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“Nuclear Terrorism: Strengthening Our Domestic Defenses, Part I”

Chairman Lieberman, Ranking Member Collins, and other Members of the Committee:

Thank you for the opportunity to testify before the committee today. My name is Dana Shea, and I am a Specialist in Science and Technology Policy at the Congressional Research Service. At the Committee’s request, I am here today to discuss efforts to strengthen nuclear detection.

My testimony today has three parts. First, I will provide a brief overview of federal efforts to enhance detection of nuclear smuggling. Second, I will discuss the Department of Homeland Security (DHS) Domestic Nuclear Detection Office (DNDO) report that describes DNDO’s coordination of these nuclear detection activities. Third, I will identify several policy issues that may be of interest to the Committee and Congress regarding future efforts in nuclear detection.

Enhancing the Global Nuclear Detection Architecture

The U.S. government has a long history in developing and deploying nuclear detection equipment in an attempt to deter and detect nuclear smuggling. For example, since the mid-1990s, the Department of Defense, the Department of State, and the Department of Energy were all engaged in cooperative threat reduction programs that aimed to secure international stockpiles of special nuclear material. Even before the establishment of DHS, these federal efforts had adopted a defense-in depth approach. For example, programs established by the Department of Energy (DOE) National Nuclear Security Administration (NNSA) were described as a first and second line of Defense against nuclear terrorism.¹

The DHS, established in 2003, expanded this defense-in-depth strategy by continuing the deployment of polyvinyl toluene (PVT) radiation portal monitors at key ports of entry into the United States.² In addition, the DHS Science and Technology Directorate began to conceptualize these federal programs as parts of a larger architecture. Homeland Security Presidential Directive 14 established the DNDO in 2005. Congress codified the office in 2006 in the SAFE Port Act.³ The DNDO became responsible for

¹ The DOE/NNSA has described the material protection, control, and accounting (MPC&A) program as “the nation’s first line of defense against the threat of theft or diversion of unsecured Russian nuclear weapons or weapons-usable nuclear material.” (National Nuclear Security Administration, Department of Energy, *MPC&A Program Strategic Plan*, July 2001.) The DOE/NNSA has also established a Second Line of Defense program that aims to strengthen the capability of partner countries to deter, detect, and interdict illicit trafficking in nuclear and other radioactive materials across international borders and through the global maritime shipping system. (National Nuclear Security Administration, Department of Energy, *Office of the Second Line of Defense Strategic Plan*, 2006.)

² The U.S. Customs Service began deploying PVT radiation portal monitors at the U.S. border prior to the establishment of DHS. The DHS continued this deployment, currently through U.S. Customs and Border Protection.

³ P.L. 109-347, Section 501.

developing an “enhanced nuclear detection architecture” that multiple federal agencies, including the Departments of Defense, Energy, Homeland Security, Justice, and State.⁴

The DNDO calls this enhanced nuclear detection architecture the global nuclear detection architecture (GNDA). The DNDO describes it as:

- a multi-layered structure of radiological and nuclear detection systems, deployed both domestically and overseas;
- a well-defined and carefully coordinated network of interrelationships among them; and
- a set of systems engineering-based principles and guidelines governing the architecture’s design and evolution over time.⁵

The DNDO global nuclear detection architecture has three layers (exterior, border, and interior) organized by their geographic scope. Each layer is itself composed of several sublayers. Each sublayer provides an independent opportunity to detect the radiological or nuclear threat. Each architecture layer has both physical and conceptual components. The physical component is the sensor systems deployed by federal agencies. The conceptual component is the mechanism for organizing and analyzing program capabilities.

The global nuclear detection architecture is more than a simple alignment of existing programs, equipment, and budgets. It aims also to identify gaps, needs, and requirements for further development of nuclear detection capability and to project necessary expansion, research, and development to close the gaps and meet the needs and requirements identified. From this perspective, the global nuclear detection architecture could be seen both as a plan that describes and aligns current government-wide efforts and as a tool to identify areas where the participating agencies need to coordinate or refine their activities to close detection gaps and vulnerabilities.

