Opening Statement

of

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Research and Development Priorities and Strategic Direction

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Introduction

Good morning Chairman Quayle, Ranking Member Wu, and distinguished Members of the Subcommittee. Thank you for the opportunity to appear before you today with my colleague Dr. O'Toole to discuss research and development (R&D) programs at the Department of Homeland Security (DHS). In order to fully express the Domestic Nuclear Detection Office's (DNDO) R&D efforts, I would first like to share my strategic vision for DNDO and provide insights into our programs.

The Domestic Nuclear Detection Office's (DNDO) mandate is to improve the nation's capability to detect and report unauthorized attempts to import, possess, store, develop, or transport nuclear or radiological material for use against the nation, and to further enhance this capability over time. With assistance and participation from a wide variety of U.S. government departments and agencies, DNDO synchronizes and integrates inter-agency efforts to develop technical nuclear detection capabilities, characterizes detector system performance, ensures effective response to detection alarms, integrates nuclear forensics efforts, coordinates the global detection architecture and conducts a transformational research and development program for advanced technology to detect nuclear and radiological materials. Countering nuclear terrorism is a whole-of-government challenge and DNDO must work with federal, state, local, international, and private sector partners to develop and implement the Global Nuclear Detection Architecture (GNDA).

Three Principles

My strategic vision for DNDO is based on three key principles that I think will help shape the office and all our activities: discipline, intellectual rigor, and transparency.

One of the first things I would like to build upon at DNDO is the *discipline* with which we approach our work. In DNDO's nearly six years of existence, the office has embarked on many efforts to enhance the GNDA, but in order to ensure that we address the most pressing and impactful needs, we must carefully review all our plans and expenditures so that we exercise discipline in utilization of resources. While we have implemented a range of measures designed to provide oversight and instill appropriate processes for administrative, management, and program activities within DNDO, we must find ways to be more efficient, especially in the current budget climate.

Building upon a disciplined approach to executing our mission, we must also ensure that there is *intellectual rigor* behind our analyses, strategies, and programs. Our decision making and planning must be supported by strong methodologies and analyses. This includes making use of available expertise and tools, like peer review, that can assist us in developing the best strategies and solutions. We must make sure that our assumptions, strategies, and solutions reflect thoughtful and deliberate analyses and defensible conclusions.

Finally, I support increased *transparency* at DNDO. Transparency is essential in providing an understanding of our mission and receiving the necessary oversight and feedback to improve our operations. I pledge that DNDO will work with all relevant stakeholders and provide as much insight as possible into our programs and planning for our partners, including Congress, the Government Accountability Office (GAO), and the American public. Working within all applicable laws and classification regulations, we will provide as much information as possible about our programs.

GNDA Strategic Plan

As you may know, National Security Presidential Directive (NSPD)-43/Homeland Security Presidential Directive (HSPD)-14 and the Security and Accountability For Every (SAFE) Port Act of 2006 (P.L. 109-347) require that DNDO be the lead federal agency for coordinating the and implementing the domestic portion of the GNDA.

We worked with federal partners to define the GNDA and the necessary roles, responsibilities, and objectives. Completion of this strategic plan was a priority when I took the lead at DNDO.

The GNDA is an interagency product that represents the inputs of: the departments of Defense, State, Energy, and Justice; the Office of the Director of National Intelligence; Intelligence Community members; the Nuclear Regulatory Commission; and the National Security Staff. The completion of the GNDA Strategic Plan represents a high degree of cooperation and coordination among the interagency to create a document that will guide multiple U.S. government efforts to fulfill the objectives and goals set forth in the plan. I am proud to say that we were able to deliver the GNDA Strategic Plan to Congress in December 2010, as promised.

Implementation of the GNDA is an ongoing process. Currently, there are many existing programs and initiatives that fall under the GNDA and many more programs that support these efforts. Using the Strategic Plan as a framework, DNDO will continue to work with interagency partners on GNDA implementation. DNDO's forthcoming domestic implementation plan will outline programs, technologies, execution, and timelines in greater detail.

DNDO will also complement the GNDA Strategic Plan with a revised GNDA annual review report. The annual report, required by Congress under the "Implementing Recommendations of the 9/11 Commission Act of 2007" (Pub. L. 110-53), will provide a means to evaluate, document and track progress to assist in refining the GNDA. It will also link the U.S. government's organizational roles and responsibilities to the GNDA's goals, and identify the analyses and investments necessary to achieve those objectives. Like the Strategic Plan, the GNDA annual report will be jointly produced and approved by all relevant USG stakeholders.

