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Report to Congressional Requesters

May 2009

COMBATING NUCLEAR SMUGGLING

DHS Improved Testing of Advanced Radiation Detection Portal Monitors, but Preliminary Results Show Limits of the New Technology

GAO-09-655

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Highlights

Highlights of GAO-09-655, a report to congressional requesters

Why GAO Did This Study

The Department of Homeland Security's (DHS) Domestic Nuclear Detection Office (DNDO) is testing new advanced spectroscopic portal (ASP) radiation detection monitors. DNDO expects ASPs to reduce both the risk of missed threats and the rate of innocent alarms, which DNDO considers to be key limitations of radiation detection equipment currently used by Customs and Border Protection (CBP) at U.S. ports of entry. Congress has required that the Secretary of DHS certify that ASPs provide a significant increase in operational effectiveness before obligating funds for full-scale procurement. GAO was asked to review (1) the degree to which DHS's criteria for a significant increase in operational effectiveness address the limitations of existing radiation detection equipment, (2) the rigor of ASP testing and preliminary test results, and (3) the ASP test schedule. GAO reviewed the DHS criteria, analyzed test plans, and interviewed DHS officials.

What GAO Recommends

GAO recommends that DHS assess ASPs against the full potential of current equipment and revise the program schedule to allow time to conduct computer simulations of ASPs' capabilities and to uncover and resolve problems with ASPs before full-scale deployment. DHS agreed to a phased deployment that should allow time to uncover ASP problems but disagreed with GAO's other recommendations. GAO believes its recommendations remain valid.

View GAO-09-655 or key components.
For more information, contact Gene Aloise at (202) 512-3841 or aloisee@gao.gov.

What GAO Found

The DHS criteria for a significant increase in operational effectiveness require a minimal improvement in the detection of threats and a large reduction in innocent alarms. Specifically, the criteria require a marginal improvement in the detection of certain weapons-usable nuclear materials, considered to be a key limitation of current-generation portal monitors. The criteria require improved performance over the current detection threshold, which for certain nuclear materials is based on the equipment's limited sensitivity to anything more than lightly shielded materials, but do not specify a level of shielding that smugglers could realistically use. In addition, DNDO has not completed efforts to improve current-generation portal monitors' performance. As a result, the criteria do not take the current equipment's full potential into account. With regard to innocent alarms, the other key limitation of current equipment, meeting the criteria could result in hundreds fewer innocent alarms per day, thereby reducing CBP's workload and delays to commerce.

DHS increased the rigor of ASP testing in comparison with previous tests. For example, DNDO mitigated the potential for bias in performance testing (a concern GAO raised about prior testing) by stipulating that there would be no ASP contractor involvement in test execution. Such improvements added credibility to the test results. However, the testing still had limitations, such as a limited set of scenarios used in performance testing to conceal test objects from detection. Moreover, the preliminary results are mixed. The results show that the new portal monitors have a limited ability to detect certain nuclear materials at anything more than light shielding levels: ASPs performed better than current-generation portal monitors in detection of such materials concealed by light shielding approximating the threat guidance for setting detection thresholds, but differences in sensitivity were less notable when shielding was slightly below or above that level. Testing also uncovered multiple problems in ASPs meeting the requirements for successful integration into operations at ports of entry. CBP officials anticipate that, if ASPs are certified, new problems will appear during the first few years of deployment in the field.

While DNDO's schedule underestimated the time needed for ASP testing, test delays have allowed more time for review and analysis of results. DNDO's original schedule anticipated completion in September 2008. Problems uncovered during testing of ASPs' readiness to be integrated into operations at U.S. ports of entry caused the greatest delays to this schedule. DHS's most recent schedule anticipated a decision on ASP certification as early as May 2009, but DHS recently suspended field validation due to ASP performance problems and has not updated its schedule for testing and certification. In any case, DNDO does not plan to complete computer simulations that could provide additional insight into ASP capabilities and limitations prior to certification even though delays have allowed more time to conduct the simulations. DNDO officials believe the other tests are sufficient for ASPs to demonstrate a significant increase in operational effectiveness.

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Abbreviations

ASP	advanced spectroscopic portal
CBP	Customs and Border Protection
DHS	Department of Homeland Security
DNDO	Domestic Nuclear Detection Office
DOE	Department of Energy
HEU	highly enriched uranium
PVT	polyvinyl toluene

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Congressional Requesters

Preventing radioactive material from being smuggled into the United States is a key national security objective. In particular, terrorists could use special nuclear material such as highly enriched uranium (HEU) or plutonium in a nuclear weapon; other radioactive materials could be used in a radiological dispersal device (a "dirty bomb"). The national security mission of U.S. Customs and Border Protection (CBP), an agency within the Department of Homeland Security (DHS), includes screening for smuggled nuclear or radiological material while facilitating the flow of legitimate trade and travel. To screen cargo at ports of entry, CBP conducts primary inspections with radiation detection equipment called portal monitors—large stationary detectors through which cargo containers and vehicles pass as they enter the United States. When radiation is detected, CBP conducts secondary inspections using a second portal monitor to confirm the original alarm and a handheld radioactive isotope identification device to identify the radiation's source and determine whether it constitutes a threat. CBP officers must investigate each alarm until they are convinced that the vehicle, occupants, and any cargo pose no threat and can be allowed to enter the United States.

According to DHS's Domestic Nuclear Detection Office (DNDO), the current generation of radiation detection equipment has limitations.[1] Specifically, the polyvinyl toluene (PVT) portal monitors currently in use can detect radiation but cannot identify the source. As a result, the monitors' radiation alarms can be set off even by benign, naturally occurring radioactive material. One way to reduce the rate of such innocent alarms—and thereby minimize unnecessary secondary inspections and enhance the flow of commerce—is to adjust the operational thresholds for the level of radiation required for PVTs to alarm (i.e., operate the PVTs at a reduced level of sensitivity). However, reducing

[1]DNDO was established within DHS in 2005; its mission includes developing, testing, acquiring, and supporting the deployment of radiation detection equipment at U.S. ports of entry. CBP began deploying portal monitors in 2002, prior to DNDO's creation, under the radiation portal monitor project. For additional information on DNDO's overall efforts to combat nuclear smuggling, see GAO, *Nuclear Detection: Domestic Nuclear Detection Office Should Improve Planning to Better Address Gaps and Vulnerabilities*, GAO-09-257 (Washington, D.C.: Jan. 29, 2009).

the sensitivity may make it more difficult to detect certain nuclear materials.

