Statement of C. Paul Robinson, Director
Sandia National Laboratories

United States Senate
Committee on Energy and Natural Resources

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INTRODUCTION

Mr. Chairman and distinguished members of the committee, thank you for the opportunity to testify on the present and future roles of the National Nuclear Security Administration's national laboratories in homeland security. I am Paul Robinson, director of Sandia National Laboratories.

Sandia National Laboratories is managed and operated for the National Nuclear Security Administration (NNSA) of the U.S. Department of Energy (DOE) by Sandia Corporation, a subsidiary of the Lockheed Martin Corporation. Sandia's unique role in the nation's nuclear weapons program is the design, development, qualification, and certification of nearly all of the nonnuclear subsystems of nuclear warheads. We perform substantial work in programs closely related to nuclear weapons, including intelligence, nonproliferation, and treaty verification technologies. As a multiprogram national laboratory, Sandia also conducts research and development for other national security agencies when our special capabilities can make significant contributions.

At Sandia National Laboratories, we perform scientific and engineering work with our missions in mind—never solely for its own sake. Even the fundamental scientific work that we do—and we do a great deal of it—is strategic for the mission needs of our sponsors. Sandia's management philosophy has always stressed the ultimate linkage of research to application. When someone refers to Sandia as "the nation's premier engineering laboratory," that statement does not tell the whole story: We are an *applied science and engineering* laboratory with a focus on developing technical solutions to the most challenging problems that threaten peace and freedom.

My statement will give an overview of Sandia's contributions to homeland security in recent months, followed by a discussion of the major laboratory capabilities of importance to the homeland security mission in the future. I will also share my thoughts on how best to structure a science and technology capability for homeland security in order to have maximum success, including suggestions for how

legislation can ensure access to the research and development (R&D) resources that the new Department of Homeland Security will require to support its missions. Let me stress at the outset, however, that our experience has been that almost any thoughtful organizational structure can work, if well-meaning and empowered people carry out the work of the organization.[1]

SANDIA'S CONTRIBUTIONS TO HOMELAND SECURITY AND THE WAR AGAINST TERRORISM

Like most Americans, the people of Sandia National Laboratories responded to the atrocities of September 11, 2001, with newfound resolve on both a personal and professional level. As a result of our own strategic planning and the foresight of sponsors to invest resources toward emerging threats, Sandia was in a position to immediately address some urgent needs.

For example, by September 15, a small Sandia team had instrumented the K-9 rescue units at the World Trade Center site to allow the search dogs to enter spaces inaccessible to humans while transmitting live video and audio to their handlers. This relatively low-tech but timely adaptation was possible because of previous work we had done for the National Institute of Justice on instrumenting K-9 units for SWAT situations.

You may perhaps be aware that a formulation developed by Sandia chemists was one of the processes used to help eliminate anthrax in this very building (Dirksen), as well as in the Hart and Ford buildings here on Capitol Hill and at contaminated sites in New York City and in the Postal Service. We developed the non-toxic formulation as a foam several years ago and licensed it to two firms for industrial production in 2000. The formulation neutralizes both chemical and biological agents in minutes.

Special devices invented by explosives experts at Sandia have proved to be effective for safely disarming several types of terrorist bombs. For the past several years, our experts have conducted training for police bomb squads around the country in the techniques for using these devices for safe bomb disablement. The shoe bombs that Richard Reid allegedly attempted to detonate onboard a trans-Atlantic flight from Paris to Miami were surgically disabled with an advanced bomb-squad tool originally developed at Sandia. That device, which we licensed to industry, has become the primary

tool used by bomb squads nationwide to remotely disable handmade terrorist bombs while preserving them for forensic analysis.

Sandia is a partner with Argonne National Laboratory in the PROTECT program (Program for Response Options and Technology Enhancements for Chemical/Biological Terrorism), jointly funded by DOE and the Department of Justice. PROTECT's goal is to demonstrate systems to protect against chemical attacks in public facilities, such as subway stations and airports. For more than a year, a Sandia-designed chemical detector test bed has been operating in the Washington D.C. Metro. The system can rapidly detect chemical agents and transmit readings to an emergency management information system. We successfully completed a demonstration of the PROTECT system at a single station on the Washington Metro. The program has since been funded to accelerate deployment in multiple Metro stations. DOE has also been requested to implement a PROTECT system for the Metropolitan Boston Transit Authority.

Another major worry for homeland security is the potential for acts of sabotage against municipal water supplies. In cooperation with the American Water Works Association Research Foundation and the Environmental Protection Agency, Sandia developed a security risk assessment methodology for city water utilities. This tool has been employed to evaluate security and mitigate risks at several large water utilities. We have used similar methodologies to evaluate risks for other critical infrastructures such as nuclear power-generation plants, chemical storage sites, and dams.

