facility (NIF). These tools are critically important to maintain confidence in our deterrent without nuclear testing. Second, we have to sustain the expertiseð peopleð to ensure that the U.S. nuclear stockpile remains healthy by applying our improved understanding of weapons performance to deal with issues that arise in aging weapon systems without resorting to nuclear tests. So far, we have been able to do that. The first weapon system to successfully complete a life-extension program under the Stockpile Stewardship Program without nuclear testing was Lawrence Livermoreôs and Sandiaôs W87 ICBM warhead. Although the job is not over, I remain confident that science-based stockpile stewardship will continue to be a technical success provided that the nation continues its investments in the science-based programmatic activities.

Budgets for NNSA nuclear weapons activities are tight and likely to remain so. As I look to the future, I am very concerned that the investments that have brought success to science-based stockpile stewardship might not be sustained. Over the longer term, failure to sustain investments in stockpile stewardship will result in loss of the expertise, capabilities, and activities that underpin the Annual Stockpile Assessment and certification of weapon modifications. That would lead to a loss in confidence in the stockpile. In some respects, the future is now at Livermore. The National Ignition Campaign, work needed to carry out the initial ignition experiments in 2010 and continuing research the following years, did not receive the full funding requested by NNSA in FY 2007, FY 2008, or FY 2009, putting timely achievement of program goals at higher risk than would be the case otherwise. Reduced levels of funding for the

Accelerated Simulation and Computing (ASC) program are eroding our capabilities to improve physics models in weapon simulation codes. Most tellingly, in FY 2008 the Laboratoryôs spending power was reduced $280 million (compared to a $1.6 billion budget in FY 2007)ð about $200 million more than anticipated. While our focus is on reducing support costs and preserving programmatic capabilities, it is noteworthy that the staff will decline from about 8,900 in October of 2006 to under 7,000 FTEs by the end of FY 2008. More than 500 of these are highly-trained scientists and engineers.

In a constrained budget environment, it is important to preserve critically needed capabilities and to stay focused on the long-term objectives: an affordable nuclear weapons complex supporting a smaller nuclear deterrent force sustained by a nuclear weapons program that provides confidence in the stockpile. Many details about the end state will have to be worked outð and depend on future nuclear weapon policy choices and world eventsð but it is clear that expertise, skills, and capabilities currently embodied in the NNSA national laboratories will be needed in the long term and can serve as useful technical resources to help define the path forward. In broad terms, a prudent path forward that would sustain science-based stockpile stewardship capabilities would be to:

Å Consolidate selected capabilities and facilities such as those for special nuclear materials to reduce costs, while preserving intellectual independence of key capabilities that are necessary for technical peer review. Fully capable, independent peer review is critical when nuclear testing is not available.

Å Sustain investments in capabilities at the NNSA laboratories that are both critical to the long-term success of stockpile stewardship and because of their technical leadership, provide a basis for expanding work for other federal agencies and addressing important national priorities (e.g., at Livermore, NIF and ASC).

Å Apply the capabilities at the NNSA laboratories to: continuing to improve their understanding of weapons physics issues to reduce uncertainties in weapon performance; managing issues that arise in stockpiled weapons; and working with the NNSA production plants and Department of Defense to devise an optimal path forward for a certifiably safe, secure, and reliable stockpile at affordable costs.

Å Work to reduce overhead costs at the NNSA laboratories and expand work for other federal agencies in a way that supports and augments NNSAôs investments in the laboratories.

This approach, which is fully consistent with NNSAôs long-term objectives for complex transformation, provides an additional valuable service to the nation. It secures a long-term role for the weapons laboratories as crown jewels of large-scale science supporting our nationôs defense, energy, environmental, and economic security. These laboratories are the largest multidisciplinary concentration of PhDs in the countryð there are no other institutions like them. As a result of this investment in the scientific and technical infrastructure by DOE and this Committee, the laboratories provide value to the country well beyond nuclear weapons workð in areas that are the defining problems of this century. And we can do even more.

NEW STOCKPILE STEWARDSHIP TOOLS AND THEIR APPLICATION

One of the greatest accomplishments of the Stockpile Stewardship Program to date is our tremendous progress in acquiring new tools and using them to better understand weapons performance. When nuclear testing was halted, there were significant gaps in our knowledge. Some nuclear test results remained unexplained and for some processes in the detonation of a nuclear device, our simulation codes were simply not adequate. Either the computers were not large and fast enough or we did not understand the physicsð or both. For those processes, we depended on nuclear test data to adjust the codes.

