Testimony of
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Chairman Meehan, Ranking Member Clarke, and distinguished members of the Subcommittee, thank you for the opportunity to appear before you today. I appreciate your interest in the advancements the Department of Homeland Security's (DHS) Domestic Nuclear Detection Office (DNDO) has made in preventing nuclear terrorism. I am honored to testify with my distinguished colleagues from the Government Accountability Office and the National Academy of Sciences. Your support and oversight, and their constructive assessments and feedback, are critical to our improvement and continued success.

Nuclear terrorism remains a serious risk because of its potential consequences. As President Obama stated in his speech at South Korea's Hankuk University in March 2012, "We know that just the smallest amount of plutonium—about the size of an apple—could kill hundreds of thousands and spark a global crisis. The danger of nuclear terrorism remains one of the greatest threats to global security." To address this risk, DNDO was established as a unique interagency organization with a singular focus on preventing nuclear terrorism. Reducing the risk of nuclear terrorism is a whole-of-government challenge, and DNDO works with federal, state, local, tribal, territorial, and international partners as well as those in the private sector, academia, and the national laboratories to fulfill its mission.

Authorities

Recognizing the threat posed by nuclear and other radioactive materials, DNDO was created by National Security Presidential Directive (NSPD)-43 and Homeland Security Presidential Directive (HSPD)-14 and subsequently codified by Title V of the Security and Accountability For Every (SAFE) Port Act (Pub. L. No. 109-347), which amended the Homeland Security Act of 2002. Pursuant to section 1902 of the Homeland Security Act, DNDO is required to develop, with the approval of the Secretary and in coordination with the Departments of Energy, State, Defense, and Justice, an enhanced global nuclear detection architecture, and is responsible for implementing the domestic portion. The architecture serves as a framework for detecting (through technical and non-technical means), analyzing, and reporting on nuclear and other radioactive materials that are out of regulatory control. Non-technical detection refers to an alert caused by law enforcement or intelligence efforts and collected by GNDA partners under their statutory authorities and consistent with national policy. DNDO is also charged to enhance and coordinate the nuclear detection efforts of federal, state, local, and tribal governments and the private sector to ensure a managed, coordinated response. To accomplish this, DNDO leads programs to develop nuclear detection and forensics capabilities, measure detector system performance, ensure effective response to detection alarms, and conduct transformational research and development for advanced detection technologies.

In 2006, DNDO's National Technical Nuclear Forensics Center was established by NSPD-17/ HSPD-4 and later authorized by the 2010 Nuclear Forensics and Attribution Act (Pub. L. No. 111-140). The

Center was given responsibilities to provide centralized stewardship, planning, and integration for all federal nuclear forensics and attribution activities. The Act also established DNDO's National Nuclear Forensics Expertise Development program and required DNDO to lead the development and implementation of the National Strategic Five-Year Plan for Improving the Nuclear Forensics and Attribution Capabilities of the United States.

These authorities have directed our focus in preventing nuclear terrorism through the enhancement of nuclear detection and technical forensics capabilities. In both instances, we rely on the critical triad of intelligence, law enforcement, and technology. Thus, to maximize the Nation's ability to detect and interdict a threat, it is imperative that we apply detection technologies in operations that are driven by intelligence indicators, and place them in the hands of well-trained law enforcement and public safety officials. Similarly, to enhance attribution capabilities, the U.S. Government (USG) must ensure that information from law enforcement, intelligence, and technical nuclear forensics is fused to identify the origin of the material or device and the perpetrators.

While we have made significant improvements in both detection and forensics over the years, the threat of nuclear terrorism persists, and requires constant vigilance.

Developing the Global Nuclear Detection Architecture

As recognized by the Government Accountability Office in past testimonies, DNDO has made progress in its strategic planning efforts. In December 2010, DNDO issued the first-ever Global Nuclear Detection Architecture Strategic Plan to guide the development and implementation of USG detection programs, activities, and capabilities. In April 2012, the Secretary issued a DHS Global Nuclear Detection Architecture Implementation Plan, which identified priorities, necessary capabilities, and monitoring mechanisms to assess progress. DNDO has worked with interagency partners to update the Global Nuclear Detection Architecture Strategic Plan. The 2014 Strategic Plan presents an updated definition and vision for the global nuclear detection architecture, as well as a mission, goals, and objectives for interagency efforts to detect, analyze, and report on nuclear or other radioactive materials that are out of regulatory control.