As a result of our sustained program of research and development on Synthetic Aperture Radar (SAR), several state-of-the-art systems have recently been provided to various DoD operational units, either through Sandia directly or by a corporate partner. These systems are deployed in various critical and time-urgent national security missions, including direct support of Joint Forge, Enduring Freedom, and homeland defense activities, and they have earned recognition for their exceptional performance and utility. Unlike more conventional electro-optical systems, SAR provides a day/night, all-weather imaging capability. Sandia has performed research and development on SARs since the early 1980s, an activity that grew from roots in nuclear weapon radar fuzing and has continued under the sponsorship of both DOE and DoD and some corporate partners.

These and other contributions to homeland security and the war against terror are possible because of strategic planning we conducted years ago and early investment in the capabilities that were needed

to respond to emerging threats. The outstanding technology base supported by NNSA for its core missions is the primary source of this capability. We also made strategic decisions to invest Laboratory-Directed Research and Development (LDRD) funds in the very things that we judged were likely to become future needs: items to the Afghanistan theater, the decontamination foam, the sensors we have deployed, and special-purpose robotics we developed. In recent months, requests for Sandia's services from federal agencies other than DOE for work in emerging areas of need have increased. Approximately twenty-eight percent of our total laboratory operating budget is now provided by federal agencies other than DOE.

SANDIA'S CAPABILITIES FOR HOMELAND SECURITY

Sandia National Laboratories and the other NNSA laboratories constitute a broad, multidisciplinary technology base in nearly all the physical sciences and engineering disciplines. We are eager to leverage those capabilities to support other national security needs germane to our missions, including homeland security, when our capabilities can make significant contributions. Following are a few areas of expertise at Sandia that are directly applicable to the homeland security mission.

Nuclear Sensing

As part of Sandia's mission for stockpile stewardship, we have long been committed to safe-guarding nuclear weapons from terrorists and actively supporting nonproliferation. The terrorist attack at the 1972 Munich Olympics focused our awareness on vulnerabilities to terrorist attacks abroad and, in particular, on the need to protect our stored nuclear weapons. This led to our work on access delay and denial systems at weapons storage sites and improving the security of weapon storage vaults. More recently, we have turned our physical protection expertise to protection and control of nuclear materials in Russia and the former Soviet Union.

One important tool in the war against nuclear terrorism is the Department of Energy's Second Line of Defense (SLD) program. Its purpose is to minimize the risk of nuclear proliferation and terrorism through cooperative efforts with foreign governments to strengthen their capability to detect and deter illicit trafficking of nuclear material across their borders. The NNSA laboratories' expertise has been essential in this program. Short-term, the Second Line of Defense program has adapted commercially available radiation detection equipment, security systems, and communications equipment to work

comprehensively with Russian Customs and other foreign agencies to stop nuclear smuggling. It is effective in detecting both weapons material and radiological dispersal devices (RDDs) or so-called "dirty bombs." Long-term, the Second Line of Defense program will deploy radiation detection equipment optimized for border use, integrate it with local, regional, and national-level communication systems geared for quick response, and cooperatively train foreign officials in use of the systems.

Sandia National Laboratories produces radiation sensors for a variety of government customers. One of our specialties is spectral sensor systems that provide automatic radioactive material identification using special algorithms developed by Sandia. These systems detect and analyze nuclear materials quickly, in real time, in indoor or outdoor environments, and with a high degree of precision that provides high confidence. We have produced a wide variety of sensor systems, from very large, fixed installations to small, rugged, portable battery-powered units.

Sandia's Radiation Assessment Identification and Detection (RAID) System was originally conceived, built, and tested before the tragic events of September 11, 2001. However, it meets the post–9/11 need to help safeguard our nation from nuclear terrorism. This system is designed to detect and identify radioactive materials transported through portals at passenger and package terminals at international ports of entry. RAID uses a commercial sodium iodide scintillation spectrometer and associated electronics, along with Sandia-developed analysis algorithms, to detect and identify radioactive materials passing within several meters of the sensor. A video image of the detection scene is displayed on a base-station computer. The system automatically and continuously updates and recalibrates for background phenomena and can identify a radioactive source even if the source is shielded.

Based on our experience with RAID and other more advanced nuclear sensing systems, we believe the state of development of our nuclear sensors is such that the technology could be quickly transferred to commercial producers and widely and rapidly deployed at a cost of less than $50,000 per unit. These deployed systems would have a very high probability of detecting a smuggled nuclear weapon or an RDD if properly deployed. Nuclear sensing systems could be placed at ports of entry, around likely targets, or even scattered throughout a city to scan people, packages, and vehicles. Since these sensors are passive devices, they don't emit a signal and, consequently, are very difficult to detect. In other words, a terrorist can't use a radar detector to determine if one of these sensors is present.

