United States Government Accountability Office

Report to the Subcommittee on Energy and Water Development, Committee on Appropriations, U.S. Senate

June 2016

COMBATING NUCLEAR SMUGGLING

NNSA's Detection and Deterrence Program Is Addressing Challenges but Should Improve Its Program Plan

The electronic version of this report was reposted June 20, 2016, to correct the name of the National Nuclear Security Administration in the Highlights page.

GAO-16-460

GAO Highlights

Highlights of GAO-16-460, a report to the Subcommittee on Energy and Water Development, Committee on Appropriations, U.S. Senate

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Why GAO Did This Study

International nuclear and radiological smuggling threatens national security. According to the Department of Homeland Security, detecting and interdicting these materials as far away from the United States as possible increases the probability of successfully deterring nuclear and radiological smuggling into the United States. To help interdict these materials, NNSA's NSDD program has partnered with 59 countries to provide radiation detection equipment and support. GAO was asked to review key aspects of the NSDD program.

This report examines (1) NSDD's plans for completing key activities and achieving its goals, (2) selected partner countries' use of NSDD-provided equipment to detect or interdict nuclear or radiological material, and (3) NSDD's challenges. GAO reviewed NSDD documents, interviewed officials, and visited a nonprobability sample of 19 sites, including land border crossings, airports, and seaports in three countries—Azerbaijan, Bulgaria, and Georgia—selected on the basis of the number and types of sites, their potential as nuclear smuggling routes, and program expenditures, among other factors.

What GAO Recommends

GAO recommends that NNSA direct NSDD to improve its program plan by more clearly articulating when and how it will complete key activities and achieve its goals. NNSA agreed with this recommendation and is taking action to address it.

View GAO-16-460. For more information, contact David C. Trimble at (202) 512-3841 or trimbled@gao.gov.

What GAO Found

The National Nuclear Security Administration's (NNSA) Nuclear Smuggling Detection and Deterrence (NSDD) program has developed a program plan that includes four 5-year goals to guide its efforts; however, NSDD cannot measure its progress toward completing key activities and achieving these goals because its program plan does not fully incorporate leading practices for program management. Leading practices include having measurable outcome-oriented goals, goals for all key activities, performance measures that align with these goals, and details for how and when key activities will be completed and goals achieved. However, NSDD's goals are not all measurable, some describe actions rather than outcomes, and they do not fully address all of the program's key activities. In addition, its performance measures are not aligned with these goals, and its program plan does not detail how it will complete key program activities or achieve its goals. Absent a program plan incorporating these leading practices, NSDD may not be able to determine when it has accomplished its mission and risks continuing to deploy equipment past the point of diminishing returns.

In each of the three selected partner countries GAO visited—Azerbaijan, Bulgaria, and Georgia—law enforcement officers and government officials attributed multiple cases of successful detection, deterrence, and interdiction of smuggled nuclear and radiological materials to the use of NSDD-provided radiation detection equipment. For example, one of these countries has been involved with 21 such smuggling cases over the past 10 years, with over 50 convictions made as a result. Moreover, some cases in these countries have involved the detection and interdiction of highly enriched uranium, which can be used to develop a nuclear weapon.

NSDD faces an unusual set of challenges in performing its work, many largely outside of its control. Nonetheless, the program is taking actions to mitigate the effects of these challenges. For example, NSDD officials cited changing conditions in partner countries as a key challenge. In particular, NSDD officials noted that the conflict between the Ukrainian government and separatist groups that began in 2014 has led to the destruction of 29 radiation portal monitors, and NSDD officials do not know whether the program will be able to fix or replace them and, if so, when. To mitigate this challenge, NSDD plans to deploy additional radiation detection equipment at key locations outside the conflict area.

Damage to a Site in Ukraine with Installed Radiation Portal Monitors

Note: The arrows identify the still-standing but damaged radiation portal monitors.

Source: Nuclear Smuggling Detection and Deterrence program (images). | GAO-16-460

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Abbreviations

DHS	Department of Homeland Security
DOE	Department of Energy
GNDA	Global Nuclear Detection Architecture
GPRA	Government Performance and Results Act of 1993
HEU	highly enriched uranium
IAEA	International Atomic Energy Agency
ISIL	Islamic State of Iraq and the Levant
ISIS	Islamic State of Iraq and Syria
MDS	mobile detection system
NAS	National Academy of Sciences
NNSA	National Nuclear Security Administration
NSDD	Nuclear Smuggling Detection and Deterrence
OMB	Office of Management and Budget
RPM	radiation portal monitor
SLD	Office of the Second Line of Defense

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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June 17, 2016

The Honorable Lamar Alexander
Chairman
The Honorable Dianne Feinstein
Ranking Member
Subcommittee on Energy and Water Development
Committee on Appropriations
United States Senate

International nuclear and radiological smuggling threatens the security of the United States. Small quantities of highly enriched uranium (HEU) or plutonium could be used to build an improvised nuclear device. Radiological materials, such as cesium-137, cobalt-60, and strontium-90, can be combined with conventional explosives to build a radiological dispersal device, often referred to as a dirty bomb.[1] According to officials from the Department of Homeland Security (DHS), detecting and interdicting such materials as close to the original source—and as far away from the United States—as possible, increases the probability of successfully deterring nuclear smuggling into the United States and strengthens national security.

According to a nuclear and radiological material trafficking database managed by the International Atomic Energy Agency (IAEA), approximately 2,700 cases of illicit trafficking of such material have been confirmed as of December 31, 2014. These cases were reported by more than 100 countries that voluntarily contribute to IAEA's database. Our past work has shown many confirmed cases involving the illicit trafficking of nuclear materials, including weapons-usable material, have been

[1]According to the International Atomic Energy Agency's (IAEA) *Code of Conduct on the Safety and Security of Radioactive Sources*, the following 16 radiological sources are considered high risk, in part because of their potential use in a radiological dispersal device: americium-241, americium-241/beryllium, californium-252, curium-244, cobalt-60, cesium-137, gadolinium-153, iridium-192, promethium-147, plutonium-238, plutonium-239/beryllium, radium-226, selenium-75, strontium-90 (yttrium-90), thulium-170, and ytterbium-169. IAEA is an independent international organization that is affiliated with the United Nations based in Vienna, Austria. It has the dual mission of promoting the peaceful uses of nuclear energy and verifying that nuclear materials intended for peaceful purposes are not diverted to military purposes. IAEA also assists other countries with the safety and security of their radiological sources.

traced to material that originated in countries of the former Soviet Union and had fallen outside of those governments' control.[2] As recognition of the threat of illicit trafficking of nuclear and radiological material expanded, the United States and others began international cooperative efforts in Russia and other countries to improve security and combat the trafficking of such material.

In 1998, the Department of Energy (DOE) established the Office of the Second Line of Defense (SLD) to provide radiation detection equipment,[3] maintenance, technical support, and training for foreign personnel at land border crossings, rail crossings, airports, and strategic seaports in Russia. These deployments back up security measures used to safeguard nuclear and radiological material at their source locations. In 2000, DOE transferred its nonproliferation and national security functions, including SLD, to the newly established National Nuclear Security Administration (NNSA).[4] SLD worked in conjunction with NNSA's efforts to provide nuclear and radiological material protection, control, and accounting upgrades to the security surrounding foreign nuclear source material, which served as NNSA's first line of defense. Following the terrorist attacks of September 11, 2001, SLD expanded and started to work in countries from the former Soviet Union and in Eastern Europe, which, according to program documents, were among the most likely

[2]GAO, *Nuclear Nonproliferation: U.S. Efforts to Help Other Countries Combat Nuclear Smuggling Need Strengthened Coordination and Planning*, GAO-02-426 (Washington, D.C.: May 16, 2002).

[3]For the purposes of this report, we use the term radiation detection equipment, which can also include items such as alarm stations or communication devices.

[4]NNSA was created by the National Defense Authorization Act for Fiscal Year 2000. It is a separate semi-autonomous agency within DOE, with a mission that includes promoting international nuclear safety and nonproliferation and reducing global danger from weapons of mass destruction. Pub. L. No. 106-65, § 3211(b) (1999).

sources of nuclear and radiological material or the potential transit countries along likely smuggling routes.[5]

In the early part of fiscal year 2015, NNSA undertook a strategic review of the program in response to changes in the global security environment, particularly Russia's decision in December 2014 to officially cut off most cooperation with the United States government on most nuclear security matters. This decision is significant to the program because Russia maintains the world's largest stockpile of HEU and plutonium, and about 45 percent of the program's sites are in Russia. The strategic review also reflected the expansion of a customs union between Russia, Belarus, and Kazakhstan to include Armenia and Kyrgyzstan. It also analyzed the effects of the emergence of the Islamic State of Iraq and the Levant (ISIL)[6] and the threats it may pose, as well as smuggling threats from other countries with large source quantities of nuclear or radiological material, such as Pakistan, India, and China. The review determined that continued engagement with partner countries was needed to ensure that the operation and maintenance of equipment was sustained.

Separate from the program's strategic review, in January 2015, NNSA reorganized some of its programs and formed the Global Material Security program to secure nuclear and radiological materials.[7] As part of this reorganization, SLD was renamed the Nuclear Smuggling Detection and Deterrence (NSDD) program. NSDD installs large-scale radiation detectors called fixed radiation portal monitors (RPM) at land border crossings, airports, rail crossings, seaports, and other locations in partner

[5]This expansion took place under SLD's Core Program, which partnered with what were considered to be "core" countries associated with the nuclear and radiological material smuggling threat. To complement the Core Program, SLD began the Megaports Initiative in 2003 in an effort to scan as much containerized cargo as possible at large, high-traffic foreign seaports for nuclear and radiological material, regardless of destination. Many of these ports are located in Asia, Western Europe, and Latin America, and handle a high-volume of cargo that is moved through the global maritime shipping network. GAO examined the Megaports Program in a separate review. See GAO, *Combating Nuclear Smuggling: Megaports Initiative Faces Funding and Sustainability Challenges*, GAO-13-37 (Washington, D.C.: Oct. 31, 2012).

[6]This organization is also commonly referred to as the Islamic State of Iraq and Syria, or ISIS.