The global nuclear detection architecture is a multi-faceted, layered, defense-in-depth framework, with the objective of making the illicit acquisition, fabrication, and transport of a nuclear or radiological device, material, or components prohibitively difficult. DNDO also relies on a well-conceived arrangement of fixed and mobile radiological and nuclear technical detection capabilities to present terrorists with many obstacles to a successful attack, greatly increasing costs, difficulty, and risk, and thereby deterring them.

To develop such a multi-faceted global nuclear detection architecture, DNDO continually assesses current and planned capabilities against the evolving radiological and nuclear threat. DNDO uses rigorous risk assessments as one means to do so. Since 2007, and as directed by HSPD-18 (Medical Countermeasures against Weapons of Mass Destruction), DNDO has collaborated with the DHS Science & Technology Directorate (S&T) to produce the Integrated Chemical, Biological, Radiological, and Nuclear Terrorism Risk Assessment. DNDO leads the biennial radiological and nuclear terrorism risk assessment, which is then combined with similar biological and chemical risk assessments. To better address the evolving threat, DNDO has improved the threat models in this risk assessment by adding an adaptive adversary model and is working with Department of Energy (DOE) National Laboratories to

enhance improvised nuclear device models. DNDO has also supported DHS risk assessments such as the Strategic National Risk Assessment and the Homeland Security National Risk Characterization. These risk assessments, coupled with requirements from our operational partners, inform DNDO resource allocations.

While USG efforts and programs are critical, developing a *global* nuclear detection architecture relies largely on the decisions of sovereign foreign partners to develop and enhance their own national and regional detection programs. DNDO contributes to interagency efforts led by the Department of State by laying the groundwork to assist partner nations in developing defense-in-depth approaches to detecting illicitly trafficked nuclear or other radioactive materials. DOE's National Nuclear Security Administration's (NNSA) Second Line of Defense program is an essential component of this defense-in-depth approach. This program helps strengthen the global nuclear detection architecture by installing and supporting the installation of fixed and mobile radiation detection equipment at high-priority locations outside the U.S. DNDO has worked closely with NNSA on training initiatives associated with building and sustaining foreign partners' radiation detection capabilities. DNDO has assisted in the development of guidelines and best practices through the Global Initiative to Combat Nuclear Terrorism and the International Atomic Energy Agency (IAEA) to outline the key characteristics of an effective architecture. To date, IAEA has used these guidelines and best practices in regional training courses to help more than 20 nations initiate planning of national level detection architectures, with over 50 national-level planners trained in architecture development. Just two weeks ago (July 14-18, 2014), DNDO helped the IAEA expand its Nuclear Security Detection Architecture awareness course during a train-the-trainer session to further develop the international instructor pool. By the end of this calendar year, the IAEA will have successfully implemented seven regional awareness courses in English, French, and Spanish. This strategic partnership will continue to serve as a "force multiplier" for USG nuclear security efforts for years to come.

Conducting Transformational Research and Developing Systems

DNDO is also responsible for conducting an aggressive, evolutionary, and transformational program of research and development to generate and improve technologies to technically detect nuclear and radioactive materials. DNDO's transformational research and development efforts seek to achieve dramatic advancements in technologies to enhance our national detection and forensics capabilities. These developments may also reduce the cost and operational burden of using advanced technology in the field to maintain an enhanced level of protection. Annually, DNDO updates its research and development strategy based on prevailing risk, advancements in technology, and the availability of funding.

Although significant progress has been made in addressing the gaps and needs of the global nuclear detection architecture and nuclear forensics, several challenges remain that require sustained investment. DNDO's technical challenges include the need for systems that:

- Are cost-effective with sufficient technical performance to ensure widespread deployment;
- Can detect special nuclear material, even when heavily shielded;

- Facilitate enhanced wide-area searches in a variety of scenarios, to include urban and highly cluttered environments;
- Can be used to monitor traffic in challenging pathways, such as between ports of entry along our land and sea borders; and
- Support the forensics determination of origin and process history of seized material.

