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DETECTING SMUGGLED NUCLEAR WEAPONS

HEARING

BEFORE THE

SUBCOMMITTEE ON TERRORISM, TECHNOLOGY AND HOMELAND SECURITY

OF THE

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THURSDAY, JULY 27, 2006

UNITED STATES SENATE,
SUBCOMMITTEE ON TERRORISM, TECHNOLOGY AND HOMELAND SECURITY, COMMITTEE ON THE JUDICIARY,
Washington, DC.

The Subcommittee met, pursuant to notice, at 2:15 p.m., in room SD–226, Dirksen Senate Office Building, Hon. Jon Kyl, Chairman of the Subcommittee, presiding.

Present: Senators Kyl and Feinstein.

OPENING STATEMENT OF HON. JON KYL, A U.S. SENATOR FROM THE STATE OF ARIZONA

Chairman KYL. All right. This meeting of the Judiciary Committee Terrorism, Technology and Homeland Security Subcommittee will come to order. I want to welcome all of you. Let me begin with my opening statement and then call on our Ranking Member, Senator Feinstein.

The 9/11 Commission said that the greatest danger of another catastrophic attack in the United States will materialize if the world's most dangerous terrorists acquire the world's most dangerous weapons. Our report shows that al Qaeda has tried to acquire or make weapons of mass destruction for at least 10 years. There is no doubt the United States would be a prime target.

In recent years, this Subcommittee has looked at threats posed by chemical, biological, and electromagnetic pulse attacks on the United States. Today, we will examine the most dire threat that we face: nuclear terrorism. We will be hearing from officials responsible for preventing the smuggling of nuclear weapons into this country, and we want to hear about the work that they are doing, the challenges they are facing, and what we in Congress can do to help ensure that the American people are protected from nuclear terrorism.

The 9/11 Commission's findings echo the argument of a review conducted before 9/11 by Howard Baker and Lloyd Cutler, which found, and I am quoting, that the "most urgent unmet national security threat to the United States today is the danger that weapons of mass destruction or weapons- usable material in Russia could be stolen, sold to terrorists or hostile nation states, and used against American troops abroad or citizens at home."

To Russia, we should now add other potential nuclear sources, such as Pakistan, Iran, and North Korea. Terrorists would need no more than 9 pounds of plutonium or 35 pounds of highly enriched uranium to create a nuclear explosion. A trained nuclear engineer—and there are plenty of them looking for work worldwide—could use this small chunk of material to create a nuclear device that would fit into a van or small watercraft.

There have been plenty of efforts by terrorists and smugglers to acquire these nuclear materials. According to the IAEA, between 1993 and 2004, there were 662 confirmed cases of smuggling of nuclear and radiological materials, and those were just the instances that we know about. of those confirmed cases, 21 involved materials that could be used to produce a nuclear weapon, and over 400 involved materials that could be used to make a dirty bomb. It is clear that this threat is very real and deserves our utmost attention.

Increased awareness of this threat spurred the President to create the Domestic Nuclear Detection Office within the Department of Homeland Security in April of 2005. DNDO was intended to be a single, accountable organization with dedicated responsibilities to develop the global nuclear detection architecture and to acquire and support the deployment of the domestic system to detect and report attempts to import or transport a nuclear device or fissile or radiological material intended for illicit use.

In addition to DNDO, other governmental agencies, such as the Defense Threat Reduction Agency and the National Nuclear Security Administration, play a role in preventing nuclear terrorism, We will hear about these organizations today and how they work with DNDO to keep America safe.

In its recent markup, the Appropriations Subcommittee on Homeland Security cut DNDO's research and development budget by 30 percent. We want to look today at the impact of that cut on the ability of the United States to develop technologies for detecting smuggled nuclear weapons. In addition, I look forward to discussing nuclear detection programs that may come before the Senate in the near future.

And, finally, I would like to consider the proposition that the United States is approaching the issue of nuclear detection at a far too leisurely pace. Some have advocated the Manhattan-type project as an approach to nuclear detection, modeled after the intensive all-out efforts by U.S. scientists to build the first atomic bomb. And I will be asking our witnesses today to address this and to give an idea of what additional funding could do for their offices and nuclear terrorism prevention in general.