DNDO Reports on the GNDA

The DNDO developed the first budget cross-cut of federal programs engaged in the global nuclear detection architecture in 2006.⁶ Subsequently, Congress enacted P.L. 110-53, the Implementing the Recommendations of the 9/11 Commission Act of 2007, which directs the Secretaries of Homeland Security, State, Defense, and Energy, the Attorney General, and the Director of National Intelligence to conduct a joint annual interagency review of their activities and ensure that each participating agency assesses and evaluates its participation in the global nuclear detection architecture. The joint annual interagency review is to include evaluation of detection technologies, identification of deficiencies, and assessment of agency capacity for implementation of its responsibilities within the global nuclear detection architecture. Additionally, the Secretary of Homeland Security is required to evaluate technologies implemented in the domestic portion of the GNDA. The results of these reviews are to be reported to Congress by March 31 of each year. The DNDO issued reports in June 2008 and January 2010.⁷

⁴ P.L. 109-347, Section 501 “Sec. 1802”.

⁵ Domestic Nuclear Detection Office, Department of Homeland Security, *FY2011 Congressional Budget Justification*, p. RD&O-86.

⁶ Domestic Nuclear Detection Office, Department of Homeland Security, *Report on Program and Budget Crosscut of Federal agencies Involved in the Global Nuclear Detection Architecture*, November 2006.

⁷ Domestic Nuclear Detection Office, Department of Homeland Security, *Domestic Nuclear Detection Office: Joint Annual Interagency Review of the Global Nuclear Detection Architecture*, June 2008; *Domestic Nuclear Detection Office, Department of* (continued...)

The January 2010 report has both strengths and weaknesses. The report is the most comprehensive and integrated source of information about the programs that comprise the GNDA, the activities underway in those programs, and how DNDO categorizes the budgets of the programs by layer. The report discusses the roles and involvement of participating agencies and identifies programs contributing to the various layers of the GNDA. The report discusses agency attempts at strategic planning and further considerations regarding the establishment of metrics to measure the completeness and success of the GNDA. The report draws heavily on the report issued in 2008, including repeating the language of the previous report's required technology assessment. The report does not address whether agencies shaped the reported budgets to align with GNDA priorities. Finally, the report is retrospective in nature and was submitted after its statutory deadline. As such, the report's timeliness may be brought into question. The rest of my testimony draws upon my analysis of the January 2010 report and other documents.

Strategic Planning

The DNDO intends that the global nuclear detection architecture eventually be an integrated, mutually enhancing infrastructure for detection, coordination, and response.⁸ Various agencies deploy and have responsibility for these systems. Some are planning additional deployments based on their individual agency needs and priorities. One hope for an integrated GNDA is that such deployments would further both the needs and priorities of the architecture as a whole, not just those of the implementing agency.

The Government Accountability Office (GAO) has criticized the limited strategic planning accompanying the GNDA. The GAO has found that federal agencies do not analyze their budgets to align their resources with overarching architecture priorities.⁹ In 2008, GAO recommended that the Secretary of Homeland Security, in coordination with the Secretaries of Defense, Energy, and State, develop a strategic plan to guide the development of a more comprehensive global nuclear strategy. Such a strategy would include clearly defined objectives, roles and responsibilities identified to meet each objective, funding identified as necessary to achieve objectives, and mechanisms to monitor progress and identify needed improvements.¹⁰ In 2009, GAO recommended that DHS develop a plan for the domestic part of the global strategy and engage with other stakeholders to develop broader strategic efforts to combat nuclear smuggling.¹¹

Since its establishment, the DNDO has acknowledged the need for interagency strategic planning in support of the GNDA. As the DNDO Director testified in 2005,

I think that is exactly what the concentrated effort within DNDO is going to bring to the table for the first time, the collective insights of the various departments that have been working these problems separately to sit down and figure out what the elements of this strategy need to be, is the deployment of a detection architecture domestically the necessary next step or is it just part of a broader strategy?

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Homeland Security, Joint Annual Interagency Review of the Global Nuclear Detection Architecture, January 2010.

⁸ Domestic Nuclear Detection Office, Department of Homeland Security, *Joint Annual Interagency Review of the Global Nuclear Detection Architecture*, January 2010.

⁹ Government Accountability Office, *Nuclear Detection: Domestic Nuclear Detection Office Should Improve Planning to Better Address Gaps and Vulnerabilities*, GAO-09-257, January 2009.