Unbeknownst to a terrorist, an alarm from one of these sensors could alert law enforcement personnel to the presence or movement of a weapon that employs radioactive material.

Of course, significant challenges exist in transitioning any technology from the laboratory to mass-produced industrial products. However, as we have demonstrated many times with technologies that we have transferred to industry in the past, Sandia works closely with industrial partners to work through the design challenges associated with manufacturing engineering and commercialization.

Chemical and Biological Agent Sensing

Sandia is researching a variety of technical solutions to counter the threat posed by chemical and biological agents. This activity is supported by the DOE Chemical/Biological Nonproliferation Program (CBNP) and the Department of Defense and includes threat and response analysis, environmental sensing and monitoring, facility protection, advance chem/bio-terror warning systems, reagent design, and decontamination technology.

Sandia is developing a portable bio-sensor called "microChemlab" to put into the hands of first responders. Configured to detect toxins such as ricin and botulinum, the device uses micro-fabricated "chips" as a miniature chemical analysis lab to isolate and identify biological agents. This system has been demonstrated to also reliably and rapidly detect a variety of chemical weapon agents in realistic situations where obscurants to mask the signature are present. The system is being modified to analyze viruses and bacteria. We are identifying commercial partners to produce and market the unit.

We are also exploring a process for identifying anthrax in a period of minutes, rather than hours. In the laboratory, we are analyzing fatty acid esters vaporized from the cell walls of bacteria and comparing them to cataloged signatures indicative of anthrax or other pathogens. If successful, these signatures can be incorporated into the hand-held microChemlab unit described above. The ability to identify a biological agent quickly is a crucial step toward developing bio-attack warning systems and defenses. Sandia's Laboratory-Directed Research and Development (LDRD) program supports this work.

Sandia is engaged in an accelerated development effort for a standoff biological weapons detection system to provide advance warning of a biological weapon threat. The system will employ ultraviolet laser-induced fluorescence to scan for and to discriminate clouds of biological agents over a broad field

of view. Prototypes of this system have been demonstrated on various mobile and fixed platforms and have demonstrated excellent standoff range and sensitivity. Under NNSA sponsorship, we are moving toward the demonstration phase of the system development in the next several months.

As critical as sensor technology is to an effective biodefense, an even more overriding question is, What should an integrated biodefense system look like? For the past several years, Sandia has been working with partners to understand the issues associated with defending cities against biological attack. Starting with the basic objectives of limiting casualties and minimizing the impact of an attack on the health care system, we have evolved system concepts that combine early medical surveillance with environmental monitoring. Early medical surveillance looks for patterns in the population for earlier indications of an attack than would be possible if we waited for definitive patient diagnoses. Environmental monitoring aims for still earlier detection by using sensors, such as those described above, to detect dispersal of a disease agent. An urban environmental monitoring system would likely consist of a wide-area monitoring component in combination with facility monitoring for high-value facilities such as government buildings, subways, and airports.

Even with a good defensive system, knowing what to do in the "fog" of a biological attack is extremely difficult, especially when information may trickle in over the course of days, where "no action" may be a decision with serious consequences, and where multiple jurisdictions complicate decision making. To better understand the real-world factors affecting such decisions and to help prepare decision makers, Sandia has developed a multi-player interactive simulation that we call, "Weapons of Mass Destruction – Decision Analysis Center" (WMD-DAC). We are currently applying this simulation capability to both biological and nuclear defense scenarios.

Explosives Detection

Today, a commercially produced, walk-through portal for detecting trace amounts of explosive compounds on a person is available for purchase and installation at airports and other public facilities. The technology for this device was developed, prototyped, and demonstrated by Sandia National Laboratories over a period of several years and licensed to Barringer Instruments of Warren, New Jersey, for commercialization and manufacture. The instrument is so sensitive that microscopic quantities of explosive compounds are detected in a few seconds.

Using similar technology, we have developed and successfully tested a prototype vehicle portal that detects minute amounts of common explosives in cars and trucks. Detecting explosives in vehicles is a major concern at airports, military bases, government facilities, and border crossings. The system uses Sandia's patented sample collection and preconcentrator technology that has previously been licensed to Barringer for use in screening airline passengers. The same technology has been incorporated into Sandia's line of "Hound™" portable and hand-held sensors, capable of detecting parts-per-trillion explosives and other compounds.

These devices could be of great value to customs and border agents at ports of entry. You will recall the incident in December 1999 when a terrorist attempted to cross into the United States from Canada at Port Angeles in Washington State. An alert border agent noticed his suspicious behavior and inspected the trunk of the vehicle, which was packed with explosives. A less alert agent might easily have allowed the vehicle to proceed. If we could install vehicle inspection portals at ports of entry to scan for explosives and radiological materials quickly and efficiently, we would greatly improve our homeland security.