Since 2005, DNDO has been developing and testing advanced spectroscopic portals (ASP), a new type of portal monitor designed to both detect radiation and identify the source. The new portal monitors use technology similar to that in handheld identification devices currently used for secondary screening. Key differences from handheld identification devices include a larger number of detectors, more sophisticated software, and a more extensive library of radiation signatures that may provide more consistent and rapid screening and may increase the likelihood of correct identification. DNDO hopes to use the new portal monitors to replace at least some PVTs currently used for primary screening, as well as PVTs and handheld identification devices currently used for secondary screening. However, the new portal monitors cost significantly more than PVTs. We estimated in September 2008 that the lifecycle cost of each standard cargo version of the ASP (including deployment costs) is about $822,000, compared with about $308,000 for the PVT standard cargo portal, and that the total program cost for DNDO's latest plan for deploying radiation portal monitors—which relies on a combination of ASPs and PVTs and does not deploy radiation portal monitors at all border crossings—would be about $2 billion.[2] Moreover, CBP officials expect operation and maintenance costs to be significantly higher for ASPs than for PVTs because of the greater complexity of ASP equipment.

Concerned about the performance and cost of the new ASP monitors, Congress required the Secretary of Homeland Security to certify that the monitors will provide a "significant increase in operational effectiveness" before DNDO obligates funds for full-scale ASP procurement.[3] The Secretary must submit separate certifications for primary and secondary inspection. In response, DNDO, CBP, and the DHS management directorate jointly issued criteria in July 2008 for determining whether the new technology provides a significant increase in operational

[2]GAO, *Combating Nuclear Smuggling: DHS's Program to Procure and Deploy Advanced Radiation Detection Portal Monitors Is Likely to Exceed the Department's Previous Cost Estimates*, GAO-08-1108R (Washington, D.C.: Sept. 22, 2008).

[3]Consolidated Appropriations Act, 2007, Pub. L. No. 110-161, 121 Stat. 1844, 2069 (2007); Consolidated Security, Disaster Assistance, and Continuing Appropriations Act, 2009, Pub. L. No. 110-329, 121 Stat. 3574, 3679 (2008).

effectiveness—four criteria for primary screening and two for secondary screening (see fig. 1). The primary screening criteria require that the new portal monitors detect potential threats as well as or better than PVTs, show improved performance in detection of HEU, and reduce innocent alarms. To meet the secondary screening criteria, the new portal monitors must reduce the probability of misidentifying special nuclear material (e.g., HEU and plutonium) and the average time to conduct secondary screenings.

Figure 1: DHS Criteria for Demonstrating a Significant Increase in Operational Effectiveness

Primary screening criteria

When special nuclear material is present in cargo without naturally occurring radioactive material, the ASP probability of a correct operational outcome must be equal to or greater than that of the PVT. (For HEU, ASPs must show improved performance compared to PVTs at operational thresholds.)

When special nuclear material is present in cargo with naturally occurring radioactive material, the ASP in primary must increase the probability of a correct operational outcome compared to the current end-to-end system.

When licensable medical or industrial isotopes are present in cargo, the ASP probability of a correct operational outcome must be equal to or greater than that of the PVT.

When the only radioactive source present in the cargo is naturally occurring radioactive material, the ASP must refer at least 80 percent fewer conveyances for further inspection than the PVT.

Secondary screening criteria

When compared to the handheld radioactive isotope identification device, ASP must reduce, by at least a factor of two, the probability that special nuclear material is misidentified as naturally occurring radioactive material, a medical/industrial radionuclide, unknown, or no source at all.

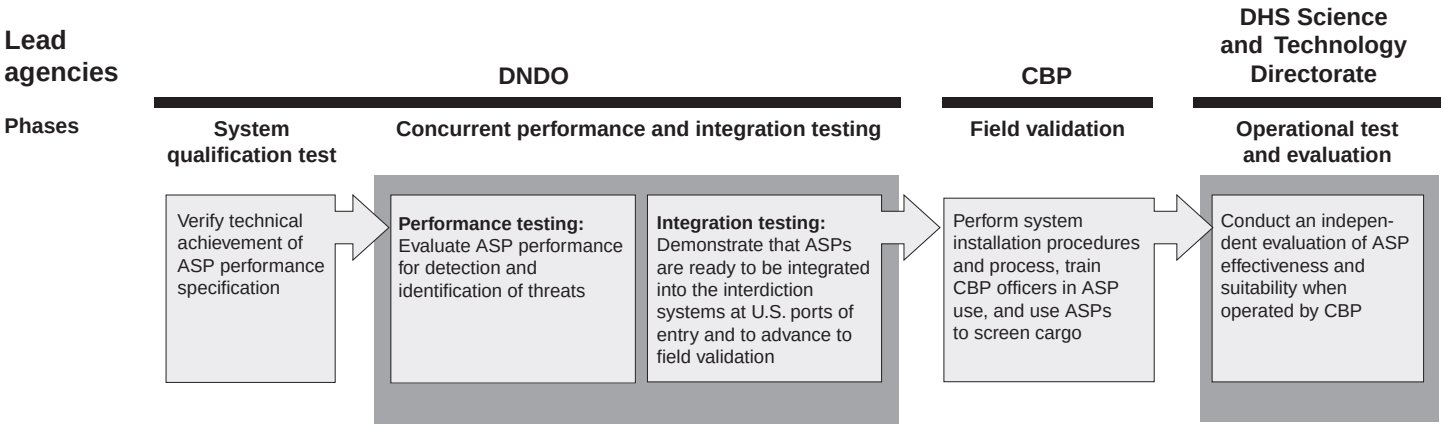
When compared to the handheld radioactive isotope identification device, the ASP must reduce the average time required to correctly release conveyances from secondary screening.

Source: DHS.

To demonstrate a significant increase in operational effectiveness for either primary or secondary screening, ASPs must satisfy all of the criteria for that deployment option, independent of satisfying the criteria for the other option. The criteria generally compare the new portal monitors to current-generation equipment as used under CBP's standard operating procedure. For example, the standard operating procedure for secondary screening calls for inconclusive readings to be sent for additional analysis to CBP's Laboratories and Scientific Services, which has access to additional software and trained experts.

DNDO designed and coordinated a series of tests, originally scheduled to run from April 2008 through September 2008, to determine whether the new portal monitors meet the certification criteria for primary and secondary screening and are ready for deployment. Key phases of testing completed to date include verifying that ASPs meet DNDO's performance specification, which was followed by concurrent testing of the new and current equipments' ability to detect and identify threats and of ASPs' readiness to be integrated into operations for both primary and secondary screening at ports of entry. Two remaining phases not yet completed include field validation at four northern and southern border crossings and two seaports, as well as an independent evaluation, conducted by the DHS Science and Technology Directorate at one of the seaports, of the new portal monitors' effectiveness and suitability (see fig. 2). Two ASP vendors have contracts with DNDO to develop the new portal monitors and are participating in the round of testing that began in 2008.[4] DNDO designed the testing to allow each vendor's system to complete all test phases and be certified based on its own performance as providing a significant increase in operational effectiveness.