¹⁰ Government Accountability Office, *Preliminary Observations on the Domestic Nuclear Detection Office's Efforts to Develop a Global Nuclear Detection Architecture*, GAO-08-999T, July 16, 2008.

¹¹ Government Accountability Office, *Nuclear Detection: Domestic Nuclear Detection Office Should Improve Planning to Better Address Gaps and Vulnerabilities*, January 2009.

People often look at the development of a strategy as a delaying tactic, but in this case I think it has got to be the way we explain, not only how we execute this problem but how we tie together the various elements of the operational community and the intelligence community to solve the problem. And until we have been able to espouse that theory and that strategy, we could have these kind of discussions for the next five years, and the panel that met yesterday has told you what that has gotten us so far. We have essentially talked about this for eight years and have done very little.¹²

The DNDO has begun to engage in strategic planning efforts. During FY2010, it plans to develop an overarching strategic plan for the development of the GNDA.¹³ The DNDO asserts in its January 2010 report that, in conjunction with its interagency partners, it has worked to develop a broad vision for the GNDA and is beginning to transform this vision into an overarching strategic plan.¹⁴ Participating agencies may be more likely to fully adopt or accept GNDA priorities if an overarching strategy and agency implementation plan is developed and articulated. In the absence of such plans, agencies may instead continue to base planning efforts on the goals of individual programs, rather than the overall architecture. Additionally, agencies that do adopt GNDA priorities may find measuring progress challenging if overarching strategic goals are not available. A key challenge for DNDO is its inability to direct the nuclear detection investments of other agencies, inside or outside DHS. The implementing agencies determine their budget priorities. Thus, strategic plans developed by DNDO might not be implemented by other agencies, if they disagree with the DNDO-developed strategy. Conversely, strategic plans developed in conjunction with other agencies may serve to validate the other agency's programmatic investments rather than assess the needs of the architecture as a whole. The DNDO concedes that an overarching strategic plan will take time, effort, and cooperation to complete.¹⁵

Metrics and Measures of Effectiveness

The effectiveness of the GNDA at preventing nuclear terrorism is difficult to assess because of its multi-layered, multi-program structure. Because the GNDA is a defense-in-depth approach, no individual layer of the architecture needs to have perfect detection. The DNDO has designed the architecture so that multiple detection opportunities exist. The combination of these detection opportunities leads to a greater overall detection probability.

The DNDO has attempted to identify pathways where detection gaps exist. This gap analysis was an important outcome of the initial architecture development activities. The DHS has used the results of the gap analysis to focus its efforts. It has deployed additional radiation detection equipment, established operational plans, and implemented pilot programs in areas where it has identified gaps. For example, the DNDO has established the West Coast Maritime Pilot to design, field, and evaluate a detection architecture for threats that could be illicitly transported on recreational craft or small commercial vessels.¹⁶

¹² Oral testimony of Vayl S. Oxford, Acting Director, Domestic Nuclear Detection Office, Department of Homeland Security, in House Committee on Homeland Security, Subcommittee on Prevention of Nuclear and Biological Attack, *DHS Coordination of Nuclear Detection Efforts, Part I & II*, H. Hrg. 109-10, April 19-20, 2005.

¹³ Domestic Nuclear Detection Office, Department of Homeland Security, *FY2011 Congressional Budget Justification*, p. RD&O-13.

¹⁴ Domestic Nuclear Detection Office, Department of Homeland Security, *Joint Annual Interagency Review of the Global Nuclear Detection Architecture*, January 2010.

¹⁵ Domestic Nuclear Detection Office, Department of Homeland Security, *Joint Annual Interagency Review of the Global Nuclear Detection Architecture*, January 2010.

¹⁶ Testimony of Acting Director Charles R. Gallaway, Domestic Nuclear Detection Office, Department of Homeland Security, (continued...)

The DNDO is in the process of developing metrics for the GNDA.¹⁷ Although program managers in agencies executing GNDA programs may have developed program-level metrics, these may not fully reflect the interactions between programs in the GNDA layers. Without GNDA-level metrics, it is difficult to assess the effectiveness of investments in the GNDA. Similarly, without implementation plans for a GNDA strategy, policymakers will be challenged in monitoring progress towards desired GNDA goals.