Bomb Disablement Technology and Training

As *first* responders, American firefighters, police, and emergency personnel will be called upon to be America's first line of defense against terrorist attacks. These men and women must be prepared for the full range of terrorist threats, from improvised explosive devices to chemical, biological, radiological, and nuclear weapons of mass destruction. It will be the responsibility of the Department of Homeland Security to ensure they have access to the training and tools they need to do their jobs.

Sandia National Laboratories began holding advanced bomb-disablement technology workshops for bomb squad technicians in 1994. Since then, Sandia has transferred advanced bomb-disablement technology to more than 750 workshop participants through *Operation America* and its predecessors, *Operation Riverside* and *Operation Albuquerque*. *Operation America* is a series of ongoing regional workshops hosted by a local police department in the state where the event is held and supported by regional FBI offices. Participants come from bomb squads, police and fire departments, and emergency response organizations throughout the United States, including most of our major metropolitan cities and the U.S. Capitol Police. They also come from other government agencies, all branches of the U.S.

military, and, internationally, from our allies in some of the world's terrorism hotspots. Participants learn applied explosives technology and advanced bomb-disablement logic, tools, and techniques. Technical classroom presentations, live-range demonstrations, hands-on training, and special high-risk scenarios give them the knowledge and technology they need to respond to terrorist threats involving explosives.

Most of the bomb-disablement technologies demonstrated in Operation America were developed by Sandia National Laboratories as part of the DOE Laboratory-Directed Research and Development (LDRD) program and our work for other federal agencies. These tools include the Percussion-Actuated Nonelectric (PAN) Disrupter used to dismantle suspected explosive devices and preserve forensic evidence. The device was used at the Unabomber's cabin in Montana and was available at the 1996 Summer and 2002 Winter Olympic Games. More recently, Massachusetts State Police, with the assistance of the FBI, used the Sandia-developed PAN Disrupter to disable the alleged shoe bombs removed from an American Airlines flight from Paris to Miami.

The PAN disrupter, as well as other advanced disablement tools developed by Sandia, are currently in use by local bomb squads and could be used against terrorist threats such as radiological dispersal devices (RDDs) and other weapons of mass destruction. Most of these bomb-disablement tools are relatively simple to assemble in the field, can be used safely from a distance, and are affordable, and they are currently in use throughout the bomb-disablement community. These tools disrupt and "render-safe" explosive packages without initiating the explosives or destroying forensic evidence.

Once Sandia has researched, developed, and tested a bomb-disablement tool, it begins the process of transferring the technology to the first-responders community, putting the technology in the hands of the men and women who need it. Operation America sponsors include Sandia National Laboratories, the National Institute of Justice, and DOE.

Critical Infrastructure Protection

National security and the quality of life in the United States depend on the continuous, reliable operation of a complex set of interdependent infrastructures consisting of electric power, oil and gas, transportation, water, communications, banking and finance, emergency services, law enforcement, government continuity, agriculture, health services, and others. Today, they are heavily dependent on

one another and becoming more so. Disruptions in any one of them could jeopardize the continued operation of the entire infrastructure system. Many of these systems are known to be vulnerable to physical and cyber threats and to failures induced by system complexity.

In the past, the nation's critical infrastructures operated fairly independently. Today, however, they are increasingly linked, automated, and interdependent. What previously would have been an isolated failure, today could cascade into a widespread, crippling, multi-infrastructure disruption. As the documented cases of attacks on vital portions of the nation's infrastructure grow, there is a sense of urgency within industry and government to understand the vulnerabilities.

The National Infrastructure Simulation and Analysis Center (NISAC), which would be transferred to the Department of Homeland Security under the Administration's bill, is a comprehensive capability to assess the nation's system of infrastructures and their interdependencies. NISAC's partners are Sandia National Laboratories and Los Alamos National Laboratory, both of which possess extensive supercomputer resources and software expertise. NISAC will provide reliable decision support analysis for policy makers, government leaders, and infrastructure operators. It will perform modeling, simulation, and analysis of the nation's infrastructures, with emphasis on the interdependencies.

Sandia pioneered Probabilistic Risk Assessment (PRA) as a tool for evaluating the risks associated with high-consequence systems such as nuclear weapons and nuclear power generation plants. We apply this tool to risk assessments for critical infrastructures such as dams, water utilities, chemical plants, and power plants. Combined with our expertise in security systems for nuclear facilities, we have helped utilities and industrial associations create security assessment methodologies that can guide owners and operators through the assessment process to determine vulnerabilities and identify mitigation options. Methodologies have been developed for water utilities, chemical storage facilities, dams, power plants, and electrical power transmission systems.