DNDO has and will continue to advance fundamental knowledge in nuclear detection and forensics through a sustained long-term investment in our Exploratory Research program and Academic Research Initiative. These efforts directly address the aforementioned challenges through basic and early-applied research to feed more mature research and development projects such as DNDO's Advanced Technology Demonstrations.

Equally important, the Academic Research Initiative is building the capabilities of universities to develop next generation scientists and engineers in areas such as advanced materials, nuclear engineering, radiochemistry, and deterrence theory. Since its inception, 57 grants have been awarded to more than 42 academic institutions across the country. In 2013 alone, the Academic Research Initiative directly supported 140 students, published 108 papers, and conducted 180 conference presentations. And, we are beginning to see these projects move up the technology pipeline. Just this year, a new room temperature thallium-based semiconductor detector transferred from Northwestern University to our Exploratory Research program. Nuclear resonance cross sections measured at Duke University are being used in our shielded special nuclear material detection projects and background radiation measurements performed by University of California at Berkeley are being used in support of operational programs across the interagency.

Several DNDO-sponsored research efforts have also led to new commercial products that provide enhanced operational capabilities to federal, state, and local law enforcement and public safety personnel. Even before a Helium-3 shortage was identified, DNDO teamed with the Defense Threat Reduction Agency to explore options for better, more cost-effective alternatives for neutron detection (Helium-3 is a gas that is widely used to detect neutrons that are emitted by certain nuclear and other radioactive materials. Helium-3 results from the radioactive decay of tritium. As the need for tritium for nuclear weapons decreased, so too did the availability of Helium-3.) For portal systems, which require the largest quantities of this gas, DNDO worked with industry and is now deploying alternative detection technologies that do not require Helium-3. This enables the country to devote the scarce supplies of Helium-3 to those applications where no substitutes are possible. We are also testing alternative systems for use in mobile, backpack, and handheld radiation detectors, several of which have already shown performance superior to the current-generation systems. Importantly, due to a collaborative USG-wide effort to address the shortfall, our USG strategic reserve of Helium-3 has increased by 70% since 2009.

Other recent DNDO technological successes that transitioned from laboratories to commercially available products include:

- Advanced radiation sensing materials such as Cesium Lithium Yttrium Chloride, Strontium Iodide, and Stilbene, which have enhanced detection characteristics and can be used to build more capable systems featuring simplified electronics, low power requirements, and greater reliability;

- New electronics and advanced algorithms that support networked radiation detection for improved wide area search capabilities;
- Compact dual-energy x-ray generators with improved density discrimination and higher shielding penetration that have been integrated into commercially available mobile radiography systems; and
- Software to automatically detect special nuclear material and shielding material in radiography images.

DNDO continues to develop breakthrough technologies that increase performance and reduce the operational burdens of our frontline operators. DNDO continues to work closely with other DHS Components to improve their mission performance.

We are collaborating with U.S. Customs and Border Protection's (CBP) Laboratories and Scientific Services to use machine learning to greatly reduce the number of nuisance alarms in radiation portal monitors; working with the Massachusetts Port Authority, DHS S&T, and the United Kingdom Home Office to develop and evaluate the next generation non-intrusive inspection imaging equipment; and continuing to jointly evaluate parameter-setting modifications to reduce the number of alarms from naturally occurring radioactive material. In fact, after a rigorous program of laboratory tests, modeling and simulation, field trials, and successful pilots at two ports of entry, CBP will deploy a new technique to the 26 largest seaports by the end of 2014. It is anticipated that this effort will reduce wait times and yield operational efficiencies.

In addition to CBP, DNDO worked closely with the U.S. Coast Guard (USCG), the Transportation Security Administration (TSA), and state and local partners to identify key operational requirements for the design of next-generation radioisotope identification devices that can be used by law enforcement officers and technical experts during routine operations to identify radioactive materials. Based on the enhanced detection material lanthanum bromide and improved algorithms, this new handheld technology is easy-to-use, lightweight, and more reliable and, because it contains built-in calibration and diagnostics, has a much lower annual maintenance cost. The new system is receiving very positive reviews from operators in the field.