A key focus of stockpile stewardship has been to fill the gaps in our knowledge to reduce our uncertainties about nuclear weapons safety, security, and performance as the stockpile ages. There are four major areas of investment in improved capabilities: more powerful computers, enhanced hydrodynamic testing capabilities to experimentally study the performance of (mock) primaries prior to nuclear explosion, an experimental facility to study the high-energy-density and thermonuclear processes in weapons (the National Ignition Facility), and tools to better understand the properties of plutonium. With these tools, we are striving to develop a better understanding of the physics, improve our simulation models, and use non-nuclear experiments and past nuclear test data to validate those model improvements. To date, some of the unknowns about nuclear weapons performance have been resolved, others we are close to resolving, and still others will require more time and effort. Greater knowledge increases the likelihood that we can resolve with confidence a problem that arises in stockpiled weapons without having to resort to a nuclear test.

Advanced Simulation and Computing (ASC)

The ASC program continues to be a remarkable success. The goal set when the Stockpile Stewardship Program began was a million-fold increase in computing power in a decade. It was estimated at the time that a computer capable of 100 trillion floating point operations per second (100 teraflops) would provide a minimum level capability to model the full performance of a nuclear weapon in three dimensions with sufficient resolution to illuminate the physics issues where we need to make significant improvement. The goal was attained with the delivery to Livermore from IBM of the 100-teraflop ASC Purple supercomputer, with over 12,000 processors and 2 million gigabytes of storage.

In April 2006, the NNSA laboratories began using ASC Purple for classified production runs. Soon after the machine began operating, a joint team of scientists from Livermore and Los Alamos performed a series of weapon simulations at unprecedented resolution using the most advanced ASC simulation software. The results gave dramatic new insights into weapons physics by pointing to phenomena not seen at lower resolution.

ASC Purple is now running series of six-month campaigns as a national user facilityð managed in a manner similar to a unique, large experimental facility. Each of the NNSA laboratories propose computing work packages to be run as campaigns. These packages, which need ASC Purpleõs size and capability, aim at achieving major stockpile-stewardship milestones. The proposals are reviewed and prioritized for relevance, importance, and technical rationale; and machine time is allocated accordingly. ASC Purple is the first ASC system to be managed in this way.

A remarkable feature of the ASC program is its strong partnerships with the U.S. computer industry and major research universities to accelerate the development of supercomputer platforms, storage and operating systems, and software capable of running efficiently on machines with 10ôs to 100ôs of thousands of processors. An example of this is Livermoreôs partnership with IBM to develop and bring into operation BlueGene/L, the worldôs fastest computer. With its system-on-a-chip technology, BlueGene/L is a world apart from its predecessors. Compared with the previous record holder, it was eight times faster and one-fourth the cost, and it required one-tenth the floor space and one-sixth the power consumption. In 2007, the machine was expanded from 131,000 to 208,000 processors and now benchmarks at 478 teraflops (with a peak speed of 596 teraflops).

BlueGene/L was acquired through the ASC program as a computational research machine for evaluating advanced architectures to help define an affordable path to petaflop computing (quadrillion operations per second). It has been remarkably successful, efficiently running simulation codes capable of addressing a broader range of weapons issues than originally envisioned. For three years running, simulations performed by researchers using BlueGene/L won the prestigious Gordon Bell Prize, which is awarded to innovators who advance high-performance computing.

It is vital that the laboratories build on the ASC programôs outstanding successes and sustain the momentum toward petaflop computing and beyond by staying on schedule for the next planned ASC investments, the Roadrunner machine for Los Alamos and the Sequoia machine for Livermore, and continuing to maintain and develop the extraordinary simulations code systems. These next two machines take different approaches to the integrated problem of the computer architecture and simulations that must run on them. Sequoia is an extension of the successful BlueGene/L approach while Roadrunner takes a different approach. Both entail risks. The continuing advances in simulation required to resolve the remaining weapons performance issues are too important to pursue only one approach. One needs to succeed and hopefully both will. The generation of machines beyond them can combine the two different approaches.