[7]In January 2015, NNSA reorganized programs within the Office of Defense Nuclear Nonproliferation into a new program office structure by consolidating the previous five program offices into four offices.

countries. It also provides partner countries with mobile detection system (MDS) assets, which include vans and backpacks fitted with radiation detection equipment that provide a more flexible means to counter the nuclear and radiological material smuggling threat and one that is less predictable to smugglers than limiting efforts to official, government-approved border crossings. NSDD also provides training and maintenance support needed to help sustain the equipment in partner countries. As of October 2015, NSDD was partnered with 59 countries. (See app. I for a list of these partners.) The program is not intended to continue indefinitely. An NSDD document states that an objective is for partner countries to assume responsibility for the long-term operation and maintenance of NSDD-provided equipment in a reasonable period of time, which it defines as within 3 to 5 years. NSDD officials have stated that they would ideally like to finish installing equipment in 4 to 5 years if world conditions do not change substantially.

You asked us to review key aspects of the NSDD program. This report examines (1) the program's plans for completing key activities and achieving its goals, (2) selected partner countries' use of NSDD equipment to detect or interdict nuclear or radiological material, and (3) challenges, if any, the program faces.

To address all three of these objectives, we reviewed NSDD and SLD program documents, including working papers supporting the fiscal year 2015 strategic review, the December 2014 SLD program plan, the 2014 Implementation and Sustainability program plans, site assurance visit reports, and individual partner country plans.[8] We interviewed NSDD officials and national laboratory officials from Los Alamos National Laboratory, Pacific Northwest National Laboratory, and Oak Ridge National Laboratory, each of which helps NSDD carry out its mission and achieve its goals. We also interviewed officials from U.S. agencies working with NSDD, such as DHS's Domestic Nuclear Detection Office and the Department of State. In addition, we interviewed a senior program director who led a National Academy of Sciences (NAS) study

[8]We maintained an emphasis on the former Core Program as some of these reorganizations occurred during our review. Nonetheless, because both the former Core Program and Megaports Initiative are now one program—the NSDD program—with a common mission and similar challenges, our findings and observations apply to NSDD as a whole. Accordingly, while discussing our findings in this report, we refer to the program as NSDD.

examining the performance measures of a U.S. government nonproliferation program and a radiation detection equipment vendor. In addition, we reviewed NSDD expenditure data from fiscal years 2011 through 2015 to examine the amount of funds spent during that time period. To assess the reliability of the expenditure data, including the issues of data entry, access, and the accuracy and completeness of the data, we compared these data to previous NNSA financial data for reasonableness, reviewed past DOE agency financial reports, and interviewed knowledgeable NSDD officials. We determined that the data were sufficiently reliable for the purposes of reporting on the amount of funds expended by NSDD from fiscal years 2011 through 2015.

We selected a nonprobability sample of 3 partner countries—Azerbaijan, Bulgaria, and Georgia—and visited a nonprobability sample of 19 sites in those countries, including land border crossings, airports, seaports, training centers, and communication centers. We examined each site's radiation detection equipment, including RPMs and MDS assets. We observed operations and interviewed law enforcement officers and government officials who either manage the sites, operate the radiation detection equipment, and adjudicate alarms or manage training operations. In addition, we interviewed radiation detection equipment maintenance providers and government officials. To select these 3 countries, we developed criteria that we applied to 34 of NSDD's 59 partner countries.[9] We developed additional criteria to exclude 20 of those 34 countries from consideration. These criteria included factors such as safety and security concerns, low program expenditure levels, access issues, and travel logistics. We then developed inclusion criteria to reduce the 14 countries to the 3 countries we visited. These criteria included factors such as the proximity to both Russia and current and historic smuggling routes, their rankings on NSDD's risk-based priority list and a global terrorism index,[10] the types and number of sites, program

[9]This review focused on the 34 partner countries that were part of the former Core Program.

[10]The global terrorism index is the Institute for Economics and Peace's 2012 Global Terrorism Index report. This report systematically ranks the nations of the world according to their terrorist activity. The report summarizes changing trends in terrorism over time and also analyzes its different dimensions in terms of geographic activity, methods of attack, organizations involved, and national context in terms of economic development and governance. The 2012 report served as one of the data sources informing NSDD's model for prioritizing the deployment of mobile detection system assets.

expenditure levels, national income, and travel logistics. We selected sites to visit within these countries based on factors such as the sites' type, location (i.e., proximity to known smuggling routes or nuclear and radiological material source countries), the country's program phase, and accessibility. These countries and sites were nonprobability samples, so our results cannot be generalized to all 59 partner countries. Appendix II provides additional details on the various criteria we used to select these 3 countries.

To examine NSDD's plans for completing key activities and achieving its goals, we identified and reviewed the activities and goals described in NSDD's 2014 program plan. To obtain additional information and insight on NSDD's plans, we reviewed documents related to NSDD's fiscal year 2015 strategic review, NNSA congressional budget requests,[11] and NNSA's March 2015 report to Congress.[12] We reviewed internal NSDD performance measure data as well as those data and measures reported in NNSA's annual congressional budget requests from fiscal years 2014 through 2017 to examine how NSDD measures progress toward completing key activities and achieving its goals. To assess the reliability of the performance measure data, including the issues of data entry, access, quality control procedures, and the accuracy and completeness of the data, we reviewed these data and interviewed knowledgeable NSDD officials. We determined that the data were sufficiently reliable for the purposes of reporting on NSDD's performance measure results from fiscal years 2010 through 2015. Moreover, we reviewed prior GAO reports, studies by NAS, the GPRA Modernization Act of 2010,[13] and guidance by the Office of Management and Budget (OMB) to identify guidance and leading practices associated with program goals as well as with challenges associated with developing performance measures for nuclear nonproliferation and deterrence-focused programs. We also interviewed a senior NAS program director.

[11]For the purposes of this report, NNSA congressional budget requests refer to NNSA's budget justifications within DOE's annual Budget Request to Congress. This documentation can also be referred to as NNSA budget documentation supporting the President's budget request.

[12]National Nuclear Security Administration, *Prevent, Counter, and Respond—A Strategic Plan to Reduce Global Nuclear Threats (Fiscal Year 2016 – Fiscal Year 2020)* (Washington, D.C.: March 2015).

[13]The GPRA Modernization Act of 2010, Pub. L. No. 111-352 (2011), amended the Government Performance and Results Act of 1993 (GPRA), Pub. L. No. 103-62 (1993).

We conducted this performance audit from September 2014 to June 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

This section describes (1) NSDD's role in nonproliferation, (2) NSDD's mission and two main programs, (3) NSDD's past expenditures and planned future funding, (4) the role of the national laboratories and contractors in NSDD's work, (5) the performance measures NSDD reports to Congress, (6) the radiation detection equipment NSDD provides to partner countries, (7) NSDD's threat assessments and country prioritization activities, and (8) locations and information on NSDD's partners.

NSDD's Role in Nonproliferation

NSDD is part of a broader U.S. government effort to prevent terrorists from acquiring, smuggling, and using nuclear and radiological materials to develop a weapon of mass destruction or dirty bomb. Its activities contribute to DHS's Global Nuclear Detection Architecture (GNDA), an integrated system of radiation detection equipment and interdiction activities to combat nuclear smuggling in foreign countries, at the U.S. border, and inside the United States. The GNDA is divided into three layers: (1) an exterior layer that comprises efforts to detect and report on material out of regulatory control outside the United States, (2) a border layer that protects avenues of approach and entry into the United States, and (3) an interior layer that includes domestic capabilities to detect and report on material outside of regulatory control within the United States.

NSDD's Mission and Two Main Programs

NSDD's mission is to strengthen the commitment and capacity of partner countries to detect, interdict, and investigate the illicit trafficking of nuclear and dangerous radiological materials that could be used by terrorists in an improvised nuclear device or radiological dispersal device—also known as a dirty bomb. To do so, NSDD manages two main programs, the Implementation Program and the Sustainability Program. The Implementation Program provides radiation detection equipment at strategically identified locations as well as MDS assets in partner countries after obtaining diplomatic agreements between the U.S. and partner countries' governments. At the end of this work, the NSDD

equipment is deployed. The Sustainability Program initially maintains the radiation detection equipment installed in partner countries, but aims to eventually transition responsibility for its operation and maintenance to the partner countries. The Sustainability Program includes two phases—the transition phase and the post-transition phase.

- **Transition phase:** This phase begins after the radiation detection equipment installed at a site or deployed to a country becomes operational. During the transition phase, NSDD provides maintenance assistance, technical support, and training, and develops national communication systems, workshops, and exercises to help prepare the partner country for assuming full operational responsibilities, including maintaining and sustaining the radiation detection equipment. It also collects and analyzes daily operating data and conducts assurance site visits to ensure that partner country site operations are performing properly. NSDD also provides a help desk to provide partner countries with assistance on operational problems. According to NSDD documents, the typical period to transition the responsibility for sustaining the long-term operation and maintenance of NSDD's radiation detection equipment to partner countries is 3 to 5 years, which marks the completion date for this phase. However, changing world events, such as the conflict in Ukraine and the fight against ISIL, can affect the timing of the transition phase's completion.

- **Post-transition phase:** This phase begins after full responsibility for sustaining the long-term operation and maintenance of the NSDD-provided radiation detection equipment is transitioned to the partner country. During the post-transition phase, NSDD is no longer providing significant financial support but may provide limited support and remain in contact with post-transition partner countries to confirm that they continue to use and maintain the NSDD-provided equipment; assist them in maintaining and maturing their capabilities where possible; and gather information on equipment performance, detections, and other data.

NSDD's Past Expenditures and Planned Future Funding

NSDD spent approximately $1 billion for work carried out in its 59 partner countries from fiscal years 2011 through 2015. This total includes expenditures related to both Implementation and Sustainability Program activities. Funds allocated to NSDD for fiscal year 2016 total approximately $142 million. According to NNSA's fiscal year 2017 budget request, NSDD plans to spend approximately $809 million from fiscal years 2017 through 2021 for future program activities. (See table 1).

Table 1: Nuclear Smuggling Detection and Deterrence (NSDD) Program's Expenditures for Fiscal Years 2011 through 2015 and Planned Funding Requests for Fiscal Years 2017 through 2021

Dollars in thousands

Fiscal year	Total expenditures	Fiscal year	Planned funding requests
2011	$251,051	2017	$144,975
2012	241,729	2018	151,698
2013	167,893	2019	160,771
2014	169,420	2020	174,149
2015	201,391	2021	177,053
Total	**$1,031,484**	**Total**	**$808,646**

Source: GAO analysis of NSDD expenditure data and the National Nuclear Security Administration's fiscal year 2017 congressional budget request. | GAO-16-460

Note: Funds allocated to NSDD for fiscal year 2016 total approximately $142 million.