Figure 2: Test Sequence Leading Up to ASP Certification



Source: GAO analysis of DNDO information.

[4]DNDO had a contract with a third ASP vendor whose system uses a more expensive type of detector that must be cooled by liquid nitrogen. DNDO determined it was not in the best interests of the government to exercise the option on the contract and allowed it to expire in November 2008. The vendor's ASP did not participate in the 2008 round of testing.

We have raised concerns since 2006 regarding DNDO's previous efforts to develop and test the new portal monitors. In October 2006, we found that DNDO's analysis of the benefits and costs of deploying the new portal monitors relied on assumptions of their anticipated performance level instead of actual test data.[5] Among other things, we recommended that DNDO conduct further testing before spending additional funds to purchase the new equipment. In September 2007, we testified that DNDO's testing at the Department of Energy's (DOE) Nevada Test Site did not represent an objective or rigorous assessment because DNDO used biased test methods that enhanced the apparent performance of the ASPs and did not test the limitations of their detection capabilities.[6] Most recently, we found in September 2008 that a DNDO report on testing conducted in 2007 did not accurately depict test results and could potentially be misleading.[7] We concluded that the results could identify areas for improvement but should not be used as indicators of ASPs' overall performance.

In this context, you asked us to review the 2008 round of testing leading up to the Secretary of Homeland Security's decision on ASP certification. We reviewed (1) the degree to which DHS's criteria for a significant increase in operational effectiveness address the limitations of the current generation of radiation detection equipment, (2) the rigor of the testing as a basis for determining ASPs' operational effectiveness and preliminary results of testing completed to date, and (3) the extent to which the test schedule allows time for DHS to review and analyze results. This report updates our September 2008 testimony, which included preliminary observations on the DHS criteria for a significant increase in operational effectiveness and the 2008 round of testing.[8]

[5]GAO, *Combating Nuclear Smuggling: DHS's Cost-Benefit Analysis to Support the Purchase of New Radiation Detection Portal Monitors Was Not Based on Available Performance Data and Did Not Fully Evaluate All the Monitors' Costs and Benefits*, GAO-07-133R (Washington, D.C.: Oct. 17, 2006).

[6]GAO, *Combating Nuclear Smuggling: Additional Actions Needed to Ensure Adequate Testing of Next Generation Radiation Detection Equipment*, GAO-07-1247T (Washington, D.C.: Sept. 18, 2007).

[7]GAO, *Combating Nuclear Smuggling: DHS's Phase 3 Test Report on Advanced Portal Monitors Does Not Fully Disclose the Limitations of the Test Results*, GAO-08-979 (Washington, D.C.: Sept. 30, 2008).

[8]GAO, *Combating Nuclear Smuggling: DHS Needs to Consider the Full Costs and Complete All Tests Prior to Making a Decision on Whether to Purchase Advanced Portal Monitors*, GAO-08-1178T (Washington, D.C.: Sept. 25, 2008).

To conduct our review, we analyzed DHS's criteria for a significant increase in operational effectiveness and DNDO's written response to our detailed questions regarding the criteria. Because the criteria compare the new portal monitors to existing equipment, we analyzed the threat guidance used to set detection thresholds for PVTs and interviewed DOE and national laboratory officials responsible for the guidance. In addition, we analyzed the test plans for the 2008 round of testing, including the test schedule and reasons for any delays. We interviewed DNDO, CBP, and other DHS officials responsible for conducting and monitoring tests, and we observed 1 day each of performance testing at the Nevada Test Site and integration testing at DOE's Pacific Northwest National Laboratory. We analyzed preliminary or final results for the phases of testing completed during our review, and we interviewed DNDO and CBP officials regarding the results. (App. I presents a detailed discussion of the scope and methodology of our review.)

We conducted this performance audit from May 2008 to May 2009 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.[9]

[9]This report does not include certain details about the capabilities and limitations of PVTs and ASPs that DHS considers to be "for official use only." We have prepared a "for official use only" version of this report in which we include such details (GAO-09-354SU).

DHS's Criteria for Significant Increase in Operational Effectiveness Require a Marginal Improvement in the Detection of Certain Nuclear Materials and a Large Reduction in Innocent Alarms

Although the DHS criteria for primary screening require an improved ability to detect certain nuclear materials at operational thresholds, ASPs could meet the criteria for improvement while still failing to detect anything more than lightly shielded material. DNDO officials acknowledge that passive radiation detection equipment, which includes both the new and current-generation portal monitors, is capable of detecting certain nuclear materials only when this material is unshielded or lightly shielded.[10] For this reason, the DOE threat guidance used to set PVTs' detection threshold is based on the equipment's limited sensitivity to anything more than lightly shielded nuclear material rather than on the assumption that smugglers would take effective shielding measures. DOE developed the guidance in 2002 and 2003 when CBP began deploying PVTs for primary screening. DOE and national laboratory officials responsible for the guidance told us the assumption of light shielding was based not on an analysis of the capabilities of potential smugglers to take effective shielding measures but rather on the limited sensitivity of PVTs to detect anything more than certain lightly shielded nuclear materials. In contrast, PVTs are more sensitive to the relatively strong radiation signature of other nuclear materials, and the threat guidance assumes a higher level of shielding for setting the operational threshold for detection of such materials. However, even for such materials, the DOE threat guidance assumes that shielding would not exceed a level provided by the contents of an average cargo container.

Moreover, DNDO has not completed efforts to fine-tune PVTs' software and thereby improve sensitivity to nuclear materials. As a result, the criteria compare ASPs to the current performance of PVTs and do not take potential improvements into account, which affects any assessment of "significant" improvement over current technology. DNDO officials expect they can achieve small improvements to PVTs' performance through additional development of "energy windowing," a technique currently being used in PVTs to provide greater sensitivity than otherwise possible. Pacific Northwest National Laboratory officials responsible for developing the technique also told us small improvements may be possible, and CBP officials have repeatedly urged DNDO to investigate the potential of the technique. DNDO collected the data needed to further develop energy

[10]According to DNDO and CBP officials, active imaging techniques (e.g., radiography systems to provide images of the contents of cargo containers) and other measures complement radiation detection equipment. In particular, such measures provide the capability to spot smuggled nuclear materials that are too heavily shielded to be detected by PVTs or ASPs.

windowing during the 2008 performance testing at the Nevada Test Site but has not yet funded Pacific Northwest National Laboratory efforts to analyze the data and further develop the technique.