The Committee will hear from five experts.

Mr. Vayl Oxford was appointed Director of the Domestic Nuclear Detection Office in September of 2005, reporting to the Secretary of the Department of Homeland Security, with responsibility for establishing the jointly staffed office and for directing all activities associated with the organization. Before this appointment, Mr. Oxford served as the transitional team leader and Acting Director of DNDO, and previously served as the Director for Counterproliferation at the National Security Council.

Dr. Peter Nanos is the Associate Director of Research and Development, Defense Threat Reduction Agency, DTRA. Before going to DTRA, Dr. Nanos was the Director of Los Alamos National Laboratory in New Mexico, having served since 2003. He was named the Interim Director of Los Alamos in January of 2003, is a retired

Vice Admiral of the United States Navy, and a 1967 graduate of the Naval Academy.

Dr. Steve Aoki is the Deputy Under Secretary of Energy for Counterterrorism. Before assuming this, he was Senior Adviser for International Affairs to the Administrator of the Department of Energy's National Nuclear Security Administration. Before joining DOE, he served at the U.S. Department of State as the Director of the Office of Proliferation Threat Reduction. From 1993 to 1996, he was on the staff of the National Security Council with responsibility for nonproliferation and export control policy. He also was a program manager at the Lawrence Livermore National Laboratory, which is part of the National Nuclear Security Administration.

Dr. Michael Levi is a Fellow for Science and Technology at the Council on Foreign Relations. He has also been a Fellow at the Brookings Institution and the Federation of American Scientists. Dr. Levi holds a Ph.D. in war studies from the University of London, Kings College, and an M.A. in physics from Princeton University.

And, finally, we are honored to have with us today Dr. Fred Ikle. Dr. Ikle is a Distinguished Scholar at the Center for Strategic and International Studies and a member of the Defense Policy Board. Before joining CSIS in 1988, Dr. Ikle served as Under Secretary of Defense for Policy during the first and second Reagan administrations and Director of the U.S. Arms Control and Disarmament Agency during the Nixon and Ford administrations. From 1999 to 2000, he served as Commissioner on the National Commission on Terrorism.

We have a distinguished panel of witnesses before us today. I am interested in examining with them how to make the Nation safer by developing and deploying nuclear detection technologies. In today's budget-constrained environment, we simply cannot spend money on every technology that might keep us safe. But if a nuclear 9/11 is, in fact, the greatest existential danger facing this Nation, then we must ensure that we are acting in a manner proportionate to the threat. That includes providing adequate funding, adequate authority, and adequate attention to the relevant agencies of our Government.

Today the Subcommittee will consider whether enough is being spent on nuclear detection and specifically what the likely impact will be of the appropriations cuts on DNDO's budget. In addition, I want to examine whether the money being spent is allocated correctly between organizations, missions, and technologies. And, finally, the Subcommittee is interested to know whether there is anything else the Congress can do to facilitate the work of the organizations represented here, and I certainly look forward to all of your statements and the lively discussion sure to follow.

In conclusion, let me also thank our Ranking Member, Senator Dianne Feinstein, who has been a real partner in this effort to deal with technology and terrorism from the very commencement of our Committee work a decade ago. I think without the close working relationship that our two staffs have and that Senator Feinstein and I have, we could not have made the progress that we have on so many different fronts. She is going to have to go to another Committee meeting in just a few minutes, and so I am going to give her the remainder of the time here and comment on anything that you would like, Senator Feinstein. But any questions that you would like to submit to the witnesses after you are gone, of course, will be submitted for the record, and we would like to get the responses from all of the witnesses to those questions.

Thank you.

STATEMENT OF HON. DIANNE FEINSTEIN, A U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator FEINSTEIN. Thank you very much, Mr. Chairman. Thank you for your leadership. It is hard to believe we have both been either Chairman or Ranking of this Subcommittee now for 10 years. I guess we both grow older in the process—hopefully wiser, too.

I would like particularly to recognize Pete Nanos. I would like to thank you for your work at Los Alamos on behalf of the University of California. It is much appreciated, and I hope you know that. I also welcome the other witnesses today.