Role of the National Laboratories and Contractors in NSDD's Work

NSDD works with several of DOE's national laboratories and private contractors to implement and complete its activities. In particular, many NSDD sustainability managers work at the Pacific Northwest National Laboratory, which also maintains NSDD's Help Desk. Three other national laboratories—Los Alamos National Laboratory, Oak Ridge National Laboratory, and Sandia National Laboratories—are involved in data analysis and technical matters. For example, Los Alamos and Sandia have models that help NSDD make prioritization decisions, and Oak Ridge analyzes daily RPM operating data to ensure that the radiation detection equipment is working properly. Los Alamos also plays a primary role in testing the radiation detection equipment prior to its deployment to partner countries as well as after its installation to further ensure that the equipment is working properly.

NSDD also hires private contractors to help implement the program by providing design, construction, and communication expertise to support the deployment and installation of radiation detection equipment to partner countries. In addition, NSDD and contractor personnel—known as forward-deployed personnel—may be stationed abroad to provide support in select partner countries.

NSDD Performance Measures

Performance measures are used to evaluate a program's progress toward completing key activities and achieving its goals, which articulate what a program seeks to achieve and by when. NSDD has three key performance measures—the cumulative numbers of (1) sites with radiation detection equipment installed; (2) MDS assets deployed; and (3)

sites and MDS assets being sustained by partner countries. These three measures are reported in NNSA's annual congressional budget requests. NSDD also collects data for three internal submetrics that help inform its measure on partner country sustainability. (See app. III for additional details about these submetrics.)

As of the end of fiscal year 2015, NSDD had installed radiation detection equipment at 575 sites in 53 partner countries and deployed 96 MDS assets in 23 of these countries.[14] Of these, the partner countries are funding the sustainment and maintenance of radiation detection equipment at 453 sites (about 79 percent of all installed sites) and for 35 MDS assets (about 36 percent of all MDS assets deployed). Table 2 shows NSDD's results for these three performance measures for fiscal year 2010 through fiscal year 2015.

Table 2: Nuclear Smuggling Detection and Deterrence (NSDD) Program Performance Measure Results, Fiscal Years 2010 through 2015

Performance measure	Fiscal year 2010	Fiscal year 2011	Fiscal year 2012	Fiscal year 2013	Fiscal year 2014	Fiscal year 2015
Cumulative number of sites with radiation detection equipment installed[a]	401	460	493	513	550	575
Cumulative number of mobile detection system assets deployed	21[b]	29[b]	38[b]	54[b]	76	96
Cumulative number of sites and mobile detection system assets sustained by partner countries[c]	63[d]	138[d]	243[d]	350[d]	412	488

Source: GAO analysis of National Nuclear Security Administration congressional budget requests, Department of Energy annual performance reports, and NSDD data. | GAO-16-460

Note: Because of changes in the type and number of performance measures NSDD reported to Congress over this time period, the performance measure results presented in this table include results tracked internally as well as those reported to Congress.

[a]Of the 575 sites with radiation detection equipment installed, 45 are sites previously affiliated with the former Megaports Initiative. Forty-four of these sites were completed as of fiscal year 2012, and the remaining site was completed in fiscal year 2013. The cumulative number reflects work since inception of the program in 1998.

[b]NSDD did not report on the cumulative number of mobile detection system (MDS) assets deployed as a performance measure until fiscal year 2014. However, NSDD tracked the number of MDS assets deployed internally. Therefore, we have provided the cumulative results as tracked by NSDD from fiscal year 2010 through fiscal year 2013.

[14]Of the 59 partner countries, six have received MDS assets only.

[c]Of the 488 total sites and MDS assets being sustained by partner countries, 418 are sites affiliated with the former Core Program, 35 are sites affiliated with the former Megaports Initiative, and 35 are MDS assets.

[d]NSDD did not report on the cumulative number of sites and MDS assets sustained by partner countries as a performance measure until fiscal year 2014. However, NSDD internally tracked the number of fixed sites and deployed MDS assets determined to be sustained by partner countries. Therefore, we have provided the cumulative results as tracked by NSDD from fiscal year 2010 through fiscal year 2013.

NSDD Radiation Detection Equipment

NSDD provides partner countries with several types of radiation detection equipment. In particular, NSDD primarily provides RPMs, handheld radiation detection devices,[15] and MDS assets. (See fig. 1 for examples of such equipment.) The MDS vans, which use the same radiation detection technology as RPMs, are increasingly deployed because they can be used at points along both "green" borders (i.e., away from official land border checkpoints) and "blue" borders (i.e., away from small seaports and large container seaports), internally at random locations, or as backups to RPMs. The equipment and components must eventually be replaced because of normal wear and tear, so in 2013, the program formed the Equipment Lifecycle Working Group to develop models that help partner countries estimate and plan for future repair and replacement costs.

[15]Handheld radiation detection devices, such as radioisotope identification devices that can identify a radiation's source material, can be used alone or in conjunction with RPMs.

Figure 1: Examples of Radiation Detection Equipment Provided by the Nuclear Smuggling Detection and Deterrence Program

Upper left: Radiation portal monitors at a land border crossing. Upper right: Radiation portal monitors at a small seaport. Lower left: Mobile detection system van along a road. Lower right: Handheld radiation detection device.

Source: Nuclear Smuggling Detection and Deterrence program (photos). | GAO-16-460

NSDD's Threat Assessment and Country Prioritization Activities

To identify and prioritize program activities, NSDD uses a combination of results obtained from two primary quantitative methods: threat assessments and risk-based models. NSDD uses threat assessments to understand the global nuclear and radiological material smuggling threat environment and to identify and rank countries and regions of concern. The countries and regions are identified and ranked based on a number of factors, including whether they possess, or are in proximity to, nuclear and radiological materials; the nature of the trafficking threat in that area,

such as the presence and capabilities of terrorist groups, endemic corruption, and inadequate state security; and the presence of possible smuggling routes. According to NSDD documents and officials, the countries and regions of concern identified have not changed significantly over time partly because the number of countries that possess the material of greatest concern—weapons-usable nuclear material—has remained relatively small. Nonetheless, these officials said that NSDD conducts threat assessments regularly to identify any potential new areas of concern and determine whether existing efforts need to be altered or additional activities need to be undertaken.

NSDD officials also said the program uses the results of the threat assessments to inform three risk-based models that it uses to prioritize partner and prospective partner countries and sites. These risk-based models examine international crossings, the global maritime shipping network, and MDS asset prioritization. According to NSDD documents, these models are used to determine the countries to which the program will deploy radiation detection equipment as well as to assist with the development of country-specific plans that identify and prioritize sites to target within each country. (See app. IV for additional details about these models.)

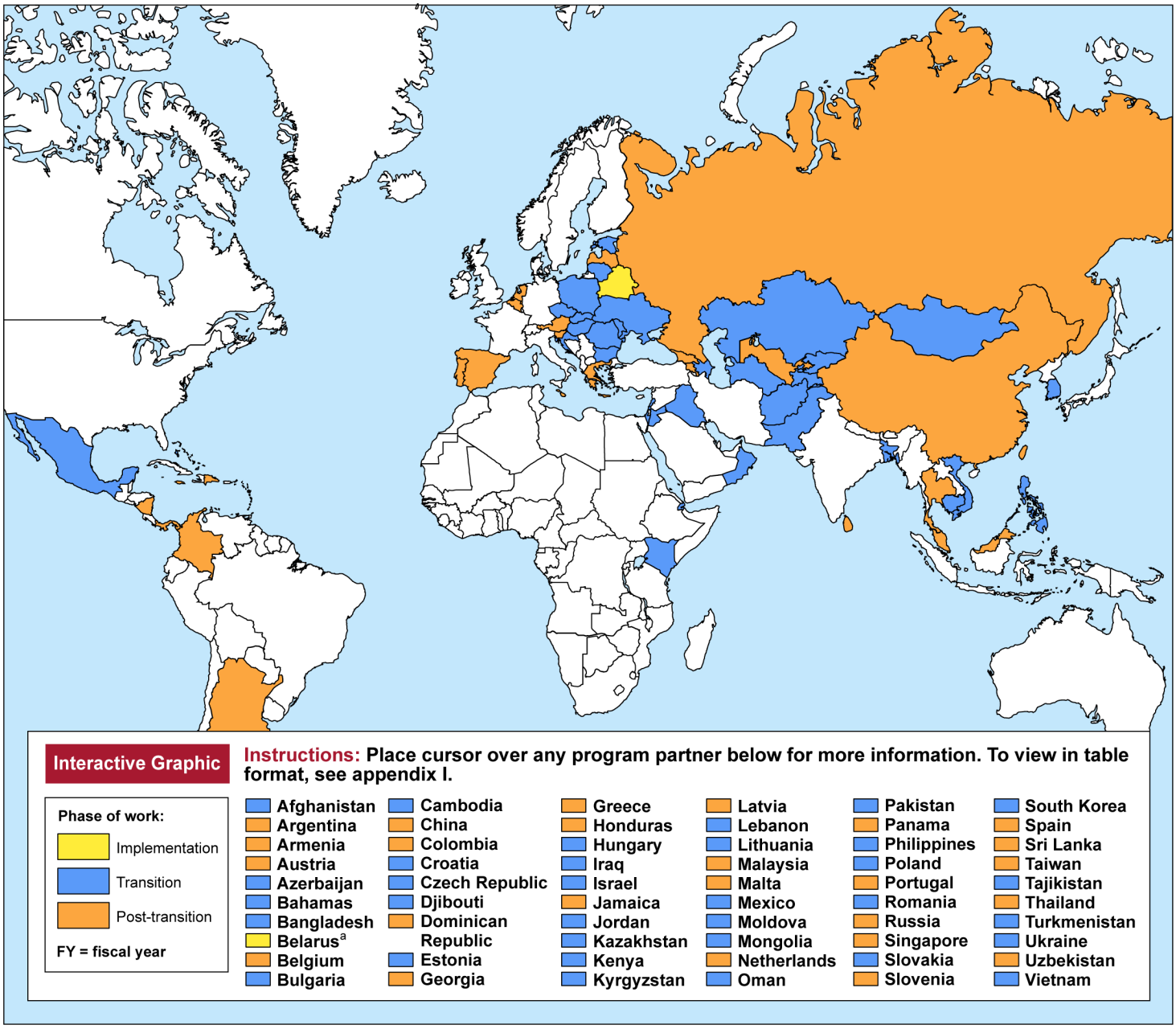
According to NSDD documents and officials, NSDD may also supplement its threat assessments and models by using qualitative assessments. According to NSDD documents, to account for specific on-the-ground realities that the risk-based model for international crossings may not capture, NSDD personnel conduct site surveys, which entail collecting various data about sites, such as their physical layout, current infrastructure, and types and numbers of traffic throughput patterns. NSDD officials said that in some cases, the results reveal that a site operates seasonally, meaning that MDS assets may be needed only when the site is open. In addition, these officials said that NSDD may base some final decisions on how program resources can be best allocated. For example, NSDD might choose to install radiation detection equipment at four sites within proximity to one another in one high-priority partner country rather than complete the installation of equipment at one site in a higher-priority country if doing so will help maximize the overall impact of its activities relative to amount of funds spent.