Other aspects of the criteria for a significant increase in operational effectiveness require that ASPs either provide more than a marginal improvement in addressing other limitations of current-generation equipment or at least maintain the same level of performance in areas in which the current-generation equipment is considered adequate:

- The primary screening requirement for an 80 percent reduction in the rate of innocent alarms could result in hundreds of fewer secondary screenings per day, thereby reducing CBP's workload and delays to commerce. The actual reduction in the volume of innocent alarms would vary and would be greatest at the nation's busiest ports of entry, such as Los Angeles/Long Beach, where CBP officials report that PVTs generate up to about 600 innocent alarms per day.[11] A DNDO official said the requirement for an 80 percent reduction in innocent alarms was developed in conjunction with CBP and was based on a level that would provide meaningful workload relief.
- The primary screening criteria requiring that ASPs provide at least the same level of sensitivity to plutonium and medical and industrial isotopes, but not specifying an improvement, were based on DNDO's assessment that PVTs adequately detect such materials, which have a stronger radiation signature than HEU.[12] In addition, CBP officials said that including medical and industrial isotopes in the criteria addressed a CBP requirement for verifying that those transporting certain quantities of these materials into the United States are properly licensed.[13]
- The secondary screening requirement that ASPs reduce the probability of misidentifying special nuclear material by one-half addresses the inability of relatively small handheld devices to consistently locate and identify

[11]About 45 percent of all sea containers arriving in the United States come through Los Angeles/Long Beach. In fiscal year 2006, CBP cleared more than 5 million containers through the port.

[12]The criteria require an improvement when the radiation emitted by naturally occurring radioactive material is used to mask smuggled special nuclear material, including both HEU and plutonium.

[13]For additional information regarding the requirement to verify the legitimacy of radioactive material shipments, see GAO, *Nuclear Security: NRC and DHS Need to Take Additional Steps to Better Track and Detect Radioactive Materials*, GAO-08-598 (Washington, D.C.: June 19, 2008).

potential threats in large cargo containers. For example, a handheld device may fail to correctly identify special nuclear material if the material is well-shielded or the device is not placed close enough to a radiation source to obtain a recognizable measurement. According to CBP and DNDO, the requirement for a reduction in the average time to conduct secondary screenings is not more specific because the time varies significantly among ports of entry and types of cargo being screened.

DHS Increased the Rigor of Advanced Portal Monitor Testing

Improvements to the 2008 round of testing addressed concerns we raised about earlier rounds of ASP testing. However, the testing still had limitations, and the preliminary results are mixed.

Improvements to Testing Provided Credibility to Test Results

As we testified in September 2008, DHS's improvements to the 2008 round of ASP testing addressed concerns we raised about previous tests. A particular area of improvement was in the performance testing at the Nevada Test Site, where DNDO compared the capability of ASP and current-generation equipment to detect and identify nuclear and radiological materials, including those that could be used in a nuclear weapon. The improvements addressed concerns we previously raised about the potential for bias and provided credibility to the results within the limited range of scenarios tested by DNDO. For example, we reported in 2007 that DNDO had allowed ASP contractors to adjust their systems after preliminary runs using the same radiological materials that would be used in the formal tests. In contrast, the plan for the 2008 performance test stipulated that there would be no system contractor involvement in test execution, and no ASP contractors were at the test location on the day we observed performance testing. Furthermore, DNDO officials told us, and we observed, that they did not conduct preliminary runs with threat objects used in the formal tests. In 2007, we reported that DNDO did not objectively test the handheld identification devices because it did not adhere to CBP's standard operating procedure for using the devices to conduct a secondary inspection, which is fundamental to the equipment's performance in the field. DNDO addressed this limitation in the 2008 round of performance testing: CBP officers operated the devices and adhered as closely to the standard operating procedure as test conditions allowed. While the test conditions did not allow CBP officers to obtain real-time technical support in interpreting the device's measurements, as they would in the field to increase the probability of correctly identifying a radiation source, DNDO officials said they addressed this limitation. For example, they treated a decision by a CBP officer to indicate the need for

technical support as a correct outcome if the test scenario involved the use of a potential threat, such as HEU.

Other aspects of testing, while not specifically addressing concerns we previously raised, also added credibility to the test results. Based on our analysis of the performance test plan, we concluded that the test design was sufficient to identify statistically significant differences between the new technology and current-generation systems when there were relatively large differences in performance. Specifically, DNDO conducted a sufficient number of runs of each scenario used in the 2008 performance testing to identify such differences.

With regard to the general conduct of the 2008 round of testing, two aspects, in particular, enhanced the overall rigor of the tests: (1) criteria for ensuring that ASPs met the requirements for each phase before advancing to the next, and (2) the participation of CBP and the DHS Science and Technology Directorate.[14] The test and evaluation master plan established criteria requiring that the ASPs have no critical or severe issues rendering them completely unusable or impairing their function before starting or completing any test phase. In addition, the criteria established a cumulative limit of 10 issues requiring a work-around (e.g., a straightforward corrective step, such as a minor change in standard operating procedures) and 15 cosmetic issues not affecting proper functioning. DNDO and CBP adhered to the criteria even though doing so resulted in integration testing conducted at the Pacific Northwest National Laboratory taking longer than anticipated and delaying the start of field validation. For example, DNDO and CBP did not allow a vendor's ASP system to complete integration testing until all critical or severe issues had been resolved.

The involvement of CBP and the DHS Science and Technology Directorate provided an independent check, within DHS, of DNDO's efforts to develop and test the new portal monitors. For example, the lead CBP official involved in ASP testing told us that DNDO provided an initial assessment of the severity of issues uncovered during testing, but CBP made the final decision on categorizing them as critical, severe, work-around, or cosmetic issues. CBP also added a final requirement to integration testing

[14]In the case of ASP testing, the Science and Technology Directorate serves as the independent operational test authority, which reports directly to the DHS Under Secretary for Management.

before proceeding to field validation to demonstrate ASPs' ability to operate for 40 hours without additional problems. According to CBP officials, their efforts to resolve issues prior to field validation reflect the importance CBP places on ensuring that ASPs are sufficiently stable and technically mature to operate effectively in a working port of entry and thereby provide for a productive field validation.

The DHS Science and Technology Directorate, which is responsible for developing and implementing the department's test and evaluation policies and standards, will have the lead role in the final phase of ASP testing; the final phase, consisting of 21 days of continuous operation, is scheduled to begin at one seaport after the completion of field validation. The Science and Technology Directorate identified two critical questions to be addressed through operational testing: (1) Will the ASP system improve operational effectiveness (i.e., detection and identification of threats) relative to the current-generation system, and (2) is the ASP system suitable for use in the operational environment at land and sea ports of entry? The suitability of ASPs includes factors such as reliability, maintainability, and supportability. Because the operational testing conducted at one seaport is not sufficient to fully answer these questions—for example, because the testing will not allow threat objects to be inserted into cargo containers—the directorate plans to also conduct an independent analysis of the results from previous test phases, including performance testing.