As Senator Kyl inferred, Senator Lisa Murkowski is doing me really a great favor by hearing a bill which benefits the water situation in California, which in turn benefits the State of Arizona because it enables us to wean off of Colorado River water. So I figure I should, at the very least, show up for the hearing, and I will.

Let me begin by saying many lessons have been learned in combating the war on terror, and in turn, our Government has used a multi-layered strategy to protect our country. Central to the effort is the Government's focus on detecting and intercepting nuclear materials and technologies. And the goal is that neither falls into the hands of terrorists or those who might sell these weapons to terrorists.

Now, to many, such a threat seems remote, but, unfortunately, it is real. I was very surprised by this, but according to the International Atomic Energy Agency, from 1993 to 2004—that is 11 years—there were 662 confirmed cases of smuggling of nuclear and radiological materials worldwide—662 confirmed cases in 11 years. While all of these cases arose in and out of other countries, the United States is certainly not immune.

A recent GAO undercover operation proved that nuclear materials could be smuggled into the United States. GAO actually shipped here to Washington enough nuclear materials to build two dirty bombs through our Northern border and again through our Southern border.

I am pleased that the fault was not with the detection devices, and there are efforts under way to ensure that the mistakes that were made are not repeated. However, clearly, there is more that must be done, and, clearly, we still have problems on both our Northern and Southern border.

We have got to put in place an integrated system that provides our citizens with maximum protection against nuclear smuggling and do it in a way that is both efficient and cost effective. So I hope that our witnesses today will give us an update on where we are, describe options going forward, and suggest tangible solutions.

Let me mention some steps that need to be taken. Today, only 5 percent of containers at our seaports are screened. We all know that. GAO recently reported that DHS' deployment of monitors at seaports and Southwest border crossings is 2 years behind schedule. GAO reported that DHS may be facing a cost overrun of $340 million and that overall deployment may not be completed before 2014.

The new generation of radiation detectors are based on prototypes that GAO said were no more effective than the portals now in use and clearly not worth the price tag of almost 10 times the cost of the current detectors. So I hope that is something we will look into.

Even after DHS completes its efforts, it appears we will still not have a device that can detect a nuclear bomb encased in lead shielding or uranium placed in a lead pipe. And, finally, it is unclear why DHS is not prioritizing development of the integrated cargo inspection scanning technology that has shown such promise.

Now, I believe that our security situation has improved since 9/11, and I would not want to give a contrary view. And the efforts are, of course, greatly appreciated. But the bottom line here is better is simply not enough.

I would like to thank Senator Kyl for holding this hearing. I am delighted to work with him. And I think it is really very important that we tackle some of these specific issues and get some cost-effective answers.

I am awful sorry I cannot be here, but I do have a series of questions, and I will give them to you, Senator. If you would be willing to submit them, I would appreciate it very much.

Chairman KYL. Thank you very much. They will be submitted, and if there is nothing further, then I think the best thing to do is to start on my left and just start with Mr. Oxford and have each of the panelists in turn go ahead and make your statements, and then we will begin the questioning. Thank you, Senator Feinstein.

So, Vayl Oxford, the floor is yours.

STATEMENT OF VAYL S. OXFORD, DIRECTOR, DOMESTIC NUCLEAR DETECTION OFFICE, DEPARTMENT OF HOMELAND SECURITY, WASHINGTON, D.C.

Mr. OXFORD. Thank you, Mr. Chairman. It is a pleasure to come before you today along with my partners from the Department of Energy and Department of Defense to discuss how DNDO is responding to the threat of nuclear and radiological terrorism.

Today, I would like to briefly discuss the formation of DNDO and what its role is in protecting against this threat, some of our accomplishments over the last year since our inception, and some of our program priorities for the upcoming year. Then I will be glad to address some of the issues that Senator Feinstein brought up specifically.

I would like to talk specifically about how we are enhancing our detection capabilities through next-generation capabilities and how through transformational research will help to overcome some of our longer-term challenges.

Let me highlight some of the accomplishments we have made in the last year since our accomplishment and what our mission is.