Characterizing System Performance

DNDO's technology efforts are coupled with a rigorous test and evaluation program. Over the years, DNDO's test program has grown and matured. To date, we have conducted more than 100 test and evaluation campaigns at more than 40 laboratory and operational venues, and evaluated systems including pagers, handhelds, portals, backpacks, and vehicle-, boat-, aircraft,- and spreader bar-mounted detectors, as well as next-generation radiography technologies. To ensure the equipment is evaluated in the manner in which it will be used, these test campaigns are always planned and executed with operational users. In addition, we include interagency partners and use peer-reviewed processes. The results from DNDO's test campaigns have informed federal, state, local, and tribal partners on the technical and operational performance of detection systems, allowing them to select the most suitable equipment and implement the most effective concepts of operation.

DNDO leads the development of technical capability standards, and in collaboration with the National Institute of Standards and Technology, also supports the development, publication, and adoption of national consensus standards for radiation detection equipment. A total of 24 standards, including 11

U.S. standards with the American National Standards Institute, 10 international standards with the International Electrotechnical Commission, and 3 technical capability standards now exist for homeland security applications. We have assessed commercially available detection systems against national and international standards and in various operational scenarios. Notably, we recently completed the Illicit Trafficking Radiation Assessment program, a collaboration with the European Commission's Joint Research Center and the IAEA to evaluate nearly 80 instruments against consensus standards. The results enabled our stakeholders to compare the performance of commercially available radiation detection equipment and provided manufacturers with constructive feedback on their products.

Implementing the Domestic Component of the Global Nuclear Detection Architecture

DNDO is instrumental in implementing the domestic component of the global nuclear detection architecture. In conjunction with federal, state, local, tribal, and territorial operational partners, DNDO applies a disciplined approach to procure small and large-scale radiation detection and/or identification systems and deploy them at ports of entry, along our land and maritime borders, and in the interior of the U.S. In addition, as part of DHS's Strategic Sourcing efforts, DNDO is the Department's commodity manager for handheld radiological and nuclear detection equipment. This enables us to take advantage of technical advancements and achieve cost savings by leveraging the volume demand of Department-wide and other federal users.

DNDO's collaborative system acquisition efforts have ensured that all USCG boarding parties carry radiation detection equipment; all incoming general aviation flights are met by CBP officers with radiation detectors; 100% of conveyances entering our Nation at land ports of entry are scanned for nuclear and other radioactive materials; almost 100% of maritime cargo is similarly scanned at our sea ports of entry; and the TSA's Visible Intermodal Prevention and Response teams are equipped with radiation detectors. Our partnership with CBP was leveraged during the recovery efforts from Hurricane Sandy. DNDO was able to replace 39 radiological detector panels and nine operator booths within two weeks of the storm, thereby supporting the quick resumption of port operations at A.P. Moller, Maher, Port Newark Container, New York Container, Global, and Red Hook terminals in New York and New Jersey. While technology acquisition and deployments are critical, we must also ensure that the training, exercise, and cross-jurisdictional protocols integral to mission success are adopted and sustained by operational partners. As such, DNDO provides program assistance services to federal, state, local, tribal, and territorial stakeholders who are developing or enhancing radiological and nuclear detection capabilities. This support includes assistance in developing and integrating local or regional programs into the global nuclear detection architecture, guiding the development of concepts of operations and standard operating procedures, and developing training and exercise products to ingrain those procedures into day-to-day activities.

DNDO has made considerable progress in enhancing national radiation detection capabilities by:

- Engaging with 29 states to raise awareness and begin developing formal radiological and nuclear detection programs. By the end of Fiscal Year 2015, DNDO plans to expand its efforts to all 50 states.
- Developing an enduring partnership with state and local jurisdictions, through the Securing the Cities program, resulting in a robust regional nuclear detection program in the New York City/Jersey City/Newark region. Based on lessons learned in this

implementation, DNDO expanded the Securing the Cities program in Fiscal Year 2013 to the Los Angeles/Long Beach area and will select a third region later this fiscal year.