Through the highly successful ASC program, we are turning simulation into a tool of predictive scienceð a full partner with theory and experiments. In particular, we are making key discoveries about physical processes in the functioning of a nuclear weapon that help us to improve models in codes and reduce sources of uncertainty in weapon performance. The more powerful Roadrunner and Sequoia computers are essential for implementing better physics models and as discussed below, the methodology we have been developing to quantify uncertainties in weapon assessments and certification. It is critically important to sustain the investments that have led to such remarkable successes in the ASC program.

Hydrodynamic Testing

Hydrodynamics testing is the most valuable experimental tool we have for diagnosing device performance issues for primaries in weapons before they enter the nuclear phase of operation. Hydrodynamics experiments are conducted at Livermoreôs Contained Firing Facility (CFF) at Site 300, our remote testing location, and the newly commissioned Dual-Axis Radiographic Hydrodynamic Test Facility (DARHT) at Los Alamos. Experiments are executed in accordance with a National Hydrotest Program, which

NNSA coordinates with the laboratories. The plans include both Integrated Weapons Experimentsð large-scale tests of mock weapon primariesð and smaller-scale Focused Experiments, performed to study specific physics or engineering issues. Over the last three years, Livermore researchers performed nearly 20 Integrated Weapons Experiments at CFF for both Livermore and Los Alamos. The Laboratory has also conducted a long series of Focused Experiments to study radiation case dynamics after high-explosive detonation. Important information was learned from these experiments that led to major improvements to weapons code physics and new insights into nuclear weapons performance.

In the NNSAôs preferred alternative for complex transformation, long-term plans call for closure of CFF when its use for hydrodynamic testing is no longer programmatically necessary and reduced NNSA support for Site 300. As these changes occur, Livermore scientists and engineers will carry out aspects of their important hydrodynamic experiments at other sites. It is critically important that sufficient funding be made available to fully utilize the new capabilities available at DARHT.

The National Ignition Facility (NIF)

NIF is critical to the success of the Stockpile Stewardship Program. It is the only facility capable of creating in a laboratory the conditions necessary to experimentally access all of the nuclear phase operations important to modern nuclear weapons. A wide range of precisely diagnosed experiments can be fielded at NIF. These experiments offer the promise of uncovering important physics details about the functioning of a nuclear weapon that were inaccessible or not examined in underground nuclear tests. NNSA scientists will gather necessary data to improve and validate physics models in simulation codes. Ignition experiments at NIF are critical to understanding fusion burn, a key phenomena in the performance of weapons in the stockpile. The design and execution of complex NIF experiments will also test the expertise of NNSA scientists and sustain their critical skills and knowledge about nuclear design.

Major progress continues to be made on NIF and preparations for fusion ignition experiments with the 192-beam laser. As has been the case since being rebaselined in 2000, the NIF project is meeting all of its technical performance, cost, and schedule milestones. Current plans are to complete the construction project and laser commissioning in March 2009 and begin the first ignition experiments in FY 2010. In July 2007, Laboratory scientists, engineers, and technicians commissioned the first of two 96-beam laser bays, assuring that each beam met NIFôs operational and performance qualification requirements. In early 2008, all 192 main laser beams were precisely aligned. As of the end of March 2008, testing has been completed on 144 of the 192 beams, and installation has begun of the final optical modules that convert the laser light from infrared to ultraviolet. More than 3.1 megajoules of infrared-light energy have been fired, making NIF by far the worldôs most energetic laser. The extraordinary laser energy (more than 1.8 megajoules of energy in ultraviolet light), the remarkable beam quality, and the ability to shape the pulse to meet the specific needs of experiments provide NIF unique and unprecedented experimental capabilities.

The National Ignition Campaign (NIC), which is being managed for NNSA by our Laboratory, involves multiple laboratories and encompasses all work needed to carry out the initial ignition experiments in 2010 and continuing research the following years. Currently, the main thrust of NIC is to prepare for experiments in 2009 to validate the ignition targetôs design. Using 96 beams, these experiments will help select the optimum radiation temperature conditions for the ignition experiments. Computer simulations, which have been validated by their close match with data gathered from the 4-beam NIF Early Light experiments conducted in 2003-2004, indicate that NIFôs laser beams will propagate effectively through the hot plasma generated in fusion experiments to achieve ignition.