Potential Issues for Congress

Debate continues among policymakers about what should comprise a nuclear detection architecture; what role DNDO should have in implementing such an architecture with other agencies; which agencies should participate in the implementation and how their policies should be coordinated; how new technologies can best be identified and integrated into the GNDA; how risk reduction in the GNDA should be assessed; and how budgets for GNDA programs should be developed and presented.

Nuclear Detection Architecture Programs

A key question for policymakers is: what activities and programs should comprise a nuclear detection architecture? Many experts have focused on the role of detection technologies for identifying and interdicting smuggled nuclear materials. Others have claimed that the concept of a nuclear detection architecture should be expanded to include other activities, such as general law enforcement and intelligence collection. Although these activities are not dedicated exclusively to nuclear smuggling, they can deter or prevent smuggling because they can lead to interdiction. However, including these activities in the GNDA could create challenges. For example, it would be difficult to determine what fraction of regular law enforcement activities should be included in a budgetary analysis of the global nuclear detection architecture. Policymakers may opt to require DNDO to assess the role of law enforcement and intelligence collection in global nuclear detection architecture and determine whether their contributions are sufficient.

DNDO's Role in Implementing the Global Nuclear Detection Architecture

The SAFE Port Act gives DNDO the responsibility to develop the global nuclear detection architecture, but the Secretaries of State, Defense, and Energy maintain their respective responsibilities for policy guidance and implementation of the portion of the global architecture outside the United States.¹⁸ As a consequence, many executive-branch agencies set policy for and implement portions of the GNDA, even within a single layer or sublayer. Policymakers may choose to assess whether this distribution of responsibilities is the most effective way to provide a coordinated and integrated architecture. Policymakers might assign the development and implementation responsibility for each portion of the GNDA to a single agency, based on which agency provides a majority of the funding for that portion or on some other criterion. Alternatively, policymakers may wish to require DNDO and other agencies to develop formal agreements that clearly delineate roles and responsibilities in developing and implementing the nuclear detection architecture.

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before the House Committee on Appropriations, Subcommittee on Homeland Security, April 1, 2009.

¹⁷ Domestic Nuclear Detection Office, Department of Homeland Security, *Joint Annual Interagency Review of the Global Nuclear Detection Architecture*, January 2010.

¹⁸ P.L. 109-347, Section 501 "Sec. 1802." See also 6 USC 592.

In its current form, the global nuclear detection architecture does not appear prescriptive. The DNDO does not seem to have dictated a particular strategy that other agencies are to comply with to optimize federal detection capabilities. Moreover, although the DNDO is responsible for implementing the architecture's domestic portion, in practice, DHS operational entities, such as the U.S. Coast Guard and U.S. Customs and Border Protection (CBP), implement the domestic architecture in conjunction with DNDO.

The DNDO has apparently focused to some extent on developing frameworks for portions of the domestic architecture, rather than for the architecture as a whole. For example, DNDO and the Coast Guard have established a joint acquisition strategy for radiological and nuclear detection equipment, DNDO and CBP developed a joint project execution plan for the deployment of radiation portal monitors, and DNDO has developed plans for individual components, such as maritime smuggling.¹⁹ Policymakers may decide to assess whether the global nuclear detection architecture requirements should be given higher priority in agency decision making or remain advisory in nature. Currently, individual agencies likely deploy systems and develop programs based on agency priorities rather than architecture priorities. This may lead to a less-than-optimal configuration of the architecture. On the other hand, agency programs and deployments may respond to essential factors beyond the scope of the nuclear detection architecture, such as maintaining international relations or fulfilling prior commitments.

Agency Participation

Policymakers may opt to consider which agencies should be considered as part of the global nuclear detection architecture. The predominant agencies in the global nuclear detection architecture are the Departments of Defense, Energy, Homeland Security, Justice, and State. The SAFE Port Act identified these agencies as having specific responsibilities for the development and implementation of the global nuclear detection architecture.²⁰ The Implementing the Recommendations of the 9/11 Commission Act of 2007 required the Director of National Intelligence, in addition to the Attorney General and the Secretaries of the above departments, to assess agency participation in the nuclear detection architecture.²¹ Other federal agencies, such as the Nuclear Regulatory Commission, and state and local entities, such as state and local law enforcement, may also have a role. Policymakers may move to mandate the formal inclusion of these agencies into the global nuclear detection architecture planning process. Such inclusion might lead to greater harmonization of efforts and ensure that the GNDA responds to the views and capabilities of the Intelligence Community and local law enforcement. On the other hand, broadening participation and consultation in the GNDA might also complicate consensus planning activities.