Locations and Information on NSDD's Partners

NSDD's 59 partners are located in areas considered to be susceptible to nuclear and radiological smuggling (see fig. 2).[16]

[16]Of these 59 partners, 27 have worked specifically with the former Core Program, 25 have worked specifically with the former Megaports Initiative, and 7 have participated in both programs.

Figure 2: Locations and Information on the Nuclear Smuggling Detection and Deterrence (NSDD) Program's Partners



Sources: GAO analysis of NSDD documents and data; Map Resources (map). | GAO-16-460

Notes:

Sites can include fixed sites where radiation portal monitors are installed at land border crossings (vehicle and pedestrian), airports, rail crossings, small seaports, and large container seaports. They can also include locations where mobile detection system assets are deployed.

A partner is considered to be in the transition phase after NSDD-provided radiation detection equipment installed at a site becomes operational. This phase typically lasts 3 to 5 years, during which NSDD provides assistance to help prepare the partner for assuming full operational responsibilities, including maintaining and sustaining the radiation detection equipment.

A partner is considered to be in the post-transition phase after full responsibility for sustaining the long-term operation and maintenance of the NSDD-provided radiation detection equipment at all sites is transitioned to the partner. NSDD no longer provides significant financial support, but may provide limited support and remain in contact with post-transition partners to monitor the extent to which they still use and maintain the NSDD-provided equipment.

Most partners have multiple sites. At times, and for various reasons, sites may be in different phases than others. A partner's overall phase depends on whether it has any sites remaining in transition; if so, then the partner as a whole is still in the transition phase. On the other hand, if all of a partner's sites are in the post-transition phase, then the partner's overall phase is post-transition.

[a]The activities in Belarus, which currently fall under NSDD's Implementation Program, are ongoing, and the first installation of equipment in the country is scheduled to be completed in 2016.

NSDD Cannot Measure Its Progress toward Completing Key Activities and Achieving Its Goals Because Its Program Plan Does Not Fully Incorporate Leading Practices

NSDD has developed a program plan that includes four 5-year goals to guide its efforts; however, NSDD cannot measure its progress toward completing key activities and achieving these goals because its program plan does not fully incorporate leading practices for program management. These practices include (1) developing measurable, outcome-oriented goals; (2) establishing goals for all key program activities; (3) aligning performance measures to these goals; and (4) detailing when and how it will complete key activities and achieve its goals. Without fully implementing these practices, NSDD risks continuing to expend resources and deploy equipment without knowing whether its key activities are complete and goals have been achieved.

Developing Measurable Outcome-Oriented Goals

In December 2014, NSDD developed a program plan that identified four 5-year goals. These goals describe key activities to be achieved as part of the program's overall mission to strengthen the commitment and capacity of partner countries to detect, interdict, and investigate illicit trafficking in nuclear and dangerous radiological materials. Specifically, NSDD's 5-year goals are to:

- close the highest-priority gaps in radiation detection equipment capabilities by supporting the deployments of fixed RPMs and related equipment at an additional 100 sites in countries that share borders with Russia;

- equip additional key large container seaports within the global maritime shipping network to maximize NSDD's global detection and deterrent effect;
- continue to deploy MDS assets to complement partner countries' radiation detection equipment capabilities by supporting partner countries' law enforcement and expanding NSDD's reach into countries where the installation of fixed radiation detection equipment may be impractical; and
- prepare partner countries to take full responsibility of the NSDD-provided radiation detection equipment and MDS assets and complete transition when appropriate.

However, NSDD cannot fully measure its progress in completing the activities necessary to achieve these goals because not all of the goals are measurable and outcome-oriented. The GPRA Modernization Act of 2010 requires agencies to set goals that are to be achieved within a time frame and are outcome-oriented and expressed in an objective, quantifiable, and measurable form,[17] and OMB provides guidance on how agencies should address these requirements.[18] Although the Government Performance and Results Act's (GPRA) requirements apply at the agency level, our previous work has found that these requirements can serve as leading practices in lower levels within an organization, such as with individual programs or initiatives.[19]

Of NSDD's four goals, only the first—installing radiation detection equipment at 100 high-priority sites in countries near Russia and other key smuggling routes—is measurable in that it allows the program to measure progress toward that end, and outcome-oriented in that it has identified a desired outcome, or ultimate result, to achieve over 5 years. The remaining three goals are not measurable or outcome-oriented because they describe actions rather than outcomes, and they do not include quantifiable or measurable end results indicating what the

[17]Pub. L. No. 111-352 (2011).

[18]Office of Management and Budget, *Preparation, Submission, and Execution of the Budget*, OMB Circular No. A-11 (Washington, D.C.: June 2015), sec. 200.

[19]GAO, *Secure Flight: TSA Should Take Additional Steps to Determine Program Effectiveness*, GAO-14-531 (Washington, D.C.: Sept. 9, 2014).

program seeks to achieve with these actions. Specifically, NSDD has not identified or described

- the number of additional large container seaports within the global maritime shipping network that need to be equipped—and by when—for the program to maximize its global detection and deterrent effect;
- the number of MDS assets that need to be deployed to partner countries—and by when—to complement partner countries' fixed radiation detection equipment capabilities; or
- the number of partner countries expected to take full responsibility for sustaining the long-term operation and maintenance of the NSDD-provided radiation detection equipment—and by when—to complete the transition phase.

By not developing measurable, outcome-oriented goals, NSDD has not identified what the program wants to achieve—and by when—and cannot fully measure progress toward completing key activities necessary for achieving these three goals.

Establishing Goals for All Key Program Activities

NSDD's program plan also does not identify goals that address all of the program's key activities. Specifically, while the program plan establishes goals that address program activities through the transition phase, it does not include goals that address key program activities undertaken when partner countries are in the post-transition phase.

According to NSDD documents and senior officials, during the post-transition phase, most partner countries will assume full responsibility for operating and maintaining the NSDD-provided radiation detection equipment and continuing to carry out the mission to counter the illicit trafficking of nuclear and radiological materials. NSDD officials said they believe that additional, smaller expenditures may still be needed to provide assistance to some of these partner countries and to further ensure the sustainment of U.S. investments—particularly for high-priority countries along key smuggling routes. Moreover, according to program documents, while no longer providing significant financial support, NSDD has an interest in providing limited support and remaining in contact with partner countries in the post-transition phase in order to confirm that these countries continue to use and maintain the NSDD-provided radiation detection equipment, assist them with maintaining and maturing their capabilities where possible, and gather information on equipment performance and detections, among other things. Other activities that

program documents and NSDD and national laboratory officials have indicated could continue after partner countries enter the post-transition phase include ongoing analysis of RPM operating data, managing the Help Desk, and estimating future dates and costs of repair and replacement.

However, the program has not established goals to reflect these key activities. Under federal standards for internal control, management is to define goals in specific terms so they are understood at all levels of the entity.[20] This involves clearly defining what is to be achieved, who is to achieve it, how it will be achieved, and the time frames for achievement. Without goals for all activities, it will be difficult for NSDD and Congress to assess progress and determine whether these key activities are complete and program goals for the post-transition phase are achieved.

Aligning Performance Measures with Established Goals

Since NNSA's fiscal year 2014 congressional budget request, NSDD has reported annually to Congress on three key performance measures that track the cumulative numbers of (1) sites with radiation detection equipment installed, (2) MDS assets deployed, and (3) sites and MDS assets sustained by partner countries. These performance measures, however, do not align with the four goals identified in NSDD's program plan, nor do they reflect the program activities for which NSDD has not established goals. For example, there is no performance measure aligned to NSDD's goal to install radiation detection equipment at 100 high-priority sites in countries near Russia and other key smuggling routes. Instead, NSDD has a higher-level performance measure that tracks the cumulative number of sites with radiation detection equipment installed, which does not allow progress made toward the completion of the 100 high-priority sites and achievement of this goal to be tracked.

According to the GRPA Modernization Act of 2010,[21] performance measures should be developed and used to measure or assess progress

[20]GAO, *Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21.3.1 (Washington, D.C.: November 1999), and *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: September 2014). GAO/AIMD-00-21.3.1 was effective through the end of fiscal year 2015 (Sept. 30, 2015). GAO-14-704G is the 2014 revision of GAO/AIMD-00-21.3.1 and became effective the first day of fiscal year 2016 (Oct. 1, 2015).

[21]Pub. L. No. 111-352 (2011).

toward each goal, and OMB's guidance for implementing GPRA states that progress is tracked through targets and time frames that are set for performance measures.[22] In addition, federal standards for internal control state that management is to define objectives in alignment with the organization's mission, plan, and goals.[23] By not aligning the program's performance measures with its established goals and other key activities, the program cannot fully measure progress.

Detailing When and How Key Activities Will Be Completed and Goals Achieved

NSDD's program plan does not detail when it will complete key program activities and achieve its goals. Leading practices in program management state that the process for defining, designing, and executing programs includes developing a program plan for completing key activities within a specified time frame in order to achieve the intended results.[24] Such a plan serves as a reference by which a program measures its success throughout its duration and includes, among other things, a summary of key milestones and a complete set of program goals.

In the absence of a program plan that includes these leading practices, NSDD's timelines have been repeatedly delayed. As shown in table 3, in each of its congressional budget requests for the past 4 years, NNSA has pushed back the reported expected completion dates for a key phase of the program: transitioning to partner countries the full responsibility for sustaining the long-term operation and maintenance of NSDD-provided radiation detection equipment. In its fiscal year 2013 congressional budget request, NNSA reported that the program was 4 years away from completing this activity. As of its fiscal year 2016 congressional budget request, NNSA reported being 7 years away from completing this activity. In short, the program is now farther away from completing this activity than it was as of the fiscal year 2013 congressional budget request.

[22]OMB Circular No. A-11 (2015).

[23]GAO/AIMD-00-21.3.1 and GAO-14-704G.

[24]Project Management Institute, *The Standard for Program Management*®, Third Edition (Newtown Square, Penn.: 2013). *The Standard for Program Management*® describes, among other things, how resource planning, goals, milestones, performance measures, and program monitoring and reporting are good practices that can enhance management for most programs.