First of all, as you noted, we were set up as a joint office in April 2005 to not only integrate DHS' efforts in nuclear and radiological threat response, but also to work as a singular authority with our partners to coordinate efforts across the U.S. Government to do this. We were assigned specific responsibilities, as you noted, to develop the global detection architecture that sets in place the global strategy for dealing with this threat; to develop, acquire, and support the deployment of the actual domestic component of that architecture; to direct the nuclear and radiological research and development program within DHS; and to serve as a focal point to help coordinate the activities across the executive branch.

In the year since its founding, the DNDO has taken major steps in accomplishing this mission. Let me cite some of our accomplishments.

First of all, we have completed the first ever global detection architecture that identified key vulnerabilities and priority initiatives across the Federal, State, and local arena. On July 14th of this year, we awarded three contracts with an estimated value of $1.15 billion for the next-generation passive radiation detection systems. The ASP program, the Advanced Spectroscopic Portal Program, will enter immediately into operational testing as well as by January into secondary screening operations with Customs and Border Protection. We expect full production to begin in 2007. These will be an integral part of our land border crossing and seaport architecture within the U.S.

We have completed two high-fidelity test and evaluation campaigns at our Nevada test site to fully characterize systems performance before we do go to deployment, and we have also completed a test series on the handheld, backpack, and mobile detection systems. As we speak, we are conducting a test and evaluation campaign to look at radiation detection pagers that our law enforcement and Federal officials routinely use in the field to make sure we understand their full performance.

We have also begun the development of next-generation radiography systems to deliver imagine systems that will allow us to detect the shielding associated with the threat that Senator Feinstein mentioned.

Finally, we are very close to awarding contracts for the next-generation improved handheld and backpack systems to deal with other avenues of our architecture.

We are also taking steps to expand our detection capabilities into aviation and maritime domains and within the domestic interior. Deployments of radiation detection equipment at U.S. airports will begin with a pilot deployment later this year at Dulles Airport, and ultimately we will have a total of 30 airports equipped with radiation detection equipment. We have also committed to provide handheld and backpack radiation detection systems to the Coast Guard to allow them to successfully interdict radiation and radioactive materials offshore.

We have launched a Southeastern Transportation Corridor Pilot program to deploy radiation detectors to truck weigh stations and other sites and, in addition, are providing the State and local authorities with the necessary training and reachback and operational protocols to effectively operate those.

As Secretary Chertoff officially announced 2 weeks ago, we have also launched the Securing the Cities initiative that will enhance protection and response capabilities in and around the Nation's highest-risk urban areas. Using the New York area as our initial engagement, the DNDO and its regional partners will develop analytically based architectures, planning, equipment, and the necessary support infrastructure to protect those cities. We also plan to train over 1,500 operators at the State and local level in the use of this kind of equipment.

There are remaining challenges, however, key, long-term challenges and vulnerabilities in our detection architecture that require a well-supported research and development program. These challenges include detecting threats from greater distances, in highly cluttered backgrounds, or in the presence of shielding and masking materials.

Our exploratory research program is focused on innovative detection materials, advanced special nuclear material detection and verification, and algorithm development. We have received over 150 proposals in response to the solicitation to National and Federal Laboratories, resulting in almost $40 million in research and development programs. A March 2006 solicitation for private industry and academia resulted in over 200 white papers, and we are currently evaluating 74 proposals for additional awards. In the upcoming year, we plan to begin our academic research program, which will fund colleges and universities to pursue innovative nuclear detection concepts and encourage them to train graduate students in the field of nuclear detection and related sciences.

This concludes my prepared statement, and with the Committee's permission, I request my formal statement be submitted for the record and, Mr. Chairman, I will be glad to take any questions you have.

Chairman KYL. Without objection.

[The prepared statement of Mr. Oxford appears as a submission for the record.]

Chairman KYL. Thank you.

Dr. Aoki?

STATEMENT OF STEVEN AOKI, DEPUTY UNDER SECRETARY FOR COUNTERTERRORISM, DEPARTMENT OF ENERGY, WASHINGTON, D.C.

Mr. AOKI. Mr. Chairman, thank you very much for the opportunity to appear today to discuss nuclear terrorism and, in particular, how to prevent terrorists from attacking the United States with nuclear or radiological weapons. As requested, I submitted a written statement for the record, so I will confine my oral remarks to a few points.