Integration of Efforts and Technology

Another key consideration within the global nuclear detection architecture is its time-phased nature. As technologies advance and threats change, the architecture must adapt to these changes. Agencies thus must develop, test, and assess new technologies for their usefulness in the global nuclear detection architecture framework. The Implementing the Recommendations of the 9/11 Commission Act of 2007 requires that technologies deployed in the nuclear detection architecture be assessed for their

¹⁹ Domestic Nuclear Detection Office, Department of Homeland Security, *FY2011 Congressional Budget Justification*, p. RD&O-18.

²⁰ P.L. 109-347, Section 501 "Sec. 1802(a)(4)". See also 6 USC 592

²¹ P.L. 110-53, Title XI, Sec. 1103.

performance, operational, and technical deficiencies by the agencies that operate or deploy them.²² The Secretary of Homeland Security is also to annually examine and evaluate development, assessment, and acquisition of radiation detection technologies for the domestic portion of the global nuclear detection architecture.²³ Finally, the Secretary of Homeland Security is required to develop a plan for a departmental technology assessment process to determine the technology readiness levels of nuclear detection technologies before such technologies are fully deployed.²⁴

Policymakers may choose to consider how often agencies should assess the capabilities of deployed and developing technologies. Frequent assessment of existing technologies might burden federal agencies but might net substantial benefits considering the changing capabilities of potential adversaries. Infrequent technology assessment might be less costly and burdensome, but could lead to outdated and ineffective technology remaining deployed, thus creating vulnerability, or new technologies being overlooked.

Policymakers may wish to require agencies to perform a more formalized assessment of the capabilities of technologies being acquired for the nuclear detection architecture. Such a formal process has been implemented in the Department of Defense, where meeting the criteria for a particular technology readiness level is required prior to specific program decisions being made.²⁵ Critics of such a proposal might claim that such assessments are qualitative and subjective, but others might see documenting technology readiness as a balance against unverified performance assumptions.

Quantitative Analysis of Risk in the Global Nuclear Detection Architecture

The joint annual interagency review report states that the architecture analysis process should consider a variety of criteria, including risk reduction, direct and indirect costs, and feasibility.²⁶ The DNDO aims to use this process to achieve substantial risk reduction through a balanced, robust, cost-effective, and layered strategy. Such an analytic approach, in which deployments in the GNDA are related to discrete risk reduction activities with quantitative measures, is a hallmark of a systems analysis approach.

The development of such a risk-based analytical model is likely challenging. The DNDO has stated that it plans to engage in “overarching risk analyses and detection modeling,” as well as continuing to support specific detection strategies.²⁷ Quantitative architectural modeling of parts of the architecture may be more easily achieved than for the architecture as a whole. Both likely require the successful development of metrics. Policymakers could take action to determine whether DNDO’s process for establishing and evaluating metrics is sufficiently robust. Policymakers might provide direction to DNDO regarding the appropriate scope of GNDA metrics; direct DNDO to establish GNDA metrics by a certain date; or require DNDO to obtain external advice, such as from the National Academy of Sciences, the National Academy of Public Administration, the DOE national laboratories, or a new advisory panel, regarding metrics and their development. Similarly, policymakers might direct other agencies coordinating defense-in-depth programs, such as the Department of Defense or the Department of Energy National Nuclear

²² P.L. 110-53, Section 1103 “Sec. 1907(a)(1)”. See also 6 USC 596a.

²³ P.L. 110-53, Section 1103 “Sec. 1907(a)(2)”. See also 6 USC 596a.

²⁴ P.L. 110-53, Section 1104.

²⁵ See Director, Research Directorate (DRD) Office of the Director, Defense Research and Engineering (DDR&E), Department of Defense, *Technology Readiness Assessment (TRA) Deskbook*, July 2009.