Table 3: Reported Expected Completion Dates for Transitioning the Long-Term Operation and Maintenance of Nuclear Smuggling Detection and Deterrence Program Radiation Detection Equipment to Partner Countries

Congressional budget request, by fiscal year	Reported expected completion dates, by fiscal year
2013	2017
2014	2021
2015	2022
2016	2023

Source: GAO analysis of National Nuclear Security Administration congressional budget requests. | GAO-16-460

NSDD officials said that its program plan does not specify timelines for completing key activities and achieving goals for several reasons. These officials told us that changing conditions in the global threat environment or in specific partner countries can delay ongoing work or lead to new programmatic efforts. The NSDD officials also said that there are uncertainties about when the construction and installation or deployment of radiation detection equipment will be completed and when all pertinent agreements with partner and prospective partner countries and relevant stakeholders will be agreed upon and signed. According to these officials, these changing conditions and uncertainties make it more challenging to carry out such planning activities.

Leading practices for program management also recommend developing a program plan that provides a framework by which the program's activities will be managed and monitored.[25] Such a plan summarizes key challenges, risks, and end-point objectives, and therefore can be a valuable tool for managing the execution of a program and for assessing progress toward achieving expected results. However, NSDD's program plan does not address these changing conditions and uncertainties. For example, the program plan does not include criteria or guidance for determining when changing global conditions may warrant adjustments to program activities. In addition, the plan does not include criteria or guidance for identifying end-point objectives, such as determining when NSDD has completed other key program activities and additional new work is no longer warranted. Further, as previously mentioned, because NSDD's program plan does not address post-transition activities, the plan

[25]Project Management Institute, *The Standard for Program Management*®.

does not include criteria or guidance for determining which partner countries, if any, may require continued financial assistance to sustain the long-term operation and maintenance of the NSDD-provided equipment because of country-specific constraints. Additionally, NSDD's program plan does not include criteria or guidance for estimating these potential expenditures. By not developing a plan that better incorporates leading practices, details when and how key activities will be completed and goals will be achieved, and includes criteria and guidance for its post-transition activities, the program may not recognize when it has accomplished its mission and risks continuing to deploy equipment past the point of diminishing returns.

Selected Partner Countries Attributed Multiple Cases of Detection, Deterrence, and Interdiction of Nuclear and Radiological Material to the Use of NSDD Equipment

Law enforcement officers and government officials from the three partner counties we selected for our review—Azerbaijan, Bulgaria, and Georgia—attributed multiple cases of successful detection, deterrence, and interdiction of smuggled nuclear and radiological materials to the use of NSDD-provided radiation detection equipment. Partner country law enforcement officers also credited NSDD-provided radiation detection equipment and activities with strengthening their countries' national security.

Law enforcement officers in one partner country told us that there have been 21 cases of nuclear and radiological material detections, deterrence, and interdictions in their country. Many of these cases resulted from the use of NSDD-provided radiation detection equipment and training in the country over the past 10 years and led to over 50 smuggling convictions. For example:

- **Detection and interdiction of nuclear material:** Law enforcement officers from this partner country told us that NSDD-provided radiation detection equipment and training were used in the seizure of weapons-grade HEU.[26] According to these officers, continuous nuclear and radiological detection and deterrence work in this country is important, in part because an IAEA investigation found that a significant amount of HEU remains unaccounted for in the region.

[26]According to IAEA, weapons-grade HEU can be used to manufacture a nuclear bomb.

- **Detection and interdiction of radiological material:** These officers told us that the use of NSDD-provided equipment and training has also led to seizures of various radioactive isotopes—strontium-90, iridium-192, and americium-241, among others. For example, the strontium-90 was seized utilizing an NSDD-provided MDS backpack, the iridium-192 was seized through the use of NSDD-provided MDS vans, and the americium-241 was also seized with the assistance of NSDD-provided MDS backpacks.

- **Deterrence:** Law enforcement officers and officials from this partner country told us that NSDD RPMs at a land border crossing forced two individuals attempting to smuggle cesium-137—an attractive isotope for use in a radiological dispersal device—to take a more difficult and circuitous route to avoid the official crossing. The smugglers were apprehended during their attempt to enter the country illegally, and law enforcement officers, while performing their search, used NSDD-provided equipment to detect and interdict the cesium-137.

In another partner country, law enforcement officers told us that since 2009 there have been 15 cases involving the detection and interdiction of radiological material resulting from NSDD-provided radiation detection equipment and training at various border points, including seizures of cesium-137, radium-226, and cobalt-60. Law enforcement officers at a seaport in this country told us cesium-137 in scrap metal was detected and seized using NSDD-provided radiation detection equipment, which they said enabled them to avoid a serious contamination problem. In addition, two seizures of radium-226 resulted from the use of NSDD-provided radiation detection equipment at a land border crossing, one of which involved material that came from a country of concern. Law enforcement officers at various locations in the country also cited seizures of cobalt-60, iridium-192, and radium-225 among the successful outcomes resulting from the use of NSDD-provided radiation detection equipment and training.

In another recent case in one partner country, law enforcement officers using NSDD-provided equipment detected radium-226 in the cargo of a truck as it attempted to exit the country en route to a country of concern within the region. According to these officers, the truck had entered the country at a border crossing that did not have radiation detection equipment installed on either side. Following the detection and interdiction of the radium-226, law enforcement officers and NSDD officials told us that both countries affected by the incident decided to work with the program to install radiation detection equipment at the

previously unequipped border crossing. According to NSDD officials, the program agreed to install radiation detection equipment at this crossing because of its proximity to several nuclear smuggling pathways and the high volume of vehicle traffic.

In addition, law enforcement officers from other partner countries have described additional positive outcomes. For example, a partner country law enforcement officer who attended an NSDD workshop cited two interdictions—one of cesium-137 and one of radium-226—that occurred as a result of using NSDD-provided MDS assets. This officer further noted that a foreign minister from the partner country then decided to secure all official northern border crossing points within the country by deploying MDS assets. In addition, according to an NSDD document, another partner country located near Russia has successfully detected various nuclear and radiological materials using radiation detection equipment it possesses as a result of its collaboration with NSDD.

NSDD Faces an Unusual Set of Challenges, Many Largely Outside of Its Control

NSDD officials identified and discussed key challenges the program faces in performing its work, including (1) changing conditions in partner countries; (2) economic, resource, and infrastructure constraints in partner countries; (3) reaching partnership agreements; (4) partner country challenges detecting materials outside official border crossings; and (5) operational challenges. Many of the challenges are largely outside NSDD's control; nonetheless, NSDD has taken actions in several areas to mitigate the effects of these challenges, according to officials.

Changing Conditions in Partner Countries

Changing conditions in its partner countries affect NSDD's relationships with those countries, according to program officials. While these challenges are largely outside the program's control, officials said the program is analyzing these changes and using judgment and experience to formulate actions to address these changes. In particular,

- NSDD officials told us Russia's decision in 2014 to stop cooperating with the U.S. government on most nuclear nonproliferation matters—including NSDD—means that the status of all NSDD sites in Russia, which comprises about 45 percent of the program's sites, is now unknown. NSDD officials told us that the longer this situation goes on, the greater the uncertainty and risks will be. In the meantime, these officials said that NSDD has developed a priority list of potential smuggling pathways emanating from Russia and is considering

reinforcing or adding new sites on those routes in areas outside Russian borders.

- The conflict between the Ukrainian government and separatist groups beginning in 2014 has also affected the program. National laboratory officials told us that 84 RPMs that were installed under NSDD are no longer operated by the Ukrainian government, including 55 in Crimea, which is currently occupied by Russia. In addition, of those 84 RPMs not operated by the Ukrainian government, 29 have been destroyed during the conflict. (See fig. 3 for an example of the damage done to one site in eastern Ukraine.) It is uncertain whether NSDD will have the opportunity to fix or replace the damaged RPMs and, if so, when. NSDD is responding by analyzing alternatives and developing plans to deploy additional radiation detection equipment at key locations of interest, according to officials.

- Another major conflict that began within the last couple of years outside of two partner countries' borders has also affected the program. According to NSDD officials, the nearby conflict has resulted in the governments focusing on the funding and resources needed to maintain military security, while non-military security, such as combating nuclear smuggling, receives less attention. An influx of refugees has further compounded the problem. Accordingly, NSDD officials are working with the local governments of these countries to provide a longer period before the responsibility for sustaining the long-term operation and maintenance of the NSDD-provided equipment is fully transitioned to the partner countries. For example, in one country, NSDD will provide funds for certain maintenance-related efforts and costs, largely because of its strategic location and the threats it faces. In addition, these officials said that one of these countries currently has great uncertainty about its political leadership, making it difficult to sign the agreements and documents needed to perform program work.

- NSDD officials also told us about how a diplomatic issue over a long-standing agreement between the U.S. government and another partner country created a period of uncertainty about NSDD's ability to continue working in that country. Specifically, the NSDD officials said that during this period, the program was unsure as to whether it would be able to finalize the completion of two sites. Nonetheless, these officials said that the program took steps to ensure that its staff remained engaged with government officials from this country during this time. According to the NSDD officials, the program was ultimately

able to complete the two sites and has maintained its relationship with the country despite the diplomatic issue.

Figure 3: Before and After Images Illustrating Damage Caused by Fighting in Ukraine to Site with Installed Radiation Portal Monitors

The image on the left shows a site located in eastern Ukraine after the Nuclear Smuggling Detection and Deterrence (NSDD) program completed installation of the radiation portal monitors (RPM) in 2013. The image on the right shows damage caused to the same site as a result of heavy fighting in 2014. The arrows indicate the location of the still-standing RPMs amidst the rubble.

Source: NSDD (images). | GAO-16-460

Economic, Resource, and Infrastructure Constraints in Partner Countries

Some of NSDD's partner countries face economic, resource, and infrastructure constraints that limit their participation in NSDD's efforts, but program officials told us that NSDD will continue to work with them because of their key locations—either along traditional smuggling routes or near countries that possess nuclear and radiological materials. Some partner countries face economic constraints that can affect their ability to enter the post-transition phase on a timely basis, according to these officials. In discussing this point with national laboratory officials, they expressed concerns that transitioning the responsibility for sustaining the long-term operation and maintenance of NSDD's radiation detection equipment to some partner countries may not be possible, usually for economic or resource reasons. In addition, NSDD officials told us that several partner countries face shortages in trained personnel and resources and that some face infrastructure constraints such as limited electrical power supply in remote locations or a shortage of good roads.