The 2008 testing still had limitations, which do not detract from the test results' credibility but do require that results be appropriately qualified. Limitations included the following:

- The number of handheld identification device measurements collected during performance testing was sufficient to distinguish only particularly large differences from ASPs' identification ability. In particular, the standard operating procedure for conducting secondary inspections using ASPs, which requires less time than when using handheld devices, allowed DNDO to collect more than twice as many ASP measurements and to test ASPs' identification ability against more radiation sources than used to test handheld identification devices.
- The performance test results cannot be generalized beyond the limited set of scenarios tested. For example, DNDO used a variety of masking and shielding scenarios designed to include cases where both systems had 100 percent detection, cases where both had zero percent detection, and

several configurations in between so as to estimate the point where detection capability ceased.[15] However, the scenarios did not represent the full range of possibilities for concealing smuggled nuclear or radiological material. For example, DNDO only tested shielding and masking scenarios separately, to differentiate between the impacts of shielding and masking on the probabilities of detection and identification. As a result, the performance test results cannot show how well each system would detect and identify nuclear or radiological material that is both shielded and masked, which might be expected in an actual smuggling incident. Similarly, DNDO used a limited number of threat objects to test ASPs' detection and identification performance, such as weapons-grade plutonium but not reactor-grade plutonium, which has a different isotopic composition. A report on special testing of ASPs conducted by Sandia National Laboratories in 2007 recommended that future tests use plutonium sources having alternative isotopic compositions. Sandia based its recommendations on results showing that the performance of ASP systems varied depending on the isotopic composition of plutonium.

- The Science and Technology Directorate's operational testing is designed to demonstrate that the average time between equipment failures (the measure of ASPs' reliability) is not less than 1,000 hours. Thus, the testing will not show how reliable the equipment will be over a longer term. DHS Science and Technology Directorate officials recognize this limitation and said they designed operational testing only to demonstrate compliance with the ASP performance specification. Furthermore, to the extent that the Science and Technology Directorate relies on performance test results to evaluate ASPs' ability to detect and identify threats, its analysis of ASPs' effectiveness will be subject to the same limitations as the original testing and analysis conducted by DNDO.

Preliminary Test Results Are Mixed

The preliminary results presented to us by DNDO are mixed, particularly in the capability of ASPs used for primary screening to detect certain shielded nuclear materials. However, we did not obtain DNDO's final report on performance testing conducted at the Nevada Test Site until early April 2009, and thus we had limited opportunity to evaluate the report. In addition, we are not commenting on the degree to which the final report provides a fair representation of ASPs' performance. Preliminary results from performance testing show that the new portal

[15]Masking is the use of naturally occurring radioactive material to make the radiation emitted by smuggled material appear to be caused by innocent cargo. In contrast, shielding blocks radiation from being emitted.

monitors detected certain nuclear materials better than PVTs when shielding approximated DOE threat guidance, which is based on light shielding. In contrast, differences in system performance were less notable when shielding was slightly increased or decreased: Both the PVTs and ASPs were frequently able to detect certain nuclear materials when shielding was below threat guidance, and both systems had difficulty detecting such materials when shielding was somewhat greater than threat guidance. DNDO did not test ASPs or PVTs against moderate or greater shielding because such scenarios are beyond both systems' ability. (See fig. 3 for a summary of performance test results for detection of certain nuclear materials.)

Figure 3: Preliminary Results from 2008 Performance Testing for Detection of Certain Nuclear Materials

Portal monitor system	At lowest shielding levels tested	Light shielding		Moderate to heavy shielding
		At about DOE threat guidance	At more than DOE threat guidance	
ASP	○	○	●	✹
PVT	○	●	●	✹

○ Frequent
● Difficult
✹ Not tested

Source: GAO analysis of DNDO information.

Note: The specific amount and type of shielding assumed in DOE threat guidance is classified.

With regard to secondary screening, ASPs performed better than handheld devices in identification of threats when masked by naturally occurring radioactive material. However, differences in the ability to identify certain shielded nuclear materials depended on the level of shielding, with increasing levels appearing to reduce any ASP advantages over the handheld identification devices—another indication of the fundamental limitation of passive radiation detection.

Other phases of testing, particularly integration testing, uncovered multiple problems meeting requirements for successfully integrating the new technology into operations at ports of entry. Of the two ASP vendors participating in the 2008 round of testing, one has fallen several months behind in testing due to the severity of the problems it encountered during integration testing; the problems were so severe that it may have to redo previous test phases to be considered for certification. The other vendor's

system completed integration testing, but CBP suspended field validation of the system after 2 weeks because of serious performance problems that may require software revisions. In particular, CBP found that the performance problems resulted in an overall increase in the number of referrals for secondary screening compared to the existing equipment. According to CBP, this problem will require significant corrective actions before testing can resume; such corrective actions could in turn change the ability of the ASP system to detect threats. The problem identified during field validation was in addition to ones identified during integration testing, which required multiple work-arounds and cosmetic changes before proceeding to the next test phase. For example, one problem requiring a work-around related to the amount of time it takes for the ASP to sound an alarm when a potential threat material has been detected. Specifications require that ASPs alarm within two seconds of a vehicle exiting the ASP. However, during testing, the vendor's ASP took longer to alarm when a particular isotope was detected. The work-around to be implemented during field validation requires that all vehicles be detained until cleared by the ASP; the effect on commerce must ultimately be ascertained during field validation.

CBP officials anticipate that they will continue to uncover problems during the first few years of use if the new technology is deployed in the field. The officials do not necessarily regard such problems to be a sign that testing was not rigorous but rather a result of the complexity and newness of the technology and equipment.

Schedule Delays Have Allowed More Time for Analysis and Review of Test Results, but DNDO's Latest Schedule Does Not Include Computer Simulations to Provide Additional Insight into ASP Capabilities

Delays to the schedule for the 2008 round of testing have allowed more time for analysis and review of results, particularly from performance testing conducted at the Nevada Test Site. The original schedule, which underestimated the time needed for testing, anticipated completion of testing in mid-September 2008 and the DHS Secretary's decision on ASP certification between September and November 2008. DHS officials acknowledged that scheduling a certification decision shortly after completion of testing would leave limited time to complete final test reports and said the DHS Secretary could rely instead on preliminary reports if the results were favorable to ASPs. DHS's most recent schedule anticipated a decision on ASP certification as early as May 2009, but DHS has not updated its schedule for testing and certification since suspending field validation in February 2009 due to ASP performance problems.

Problems uncovered during testing of ASPs' readiness to be integrated into operations at U.S. ports of entry have caused the greatest delays to date and have allowed more time for DNDO to analyze and review the

results of performance testing. Integration testing was originally scheduled to conclude in late July 2008 for both ASP vendors. The one ASP system that successfully passed integration testing did not complete the test until late November 2008—approximately 4 months behind schedule. (The delays to integration testing were due in large part to the adherence of DNDO and CBP to the criteria discussed earlier for ensuring that ASPs met the requirements for each test phase.) In contrast, delays to performance testing, which was scheduled to run concurrently with integration testing, were relatively minor. Both ASP systems completed performance testing in August 2008, about a month later than DNDO originally planned.