Cyber Sciences

Computer systems and networks are attractive targets of attack for high-tech criminals, foreign governments, and, increasingly, terrorists. Government, commerce, and the military increasingly rely on cyber networks in their operations. Computerized Supervisory Control And Data Acquisition

(SCADA) systems often control the operations of critical infrastructure systems such as power utilities and distribution networks and municipal water supplies.

Sandia conducts significant research in the technologies intended to protect cyber and network resources and the information that resides on such systems. Programs that assess the vulnerabilities associated with these systems are in place for our own resources as well as for those at other federal government agencies. Sandia operates a SCADA laboratory to study such cyber control systems and to determine effective protection strategies. We conduct red-teaming to challenge cyber and information systems and identify and remove vulnerabilities. Our objectives are to enhance the resistance of cyber systems and critical information systems to attack and to develop solutions for survivability and response options. Our understanding of the issues associated with computer and network vulnerabilities is enhanced by the microelectronic design and fabrication capability resident at Sandia as well as the state-of-the-art work performed as part of NNSA's Advanced Simulation and Computing (ASC) campaign.

Nuclear Incident Response

The President's bill to establish a Department of Homeland Security defines a Nuclear Incident Response Team that includes entities of the Department of Energy and the Environmental Protection Agency that perform nuclear and/or radiological emergency support functions (Section 504).

NNSA plays a vital support role in combating acts of nuclear terrorism through its Nuclear Emergency Support Team (NEST). NEST provides the FBI and other federal and state agencies with technical assistance in response to terrorist use or threat of use of a nuclear or radiological device in the United States. NEST also supports the Department of State in a similar role for incidents overseas. Another NNSA team, the Accident Response Group (ARG), has the different mission of providing technical support in response to accidents involving U.S. nuclear weapons while they are either in the custody of DOE or the military services. The ARG and NEST teams draw from the same pool of experts at the NNSA laboratories, all of whom are volunteers.

NEST maintains a fast-response capability for a radiological emergency involving dispersal of radioactive debris—for example, from the detonation of a so-called "dirty bomb" or radiological dispersal device (RDD). NNSA's Radiological Assistance Program (RAP) provides initial responders

who can be on the scene in a matter of hours. Their support role is to characterize the radiological environment, provide technical advice to the FBI, FEMA, and other emergency response agencies, and to assist with decontamination and material recovery. NNSA is in the process of enhancing the Radiological Assistance Program to perform radiological weapons detection and device characterization missions on a regional basis consistent with the FEMA response regions.

The Joint Technical Operations Teams (JTOTs) are major operational elements of NEST that directly assist military units and crisis response operations. These teams are trained and equipped to support render-safe operations and advise on stabilization, packaging, and disposition procedures.

In addition to the NEST and ARG capabilities, NNSA maintains Consequence Management Teams that are available to provide assistance to federal and state agencies that require radiological emergency assistance after a detonation has occurred. The teams are trained and equipped to support assessment, monitoring and sampling activities, laboratory analysis, and health and safety support to incident responders.

Sandia National Laboratories contributes more than one hundred team members to the various elements of NEST, ARG, RAP, and Consequence Management. Sandia's role focuses largely on RAP incident response, device characterization, render-safe techniques, assessment and prediction of consequences from radiological incidents and accidents, and methods for containment of radiological materials. Sandia is the only NNSA laboratory that maintains the capability for containment of particulates that would be released in an RDD explosion.

U.S. / Russian Nuclear Security Programs

Sandia supports a broad range of cooperative programs with Russia in nuclear security. These programs, funded by NNSA, DoD's Cooperative Threat Reduction program, and the Department of State, address the safety and security of nuclear weapons, the security of fissile materials, verification of fissile materials, and defense conversion.

I want to make special note of the importance of the activities with Russia. The terrorist attacks last September have made us all acutely aware of the catastrophic potential of weapons of mass destruction should they end up in the wrong hands. The cooperative efforts to protect nuclear materials and

maintain state control over nuclear capabilities and assets in Russia are important initiatives that must continue.

We promote a vision called "Global Nuclear Management" that, if realized, would systematize the control of all nuclear materials in the world. However, the current state of protection for nuclear materials in Russia, while improved through the past efforts of this program, is an important indication of the potential for nuclear material proliferation. We must continue these efforts with Russia.