First, this is a hard problem. Detecting a clandestinely transported nuclear weapon or materials to build one is inherently difficult. The radiation signatures emitted by fissile materials are relatively weak and can be further attenuated by shielding. Nonetheless, we believe this is a problem that can be successfully addressed, particularly for situations like land or seaports of entry where we potentially have enough access to the items being inspected to have a good chance of detecting a smuggled weapon. We are working closely with colleagues at DNDO, DOD, and other agencies to develop, test, and implement the most effective technology for this mission. We are also pursuing research and development to improve current systems and to explore fundamental advances in detection technology.

The built-in challenges of the detection program, challenges brought to us by the laws of physics, make it vitally important that our approach to detection be embedded in a comprehensive, overall strategy that looks for multiple opportunities to prevent an attack. We need to block every step along the way, from terrorist acquisition of nuclear materials through delivery to the target, and to be ready to disarm a terrorist device should we uncover one before it is detonated.

We also need to build the capability to identify the source of any illicitly obtained nuclear materials, both to track down weaknesses in security and to hold accountable those who contribute to an attack.

Even if our individual measures and individual steps are not perfect, a coherent strategy can help deter attack by increasing its difficulty and reducing the likelihood that it can be carried to completion. Such a strategy necessarily cuts across traditional agency lines and responsibility, and we, therefore, welcome the role that DNDO is now playing to develop and articulate an overall strategic architecture that includes contributions from a number of Federal agencies, each acting with their own authorities and budgets.

When you take a strategic look, this underscores the value of preventing terrorists from acquiring nuclear weapons or materials in the first place. Although it is outside the scope of today's hearing, I would note that DOE and other agencies have over the past decade made major investments to strengthen the security of nuclear storage sites in Russia and other countries, with this threat very much in mind. We have done even more to provide strengthened security at our own nuclear facilities in the United States.

A related observation reflecting our experience in deploying nuclear detectors internationally and in conducting nuclear search operations is that attention must be given to the overall concept of operations for finding nuclear materials, not only the performance of individual portal monitors or the detectors.

Our detection system needs to be able to identify the wide variety of natural and manmade sources of radiation that it may encounter in commerce or in ordinary shipments, but also to respond effectively and quickly if an alarm turns out to be real.

As we increase the deployment of nuclear detection equipment by Federal, State, and local government authorities, we need to ensure that we also strengthen the ability to call in higher-level expertise, including national Render Safe Teams, when and if needed.

Let me conclude with a brief summary of what DOE as an agency contributes to the nuclear detection mission.

First, we operate the National Laboratory system that maintains expertise on nuclear weapons and related areas of science. Within the National Labs, DOE funds R&D specifically focused on the problems of nuclear detection. All of the agencies represented on this panel, and a number who are not here today, draw heavily from the National Labs' science base in carrying out their own missions.

Secondly, as I mentioned, DOE's Defense Nuclear Nonproliferation Program carries out extensive cooperation with other countries aimed at improving security for nuclear materials and weapons. Through the Second Line of Defense and MegaPorts activities, DOE also provides assistance to install nuclear detection equipment at foreign border crossings and major seaports. These programs are important components of the overall detection architecture being developed by DNDO.

Thirdly, DOE's Office of Emergency Operations provides technical support for nuclear search operations, for disarming and disposing of a terrorist nuclear device should one be discovered, for attribution and consequence management in the event of a terrorist of any kind involving nuclear or radioactive materials. This mission is carried out by the specialist teams involving DOD or FBI as well as DOE experts.

This concludes the prepared remarks, and I look forward to your questions and discussion. Thank you.

[The prepared statement of Mr. Aoki appears as a submission for the record.]

Chairman KYL. Thank you, Dr. Aoki.

And now Dr. Pete Nanos.

STATEMENT OF GEORGE PETER NANOS, ASSOCIATE DIRECTOR, RESEARCH AND DEVELOPMENT, DEFENSE THREAT REDUCTION AGENCY, FORT BELVOIR, VIRGINIA

Mr. NANOS. Mr. Chairman, it is an honor to be here today to address the Defense Threat Reduction Agency's Radiation Detection program. I will excerpt and highlight a couple of issues from my prepared remarks.