NSDD officials said the program employs a phased approach to transitioning the full responsibilities for sustaining the operation and

maintenance of the NSDD-provided equipment with most of its partner countries to accommodate these constraints. In three partner countries cited as having such constraints, NSDD officials said the program collaborated with these countries in ways that enabled them to assume responsibility for specific activities and for maintenance and other costs over a period of time, rather than all at once. However, national laboratory and NSDD officials said that having all partner countries assume full responsibility for sustaining the long-term operation and maintenance of the NSDD-provided radiation detection equipment may not be possible in some cases because of country-specific constraints. Furthermore, national laboratory officials expressed concern about additional funding the program may need in order to continue providing long-term assistance to those partner countries. NSDD officials said that countries facing such constraints require a higher level of continued engagement and funding by the program to ensure the sustainability and maintenance of their radiation detection equipment.

Reaching Partnership Agreements

NSDD officials told us that the program sometimes experiences difficulties in reaching partnership agreements with prospective partner countries but said the program has taken steps to continue its efforts. For example, NSDD officials cited a strategically located country that the program has tried to engage for many years. Specifically, NSDD tried to work with this country's national police and, in 2008, provided handheld radiation detection equipment and training to the country's national police officers, but their superiors in the government stopped that effort. Nevertheless, NSDD is continuing its efforts and often invites representatives of the country to NSDD workshops, according to officials. On a positive note, NSDD recently gained access to a country it was unable to partner with previously. According to NSDD officials, new world developments have caused that country to decide to expand its partnerships, so it is now more willing to work with the U.S. government. Accordingly, NSDD officials said the program will initiate work at 5 fixed sites, with plans to eventually complete 10 to 15 sites. NSDD will also provide MDS assets.

In addition, NSDD officials told us that for high-priority countries where the program cannot operate for political or other reasons, NSDD's fiscal year 2015 strategic review calls for the program to begin using a "one-step-out" approach—that is, to provide radiation detection equipment to other partner countries that are "one step" away at (1) strategic airports located one direct flight away and (2) small maritime vessels and seaports one port-of-call away. To identify prospective airports to target

under this new approach, NSDD officials analyzed air traffic data to identify direct flights from these countries to partner countries and identified 22 airports in 17 countries. According to an NSDD document, the program plans to conduct an initial pilot focused on strategic airports in these countries sometime in fiscal year 2016. Similarly, an NSDD document shows that the program conducted a threat analysis focused on unregulated small maritime vessels that identified locations where the program could deploy radiation detection equipment. According to NSDD documents and officials, the program plans to conduct pilot projects focused on small maritime vessels in partner countries shortly. NSDD officials said that the one-step-out approach may enable the program to place radiation detection equipment on some of the most common pathways out of countries that choose not to partner with the program.

Partner Country Challenges Detecting Materials Outside Official Border Crossings

NSDD officials told us that partner countries face challenges detecting materials outside official border crossings, but the program has taken actions to mitigate those risks. For example, law enforcement officers in one partner country we visited told us that smugglers know the locations of fixed RPMs and attempt to circumvent them by crossing the border outside the official crossing. In another case, NSDD officials cited an acute example where a partner country is engaged in border disputes, and as a result, the border crossing areas are not well-defined. Law enforcement officers from this country said the country is located along nuclear smuggling routes, and both HEU and other radiological material have been interdicted there. NSDD officials and law enforcement officers from this country told us that fixed RPMs could not be installed in some areas because doing so could indicate an implicit acceptance of borders that the partner government disagrees with. As a result, in 2008, NSDD initiated a pilot program to deploy MDS assets to assist the country's law enforcement officers, per program officials. Law enforcement officers told us that NSDD's MDS assets provide operational flexibility and introduce unpredictability for potential smugglers. For example, the MDS vans enable them to set up unofficial random checkpoints along key roadways near disputed areas. Eight MDS vans and three MDS backpacks are now deployed in the country, which, according to law enforcement officers, have aided in multiple seizures of nuclear and radiological material.

Operational Challenges

NSDD officials identified and discussed operational challenges the program faces, namely, (1) motivating partner countries to plan for and fund the replacement of NSDD-provided equipment and (2) difficulties in

outreach to build partner country buy-in and mitigate the effects of staff turnover.

Planning for and Funding the Replacement of NSDD-Provided Equipment

A key challenge facing partner countries is planning for and funding the replacement of NSDD-provided radiation detection equipment or its component parts. Accordingly, as discussed above, in 2013, the program formed the Equipment Lifecycle Working Group to develop models that help partner countries estimate and plan for future repair and replacement costs. An NSDD document states that the group was established to provide life cycle management guidance and support to partner countries. According to a working group paper and our discussions with NSDD officials, the program's key efforts are the following:

- **Maintenance modeling.** The maintenance modeling effort focuses on estimating the timing and costs of replacing the key parts of different types of radiation detection equipment, such as RPMs and handheld detection devices, using probabilistic methods. The lead modeler from Pacific Northwest National Laboratory was also involved in previous equipment life cycle modeling efforts, and the program received input from a vendor on expected failure rates and life expectancies.

- **Radiation detection equipment life cycle planning and development.** NSDD has had preliminary equipment life cycle planning discussions with two partner countries. Future activities include developing the tools to enable partner countries to account for factors such as regional climates more precisely and to increase the level of confidence in the estimates.[27]

Outreach to Build Partner Country Buy-in and Mitigate the Effects of Staff Turnover

NSDD and national laboratory officials said outreach to partner countries must be consistent and continuous so that officials in partner countries understand and buy-in to the mission and program goals. This can be especially challenging when geographic distances between program officials and overseas sites, and the length of time needed to travel between sites within a country, are large. For example, when we visited sites overseas, we sometimes traveled between 6 and 8 hours a day to reach some destinations, and the countries we visited were not as large as some of NSDD's other partner countries. NSDD partners with 59 countries, each with its own circumstance and situation. NSDD officials

[27]According to NSDD officials, the models presently do not account for the challenge posed by potential technological advances.

said that in some areas of the world, local officials may not understand the nuclear smuggling threat as well as officials in countries close to large quantities of nuclear material. In addition, many partner countries face more immediate situations, such as conflicts and refugees, which can decrease these countries' efforts to counter nuclear and radiological smuggling. Program officials told us that NSDD tries to address these challenges through the use of forward-deployed personnel and personal contact.

Buy-in from each partner country needs to come from multiple people and has to span various levels of government, according to NSDD officials. For example, during a meeting with a high ranking government official of a partner country we visited, he described his country's partnership with NSDD as a major bilateral investment. However, he also expressed concern that members of his government may not provide the level of funding needed to maintain the NSDD-provided radiation detection equipment because of competing domestic funding needs. As a result, his agency is analyzing future costs and engaging members of the government on the needs of the program and risks of nuclear smuggling.

NSDD and national laboratory officials as well as officials we spoke to in partner countries we visited cited personnel turnover and reorganizations as another challenge requiring continued outreach efforts. In one partner country, we interviewed the director of the law enforcement agency working with NSDD about the benefits and challenges of the program. The very next day, we learned from other officials from this country that he had been replaced. According to national laboratory officials, his replacement initially was not very familiar with the program, but when several NSDD officials engaged the new director, he became very receptive to the mission. In addition, according to NSDD officials, in some partner countries government reorganizations can occur frequently. One partner country, located in a region of concern, recently had a reorganization that delayed 15 sites from entering the post-transition phase from the planned date of January 2015 until sometime in 2016.

Conclusions

NSDD plays a key role in building the capacity of its 59 partner countries to detect, interdict, and investigate the illicit trafficking of nuclear and radiological materials, and the use of NSDD-provided equipment has resulted in positive outcomes, including the interdiction of weapons-grade HEU. The program, however, faces an unusual set of challenges in the performance of its duties, many of which are outside of its control.

Nonetheless, NSDD has taken actions to mitigate the effects of these challenges.

However, NSDD cannot fully measure its progress because its 5-year goals are not all measurable and do not fully address all of the program's key activities. Furthermore, its performance measures are not aligned with its goals. In addition, without a program plan detailing when and how NSDD will complete key activities and achieve its goals, the program's projected dates for transitioning to its partner countries the full responsibility for sustaining the long-term operation and maintenance of the NSDD-provided radiation detection equipment continue to be delayed. Further, without criteria or guidance for identifying partner countries that may require additional financial assistance, determining when changing conditions may warrant adjusting program plans, or identifying any program activities that could help maintain sustainability, NSDD may not be able to determine when it has fully accomplished its mission and risks continuing to deploy equipment past the point of diminishing returns.

Recommendation for Executive Action

We recommend that the Administrator of the National Nuclear Security Administration direct NSDD to take the following action:

Develop a more detailed program plan that clearly articulates when and how it will achieve its goals, including completing key activities such as the deployment of radiation detection equipment to partner countries and having these countries fully fund the sustainment and maintenance of this equipment. The plan could include measurable goals for all of NSDD's key activities and performance measures that align with these goals, criteria and guidance for identifying partner countries that may require additional financial assistance, determining when changing conditions may warrant adjusting program activities, or identifying any program activities that could help maintain sustainability.

Agency Comments

We provided a draft of this report to NNSA for comment. In written comments provided by NNSA (reproduced in app. V), NNSA agreed with our findings and recommendation to improve NSDD's program plan. Specifically, NNSA stated that NSDD is working to develop a more comprehensive program plan that will incorporate the features cited and recommended in our report. According to NNSA, NSDD's new program plan, targeted for completion by the end of fiscal year 2016, will define measurable program goals along with the performance measures for those activities and include criteria and guidance for identifying partner

countries that may require continued assistance, among other things. NNSA also provided technical comments for our consideration.

We are sending copies of this report to the appropriate congressional committees, the NNSA Administrator, and other interested parties. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff members have any questions about this report, please contact me at (202) 512-3841 or trimbled@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix VI.

David C. Trimble
Director, Natural Resources and Environment

Appendix I: Information on the Nuclear Smuggling Detection and Deterrence Program's Partners

Table 4 provides information on the Nuclear Smuggling Detection and Deterrence program's partners.