NIC is following a well-defined technical path toward ignition on NIF and the transition of NIF to routine operations in 2012 as a highly flexible high-energy-density user facility for research for stockpile stewardship as well as energy security and the basic science of matter at extreme conditions. However, NIC did not receive the funding requested by NNSA in FY 2007 and FY 2008, putting timely achievement of program goals at higher risk than would be the case otherwise. We remain confident that ignition will be achieved soon after the experimental program begins in 2010. We have larger concerns about a shortfall in the future funding needed to sustain the experimental effort and achieve the full benefits of NIFôs unique capabilities. NIF is the only source of the data about the ñnuclear phaseò of operation that are necessary for the long-term success of stockpile stewardship.

A number of key uncertainties about nuclear weapons physics relate to weapons performance near the time the device ñgoes nuclearò and thereafter. The process of boosting the fission yield of primaries, in particular, is key to weapons performance and is not well understood. NNSA has launched a science campaign to investigate the physics of boost and improve the modeling of it in simulations with the goal of reducing uncertainties in weapon performance. Data and insights from NIF experiments are required to develop and validate the models. Ignition and thermonuclear burn is another area where NIF experiments will enable scientists to better understand the underlying physics and reduce weapon performance uncertainties.

In addition, NIF experiments will provide critically needed equation-of-state, opacity, and material dynamics data to improve and validate weapon simulation models. NIF is unique in its capabilities for these types of experiments because of its ability to produce very high temperatures in a sufficiently large volume for a sufficiently long period of time and because of its excellent diagnostics. These same attributes make possible scaled experiments of hydrodynamic and radiation transport phenomena, with results that can be directly compared to simulation model predictions of nuclear-phase weapon performance. As it nears completion, it is extremely important that the NIF project be fully funded so that it can be completed on time and that NIF be fully utilized to demonstrate ignition and resolve the weapons physics issues critical to continuing to certify the stockpile without nuclear testing. At this point in the project, there is little flexibility to accommodate funding shortfalls without impact on completion.

Plutonium Research Capabilities and Facilities

Plutonium is an extremely complex material and understanding its detailed properties is a major scientific challenge. Completed in 2006, a concerted long-term study by Livermore and Los Alamos researchers concluded that the performance of plutonium pits in U.S.

nuclear weapons will not sharply decline due to aging effects over decades. Because plutonium is highly radioactive, over time it damages materials in weapons including the pits themselves. However, the study concluded that the plutonium pits for most, but not all, nuclear weapons have minimum lifetimes of at least 85 years. These results have important implications in planning for the weapons production complex of the future.

Still, there is much we do not know about the material and its properties at extreme conditions, which is important for weapon performance. In 2007, Livermore researchers met an important stockpile stewardship milestone by completing the development of a new description of plutonium under a variety of physical conditionsð an ñequation of state.ò This equation of state is based on advanced theory and simulation, including simulations only now possible with the ASC Purple and BlueGene/L supercomputers, together with very accurate data from diamond-anvil-cell measurements at high static pressures and dynamic experiments using the Joint Actinide Shock Physics Experimental Research (JASPER) gas gun at the Nevada Test Site. Work with this equation of state tells us that the technical research into this complex material must continue if we are to meet all the needs of the stewardship program.

Large-scale work with plutonium at Livermoreôs plutonium facility (Superblock), which has provided vital support to the Stockpile Stewardship Program, will be phased out. NNSAôs plans for complex transformation include the consolidation of weapons-useable special nuclear materials to fewer sites. All Category I/II quantities of special nuclear materials are to be removed from Livermore by the end of 2012ð two years earlier than planned when the first shipment of plutonium left the Laboratory for Los Alamos in late 2006. Since then, two more shipments of material have been made to the Savannah River Site in South Carolina, where surplus nuclear materials are being consolidated.

Livermore researchers will continue research and development activities to better understand plutonium, improve plutonium part manufacturing processes, and provide surveillance of stockpiled weapons. Our plutonium research breakthroughs have proved important over the years, and the two-laboratory approach is a vital part of effective peer review processes. Category III amounts of nuclear materials will remain on the Livermore site for small-scale experiments. For other activities, Laboratory scientists and engineers will begin using facilities elsewhere to conduct their work. To this end, modern plutonium-capable facilities are necessary for stockpile stewardship and sustaining the nationôs nuclear stockpile. It is essential that the nation proceed with the Chemistry and Metallurgy Research (CMR) Building Replacement Project at Los Alamos.