Within DNDO we will place much greater emphasis on defining the GNDA, both as it exists now and as we determine it should exist in the future. The responsibility to define the architecture is DNDO's greatest challenge and its greatest opportunity. Over the next several

years, our long-term architectural vision can be characterized by several common themes that apply across all layers. In every layer and pathway we will seek to increase detection coverage and capability and deter terrorists from planning or attempting nuclear terrorism. The architecture will also introduce uncertainty for adversaries with regard to the risk of interdiction, and take maximum advantage of existing activities that can contribute to the overall capability to prevent nuclear terrorism.

Strategic Emphasis

Our future enhancements to the domestic architecture will focus on situations where there is some intelligence information available, but where information may not be precise. Future implementations of the GNDA will emphasize mobile or agile detection components, which will increase our capability to respond to escalated threat levels by focusing detection assets to interdict these threats. These threats will impact the way we move forward with deployments and systems development, as well as how we provide support and training to build effective operational concepts. We will use existing capabilities and assets, on a federal, State, and local level, to surge our radiological and nuclear detection abilities in a coordinated fashion to respond to suspected threats or radiological/nuclear detection scenarios. This will not be one specific program, rather a concept of operations that will bring together multiple capabilities and rely on a breadth of assets.

We need to utilize the integrated efforts of federal, state, and local responders to perform radiological and nuclear detection in concentrated regions or areas when information indicates there may be a need for responsive search operations for preventive detection. We have many programs, assets, and capabilities that contribute to radiological and nuclear detection response activities, and we must work to enhance coordination and implementation mechanisms to ensure that we make the best use of all available personnel, equipment, and knowledge. A more flexible architecture will strategically bring together the assets and capabilities for detection and search operations into a unified effort for the domestic prevention of radiological and nuclear terrorism. Some current programs have begun to establish more randomized and mobile capabilities with broad applications, including the radiological and nuclear detection equipment and training DNDO has provided for all U.S. Coast Guard boarding teams and Transportation Security Administration Visible Intermodal Prevention and Response teams. We have recently reached an important milestone for the development of advanced handheld systems, which were developed through DNDO and approved for production and deployment in September 2010. This system is the first of DNDO's next generation human-portable systems and will be acquired for U.S. Customs and Border Protection and other users in support of their operations. Following the success of our advanced handheld, the small area search handheld system, RadSeeker, will be ready for a production and deployment system this year. Our work will continue to enhance our federal capabilities and build on these efforts in a strategic way so that the pieces are linked together and can respond as needed.

DNDO also has a number of separate state and local pilot programs and training efforts that can contribute to distributed, agile capabilities to develop an effective domestic architecture. My

objective for 2011 is to increase our focus on DNDO state and local support programs and consolidate the efforts into an integrated program. One element for doing that is the Securing the Cities (STC) initiative. The current STC pilot was initiated in the New York City region and has resulted in unprecedented regional cooperation among federal, state, county, and city agencies in the Tri-state region. The STC program provides assistance to state and local jurisdictions, which enable these entities to build and sustain capabilities by: deploying current technologies regionally in a coordinated manner; designing, acquiring, and deploying a regional architecture for radiological/nuclear detection focused on state and local jurisdictions; developing and implementing a common, multi-agency concept of operations (CONOPS) for sharing sensor data and resolving alarms; and instituting training and exercising by the regional agencies to execute the CONOPS at a high level of proficiency. STC partners in the New York region use commercially available radiological and nuclear detection equipment and work with DNDO to establish requirements and conduct operational assessments of equipment in the development stages. The President's FY 2012 budget request outlines a transition from the STC pilot to a three-phased program that will continue in NYC and commence in another UASI Tier I region. DNDO will assist regional partners in implementing self-supported sustainment of capabilities and real-time sharing of data from fixed, mobile, maritime and human-portable radiation detection systems.