Table 4: Information on the Nuclear Smuggling Detection and Deterrence (NSDD) Program's Partners

Partner	Types of sites	Total number of sites	Phase of work	Actual or estimated date for entering post-transition
Afghanistan	Mobile	1-5	Transition	FY 2017
Argentina	Fixed	1-5	Post-transition	FY 2014
Armenia	Fixed	5-10	Post-transition	FY 2015
Austria	Fixed	1-5	Post-transition	FY 2011
Azerbaijan	Fixed and mobile	15-20	Transition	FY 2017
Bahamas	Mobile	1-5	Transition	FY 2016
Bangladesh	Fixed	1-5	Transition	FY 2017
Belarus	Fixed and mobile	5-10	Implementation[a]	To be determined
Belgium	Fixed	1-5	Post-transition	FY 2010
Bulgaria	Fixed and mobile	25-30	Transition	FY 2016
Cambodia	Fixed	1-5	Transition	FY 2016
China	Fixed	1-5	Post-transition	FY 2015
Colombia	Fixed	1-5	Post-transition	FY 2014
Croatia	Fixed and mobile	5-10	Transition	FY 2018
Czech Republic	Mobile	1-5	Transition	FY 2016
Djibouti	Fixed and mobile	1-5	Transition	FY 2018
Dominican Republic	Fixed	1-5	Post-transition	FY 2011
Estonia	Fixed and mobile	5-10	Transition	FY 2018
Georgia	Fixed and mobile	20-25	Post-transition	FY 2012
Greece	Fixed	5-10	Post-transition	FY 2004
Honduras	Fixed	1-5	Post-transition	FY 2015
Hungary	Mobile	5-10	Transition	FY 2016
Iraq	Mobile	1-5	Transition	FY 2018
Israel	Fixed and mobile	1-5	Transition	FY 2018
Jamaica	Fixed and mobile	1-5	Post-transition	FY 2015
Jordan	Fixed and mobile	5-10	Transition	FY 2018
Kazakhstan	Fixed and mobile	30-35	Transition	FY 2017
Kenya	Fixed	1-5	Transition	FY 2016
Kyrgyzstan	Fixed	10-15	Transition	FY 2017
Latvia	Fixed and mobile	5-10	Post-transition	FY 2015
Lebanon	Fixed	5-10	Transition	FY 2016

Partner	Types of sites	Total number of sites	Phase of work	Actual or estimated date for entering post-transition
Lithuania	Fixed and mobile	15-20	Transition	FY 2016
Malaysia	Fixed	1-5	Post-transition	FY 2014
Malta	Fixed	1-5	Post-transition	FY 2015
Mexico	Fixed and mobile	5-10	Transition	FY 2018
Moldova	Fixed and mobile	15-20	Transition	FY 2017
Mongolia	Fixed	15-20	Transition	FY 2016
Netherlands	Fixed	1-5	Post-transition	FY 2008
Oman	Fixed and mobile	1-5	Transition	FY 2016
Pakistan	Fixed	1-5	Transition	FY 2018
Panama	Fixed and mobile	5-10	Post-transition	FY 2014
Philippines	Fixed	1-5	Transition	FY 2016
Poland	Fixed and mobile	10-15	Transition	FY 2017
Portugal	Fixed	1-5	Post-transition	FY 2013
Romania	Fixed and mobile	15-20	Transition	FY 2018
Russia	Fixed and mobile	250-300	Post-transition	FY 2013
Singapore	Fixed	1-5	Post-transition	FY 2012
Slovakia	Fixed and mobile	10-15	Transition	FY 2016
Slovenia	Fixed and mobile	5-10	Post-transition	FY 2014
South Korea	Fixed	1-5	Transition	To be determined
Spain	Fixed	1-5	Post-transition	FY 2014
Sri Lanka	Fixed	1-5	Post-transition	FY 2014
Taiwan	Fixed	1-5	Post-transition	FY 2013
Tajikistan	Mobile	1-5	Transition	FY 2017
Thailand	Fixed	1-5	Post-transition	FY 2014
Turkmenistan	Fixed	1-5	Transition	FY 2016
Ukraine	Fixed and mobile	50-100	Transition	FY 2018
Uzbekistan	Fixed	20-25	Post-transition	FY 2015
Vietnam	Fixed	1-5	Transition	FY 2016

Legend: FY = fiscal year

Source: GAO analysis of NSDD documents and data. | GAO-16-460

Notes:

Sites can include fixed sites where radiation portal monitors are installed at land border crossings (vehicle and pedestrian), airports, rail crossings, small seaports, and large container seaports. They can also include locations where mobile detection system assets are deployed.

A partner is considered to be in the transition phase after NSDD-provided radiation detection equipment installed at a site becomes operational. This phase typically lasts 3 to 5 years, during which NSDD provides assistance to help prepare the partner for assuming full operational responsibilities, including maintaining and sustaining the radiation detection equipment.

A partner is considered to be in the post-transition phase after full responsibility for sustaining the long-term operation and maintenance of the NSDD-provided radiation detection equipment at all sites is transitioned to the partner. NSDD no longer provides significant financial support, but may provide limited support and remain in contact with post-transition partners to monitor the extent to which they still use and maintain the NSDD-provided equipment.

Most partners have multiple sites. At times, and for various reasons, sites may be in different phases than others. A partner's overall phase depends on whether it has any sites remaining in transition; if so, then the partner as a whole is still in the transition phase. On the other hand, if all of a partner's sites are in the post-transition phase, then the partner's overall phase is post-transition.

[a]The activities in Belarus, which currently fall under NSDD's Implementation Program, are ongoing, and the first installation of equipment in the country is scheduled to be completed in 2016.

Appendix II: Final Pool of Nuclear Smuggling Detection and Deterrence Program Partner Countries and Select Criteria Considered during Country Selection Process

Table 5 lists the final pool of Nuclear Smuggling Detection and Deterrence program partner countries from which we selected countries for our review and the criteria we considered.

Table 5: Final Pool of Nuclear Smuggling Detection and Deterrence (NSDD) Program Partner Countries and Select Criteria Considered during Country Selection Process

Partner country	Geographic location	Program funds expended, listed by rank	Total number of sites, listed by rank	Total number of post-transition sites, listed by rank[a]	Total number of different types of sites[b]	Country income level, with one being highest[c]
Armenia	Caucasus, bordering Iran, Turkey, Georgia, and Azerbaijan	10	11	11	3	12
Azerbaijan	Caucasus, bordering Iran and Russia	1	3	8	5	10
Bulgaria	Southeastern Europe, between Romania and Turkey, and bordering the Black Sea	3	2	2	6	11
Croatia	Southeastern Europe	11	11	8	3	7
Estonia	Baltics, bordering Russia	6	9	4	6	4
Georgia	Caucasus, bordering Russia, Turkey, and the Black Sea	2	1	1	6	13
Greece	Southern Europe, bordering Bulgaria and Turkey	8	13	6	3	2
Latvia	Baltics, bordering Belarus and Russia	9	9	4	5	5
Lithuania	Baltics, bordering Belarus and Russia	4	7	13	6	6
Moldova	Eastern Europe, between Romania and Ukraine, and near the Black Sea	12	7	13	4	14
Poland	Central Europe, bordering Belarus, Russia, and Ukraine	7	4	12	4	8
Romania	Southeastern Europe, between Bulgaria and Ukraine, and bordering the Black Sea	5	5	8	5	9
Slovakia	Central Europe	14	5	3	3	3
Slovenia	Southeastern Europe	13	13	6	3	1

Source: GAO analysis of NSDD data. | GAO-16-460

Note:

The rankings in this table are based on data analyzed and taken into consideration as of January 2015 while conducting our country selection methodology. The rankings may no longer be current given the time period they reflect.

[a]A site is considered to be post-transition after full responsibility for the operation and maintenance of the NSDD-provided radiation detection equipment has transitioned to the partner country.

[b]For the purposes of our review, we considered six different types of sites. They are (1) land border crossings (vehicle and pedestrian), (2) airports, (3) mobile detection system assets, (4) rail crossings, (5) seaports, and (6) training centers.

[c]For the purposes of our review, we considered a country's income level to be the gross national income, per capita, based on 2013 data from the World Bank.

Appendix III: Nuclear Smuggling Detection and Deterrence Program Uses Submetrics and Other Means to Attempt to Offset Performance Measure Limitations

The Nuclear Smuggling Detection and Deterrence (NSDD) program's performance measures have certain limitations that are inherent in measuring deterrence-focused programs. For example, Office of Management and Budget guidance states that programs with a deterrence or prevention focus can be difficult to measure.[1] Similarly, a study by the National Academy of Sciences notes that deterrence is largely "unknowable and unmeasurable" in that one cannot measure something that has not happened.[2]

Given these inherent limitations, NSDD officials told us that the program uses three internal submetrics, assurance visits, and its Maturity Model tool to attempt to offset the inherent limitations associated with performance measures developed for deterrence-focused programs like NSDD. Specifically, NSDD's three submetrics are (1) operations and management, which tracks the number of countries and sites that retain planning and management responsibility to operate and support the NSDD-provided equipment; (2) training, which tracks the number of countries and sites that retain the full training responsibility to operate and support the equipment; and (3) maintenance and logistics, which tracks the number of countries and sites that retain full maintenance responsibility to operate and support the equipment. According to program documents, each submetric is associated with seven sustainability principles and specific indicators that NSDD uses to assess a partner country's progress in developing a capacity to support that activity. Specifically, the seven sustainability principles, as defined by NSDD, are as follows:

- **Performance and capability assurance:** A comprehensive approach to institutionalizing a multi-level review of NSDD-provided radiation detection equipment to confirm that all aspects of the equipment function as designed, from performance of trained individuals to sustained operability of the equipment. Examples of key components include performance testing, data gathering and analysis, and defining metrics.

[1]Office of Management and Budget, *Performance Measurement Challenges and Strategies* (Washington, D.C.: June 18, 2003).

[2]National Academy of Sciences, *Improving Metrics for the Department of Defense Cooperative Threat Reduction Program* (Washington, D.C.: The National Academies Press, 2012).

- **Life cycle management:** A comprehensive approach to institutionalizing consistent, long-term planning and management of all aspects of the NSDD-provided radiation detection equipment through proper budgeting, data gathering and tracking, and analysis to confirm consistent operation of the equipment after NSDD's direct support ends.

- **Organization and personnel:** A documented understanding of the roles, responsibilities, authorities, and accountabilities within site, regional, and national organizations of the partner country that support the NSDD-provided radiation detection equipment. This includes reliability of personnel who are responsible for operating the equipment, including those responding to detections of nuclear and radiological materials. Examples include departments or services within partner country branches that have responsibility for nuclear material protection systems at sites, emergency response, and handling of nuclear materials and information.

- **Configuration management:** The establishment of processes and procedures for reviewing and documenting changes that occur after a site in the partner country is declared operational in order to confirm the continued and effective operation of the NSDD-provided radiation detection equipment. This includes retaining site diagrams, documenting decisions and changes, and updating operational procedures as needed, among other things.