- Supporting domestic maritime capability development by working with regional Area Maritime Security Committees to develop operational procedures, training, and exercises to reinforce their Area Maritime Security Plans and address the small vessel threat.
- Deploying Mobile Detection Deployment Units to provide radiation detection and communications equipment for federal, state, and local agencies to augment their capabilities during special events or in response to elevated threat conditions. To date, these units have been deployed over 150 times.

DNDO provides training products and support to develop, enhance, and expand radiological and nuclear detection capabilities. In partnership with the Federal Emergency Management Agency (FEMA) the Federal Law Enforcement Training Center, DOE, and the Department of Justice (DOJ), DNDO develops and implements protocols and training standards for the effective use of radiation detection equipment and associated alarm reporting and resolution processes. DNDO has developed 42 separate courses in support of emerging detection technologies and operational environments to support our federal, state, and local stakeholders. Since 2005, more than 27,000 law enforcement and public safety personnel from 35 states have participated in DNDO-supported radiological and nuclear detection training.

DNDO also assists state and local partners in developing, designing, and conducting exercises that are compliant with the Homeland Security Exercise and Evaluation program methodology. The exercises provide valuable hands-on experience for personnel performing radiological and nuclear detection operations and assist decision makers in integrating the detection mission into their daily operations. To date, DNDO has conducted exercises with 21 states and annually supports up to 15-20 exercises. DNDO continues to develop and apply standardized and customizable exercise templates and guidelines evaluating the implementation and performance of federal, state, and local radiological and nuclear detection programs while fostering the exchange of ideas and best practices amongst state and local partners.

DNDO fields a unique Red Team to objectively assess the operational effectiveness and performance of DNDO programs and deployed radiological and nuclear detection capabilities at the federal, state, and local levels. Our Red Team works across the inter-agency employing an all-of-government approach to collectively improving our national capabilities. At the federal level we partner with the Departments of Energy, Defense, and Justice; within DHS with CBP, FEMA, TSA, USCG, and U.S. Secret Service; and with a myriad of state and local agencies across the United States. The Red Team evaluates deployed systems and operations and their associated tactics, techniques, and procedures, in as-close-to-realistic-environments as possible. As covert and overt assessments are generally the only opportunity for operators of radiological and nuclear detection systems to gain experience detecting uncommon nuclear sources, these operations provide valuable feedback on the performance of tactics, techniques, and procedures. This feedback enables operators to improve their concepts of operation and readiness. For the past five years, DNDO's Red Team has averaged more than 25 overt and covert assessments per year.

DNDO is responsible for enhancing and coordinating the nuclear detection efforts of federal, state, local, and tribal governments and the private sector to ensure a managed, coordinated response. We also coordinate across the interagency to establish protocols and procedures to ensure that the technical

detection of unauthorized nuclear explosive devices, fissile material, or other active radioactive material is promptly reported to the Secretaries of Homeland Security, Defense, and Energy, the Attorney General, and others as appropriate for action by law enforcement, military, emergency response, or other authorities.

DNDO's Joint Analysis Center is essential in enhancing situational awareness, as well as providing technical support and informational products, to federal, state, and local partners. The Joint Analysis Center employs a secure web-based dashboard to collaborate with mission partners and uses a geographic information system to show detection information, detectors, situational awareness reports, and other overlays in a geospatial viewer. Using the Joint Analysis Center Collaborative Information System, DNDO facilitates nuclear alarm adjudication and the consolidation and sharing of information and databases. This system provides our state and local partners with the ability to manage, document, and execute a radiological and nuclear detection program. This includes the ability to electronically maintain training, certification, and Memoranda of Understanding and Memoranda of Agreement between jurisdictions. The system also consolidates and maintains a database of detector equipment and Nuclear Regulatory Commission state licensees. Through this information system, we connect to the Triage system, maintained by DOE's NNSA, to enable a seamless transition when national-level adjudication assistance is required. To increase awareness of lost and stolen sources and other relevant information, DNDO's Joint Analysis Center publishes weekly information bulletins, summarizing relevant news articles and providing useful facts about radioactive materials.