New Approach for Technology Development, Test, and Evaluation

As we develop solutions that support flexible, coordinated capabilities and a deeper understanding of an effective architecture, we need to continue to improve our technological capability. DNDO is mandated to serve as "the primary entity in the U.S. Government to further develop, acquire, and support the deployment of an enhanced domestic system to detect and report on attempts to import, posses, store, transport, develop…"[1] nuclear weapons or materials. Historically, we have focused on developing technology and detection systems to address identified needs. We are now transitioning to a new approach, focusing on commercially developed devices, developing government standards, and testing to those standards. Because industry has repeatedly demonstrated the ability to rapidly improve detection technologies, we have an opportunity to shift our approach to one that is more flexible and adaptable and relies on the private sector – as well as other DHS components – to enhance existing products and develop new devices. This technical transition will also include a new approach at the systems level, which defines strategic interfaces at various points in the detector/system architecture, allowing improvements without wholesale changes to the entire system.

DNDO will place greater emphasis on developing standards for radiological/nuclear detection equipment and testing to those standards, while taking advantage of the technological advancements made by the private sector and building upon those efforts. In addition, we will enhance our approach to testing to reflect the recommendations of the recent report from the National Academies of Sciences, which encouraged us to more heavily integrate detector

[1] Security and Accountability For Every Port Act of 2006 (SAFE Port Act, P.L. 109-347, Sec. 1802)

modeling. Data collected in the field can then be used with the models to understand system behavior instead of relying on new testing alone.

Testing and evaluating systems to achieve technical and operational standards is crucial in developing and delivering the necessary equipment to our stakeholders. DNDO is required by the SAFE Port Act "to carry out a program to test and evaluate technology for detecting a nuclear explosive device and fissile or radiological material, in coordination with the Secretary of Defense and the Secretary of Energy, as appropriate." In response, DNDO has conducted more than 50 separate test and evaluation campaigns at more than 20 experimental and operational venues. These test campaigns were planned and executed with the interagency using rigorous, reproducible, peer-reviewed processes. Tested detection systems include pagers, handhelds, portals, backpacks, mobiles, boat- and spreader bar-mounted detectors, and next-generation radiography technologies. The results from DNDO's test campaigns have informed federal, state, local and tribal operational users on the technical and operational performance of radiological and nuclear detection systems to select the most suitable equipment and effective CONOPs as we work to keep the nation safe from nuclear terrorist threats.

DNDO is also required by the SAFE Port Act, in collaboration with the National Institute of Standards and Technology, to publish technical capability standards and recommended standard operating procedures for the use of nonintrusive imaging and radiation detection equipment in the United States. In executing its T&E and Standards responsibilities, DNDO collaborates with the Test & Evaluation and Standards Division of DHS S&T. This collaboration includes coordination of American National Standards Institute (ANSI) N42 consensus standards, major systems operational testing and evaluation, including large programs like the Advanced Spectroscopic Portal (ASP) program, the implementation of DHS T&E guidance in smaller systems development efforts, and coordination of T&E facilities. The DNDO T&E lead participates on the DHS T&E Council, and DNDO T&E staff has made good use of T&E training and certification capabilities developed by S&T.

We also have supported the development, publication and adoption of national consensus standards for radiation detection equipment. Several such standards now exist for use in homeland security. The DNDO Graduated RN Detector Evaluation and Reporting (GRaDER^{SM}) Program is using these standards to test and evaluate both commercially developed systems. GRaDER is a conformity assessment program that provides independent standards compliance information for selected radiation detection equipment. The program has created the infrastructure for vendor voluntary testing of commercial off-the-shelf radiological/nuclear detection equipment by independent accredited laboratories against national consensus standards and government-unique Technical Capability Standards. Final test results for our initial GRaDER testing are expected beginning this month. We anticipate that the GRaDER Evaluated Equipment List – which is supported by the Federal Emergency Management Agency's guidance for compliance in relation to their grants program – will enable federal, state, local, tribal and territorial agencies to make more informed radiological/nuclear detector procurement decisions by ensuring they are buying equipment that has demonstrated compliance with published standards.

Beyond our work with Component partners, DNDO's testing expertise and experience is sought by interagency partners, such as the departments of Energy and Defense, and international partners such as the United Kingdom, Canada, Israel, the European Union, and the International Atomic Energy Agency. DNDO has an active partnership with the European Commission's Joint Research Center to conduct the Illicit Trafficking Radioactive Assessment Program+10, an ambitious three-year test program to evaluate nine classes of radiological/nuclear detection systems in U.S. and European test facilities.