- **Processes and procedures:** The confirmation of consistent operations, maintenance and corrective maintenance practices, and other critical processes relevant to ensuring the optimal operation of the NSDD-provided radiation detection equipment in the partner country by identifying and documenting processes. This includes developing site-, regional-, and national-level documents that designate the implementation of regulatory requirements and delineate the process the partner country will use for completing required tasks.

- **Training:** The development of training materials, such as instructor and student manuals, by NSDD, specific vendors, and the partner country; partner country acceptance of those materials; training of qualified and certified instructors; and the provision of special training to assist in the transition of full responsibility for training from NSDD to the partner country.

- **Maintenance and logistics:** The comprehensive suite of processes, plans, procedures, and resources supporting scheduled and corrective maintenance at sites and facilities. This can include maintenance and repair, conducted either by site personnel, an equipment vendor, or both, at the discretion of the partner country; tracking and trending of maintenance and logistics data; and logistics management and planning.

As shown in table 6 below, each submetric is associated with one or more of the sustainability principles and a set of related indicators that are used to assess the partner country's progress in developing the capacity to support that element.

As an example of how this works, to determine if a partner country is ready to assume all training responsibilities necessary for the continued operation and support of the NSDD-provided radiation detection equipment, program officials assess whether the partner country has (1) established and implemented a training program built upon NSDD's training curriculum, (2) developed a process to conduct performance evaluations of those trained, and (3) identified and certified a cadre of subject matter experts to serve as training instructors. Program documents indicate that a partner country must achieve all of an activity's indicators before NSDD will transition full responsibility of that activity to the partner country. According to these documents, once a partner country has achieved all of the indicators for each of the three submetric activities, it has demonstrated the requisite capabilities to maintain and sustain the radiation detection equipment and will enter the post-transition phase.

In addition, NSDD conducts on-site assurance visits that enable program officials and in-country stakeholders to visit sites and check on the status of the installed radiation detection equipment; observe site operations, including how site operators respond to, and adjudicate, alarms set off by this equipment; and assess the extent to which established procedures are followed, among other actions. These visits also afford program officials with opportunities to provide site operators with additional assistance, for example, by holding discussions on lessons learned and best practices, providing on-the-spot training, and helping develop corrective action plans in the event that any problems are identified.

NSDD has also developed a Maturity Model tool that it uses as part of a program effort to determine whether those partner countries in the post-transition phase continue to develop and increase their capacity to deter,

detect, and interdict illicitly smuggled nuclear and radiological materials. Specifically, the tool is used by program personnel to assess partner countries' capacities and capabilities in the areas of operations and management, training, and maintenance and logistics, which are the activities associated with the program's three internal submetrics. According to NSDD documents, the Maturity Model tool helps to identify whether and how a partner country's capacity in these areas can be further developed as well as prioritize what assistance could be offered to those partner countries in the post-transition phase.

Table 6: Nuclear Smuggling Detection and Deterrence (NSDD) Program Submetrics and Associated Sustainability Principles and Indicators

Submetric	Description	Sustainability principles	Indicators to be achieved
Operations and management	Tracks the number of partner countries or sites that have assumed full planning and management responsibility to operate and support the NSDD-provided radiation detection equipment.	• Performance and capability assurance • Life cycle management • Organization and personnel • Configuration management • Processes and procedures	• Participates in performance assessments • Establishes a country-wide formal process to address funding sources and expenses associated with the radiation detection equipment • Develops documented roles and responsibilities of all organizations supporting the radiation detection equipment • Allocates personnel to operate and maintain the radiation detection equipment • Establishes a configuration baseline for the radiation detection equipment • Creates process to update the configuration baseline for the radiation detection equipment • Establishes a defined reachback process or a national response plan • Utilizes standard operating procedures and concept of operations for the operation of the radiation detection equipment
Training	Tracks the number of partner countries or sites that have assumed full training responsibility to operate and support the NSDD-provided radiation detection equipment.	• Training	• Develops a performance evaluation process • Establishes a training program to operate and support the radiation detection equipment • Identifies subject matter experts as instructors for training courses

Submetric	Description	Sustainability principles	Indicators to be achieved
Maintenance and logistics	Tracks the number of partner countries or sites that have assumed full maintenance responsibility to operate and support the NSDD-provided radiation detection equipment.	• Maintenance and logistics	• Identifies and applies a process to manage spare parts inventories • Establishes an approach to manage those entities providing maintenance for all radiation detection equipment • Demonstrates the capability to plan, schedule, and track maintenance actions required to keep the radiation detection equipment operating at an optimal level • Demonstrates the capability to obtain and manage an inventory of radiological sources for use in radiation detection equipment configuration activities

Source: NSDD documents. | GAO-16-460

Appendix IV: Risk-Based Models Employed by the Nuclear Smuggling Detection and Deterrence Program Help Prioritize Countries and Sites within Those Countries

International crossings. The Nuclear Smuggling Detection and Deterrence (NSDD) program uses this model to identify and analyze partner countries' land border crossings (e.g., vehicle and pedestrian border crossings), airports, and small seaports to prioritize sites for assistance and to determine where to deploy radiation detection equipment and at how many sites within a partner country, and a plan is developed for each. After first creating a list of prioritized source countries, transit countries or regions, and destination countries or regions by ranking a range of potential nuclear and radiological smuggling scenarios for risk, NSDD uses the model to identify and prioritize individual countries and sites within those countries at which radiation detection equipment would be installed. To do so, additional calculations are made based on a variety of factors, including the number of official points of entry and exit that are monitored by law enforcement or customs entities, the presence of smuggling routes, and specific conditions affecting the country like corruption and the quality of its infrastructure. NSDD uses these results to: (1) create a tiered priority list of countries that the program should target for assistance and (2) develop country-specific plans that provide a detailed evaluation of the relative nuclear and radiological smuggling risk associated with the land border crossings, airports, and small seaports within those countries.

Global maritime shipping network. To help identify and prioritize large, high-volume container foreign seaports that operate within the global maritime shipping network, NSDD uses a model that ranks these ports according to their relative attractiveness to potential nuclear or radiological material smugglers. The model scores the large container seaports using two categories: (1) scannable shipping volume—the percentage of a port's total container throughput that can be scanned using NSDD-provided detection equipment—which accounts for 75 percent of the score, and (2) potential threat, which accounts for 25 percent of the score. The model also analyzes shipping lane connectivity between ports to determine the likelihood that a particular port would be used to deliver nuclear or radiological material or weapons. Higher scores are considered more attractive to smugglers and therefore of potentially higher priority to the program. NSDD most recently utilized the global maritime shipping network model in August 2014 in order to reassess the level of remaining large container seaports work; five additional ports were identified as priorities to be addressed.

Deployment and prioritization of MDS assets. NSDD also employs a model to identify and prioritize those countries to which the program may deploy mobile detection system (MDS) assets and provide training and

related support. The model prioritizes countries using two scoring categories: (1) risk, which accounts for 60 percent of the score, and (2) partnership and capacity, which accounts for 40 percent of the score. The risk score is based on several weighted factors, including whether the country possesses nuclear material, the presence of active terrorist groups, and past nuclear or radiological smuggling incidents. The partnership and capacity score is also based on several weighted factors, such as the extent to which the country's police services can reliably enforce law and order and the quality of the country's trade and transportation infrastructure. NSDD revised the model in 2013 in response to expanded interest in MDS assets among partner and prospective partner countries. The results led to the identification and ranking of 79 countries, including existing partner countries, to target for the deployment of MDS assets. Since that time, NSDD has provided MDS assets to a number of existing partner countries and has begun outreach efforts aimed at expanding its deployment of MDS assets to prospective partner countries, like those in the Balkans.

Appendix V: Comments from the National Nuclear Security Administration

Department of Energy
Under Secretary for Nuclear Security
Administrator, National Nuclear Security Administration
Washington, DC 20585

May 31, 2016

Mr. David C. Trimble
Director, National Resources
and Environment
U.S. Government Accountability Office
Washington, DC 20548

Dear Mr. Trimble:

Thank you for the opportunity to review the Government Accountability Office (GAO) draft report "COMBATING NUCLEAR SMUGGLING: NNSA's Detection and Deterrence Program Is Addressing Challenges but Should Improve Its Program Plan" (GAO-16-460). We appreciate GAO's acknowledgment that the National Nuclear Security Administration's (NNSA) Nuclear Smuggling Detection and Deterrence (NSDD) Program plays a key role in the detection and deterrence of nuclear and radiological smuggling worldwide by building the capacity of its partner countries. The report accurately describes the unusual set of challenges faced in performing this work, and recognizes many are largely outside our control, such as conflicts resulting in changed borders and/or destruction of installed sites. As noted in the report, NSDD is taking action to mitigate the effects of these challenges and our partners have reported multiple cases of successful detection, deterrence, and interdiction of smuggled nuclear and radiological materials due to the use of NSDD-provided radiation detection equipment.

We agree with the auditors' recommendation to enhance the December 2014 NSDD Program Plan by more clearly articulating how and when the program intends to achieve its goals. NSDD does have documented goals for the numbers of ports to be equipped, mobile systems to be deployed, and sites to be transitioned, although these are not expressly contained in the December 2014 plan. The numbers are, however, reflected in the program's Congressional metrics, with a timeline for completion. Progress toward all three metric areas is being closely tracked and documented on a quarterly basis. NSDD is on track to complete the deployments identified in the 2012 Strategic Review one year ahead of schedule and acknowledges minor delays (two sites) in partner country transitions.

NSDD is currently working on the development of a more comprehensive program plan that will include the features cited and recommended in the GAO report. This new program plan, targeted for completion by the end of Fiscal Year 2016, will incorporate the results of the 2015 Strategic Review to more fully articulate program activities; define measurable program goals along with the performance measures for those activities; and include criteria and guidance for

identifying partner countries that may require continued assistance. The plan will also incorporate criteria for identifying end-point objectives and circumstances, or events that indicate a need to reassess the program plan.

If you have any questions, regarding this response, please contact Dean Childs, Director, Audit Coordination and Internal Affairs, at (301) 903-1341.

Sincerely,

Frank G. Klotz

Appendix VI: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contact named above, Ned Woodward (Assistant Director), Richard Burkard, Pamela Davidson, Amanda K. Kolling, Benjamin T. Licht, Alison O'Neill, Kevin Remondini, Dan C. Royer, and Franklyn Yao made key contributions to this report.