The schedule delays have allowed more time to conduct injection studies—computer simulations for testing the response of ASPs and PVTs to the radiation signatures of threat objects randomly "injected" (combined) into portal monitor records of actual cargo containers transported into the United States, including some containers with innocent sources of radiation. However, DNDO does not plan to complete the studies prior to the Secretary of Homeland Security's decision on certification even though DNDO and other officials have indicated that the studies could provide additional insight into the capabilities and limitations of advanced portal monitors. According to DNDO officials, injection studies address the inability of performance testing conducted at the Nevada Test Site to replicate the wide variety of cargo coming into the United States and the inability to bring special nuclear material and other threat objects to ports of entry and place them in cargo during field validation. Similarly, while they acknowledged that injection studies have limitations, DOE national laboratory officials said the studies can increase the statistical confidence in comparisons of ASPs' and PVTs' probability of detecting threats concealed in cargo because of the possibility of supporting larger sample sizes than feasible with actual testing. A February 2008 DHS independent review team report on ASP testing also highlighted the benefits of injection studies, including the ability to explore ASP performance against a large number of threat scenarios at a practical cost and schedule and to permit an estimate of the minimum detectable amount for various threats.[16]

[16]DHS Homeland Security Institute, *Independent Review of the Department of Homeland Security Domestic Nuclear Detection Office Advanced Spectroscopic Portal: Final Report* (Feb. 20, 2008).

DNDO has the data needed to conduct the studies. It has supported efforts to collect data on the radiation signatures for a variety of threat objects, including special nuclear materials, as recorded by both ASP and PVT systems. It has also collected about 7,000 usable "stream-of-commerce" records from ASP and PVT systems installed at a seaport. Furthermore, DNDO had earlier indicated that injection studies could provide information comparing the performance of the two systems as part of the certification process for both primary and secondary screening. However, addressing deficiencies in the stream-of-commerce data delayed the studies, and DNDO subsequently decided that performance testing would provide sufficient information to support a decision on ASP certification. DNDO officials said they would instead use injection studies to support effective deployment of the new portal monitors.

Conclusions

Given that radiation detection equipment is already being used at ports of entry to screen for smuggled nuclear or radiological materials, the decision whether to replace existing equipment requires that the benefits of the new portal monitors be weighed against the costs. DNDO acknowledges that ASPs are significantly more expensive than PVTs to deploy and maintain, and based on preliminary results from the 2008 testing, it is not yet clear that the $2 billion cost of DNDO's deployment plan is justified. Even if ASPs are able to reduce the volume of innocent cargo referred for secondary screening, they are not expected to detect certain nuclear materials that are surrounded by a realistic level of shielding better than PVTs could. Preliminary results of DNDO's performance testing show that ASPs outperformed the PVTs in detection of such materials during runs with light shielding, but ASPs' performance rapidly deteriorated once shielding was slightly increased. Furthermore, DNDO and DOE officials acknowledged that the performance of both portal monitors in detecting such materials with a moderate amount of shielding would be similarly poor. This was one of the reasons that performance testing did not include runs with a moderate level of shielding.

Two additional aspects of the 2008 round of testing call into question whether ASPs' ability to provide a marginal improvement in detection of nuclear materials and reduce innocent alarms warrants the cost of the new technology. First, the DHS criteria for a significant increase in operational effectiveness do not take into account recent efforts to improve the current-generation portal monitors' sensitivity to nuclear materials through the "energy windowing" technique, most likely at a much lower cost. Data on developing this technique were collected during the 2008

round of performance testing but have not been analyzed. Second, while DNDO made improvements to the 2008 round of ASP testing that provided credibility to the test results, its test schedule does not allow for completion of injection studies prior to certification even though the studies could provide additional insight into the performance of the new technology. Without results from injection studies, the Secretary of Homeland Security would have to make a decision on certification based on a limited number of test scenarios conducted at the Nevada Test Site.

Assuming that the Secretary of Homeland Security certifies ASPs, CBP officials anticipate that they will discover problems with the equipment when they start using it in the field. Integration testing uncovered a number of such problems, which delayed testing and resulted in ASP vendors making multiple changes to their systems. Correcting such problems in the field could prove to be more costly and time consuming than correcting problems uncovered through testing, particularly if DNDO proceeds directly from certification to full-scale deployment, as allowed under the congressional certification requirement that ASPs provide a significant increase in operational effectiveness.

Recommendations for Executive Action

We recommend that the Secretary of Homeland Security direct the Director of DNDO to take the following two actions to ensure a sound basis for a decision on ASP certification:

- Assess whether ASPs meet the criteria for a significant increase in operational effectiveness based on a valid comparison with PVTs' full performance potential, including the potential to further develop PVTs' use of energy windowing to provide greater sensitivity to threats. Such a comparison could also be factored into an updated cost-benefit analysis to determine whether it would be more cost-effective to continue to use PVTs or deploy ASPs for primary screening at particular ports of entry.
- Revise the schedule for ASP testing and certification to allow sufficient time for review and analysis of results from the final phases of testing and completion of all tests, including injection studies.

If ASPs are certified, we further recommend that the Secretary of Homeland Security direct the Director of DNDO to develop an initial deployment plan that allows CBP to uncover and resolve any additional problems not identified through testing before proceeding to full-scale deployment—for example, by initially deploying ASPs at a limited number of ports of entry.

Agency Comments and Our Evaluation

We provided a draft of this report to DOE and DHS for their review and comment. DOE provided technical comments, which we have incorporated into our report as appropriate. DHS's written comments are reproduced in appendix II.

DHS agreed in part with our recommendations. Specifically, DHS stated that it believes its plan to deploy ASPs in phases, starting at a small number of low-impact locations, is in accordance with our recommendation to develop an initial deployment plan that allows problems to be uncovered and resolved prior to full-scale deployment. We agree that this deployment plan would address our recommendation and note that DHS's comments are the first indication provided to us of the department's intention to pursue such a plan.

In contrast, DHS did not concur with our recommendations to (1) assess whether ASPs meet the criteria for a significant increase in operational effectiveness based on a comparison with PVTs' full potential, including further developing PVTs' use of energy windowing; and (2) revise the ASP testing and certification schedule to allow sufficient time for completion of all tests, including injection studies. With regard to energy windowing, DHS stated that using current PVT performance as a baseline for comparison is a valid approach because the majority of increased PVT performance through energy windowing has already been achieved. While DHS may be correct, its assessment is based on expert judgment rather than the results of testing and analysis being considered by the department to optimize the use of energy windowing. Given the marginal increase in sensitivity required of ASPs, we stand by our recommendation to assess ASPs against PVTs' full potential. DHS can then factor PVTs' full potential into a cost-benefit analysis prior to acquiring ASPs. On this point, DHS commented that its current cost-benefit analysis is a reasonable basis to guide programmatic decisions. However, upon receiving DHS's comments, we contacted DNDO to obtain a copy of its cost-benefit analysis and were told the analysis is not yet complete.