Research and Development: Programs and Coordination

The Transformational and Applied Research (TAR) programs at DNDO support basic and applied research of systems with increased capabilities. I will describe the TAR portfolio as it currently exists within DNDO. Our research and development contributes to advances in nuclear detection and technical nuclear forensics. TAR projects feed into the DNDO Solutions Development process and shape our work on systems development. Within DNDO, these programs address advanced compact high-performance handheld systems; advanced passive standoff detection technologies; improved detection through networked and distributed detection systems; better detector materials; and improved material characterization and radiochemistry. Additionally, DNDO is pursuing targeted technologies for the detection of shielded special nuclear material through passive, active, and radiographic interrogation programs, and the development of key supporting systems for varied deployment schemes. TAR divides projects between the Exploratory Research Program (ERP) and the Near Term Research Program (NTRP). Underlying these efforts is our work to ensure a continued pipeline for human capital development and basic research, executed through DNDO's partnership with the National Science Foundation for the Academic Research Initiative. Currently, the Academic Research Initiative has awards with 30 universities through 36 grants supporting 118 students.

The ERP explores innovative, high-risk, early-stage technologies, concepts and ideas that can make transformational contributions to support the GNDA and reduce the risk of nuclear terrorism. Specifically, the ERP researches technology and techniques that: 1) address capability gaps and weaknesses in the GNDA, with an emphasis on radiological and nuclear detection; 2) provide substantial performance improvement or cost reductions of radiological/nuclear detection capabilities; and 3) improve nuclear forensics capabilities. Efforts under the ERP are intended to transform the basic building blocks of nuclear detection technology and supporting fields for dramatic improvements in technical capabilities, with the research generally culminating in a proof of concept or proof of feasibility demonstration in a laboratory setting. Successful ERP technologies and concepts may then transition to support a subsequent near-term research project or spur commercial development. ERP also provides performance modeling, improved algorithm development, and other support capabilities for the broader DNDO mission.

Additionally, our ERP work began exploring options for alternative neutron detection, years before the recent helium-3 shortage was identified. Helium-3 is commonly used as a neutron detector material in radiation detection equipment. Our exploratory research projects have been

developing near and long-term alternatives to helium-3 neutron detectors for different applications, including portals, backpacks, handhelds, and pagers. These technologies are aimed at achieving efficiencies and discrimination capabilities that are equivalent to or better than helium-3 detectors, as well as examining detector cost-competitiveness. Approximately 15 different technology approaches are being pursued, including those based on boron or lithium.

Some of these technologies have advanced to a point where they could be tested with other alternative neutron detection technologies. We have completed a test campaign for neutron detection at Los Alamos National Laboratory that evaluated 11 units in three application spaces, which helped us to identify and verify the performance of several very promising technologies and effectively target funding.

The second program within TAR is the NTRP, which performs accelerated development, characterization, and demonstration of leading-edge technologies to address critical gaps in nuclear detection capabilities. The NTRP was started in 2006 and was formerly called the Advanced Technology Demonstration (ATD) Program.

Contracts awarded under the NTRP are typically executed in four distinct phases: preliminary design review, critical design review, characterization readiness review, and characterization assessment. The NTRP characterization results form the basis for a subsequent initial cost benefit analysis to determine if the technology should transition to system development and eventual production and deployment.

Our basic and applied research efforts push the envelope by identifying gaps in current technologies and architectural needs and selecting R&D programs that can begin the early stage work necessary to address these challenges. Our programs must be able to reach out to operators for user requirements and to balance both “technology push” and “technology pull” efforts, as appropriate. For technology push efforts, the developer of a technology is pushing a new concept out for examination by the operator. These are often new or advanced concept detectors that could improve threat detection or allow for altered or simplified CONOPS. These technology push systems are often state-of-the-art with enhanced or dramatically improved capabilities that might be otherwise unknown to operators. Technology pull refers to equipment and programs where operators have identified CONOPS and features that they need in order to achieve their missions. The operators are pulling the technologies in directions that guide development for industry and the government.