As the Associate Director for Research and Development at DTRA, I am responsible for making R&D investments in capabilities to reduce, eliminate, counter, and defeat the threat of weapons of mass destruction and mitigate their effects.

Most importantly, the Defense Threat Reduction Agency is a combat support agency, which means that the warfighter in the field is our customer and primary focus. Since our establishment in 1998, we have been providing capabilities for the Department of Defense's nonproliferation, counterproliferation, and consequence management programs—the three pillars of the President's National Strategy to Combat WMD.

As the President stated in March 2006 in the National Nuclear Security Strategy of the United States, "There are few greater threats than a terrorist attack with WMD." That message has been reflected throughout DOD guidance documents, starting with the National Security Strategy and included in the National Defense Strategy, the National Military Strategy, and the National Strategy to Combat WMD.

Further, in the report of the 2006 Quadrennial Defense Review, there is additional guidance. It calls on the need to generate the capabilities to locate, tag, and track WMD, their delivery systems and related materials, including the means to move such items; the capabilities to detect fissile materials such as nuclear devices at stand-off ranges—and the emphasis here is on stand-off ranges for DOD; interdiction capabilities to stop air, maritime, and ground shipments of WMD, their delivery systems, and related materials;

and persistent surveillance over wide areas to locate WMD capabilities or hostile forces.

The Department of Homeland Security Domestic Nuclear Detection Office, with personnel from several Federal departments, has drafted a global nuclear detection architecture. The Department of Defense retains the responsibility for implementing their parts of that architecture, both within their facilities in the United States and as part of its operations outside the United States. DOD is working with the other Federal departments to draft a Memorandum of Agreement to promote an integrated national research and development effort, without duplication, to provide better nuclear and radiological detection.

Our DOD-specific missions require mobile and transportable detection systems. Stand-off is important, and even more important than that is high search rate. DOD has the responsibility to go into hostile environments, locate materials rapidly, and fix the situation. That requires a different technology in some cases; in other cases, different applications of technology in order to do that job properly.

I do not mean that there is no overlap between our missions. Clearly, DNDO is interested in putting detectors in backpacks and mobile vehicles to use to protect our borders. However, the focus of our operations is different, and so some of the details of the engineering is different. The important thing, I think, between us is that we maintain a comprehensive S&T program that covers all the needs; we make sure that we share so that there is no duplication; and that we do the best we can to give our country the needed capability.

The Department has focused on the WMD challenge for many years, and we have been making steady progress in expanding our capabilities to combat WMD and in building interagency partnerships. The QDR continues this momentum by providing specific near-term direction and longer-term guidance on capabilities and the required investments.

Mr. Chairman, this concludes my remarks. I would be pleased to respond to any questions you might have.

[The prepared statement of Mr. Nanos appears as a submission for the record.]

Chairman KYL. Thank you, Dr. Nanos.

Dr. Levi?

STATEMENT OF MICHAEL A. LEVI, FELLOW FOR SCIENCE AND TECHNOLOGY, COUNCIL ON FOREIGN RELATIONS, NEW YORK, NEW YORK

Mr. LEVI. Mr. Chairman, thank you very much for inviting me to speak to you today about the challenge of detecting the smuggling of nuclear weapons and about the potential for transformational research in particular.

I should say it is also an honor to sit here alongside so many dedicated and accomplished public servants.

The threats from nuclear terrorism and from covert nuclear attack by a state are substantially different. We are speaking about both of them here today, but I want to separate my remarks on each of the two. I am going to focus on nuclear terrorism first.

The first important point is that security at the source of nuclear materials is the most important part of the defense, but at the same time it is insufficient alone.

The second important point to keep in mind is that preventing nuclear smuggling is different from preventing the acquisition and movement of radioactive materials. What we are fighting is terrorists with limited, though often substantial, capabilities that must acquire, possibly build, transport, and detonate a weapon, none of which, aside from perhaps the last step, are all that easy. And they have to do that within some strategic, political, or religious context that they have.

Correspondingly, detecting nuclear smuggling involves detecting nuclear materials, but it also involves detecting nuclear terrorists, operations to build nuclear weapons, and the supporting fundraising, recruiting, and operational security efforts. On top of that, those efforts have to work together as a system.