MANAGING THE HEALTH OF THE STOCKPILE

Lawrence Livermore is responsible for the nuclear explosive packages in five nuclear weapons systemsð four that were designed by Livermore: the W62 ICBM warhead, the W84 cruise missile warhead (inactive), the B83 strategic bomb, and the W87 ICBM warhead; and one designed by Los Alamos: the W80 cruise missile warhead. The Laboratory monitors the health of the weapons for which it is responsible, conducts stockpile stewardship activities to better understand aging effects on weapons materials and components, develops advanced technologies for weapon surveillance, evaluates issues as they arise in stockpiled weapons, and pursues programs to extend the stockpile life of weapons. In addition, Livermore scientists and engineers develop advanced technologies for weapons surveillance and manufacture of weapons parts, and the Laboratory participated in the Reliable Replacement Warhead Feasibility Study.

Livermore also assists others in the nuclear weapons complex on production issues. Laboratory engineers are working closely with the Pantex and Y-12 Throughput Improvement Project teams to improve plant efficiencies, expedite completion of joint projects, and introduce new capabilities. In addition, Livermore helped with the resumption of weapon pit manufacturing at Los Alamos, where a team succeeded in fabricating and certifying new pits for the W88 submarine-launched ballistic missile warheads. The Laboratory supplied radiographic inspection capabilities, produced small-scale plutonium samples for testing, and provided engineering evaluations and peer reviews based on a wide range of independently conducted experiments and simulations.

Comprehensive Peer Review and Advanced Certification

Livermore is a key participant in formal review processes and assessments of weapon safety, security, and reliability. As part of the Annual Stockpile Assessment Process, Lawrence Livermore and Sandia prepare Annual Assessment Reports for each of the nuclear weapons systems for which the two laboratories are jointly responsible. As input to the reports, Laboratory scientists and engineers collect, review, and integrate all available information about each weapon system, including physics, engineering, chemistry, and materials science data. These Annual Assessments use the advanced tools developed by the stockpile stewardship programð such as ASC, DARHT, and soon NIFð as an integral part of the assessments. This work is subjected to rigorous, in-depth intralaboratory review and to expert external review, including formal use of red teams.

With the aging of U.S. nuclear weapons, risks are growing that reliability issues will arise, and modifications to extend the stockpile lifetime of weapons are likely to become more complex and challenging to certify. In recognition of these issues, the JASON Defense Advisory Group recommended to NNSA that the weapon certification process be improved through expanded peer review mechanisms and refinement of the computational tools and methods for certification. To address these recommendations, NNSA was directed by Congress to implement a new Science Campaign called Advanced Certification to significantly increase the scientific rigor of certifying the nationôs nuclear deterrent. The campaign is focused on expanding and applying the Stockpile Stewardship Program methodology called the quantification of margins and uncertainties (QMU). By enhancing the scientific rigor and transparency of QMU, the Advanced Certification Science Campaign will improve the quality of the assessments and enable better peer review by external panels of experts. These efforts will expand the applicability and validity of the process, initially developed for the existing stockpile, to complex Life Extension Programs and reuse of previously produced components such as pits, and they will answer questions raised by the JASONs in their consideration of the Reliable Replacement Warhead.

In conjunction with the Annual Assessment process, the laboratories have recommended that a more Comprehensive Peer Review process be implemented. In this process, responsibility for assessing a nuclear package in a weapon system will remain with the current responsible design laboratory. However, surveillance and underground test data for *all* stockpile systems will be accessible to both design laboratories, and each laboratory will annually carry out comprehensive independent analyses of *all* stockpile systems, thereby enabling in-depth, intensive laboratory technical peer review. This effort will provide the responsible laboratory and NNSA with more comprehensive evaluations of the stockpile and more efficiently apply complex-wide resources to address time urgent stockpile issues, such as significant finding investigation (SFI) resolution. I believe that adding the Comprehensive Peer Review process is the single most important action to take to improve confidence in the nuclear deterrent in the absence of nuclear testing.

Life-Extension Programs (LEPs)

The LEP that refurbished the W87 ICBM warhead was a successful example of stockpile stewardship. Congress authorized the W87 LEP in 1994, the first rebuilt W87 was delivered back to the Department of Defense (DoD) on schedule in 1999, and Lawrence Livermore and Sandia completed formal certification in 2001. NNSA and DoD established an extensive technical review process to certify the design changes and production procedures. The process entailed thorough internal reviews at Livermore, technical reviews by NNSA (including peer review by Los Alamos), and reviews by DoD. Throughout the program, the Laboratory collaborated with the production plants, working to ensure the quality of the W87 refurbishment work.