ENSURING ACCESS TO THE NNSA AND DOE LABORATORIES FOR HOMELAND SECURITY MISSIONS

The national laboratories of the NNSA and DOE are widely regarded as the premier science and technology laboratories in the federal government. These institutions have a long history of excellence in research and development for nuclear weapons and other national security applications. They are uniquely able to deploy multidisciplinary teams on complex problems in a way that integrates science, engineering, and design with product realization. These labs already have the scientists and engineers in place to contribute to the counterterrorism program, and most of them already handle classified research projects, which will be a requirement in dealing with terrorism threats issues and responses.

In a world where threats are increasingly insidious—with worrisome developments in chemical and biological weapons, cyber warfare, and proliferation of radiological and nuclear capabilities—it is important that the NNSA and DOE laboratories be major contributors in the national effort to address these threats. These national laboratories can provide enormous value to homeland security challenges. They are also the logical entities to perform technology evaluation on the many products and proposals that will inevitably be advocated to the Department of Homeland Security from countless vendors.

I would recommend that the new Homeland Security Department operate initially with the nation's existing research and development centers. It is unlikely that a new "stand-alone" science and technology laboratory could be created from scratch in time to make significant contributions. The United States is at war, and we must be bring technology to bear as rapidly as possible. There is no luxury of time to organize, build, or bring a new laboratory into successful operation.

The natural desire for a new agency to have organic laboratory assets that it "owns" can be addressed in the longer term. However, it makes eminent sense to begin with the assets that exist now

at national laboratories and other appropriate research providers, then evolve over time to a future state where separate labs could be pulled out and designated as homeland security laboratories. Ultimately, it may prove desirable for existing elements of the national laboratories (at least those which demonstrate that they are particularly important for homeland security) to be spun-off into independent Federally Funded Research and Development Centers (FFRDCs) for homeland security.

Any new FFRDCs that might be created at some future time should always have "permeable membranes" that allow sharing of expertise from other parts and programs of sister laboratories in the NNSA, DOE, or other research centers. Placing a bureaucratic wall around a homeland security laboratory would reduce rather than enhance its effectiveness.

It has long been my opinion that the nation would be better served if the national laboratories that were created by acts of Congress could in fact become *true* national laboratories, with simplified procedures in place to allow their unique resources to be rapidly and efficiently applied to support any agency of the federal government with responsibility for important national missions. The current homeland security crisis easily qualifies as an appropriate case for this approach.

Unfortunately, established bureaucratic structures and regulations that keep agencies at arm's length from one another will stand in the way of effective utilization of the NNSA or other DOE laboratories for homeland security unless legislative action is taken to remove the barriers. As a first step, it would be helpful to explicitly authorize NNSA to carry out research and development for homeland security by adding that activity to the NNSA's list of authorized activities at Title 42, Section 2121, of the United States Code. Similar action was taken by the 101st Congress when it added technology transfer to the NNSA's authorized activities with the Department of Energy National Competitiveness Technology Transfer Act of 1989.[2]

Next, the Homeland Security Act should give the Department of Homeland Security the power to task the NNSA laboratories directly, just as the Science, Energy, Environmental, and other non-NNSA offices of DOE are able to do. Similarly, using the Joint Sponsorship provisions already within the Federal Acquisition Regulations would allow NNSA and the Homeland Security Department to embrace these missions and to jointly undertake research and development activities under mutual agreement. These authorities would eliminate the bureaucratic red tape and additional costs associated

with the Work-for-Others (WFO) process that could otherwise inhibit access and utilization of the laboratories by non-DOE sponsors.

ORGANIZING THE RESEARCH AND DEVELOPMENT FUNCTION IN THE DEPARTMENT OF HOMELAND SECURITY

It will be important for the Homeland Security Department to have the authority to determine for itself how and where to make its research and development (R&D) investments to support its mission goals. There will be some laboratories and institutions that will lobby to be designated as homeland security laboratories or as centers of excellence for this or that homeland security mission area. The Department will need to look beyond labels to demonstrated capabilities and a track record of deliverables. Its R&D program should encourage a *competition of ideas* among many performers, including industrial firms, universities, and federal laboratories, and then fund the development of the best ideas based on considerations of technical merit and not on who the performer is.

The Department of Homeland Security must adopt a two-track strategy for R&D that addresses both near-term and long-term needs. DHS must quickly demonstrate and deploy applied technology for threats that exist now. In the near term, the Department's R&D program must stress deployment of technologies for which a research base already exists. It will need to rely on laboratories that can work effectively with industry and perform Advanced Concepts Technology Demonstrations in an expedited fashion under programs managed at the Under Secretary level.