What does this mean for technology? The first thing we need to understand is that terrorist groups have varying capabilities and goals. That means that some may be more challenging than others. It is important to look at the worst-case scenario. It is also important to design defenses that could defeat less than worst-case plots. Experience from defense planning has taught us that designing a defense against the worst case does not always provide an appropriate defense against other targets. For materials in particular, that means looking at detecting shielded highly enriched uranium, but also at other target materials.

How about transformational technology? First, it is very important, as Steve Aoki mentioned, that there are fundamental physical limits to what you can do in transforming technology. But there is room for progress.

I want to make a few basic points, and the theme here is that there is room for improvement in the hardware, but that transforming detection is about more than hardware.

We can improve detection sensitivity. We can also combine detection of radiation with detection of other materials that might be involved in nuclear terrorism. Shielding is one. Combining detection with profiling of potential terrorists is another. Detecting the explosives that might be part of a nuclear weapon and combining that, in particular in an automated way, getting the right software with nuclear radiation detection is important.

Another opportunity, combination of hardware and software, is the ability to integrate multiple detectors, wide networks of detectors. That requires software to combine the pieces. It also requires portability, lower power, and lower cost for detectors.

And, finally, we need to think about transformational concepts of operations, in particular leveraging intelligence to make best use of our detectors. The biggest source of intelligence may be at the source. The systems we are installing to prevent the theft of materials may also provide us with warning that theft has occurred.

Let me describe a handful of specific policy measures that I think these imply. The first is that transformational technology is worth not only the investments that are occurring now, but is worth greater investment. The budget for transformational technology at DNDO is smaller than all but one program budget at DARPA, the

Defense Department's long-term, high-risk, ambitious detection program.

On top of that, we need to make sure we are doing this in the widest context possible. DNDO is integrating radiation detection efforts. We need an approach that integrates all of our efforts to defend against nuclear terrorism. I would recommend that the place to do that is at the National Counterterrorism Center, the NCTC, both to lay out the responsibilities across departments and to make sure we have the right underlying intelligence assessment of what exactly the threat is to design and measure our efforts against.

Thank you for your attention. I look forward to your questions.

[The prepared statement of Mr. Levi appears as a submission for the record.]

Chairman KYL. Thank you, Dr. Levi.

And now Dr. Fred Ikle.

STATEMENT OF FRED C. IKLE, DISTINGUISHED SCHOLAR, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES, WASHINGTON, D.C.

Mr. IKLE. Mr. Chairman, thank you for inviting me to testify here. I am the rear guard for these excellent four witnesses, so I am in charge of looking backward.

A sense of history helps us prepare for the future. Eleven years ago, the Defense Science Board fully explained the need for better tools to detect smuggled nuclear weapons and proposed specific technologies that could and should be developed. 2 years later, the Defense Science Board reiterated these recommendations. In 1999, the National Intelligence Council issued a report pointing out that smuggling nuclear weapons is much easier than building missiles and nuclear warheads that fit into them. Indeed, putting a nuclear warhead in a large container is less difficult than putting one into a missile cone.

Yet, even including the Hart-Rudman Commission, Mr. Chairman, that you mentioned, nothing was done until 9/11.

But even then, after 9/11, it was a long, uphill struggle to overcome the bureaucratic obstacles, including some people who mistakenly, unlike Dr. Levi, talked about physical limits as an absolute limit that you could not—that prevented you from making any progress. And that was an obstacle for a full year. But thanks to Vayl Oxford's leadership, the interminable interagency debates about road maps were finally terminated and replaced by real research; real work at the laboratory benches is what we need.

And as Dr. Nanos testified, the Defense Threat Reduction Agency is ramping up research and development on the specific, quite different nuclear detection systems that the combat commanders so badly need. Whether this urgent R&D for our military needs can move ahead with enough speed and conviction will be decided in part by Congress, especially the Appropriations Committees. What budget levels should be met for these military needs? In my rough estimate, a ramp-up to $200 million for fiscal year 2008 would be about right as a target. Compare this with the $251 billion next year—just 1 year—for the F-35 fighter aircraft, more than a thousand times larger than protecting us from nuclear weapons, or the more than $10 billion next year, more than 50 times larger, for missile defense. Now, I am all for missile defense and have spoken up on that for a long time. We need it. We need it to close half the barn door. But we must not leave the other half of the door open to smuggled nuclear weapons.