Subsequent LEPs are proving to be challenging, and future ones can be expected to be even more difficult because there are going to be more things that need to be fixedð that happens with age. Nuclear weapons include a variety of reactive and organic materials sealed in close proximity in a hostile radiation environment. In some weapon systems, we are beginning to see aging signs that concern us. Cold-War-era weapons were designed to meet stringent military characteristics (MCs). The limits of what was possible were often pushed in the design of currently-deployed weapons. Ease of manufacture or long shelf-life were lower design priorities. Exotic and/or environmentally unfriendly materials are used in a number of instances to improve performance, and manufacture of the weapons entailed numerous steps that are difficult to exactly reproduce. Furthermore, while there is a basis for high confidence in the performance of the stockpiled weapons as they were produced, some designs do not have large performance margins, which makes their performance less resilient to change. These factors increase the difficulty of certification of any modifications in refurbishments and the expense of rebuilding the weapons.

Reliable Replacement Warhead Feasibility

After authorization by Congress, the Nuclear Weapons Council launched the Reliable Replacement Warhead (RRW) Feasibility Study in 2005. The goal of the RRW is to replace existing aging warhead systems with designs that more closely meet the requirements of the post-Cold War era. The RRW would include advanced safety and security technologies, and it would be designed to have much larger performance margins than the system being replaced. Large performance margins make it easier to certify reliable performance without underground nuclear testing. These designs would be based on devices that were well tested previously, further obviating the need for nuclear testing. They would be manufactured from materials that are more readily available and more environmentally benign that those used in current designs. The objective is for these modified warheads to be much less costly to manufacture by a smaller, modernized production complex. The RRW is to maintain the current military capabilityð not to improve it.

In early 2007, NNSA announced its decision that Livermore and Sandia national laboratories would provide design leadership for the RRW for the U.S. Navy. After the decision, NNSA and the Navy began work to further define and develop detailed cost estimates for the RRW program. This work was intended to support a future decision to seek congressional authorization and funding in order to proceed into system development and potentially subsequent production. The effort has since been halted. Seeking clarification on a number of related policy and technical issues, Congress stopped funding for RRW work in FY 2008. The nation would benefit from a clearer view of the costs of RRWs versus programs to extend the life of existing warheads or a blending of the RRW and LEP approachesð together with the technical challenges and risks of the various options. Considerable technical work is needed to support an informed decision about the preferred options for the nationôs enduring nuclear deterrent and nuclear weapons complex. It is important that we expeditiously start to develop the needed information.

SUPPORT OF DEFENSE NUCLEAR NONPROLIFERATION PROGRAMS

Livermore engages in a wide range of activities for NNSAôs Defense Nuclear Nonproliferation Program, whose important mission is to address the threat that hostile nations or terrorist groups may acquire weapons-useable material, equipment or technology, or weapons of mass destruction (WMD) capabilities. We contribute to almost all program areas because the Laboratory takes an integrated, end-to-end approach to its WMD nonproliferation workð from preventing proliferation at its sources, to detecting proliferant activities and identifying ways to counter those efforts, to responding to the threatened or actual use of WMD.

Another feature of the Laboratoryôs work is that we work closely with end-users of our technologies and systems so that our research and development efforts are informed by real-world operational needs. Livermore, in fact, supports several sponsors with unique operational capabilities. For Defense Nuclear Nonproliferation these include the National Atmospheric Release Advisory Center (NARAC), the Nuclear Incident Response Program, and the Forensic Science Center, which supports multiple sponsors. NARAC is the source of technical capabilities that also support the Department of Homeland Securityôs (DHSôs) Interagency Modeling and Atmospheric Assessment Center. As a result of our special capabilities, the Laboratory is also responsible for DHSôs Biodefense Knowledge Center and DoDôs Counterproliferation Analysis and Planning System and the Homeland Defense Operational Planning System. The uniqueness of Livermoreôs capabilities is borne out by the fact that we are one of only twelve world-wide laboratories, and currently the only one in the United States, certified to analyze samples pertaining to the Chemical Weapons Convention and the only certified forensics laboratory able to receive all types of forensics evidenceð nuclear, biological, explosive, and hazardous chemicals.