DHS will also require a strategic research program to address longer-term issues. This program should commission research in areas that hold potential for breakthrough technologies of importance to homeland security. It may perhaps function like the Defense Advanced Research Projects Agency (DARPA) or be staffed as a small Federally Funded Research and Development Center (FFRDC) reporting to the Office of the Secretary, as recommended by the National Research Council report.[3]

I believe it will also be important to establish some research programs that are funded at the mission level, not just at the task level, within key laboratories. Our experience is that laboratory staff become far more likely to produce important results in support of their missions when they can devote themselves in a streamlined and focused way—with the most knowledgeable and most qualified individuals having the freedom to pursue new ideas, choose the best approaches, and act on new

research results with a minimum of bureaucracy. What has made this model so successful in the past for both our military and other sponsors has been the way in which we have integrated new technologies by placing the emphasis on technology solutions. Whenever we have been given cradle-to-grave responsibility for bringing "leap-frog science" to bear in the shortest possible time, our technical staff have worked in close teamwork with the end users of the technology to assure that what is delivered to the field will be successful. This unique approach to marrying "technology-push" with "requirements-pull" is a hallmark of Sandia's R&D philosophy.

Each Under Secretary of Homeland Security will have unique R&D requirements. Clearly, the Under Secretary for Chemical, Biological, Radiological, and Nuclear Countermeasures will need access to a substantially different set of R&D resources than the Under Secretary for Border and Transportation Security. But the needs for improved technology are widespread.

We recommend that each Under Secretary create a laboratory network tailored for his or her missions by directly tasking existing institutions that possess the competencies required. We call this entity a "virtual national laboratory," and it has already been tried and proven in the NNSA laboratory system and elsewhere as an effective model for multi-institutional programs involving research and technology development. Virtual national laboratories may be of permanent or limited duration and can be reconfigured as necessary for evolving requirements.

To illustrate, the Under Secretary for Chemical, Biological, Radiologcial, and Nuclear Countermeasures may design one or more matrixed laboratory systems that include representation from the National Institutes of Health, some DOE/NNSA labs, leading research universities, and the pharmaceutical industry. The Under Secretary for Border and Transportation Security may design one or more matrixed laboratory systems for his or her needs that include representation from the Naval Research Laboratory and other DoD labs, DOE/NNSA, industry, and universities.

Each of these "virtual national laboratories" would have a defined organizational structure with a laboratory director and program directors, although it would own no real property. The laboratory director would manage a Laboratory Liaison Council (LLC) with representation from the constituent institutions. The LLC would be the Under Secretary's vehicle for direct access to the national laboratory system. There would be no requirement to go through each institution's sponsoring federal agency in a "work-for-others" procurement process.

A significant advantage of this concept is that it encourages competition of the right sort—competition of ideas (not direct competition of labs for money)—and cooperation on results, pulling together the right resources for a particular mission focus. It encourages rapid transition of the fruits of research into development and application and helps avoid the "valley of death" that often prevents promising research from moving from development to deployment.

Specific recommendations to implement this concept in the DHS legislation are attached in the appendix to my statement.

SUMMARY AND CONCLUSION

Sandia National Laboratories and the other NNSA and DOE laboratories constitute a broad, multidisciplinary technology base in nearly all the physical sciences and engineering disciplines. We are eager to leverage our capabilities to support the science and technology needs of the new Department of Homeland Security.

Sandia possesses strong competencies in nuclear, chemical, and biological sensors and engineered systems suitable for transfer to industry and deployment in homeland security applications. We have been proactive in supporting our nation's first responders and addressing the challenges of infrastructure protection. We have a track record of anticipating emerging homeland security threats and investing in technology development to counter them through our Laboratory-Directed Research and Development (LDRD) program and sponsor-directed programs. We are the premier national laboratory for working with industry to transition technologies into deployable commercial applications.

Bureaucratic and regulatory roadblocks exist that limit access to the DOE/NNSA national laboratories by other federal agencies, and those obstacles should be removed by the homeland security legislation in order to facilitate direct access to those resources. The Homeland Security Department needs the authority to manage a research and development program that encourages competition of ideas among many performers—including industrial firms, universities, and federal laboratories—and then fund the development of the best ideas based on technical merit and applicability to mission needs.

On behalf of the dedicated and talented people who constitute Sandia National Laboratories, I want to emphasize our commitment to strengthening United States security and combating the threat to our homeland from terrorism and weapons of mass destruction. It is our highest goal to be a national

laboratory that delivers technology solutions to the most challenging problems that threaten peace and freedom.