Many of our important research and development successes highlight the necessity of integrating architectural analyses with R&D efforts. One example of DNDO’s R&D work that is transitioning through technology push efforts is our Long Range Radiation Detection (LRRD) program. The LRRD program is the follow-on program to the Stand-Off Radiation Detection Systems (SORDS) ATD program, completed in FY 2010. The overarching goal of the LRRD program is to determine if a passive, long-range, radiological/nuclear detection system with localization capability should be developed and fielded. To achieve this goal, the LRRD program will allow systems developers to determine if there is a need, identify that need with a

gap in the GNDA, and evaluate whether that need can be met in a cost effective manner. Next, we must collect user requirements and perform an analysis of alternatives, the result of which helps us determine if we will field one or more systems.

The LRRD systems are undergoing a series of activities that engage federal, state, and local partners in utilizing and assessing the technology. Participating in these activities are two SORDS prototypes and the Roadside Tracker (RST), which were developed through the ERP. The SORDS technologies are designed to detect and identify sources from 100 meters away on a mobile platform, and the RST is designed to detect and identify sources in vehicles over five lanes of traffic at speeds of up to 70 mph. An operational demonstration will evaluate the potential utility of these systems in a simulated urban environment, and follows the technology demonstration that was conducted at Fort Belvoir in November 2010. Next week, the operational demonstration will include the cooperative efforts of DNDO, Fort Indiantown Gap Military Reservation, the 3rd Civil Support Team, Nassau & Suffolk County Police Departments, the Department of Energy's National Nuclear Security Administration, and the Defense Threat Reduction Agency. Following the completion of the operational demonstration, we will work with the Nassau & Suffolk County Police Departments to provide a live demonstration of the LRRD systems for radiological/nuclear scanning at a real event. The live demonstration will allow operators to use the systems and provide feedback for future technology and CONOPS development. This project is illustrative of the important interplay between R&D efforts, technical and operational evaluation activities, and operators in the field, which all together lead to the best solutions.

As Under Secretary O'Toole mentioned, the FY 2011 and FY 2012 President's Budget Requests transfer our TAR activities to DHS S&T, pending Congressional approval of the budget. In order to maintain and improve the current levels of integration for transformational research and development activities and transitions of technologies for use by operators, my office will work closely with S&T to ensure that the pipeline for technological advancements remains coordinated to address gaps in the GNDA and operational needs.

Nuclear Forensics

DNDO has an additional mandate, codified last year in the "Nuclear Forensics and Attribution Act" (P.L. 111-140), to provide stewardship and integration for U.S. government technical nuclear forensics efforts. Nuclear forensics is a key supporting element to the GNDA and must be closely linked in order to receive relevant information and provide data and analyses that can impact detector development, tuning, and deployment. Established in 2007, DNDO's National Technical Nuclear Forensics Center (NTNFC) serves as a national-level "system integrator" for joint planning, exercising and evaluating our national capabilities, while also investing in technical capability advancement. Last year, the NTNFC led the interagency effort to develop the "National Strategic Five-Year Plan for Improving the Nuclear Forensics and Attribution Capabilities of the United States," which was signed by the President and submitted to Congress. NTNFC also has the responsibility to develop the U.S. government's capability to rapidly, accurately and credibly identify the origin and history of radiological and nuclear materials

intercepted before a detonation. We work with laboratory experts to develop standard reference materials for the validation of analytical methodologies; develop validated methodologies to be employed in nuclear forensics activities; and develop and validate predictive models and techniques to improve the understanding of how material signatures.

Conclusion

My vision of DNDO is for us to continue to improve our work developing a broad spectrum of capabilities, including nuclear detection, reporting and analysis, and nuclear forensics. Our responsibilities include coordinating the development of the GNDA and implementing the domestic portion of that architecture. We also must provide the analyses and integration mechanisms for detection and reporting that will link technical elements like research, systems development, testing and evaluation to operational solutions for mitigating the threat of nuclear terrorism. Our research and development work will consistently be matched with needs in the GNDA and the operational requirements of our end users. My hope and expectation is that, over time, we will develop a reputation that allows us greater leverage in defining detection architecture throughout the world.

Other U.S. government agencies and Congress make important contributions in accomplishing the mission to prevent nuclear terrorism, and I am committed to working in coordination with all parties to develop effective strategies, capabilities, and technologies.

Chairman Quayle, Ranking Member Wu, I thank you for this opportunity to discuss DNDO's strategic direction and my vision for its future. I am happy to answer any questions the Subcommittee may have.