Selected examples of the Laboratoryõs activities in support of Defense Nuclear Nonproliferation include:

- Å In support of the Global Threat Reduction Initiative, Livermore is leading the effort to secure more than 1,000 radioisotopic thermonuclear generators deployed across Russia. Installed in the 1970s as remote power sources, these devices are highly radioactive and largely unsecured, thus posing proliferation and terrorism risks.
- Å In support of the Material Protection Control and Accounting (MPC&A) program, Livermore completed MPC&A upgrades for the last two Russian navy sites in the Kamchatka region in 2007. The Laboratory also leads the Federal Information System effort to establish a comprehensive national nuclear material accounting system for Russia.
- Å In a significant breakthrough to strengthen international nuclear safeguards, a team of researchers from Lawrence Livermore and Sandia recently demonstrated that the operational status and thermal power of reactors can be precisely monitored over hour- to month-timescales using a cubic-meter-size antineutrino detector. The detectors could be used to ensure that nuclear fuel in civilian power reactors is not diverted for weapons purposes.
- Å In support of efforts to monitor for underground nuclear explosions, Livermore develops tools and methodologies for detecting seismic events in regions of proliferation concern. In 2007, Laboratory scientists produced regional seismic calibrations for the Persian Gulf and surrounding regions, and they developed improved methods for distinguishing the waveform for earthquakes and nuclear explosions in North Korea.
- Å The Laboratory works on a variety of advanced detection capabilities. One example is major success in 2007 in developing a passive technique to detect shielded highly-enriched uranium, an important breakthrough for homeland protection.

All of these capabilities are built upon the science and technology infrastructure required to meet our nuclear weapons responsibilities.

SUMMARY REMARKS

On October 1, 2007, a newly formed public-private partnership, Lawrence Livermore National Security, LLC (LLNS), began its contract with the Department of Energy to manage and operate the Laboratory. LLNS is honored to take on the responsibility. We see a future with great opportunities to apply our exceptional science and technology to important national problems. To this end, we have identified four top-level goals.

First, we will work with NNSA to provide leadership in transforming the nationõs nuclear weapons complex and stockpile to meet 21st-century national security needs. As in NNSAõs preferred alternative for complex transformation, we envision Livermore as a center of excellence for nuclear design with centers of excellence for supercomputing with petascale machines, high-energy-density physics with the National Ignition Facility (NIF), and energetic materials research and development with the High Explosives Applications Facility (HEAF). We are vigorously supporting the goal of consolidation and working toward eliminating Category I/II quantities of special nuclear material from the site by 2012.

Second, we will carry forward Livermoreôs tradition of exceptional science and technology that anticipates, innovates, and delivers. This is the science and technology that brought into operation currently the worldôs most powerful computer and used it the last three years in a row to win the Gordon Bell Prize with amazing scientific simulations; that is finishing commissioning of NIF and preparing for experiments to achieve the power of the sun in a laboratory setting for national security, long-term energy security, and scientific exploration; that is developing advanced radiation detection systems as well as analysis-on-a-chip technologies and DNA signatures for rapid detection of pathogens for health and security applications; and that has provided critical technical support since 1990 to the Intergovernmental Panel on Climate Change, which was a co-winner of the Nobel Peace Prize in 2007 for its work.

Third, we will aggressively make available the core scientific and technical capabilities of the Laboratory to meet pressing national needs in areas that build on and contribute to the core missions and strengths of the Laboratory. As I highlighted in this testimony, the nation and the world face many complex challenges in the 21st century that require the exceptional science and technology and sustained multidisciplinary efforts that the Laboratory can offer.

Four, we will enhance business and operational performance, paying particular attention to safe and secure operations and improving our operational efficiency and cost effectiveness. Public trust in our Laboratory depends on meeting mission goals through safe, secure, disciplined, and cost-efficient operations.

LLNSô start as managing contractor at the beginning of FY 2008 coincided with the reduction of $280 million in spending power at the Laboratory. We have been working to dramatically reduce support costs and the staff will decline from about 8,900 in October of 2006 to under 7,000 FTEs by the end of FY 2008. More than 500 of these are highly-trained scientists and engineers. The change is painful, but it is my responsibility to ñright sizeò the Laboratory to budget realities.

It is the nationôs responsibility to ñright sizeò the NNSA laboratories to their important, continuing missions and their broader responsibility to ñthink aheadò and pursue multidisciplinary science and technology in anticipation of emerging national needs. I urge your continuing support for a strong Stockpile Stewardship Program and for sustaining the NNSA laboratoriesô work on the science-based stockpile stewardship and NNSA nonproliferation programs as well as other activities to meet vital national needs.