In addition to direct interaction with individual states and law enforcement agencies, DNDO hosts biennial State and Local Stakeholder Working Group meetings and annual Executive Steering Council meetings with law enforcement and other supervisory personnel to exchange best practices and to obtain feedback on DNDO's initiatives. The State and Local Stakeholder Working Group provides a forum for DNDO to meet with our stakeholders to discuss their current activities, lessons learned, and planned detection initiatives. This forum also provides state and local leaders an opportunity to convey their perspective on mission needs and radiation detection requirements, so that DNDO can develop the necessary products and services to support their efforts. The Executive Steering Council provides policy coordination and implementation between DNDO and senior-level state and local leaders regarding radiation detection programs, and serves as a mechanism to solicit input from senior leaders on their successes, evolving requirements and challenges, as well as for DNDO to apprise them of ongoing efforts to support their jurisdictions. Both the Stakeholder Working Group and the Executive Steering Council have been received favorably and continue to reinforce the relationship between DNDO and key stakeholders.

Acquisition Process Improvements

Initiated in 2004 and canceled in 2011, the Advanced Spectroscopic Portal program was started with the goal of improving the performance of the current radiation detection system that is deployed to our seaports and land border crossings. To ensure we did not repeat the same issues that led to the cancellation of the program, including close end-user collaboration, DNDO and CBP completed a Lessons Learned/Post Implementation Review and identified 32 lessons learned, including significant findings in acquisition management. DNDO will share these observations with the new DHS Joint Requirements Council to ensure maximum benefit is achieved from these past difficulties. Based in part on these lessons learned, DNDO has significantly bolstered acquisition management policy and

strengthened its implementation via robust and disciplined governance and program management processes. In doing so, we ensure programs are selected based on sound business cases and are effectively managed, resulting in an efficient and effective use of DNDO's appropriated funds.

To enhance mission delivery and improve investment management, DNDO designed the Solution Development Process. Aligned with DHS Acquisition Management Directive 102-01, the Solution Development Process institutes an integrated governance approach to program and project oversight throughout the systems engineering lifecycle. The process brings all programs and projects under governance—establishing a shared language, with common practices to increase efficiencies, promote programmatic and budgetary transparency, and bolster accountability. It aligns with DHS enterprise architecture, acquisition management, and capital planning and investment processes. Further, the framework guides management, through the Governance Review Board, and Integrated Product Teams in the delivery of new solution concepts to end users and stakeholders, while maintaining a focus on DNDO's mission, goals, and objectives. As a critical component of the process, it includes active involvement of operational partners, who serve as Lead Business Authorities, and requires rigorous technical reviews at each programmatic stage. In adhering to the process, DNDO ensures current and future programs are appropriately structured and have the necessary oversight for success. DNDO will continue to incorporate lessons learned and process improvements as the process matures, sharing them throughout DHS to strengthen departmental unity of effort—one of the Secretary's top priorities.

Recognizing the important contributions and innovations of private industry, national laboratories, and academia, DNDO has evolved its acquisition focus from one that is predominantly fueled by a government-funded, government-managed development process to one that relies upon industry-led development. As such, DNDO technology development programs now proceed with a "commercial first" approach; engaging first with the private sector for solutions and only moving to a government-sponsored and managed development effort if necessary. This approach leverages industry-led innovation, takes advantage of industry's innate flexibility and ability to rapidly improve technologies, and reduces government-funded development efforts. In some cases, shifting to commercial-based acquisitions will reduce the total time to test, acquire, and field technology.

Forensics Capabilities

In the event of an act of nuclear terrorism or interdiction there will be enormous pressure for rapid, accurate attribution. The resulting USG response will have to be supported by sound scientific evidence supporting the determination of who was responsible, for which the bar will be set very high by our stakeholders and allies. Nuclear forensics – as the technical pillar of attribution – will support leadership decisions. DNDO's National Technical Nuclear Forensics Center focuses on continuously evaluating and improving the nuclear forensic capabilities with specific responsibilities to:

- Improve the readiness of the overarching USG nuclear forensic capabilities, from pre- to post-detonation, through centralized stewardship, planning, assessment, gap analysis, exercises, improvement, and integration;
- Advance the technical capabilities of the USG to perform forensic analyses on pre-detonation nuclear and other radioactive materials; and
- Build and sustain an expertise pipeline for nuclear forensic scientists.