APPENDIX

Recommendations for Structuring Research and Development In the Department of Homeland Security

- Each Under Secretary should have authority for "conducting a national scientific research and development program to support the missions of the Department" for which he or she is responsible, ". . . including directing, funding, and conducting research and development relating to the same" (as per Sec. 301 (2) of the President's bill).
- In addition, each Under Secretary should appoint a Director of Research and Development with authority to immediately create networked laboratory systems (virtual national laboratories) through cooperative arrangements with federal, academic, and private research institutions. Appropriate funding will be required.
- Directors of Research and Development will be assisted by Laboratory Liaison Councils with representation from the institutions of the virtual national laboratory.
- Directors of Research and Development should have authority and appropriated funding to originate and award Cooperative R&D Agreements (CRADAs) and other technology transfer mechanisms between virtual national laboratories and industry on an expedited basis.
- DHS legislation should authorize all relevant federally funded R&D institutions to accept direct tasking from the DHS and should instruct "landlord" agencies to facilitate DHS taskings of institutions under their sponsorship.
- At least initially, DHS should rely on the established great laboratories of the nation, rather than creating new ones for its science and technology (S&T) program. There is insufficient time to establish a "green field" laboratory that can make contributions on the scale required in a timely manner.
- Congress should add homeland security to the NNSA's list of authorized activities at Title 42, Section 2121 of the United States Code.

- Thought must be given to ensuring that S&T activities are not encumbered with bureaucratic processes that stifle the imaginative and innovative work required if we are to be successful. New processes will be required in some cases, rather than importing existing ones from organizations brought into the new department.
- As recommended by the National Research Council,[4] an office of "Under Secretary for Technology" should be created, reporting to the Secretary of Homeland Security. This office will manage a strategic, peer-reviewed research program with universities, national laboratories, and industry. Sustained funding at the mission level will be required.
- Also as recommended by the National Research Council,[5] a Homeland Security Institute should be established as a Federally Funded Research and Development Center (FFRDC) under the direction of the Under Secretary for Technology. This entity should perform policy and systems analysis, help define standards and metrics, and assist agencies with evaluating technologies for deployment.

WITNESS DISCLOSURE INFORMATION

Witness name: C. Paul Robinson

Capacity in which appearing: Representative of a non-government entity

Name of entity being represented: Sandia National Laboratories (GOCO)

Position held: President and Laboratories Director

Parent organization (managing contractor): Lockheed Martin Corporation

Federal contract: Management and operating contract between Sandia Corporation and U.S. Department of Energy, DE-AC04-94AL85000.

FY2000 cost: $1,540,019,000; negotiated fee: $16,110,000.

FY2001 cost: $1,580,187,000; negotiated fee: $16,300,000.

FY2002 cost: $1,684,552,000; negotiated fee: $17,270,000.

Curriculum Vitae:

Dr. C. Paul Robinson is President of Sandia Corporation and Director of Sandia National Laboratories, with principal sites in Albuquerque, New Mexico and Livermore, California.

Joining Sandia in 1990, Robinson was Director and Vice President before becoming President in 1995.

Ambassador Robinson served as Chief Arms Control Negotiator from 1988–90 and headed the U.S. Delegation to the Nuclear Testing Talks in Geneva. He was appointed by President Ronald Reagan, confirmed by the US Senate, and reappointed by President George Bush. These negotiations produced protocols to the Threshold Test Ban Treaty and the Peaceful Nuclear Explosions Treaty, which were ratified unanimously by the Senate.

From 1985–88, Robinson was Senior Vice President, Principal Scientist, and Board Member of Ebasco Services, Inc., a major engineering and construction firm. He spent most of his early career (1967–85) at Los Alamos National Laboratory, where he led the laboratory's defense programs. He is a longstanding member of the Strategic Advisory Group for the Commander-in-Chief, U.S. Strategic Command. Robinson has served on DoD's Threat Reduction Advisory Committee since 1998. He was Chair of the Presidential Technical Advisory Group on Verification of Warhead Dismantlement and Special Nuclear Materials Controls. He previously served on the Scientific Advisory Group on Effects for the Defense Nuclear Agency, on Defense Science Board studies, and has advised other government agencies.

Dr. Robinson received the Outstanding Public Service Medal from the Joint Chiefs of Staff and was elected to the National Academy of Engineering. He currently serves on several community and educational boards, including the Great Southwest Council of the Boy Scouts of America, the Explora Science Museum, and the Florida State University Research Foundation's Board of Trustees. He is also a trustee of the Kazakhstan Nonproliferation Institute. Robinson holds a B.S. in Physics from Christian Brothers College, a Ph.D. in Physics from Florida State University, and an honorary doctorate from Christian Brothers University.

REFERENCES

[1] This conclusion is one of the observations made by the authors of *Built to Last: Successful Habits of Visionary Companies*, by James C. Collins and Jerry I. Porras, who made a landmark study of America's most successful companies.

[2] Pub. L. 101-189, div. C, title XXXI, Sec. 3157, Nov. 29, 1989, 103 Stat. 1684.

[3] *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism*, National Research Council, June 25, 2002, p 12–7.

[4] Ibid., p. 12–6.

[5] Ibid., p. 12–7.