With regard to injection studies, DHS agreed that the schedule for ASP certification must allow sufficient time for review and analysis of test results but stated that DHS and DOE experts concluded injection studies were not required for certification. DHS instead stated that the series of ASP test campaigns would provide a technically defensible basis for assessing the new technology against the certification criteria. However, DHS did not rebut the reasons we cited for conducting injection studies prior to certification, including test delays that have allowed more time to conduct the studies and the ability to explore ASP performance against a

large number of threat scenarios at a practical cost and schedule. On the contrary, DHS acknowledged the delays to testing and the usefulness of injection studies. Given that each phase of testing has revealed new information about the capabilities and limitations of ASPs, we believe conducting injection studies prior to certification would likely offer similar insights and would therefore be prudent prior to a certification decision.

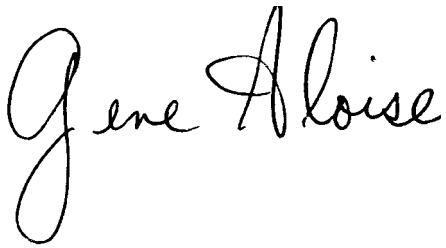
DHS provided additional comments regarding our assessment of the relative sensitivity of ASPs and PVTs and our characterization of the severity of the ASPs' software problems uncovered during field validation. With regard to sensitivity, DHS implied that our characterization of the relative ability of ASPs and PVTs is inaccurate and misleading because we did not provide a complete analysis of test results. We disagree. First, in meetings to discuss the preliminary results of performance testing conducted at the Nevada Test Site, DNDO officials agreed with our understanding of the ability of ASPs and PVTs deployed for primary screening to detect shielded nuclear materials. Furthermore, contrary to the assertion that a complete analysis requires a comparison of ASPs to handheld identification devices, our presentation is consistent with DHS's primary screening criterion for detection of shielded nuclear materials, which only requires that ASPs be compared with PVTs. Finally, while we agree that the performance test results require a more complete analysis, DNDO did not provide us with its final performance test report until early April 2009, after DHS provided its comments on our draft report. In the absence of the final report, which DNDO officials told us took longer than anticipated to complete, we summarized the preliminary results that DNDO presented to us during the course of our review as well as to congressional stakeholders.

With regard to ASP software problems uncovered during field validation, we clarified our report in response to DHS's comment that the severity of the problems has not yet been determined. DHS stated that its preliminary analysis indicates the problems should be resolved by routine adjustments to threshold settings rather than presumably more significant software "revisions." However, given the history of lengthy delays during ASP testing, we believe that DHS's assessment of the severity of problems encountered during field validation may be overly optimistic.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the Secretaries of Homeland Security and Energy; the Administrator of NNSA; and interested

congressional committees. The report will also be available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staffs have any questions about this report, please contact me at (202) 512-3841 or aloisee@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 key contributions to this report are listed in appendix III.



Gene Aloise
Director, Natural Resources
and Environment

List of Requesters

The Honorable Joseph I. Lieberman
Chairman
Committee on Homeland Security
and Governmental Affairs
United States Senate

The Honorable Henry A. Waxman
Chairman
The Honorable John D. Dingell
Chair Emeritus
The Honorable Joe Barton
Ranking Member
Committee on Energy and Commerce
House of Representatives

The Honorable Bennie G. Thompson
Chairman
The Honorable Peter T. King
Ranking Member
Committee on Homeland Security
House of Representatives

The Honorable Edolphus Towns
Chairman
Committee on Oversight and Government Reform
House of Representatives

The Honorable Bart Gordon
Chairman
Committee on Science and Technology
House of Representatives

The Honorable Bart Stupak
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The Honorable Greg Walden
Ranking Member
Subcommittee on Oversight and Investigations
Committee on Energy and Commerce
House of Representatives

The Honorable Yvette D. Clarke
Chairwoman
The Honorable Daniel E. Lungren
Ranking Member
Subcommittee on Emerging Threats,
Cybersecurity, and Science and Technology
Committee on Homeland Security
House of Representatives

The Honorable Charles E. Schumer
United States Senate

The Honorable James R. Langevin
House of Representatives

The Honorable Michael T. McCaul
House of Representatives

Appendix I: Scope and Methodology

To evaluate the degree to which Department of Homeland Security's (DHS) criteria for a significant increase in operational effectiveness address the limitations of the current generation of radiation detection equipment, we clarified the intent of the criteria through the Domestic Nuclear Detection Office's (DNDO) written answers to our questions and through interviews with U.S. Customs and Border Protection (CBP) officials. We also took steps to gain a fuller understanding of the strengths and limitations of the current-generation equipment, which the criteria use as a baseline for evaluating the effectiveness of advanced spectroscopic portals (ASP). In particular, we obtained copies of the Department of Energy (DOE) threat guidance and related documents used to set polyvinyl toluene (PVT) thresholds for detection of nuclear materials. We interviewed DOE and national laboratory officials responsible for the threat guidance about the process for developing it and the basis for its underlying assumptions, including shielding levels. We also interviewed DNDO and Pacific Northwest National Laboratory officials regarding the extent to which PVTs currently deployed at ports of entry meet the guidance and the development and use of energy windowing to enhance PVTs' sensitivity to nuclear materials.

To evaluate the rigor of the 2008 round of testing as a basis for determining ASPs' operational effectiveness, we reviewed the test and evaluation master plan and plans for individual phases of testing, including system qualification testing conducted at vendors' facilities, performance testing conducted at the Nevada Test Site for evaluating ASP detection and identification capabilities, and integration testing conducted at Pacific Northwest National Laboratory for evaluating the readiness of ASPs to be used in an operational environment at ports of entry. We also reviewed draft plans for field validation conducted at CBP ports of entry and the DHS Science and Technology Directorate's independent operational test and evaluation. In reviewing these documents, we specifically evaluated the extent to which the performance test design was sufficient to identify statistically significant differences between the ASP and current-generation systems and whether DHS had addressed our concerns about previous rounds of ASP testing. We interviewed DNDO, CBP, and other DHS officials responsible for conducting and monitoring tests, and we observed, for one day each, performance testing at the Nevada Test Site and integration testing at DOE's Pacific Northwest National Laboratory. We also interviewed representatives of entities that supported testing, including DOE's National Nuclear Security Administration and Pacific Northwest National Laboratory, the National Institute of Standards and Technology, and the Johns Hopkins University Applied Physics Laboratory. We reviewed the DHS independent review team report of

previous ASP testing conducted in 2007, and we interviewed the chair of the review team to clarify the report's findings. Finally, we examined preliminary or final results for the phases of testing completed during our review, and we interviewed DNDO and CBP officials regarding the results.