²⁶ Domestic Nuclear Detection Office, Department of Homeland Security, *Joint Annual Interagency Review of the Global Nuclear Detection Architecture*, January 2010.

²⁷ Domestic Nuclear Detection Office, Department of Homeland Security, *FY2011 Congressional Budget Justification*, p. RD&O-13.

Security Agency, to identify best practices and lessons learned that could be applied by DNDO when considering the GNDA.

Coordinated Budget

A key question for congressional policymakers is whether the investments being made by the federal government are sufficient to meet the needs of the GNDA. In January 2009, the GAO recommended that the joint annual interagency review report be used

to guide future strategic efforts to combat nuclear smuggling. This effort should include analyzing overall budget allocations to determine whether government-wide resources clearly align with identified priorities to maximize results and whether there is duplication of effort across agencies.²⁸

The joint annual interagency review report does not describe a process for using the report to modify budget allocations or align resources with identified priorities. While the report has been reviewed and approved by the Departments of Homeland Security, Defense, Energy, Justice, and State and the Office of the Director of National Intelligence, the text of the report does not make clear whether it is used as part of these agencies' programmatic or strategic planning processes.

The joint annual interagency review report does provide consolidated funding levels by architecture layer. While the level of funding may not accurately reflect the level of effort, importance, or value of the program, it is one method for assessing the relative focus in the layers of the GNDA. Policymakers might expand or reduce agency funding levels to more closely match levels determined by DNDO to meet the needs of the global nuclear detection architecture; increase overall funding for all aspects of the global nuclear detection architecture to increase redundancy; or decrease funding if it believes other priorities are more important.

As I have already stated in my testimony, the architecture contains a network of interrelated programs. It is challenging to determine the full ramifications of shifting funding between these programs. Potential unexpected ramifications include imperiled international agreements, perceptions of weakness or strength in the various programs, and interagency disagreements. Unless the global nuclear detection architecture has a robust evaluative system with clear metrics that tie architecture performance to program funding, changes in investment in the different architecture layers may not yield optimal risk reduction. It is difficult to assess without careful evaluation whether shifting funds from one program to another will have a positive or negative net impact; the relative size of the two programs is not necessarily the relevant criterion for assessing its effect on the global nuclear detection architecture. Since DNDO is not statutorily empowered to direct changes in the funding of other agencies, only through higher-level budgetary policy decisions can interagency funding profiles be changed. This situation may result in a mismatch between the optimal investment levels for the global nuclear detection architecture and the actual investments made. Policymakers might choose to provide the DNDO Director with the authority to review and assess the budgets of other departments and agencies involved in the global nuclear detection architecture and to comment or recommend alternative budget allocation to other departments and agencies or directly to the Office of Management and Budget. The Director of the National Security Agency was granted a similar type of authority for national security telecommunications and information systems security programs.²⁹

²⁸ Government Accountability Office, *Nuclear Detection: Domestic Nuclear Detection Office Should Improve Planning to Better Address Gaps and Vulnerabilities*, GAO-09-257, January 2009, p. 34.

²⁹ Executive Office of the President, The White House, *National Policy for the Security of National Security Telecommunications* (continued...)

Another possible approach would be for policymakers to require that the combined agencies create a single global nuclear detection architecture budget. This might provide policymakers with a more transparent correlation between agency funding and the global nuclear detection architecture. For example, an annual budget supplement is issued for the National Nanotechnology Initiative, another multi-agency federal endeavor with a large budget. Such a budget supplement for nuclear detection might be coordinated by DNDO through an interagency process; by the National Security Council or the National Science and Technology Council; or through another agency that participates in the GNDA.

Conclusion

The detection of nuclear smuggling and prevention of nuclear terrorism are high national and homeland security priorities. This multi-agency endeavor is complex and relies heavily on coordination between the participating agencies. The Department of Homeland Security and the Domestic Nuclear Detection Office face significant challenges in coordinating these activities. The DHS and DNDO may benefit from continued congressional oversight of efforts to keep the United States safe from the threat of nuclear terrorism. Mr. Chairman, that concludes my prepared statement. I would be happy to answer any questions that you or other Members of the Committee might have.

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and Information Systems, National Security Directive 42 (NSD-42), July 5, 1990.