Operational readiness has improved markedly in recent years. DNDO has led the way in integrating the nuclear forensics community through the alignment of program capabilities, coordination of research

and development and operational activities, and accelerated capability development through synchronized interagency investments. The interagency uses two primary DNDO-led mechanisms, the Nuclear Forensics Executive Council and Steering Committee, to facilitate consistent coordination across the USG. DNDO is also leading the interagency effort to update the National Strategic Five-Year Plan for Improving the Nuclear Forensics and Attribution Capabilities of the United States and to synchronize resources among partner agencies through an established Budget Crosscut. Requirements are now regularly identified and developed by the Nuclear Forensics Requirements Center, co-chaired by DNDO and the FBI.

Since the Nuclear Security Summit in 2010, international partnerships in nuclear forensics have greatly expanded, resulting in stronger national and international capabilities. DNDO provides subject matter expertise to numerous initiatives, including multinational nuclear forensics tabletop exercises and documentation, to enhance understanding among policy makers, law enforcement officials, and scientists, and to encourage and assist other nations in developing their national capabilities.

Forensics exercises have become realistic and complex, with intensive multiagency planning among the FBI, DOE, Army, Air Force, and DNDO. Many of the exercises now include state and local law enforcement. Other exercises have involved the intelligence community, in order to plan and synchronize the fusion of intelligence, law enforcement and technical forensics information, leading to a more efficient and effective attribution process.

Nuclear forensics capabilities for analysis of nuclear and other radioactive materials have steadily advanced. DNDO's efforts are focused on continually improving the accuracy, precision, and timeliness of material characterization information, and linking that information to the process and place of that material's origin. To date, DNDO has developed seven radiological and nuclear certified reference materials, which are forensically-relevant calibration standards used by the national laboratories to improve confidence in analytical conclusions. Additionally, DNDO has developed the first-ever laboratory-scale uranium processing capability that allows us to determine forensic signatures associated with specific variations in uranium manufacturing processes. This capability enables us to determine forensics signatures without having direct access to samples from foreign fuel cycles. We are now beginning development of a similar plutonium processing capability. Further, in cooperation with DOE and the Department of Defense, DNDO has developed and installed a nuclear forensics data evaluation capability at Sandia National Laboratories that enables forensic analysts to develop and test data analysis tools and evaluate large sets of data in order to identify distinguishing characteristics of specific nuclear materials. Together with the remainder of our portfolio, these projects are significantly improving the national ability to trace nuclear materials back to their source.

DNDO's efforts to restore the expertise pipeline have also shown substantial success to date. The Congressionally-mandated National Nuclear Forensics Expertise Development program is a comprehensive effort to grow and sustain the scientific expertise required to execute the national technical nuclear forensics mission. Launched in 2008, this effort is a key component in assuring a robust and enduring nuclear forensics capability and its contribution to the Nation's efforts at preventing nuclear terrorism. In close partnership with eight National Laboratories, the program has provided support to more than 300 students and faculty and 23 universities. In 2008, DNDO commissioned an independent expert panel, the Nuclear Forensics Science Panel Education Sub-Panel, to examine the deficiencies in the nuclear forensics expertise pipeline and make recommendations to address them. We

are steadily progressing toward the initial milestone, as established by the Science Panel's recommendation, of adding 35 new Ph.D. scientists into the nuclear forensics field by 2018 to replace anticipated attrition or retirements from the DOE National Laboratories. 19 new nuclear forensics scientists have come through the National Nuclear Forensics Expertise Development program and been hired since the program's inception.

Closing

While DNDO has made considerable progress since it was established in 2005, much remains to be done. It will be a challenge to remain one step ahead of the adversary – particularly one that is intelligent and adaptable. We must ensure our efforts are robust so that the obstacles terrorists face are many. DNDO's detection and forensics programs, in concert with those of our partners and stakeholders, are foundational elements in creating these impediments. Together, we can build upon DNDO's integrated approach to architecture planning, testing and assessments, research and development, operational support, and nuclear forensics to strengthen the Nation's capabilities to detect and interdict the nuclear threat and to hold those responsible accountable for their actions. We remain committed to this challenge and we deeply appreciate this Subcommittee's sustained interest and support in these shared goals to secure the homeland.

Thank you again for this opportunity, I would be happy to answer any questions from the Committee.