To evaluate the test schedule, we analyzed the initial working schedule DNDO provided to us in May 2008 and the schedule presented in the August 2008 test and evaluation master plan, and we tracked changes to the schedule and the reasons for any delays. We interviewed DNDO and other officials with a role in testing to determine the amount of time allowed for analysis and review of results. We interviewed DNDO and Pacific Northwest National Laboratory officials regarding the injection studies, including reasons for delays in the studies and plans for including the results as part of the ASP certification process.

We conducted this performance audit from May 2008 to May 2009 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.

Appendix II: Comments from the Department of Homeland Security

U.S. Department of Homeland Security
Washington, DC 20528

Homeland Security

March 24, 2009

Mr. Gene Aloise
Director, Natural Resources and Environment
U.S Government Accountability Office
441 G Street NW
Washington, DC 20548

Dear Mr. Aloise:

RE: Draft Report GAO-09-354SU, Combating Nuclear Terrorism: DHS Improved Testing of Advanced Radiation Detection Portal Monitors, But Preliminary Results Show Limits of the New Technology (360961)

The Department of Homeland Security (DHS) appreciates the opportunity to comment on the above referenced draft report and clarify several points. DHS is committed to rigorous testing prior to the deployment of new technologies and is pleased that the Government Accountability Office (GAO) recognizes improvements that the Domestic Nuclear Detection Office (DNDO) has incorporated into its testing programs.

The comments provided below in response to the subject report are restricted to points that are directly relevant to the three areas that GAO was asked to review: (1) the degree to which DHS's criteria for significant increase in operational effectiveness address the limitations of existing radiation detection equipment, (2) the rigor of Advanced Spectroscopic Portal (ASP) testing and preliminary test results, and (3) the ASP test schedule.

Report Recommendation: *"Assess whether ASPs meet the criteria for significant increase in operational effectiveness based on a valid comparison with PVTs' full performance potential, including the potential to further develop PVTs' use of energy windowing to provide greater sensitivity to threats. Such a comparison could also be factored in to an updated cost-benefit analysis to determine whether it would be more cost-effective to continue to use PVTs or deploy ASPs for primary screening at particular ports of entry."*

DHS does not concur with this recommendation.

It is the judgment of experts that the majority of any increased Polyvinyl Toluene (PVT) performance from energy windowing has already been achieved in the existing systems; therefore we are confident that using the current understanding on PVT energy windowing as a baseline is a valid approach. DHS believes that Customs and Border Protection (CBP), the Office of the Undersecretary for Management, and DNDO have collaborated to establish a meaningful set of criteria to measure the relative operational effectiveness of the current ASP

and PVT systems. Therefore, the current cost-benefit analysis is a reasonable basis to guide programmatic decisions. However, given that PVT systems will continue to be operated in the field, DNDO has initiated efforts to continuously improve the capability of the PVT systems. These efforts include an ongoing analysis of potential optimization of the PVT energy windowing capability that will proceed in parallel with other activities related to Certification.

Report Recommendation: *"Revise the schedule for ASP testing and certification to allow sufficient time for review and analysis of results from the final phases of testing and completion of all tests, including injection studies".*

DHS does not concur with aspects of this recommendation.

We agree that there must be sufficient time to review the analyses and results. The current schedule for certification is predicated on completing all of the requisite testing and analysis of results required to satisfy the criteria for demonstrating significantly improved operational effectiveness. DHS has demonstrated that it is implementing a deliberate process to ensure all the pre-established exit criteria have been achieved prior to concluding the relevant phase of testing.

However, a team of subject matter experts from the Department of Energy (DOE) and DHS concluded that injection studies were not required for Certification. The basis of this decision was a review of the series of test campaigns planned for ASP and the joint determination that these tests would provide a technically defensible basis for assessing the ASP technology against the Certification criteria. "Accordingly, Certification will be based on the whole body of experimental knowledge collected on ASP, including technical performance at Nevada Test Site (NTS), integration testing at 331-G, field validation at ports of entry, reanalysis of selected raw data files through a validated replay tool, and independent Operational Test & Evaluation. Nevertheless, DHS believes that injection studies are useful and will continue to support and perform them as an aid for deployment decisions and for future development.

Regarding the conclusions section in your report, we offer the following additional comments:

- Conclusions regarding the relative effectiveness of PVT and ASP to detect Highly Enriched Uranium (HEU) require a more complete analysis than given in your report. For example, the effectiveness of a system should include the entire system (primary plus secondary inspection). Such an analysis would necessarily incorporate a comparison of ASP to a hand-held RIID. Without including the whole system, conclusions about overall detection effectiveness are inaccurate and misleading.
- We agree with CBP that we will inevitably discover problems with this highly advanced and complex system as it transitions into field operation. There is simply no way to fully anticipate and replicate all real-world problems before deployment to the field: computer modeling and simulation does not provide the same level of experience or exposure. In anticipation of this fact, deployment will be accomplished in phases, starting with a small number of low impact locations. As the issues with the system are corrected, we will gradually build up to wider deployment. The process will be similar to what was used in the successful deployment of PVTs. Therefore, DHS believes ASP deployment will be implemented in accordance with your

recommendation to the Secretary to discover and resolve problems through initial deployment to a limited number of locations.

Finally, there were a few conclusions in the body of your report that we would like to comment on:

- We agree that the NTS test did not "*represent the full range of possibilities for concealing smuggled nuclear or radiological materials*" because such a range is impractically large to create. However, the NTS test campaign included an extensive array of shielding and masking configurations in a plan designed jointly by DHS and DOE to cover a range relevant to a passive radiation scanning application.
- Your report states that "*CBP suspended field validation after one week because of serious performance problems requiring software revisions.*" Although it remains for analysis to determine the severity of the problems encountered, preliminary analysis indicates that the problems should be resolved by making adjustments to threshold settings. Such adjustments are part of any installation of an RPM (PVT or ASP) and are not software revisions. As mentioned above, it is impossible to anticipate all the problems that will occur in real-world operation, so it is not surprising to encounter problems, given that this is the first opportunity for the latest version of ASP to operate in the flow of real commerce.

Thank you for the opportunity to review and provide comments on your report. We look forward to working with you on future homeland security issues.

Sincerely,

Jerald E. Levine
Director
Departmental GAO/OIG Liaison Office

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Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Gene Aloise, (202) 512-3841 or aloisee@gao.gov

Staff Acknowledgments

In addition to the contact named above, Ned Woodward, Assistant Director; Dr. Timothy Persons, Chief Scientist; James Ashley; Steve Caldwell; Joseph Cook; Omari Norman; Alison O'Neill; Rebecca Shea; Kevin Tarmann; and Eugene Wisnoski made key contributions to this report.

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