Mr. Chairman, I shall use my remaining minutes to focus on the Pentagon's challenges since the homeland security needs have received far more attention and are better understood. Assume the President has just received a reliable intel warning that a nuclear bomb is being smuggled on one of several ships sailing from North Korea. He would turn to the Department of Defense to take lead action to find this bomb and render it harmless. But today neither the Defense Department, nor DOE, nor Homeland Security, nor the FBI have the tools to find and safely disarm this bomb. The Navy could sink every ship sailing from North Korea, without proof which ship had the weapon and without confirmation that any of the ships had a nuclear bomb. Considering our intelligence quarrels about Saddam Hussein's WMD, I am not sure we want to go that route?

A Spanish philosopher once said, "The beginning of wisdom is fear." But it is painful to explore the abyss of a justified deep fear. We have become so used to the non-use of nuclear weapons, a dispensation that lasted for more than 65 years—one of the greatest accomplishments in all of military history.

But the morning after, when this dispensation has abruptly come to an end, what will we do? All the concerns about affecting the public by active interrogation that Dr. Aoki properly referred to, all the budget constraints would be swept away. Dr. Nanos' agency would be funded with billions to develop and build the technology—precisely the technology recommended more than 10 years ago, but which we failed to build when we used the time to fill spiral-bound reports with "road maps" and "architectures."

Now, Congress has invested a great deal in improving the intelligence capabilities, which is fine. But a priority of this effort has been directed against individuals and organizations attempting to prepare an attack—cell phone chatter and financial transactions, suspicious people taking pictures below the Brooklyn Bridge, airplane passengers arriving with names on a list. This works when it takes a lot of people to do limited damage.

But once the ultimate evildoers obtained a nuclear bomb and know how to detonate it, they do not have to chat on cell phones; they do not have to take pictures below a bridge, because the blast will destroy it from any angle; they will not use a passport with a name like Osama bin al Qaeda. So the suspect search for people will be less effective than the search for fissile materials. If only we had built the very best technology for this search.

We have to take the enemy into account, Mr. Chairman, or as Winston Churchill put it: However absorbed a commander may be in the elaboration of his own thoughts, it is necessary sometimes to take the enemy into consideration.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Ikle appears as a submission for the record.]

Chairman KYL. Well, thank you very much, Dr. Ikle, and all members of the panel. I think your last comment helps me to put into perspective the questions that I would like to pose.

I have to some extent assumed, but will state specifically, that we all acknowledge the nature of the enemy that we are concerned about here today, an enemy that is so bent upon achieving its goals that it will literally stop at nothing, including overriding that 65-year nuclear dispensation that you spoke of, Dr. Ikle.

I do not have any doubt, having served on the Intelligence Committee and being familiar with what all of you are familiar with, that if certain terrorist groups were able to get their hands on a device which they could detonate, that they would try to find a way to do it.

If we all agree to that, then it would be unthinkable for us not to do everything we could within reason to obviate that threat. Intelligence is, of course, the key place to begin. Dr. Levi pointed out that it goes far beyond just a detection device proposition. You would look at all the different ways in which it could be done and try to determine whether you can find out things about the people or the transportation methodologies or the other ways that you might have to detect the threat when it came. But at the end of the day, I think Dr. Ikle is correct. A lot of questions would be asked after the fact why you did not have a better way of finding out that this was going to happen or potentially detecting it.

Now, I acknowledge the different responsibilities, and one of the benefits of having a panel such as we have today is that we have a glimpse of each of the entities that have the primary responsibility for our Government's response to this as well as to area outside experts, both with experience.

Do I understand—and I primarily ask the three of you this question, but anybody can chime in. Do I understand that in a very rough way, the research part of the effort is for the most part led by the Department of Energy; the applied technology deployment into the field to do the very best detection that we can with what we have available now is done through the Department of Homeland Security; and the application of what we need for the purely or primarily military applications would be accomplished through the Department of Defense; but that there is a lot of overlap? And, in fact, part of my question here is: Is the DNDO R&D group where the priorities are set, or is there some other level that goes across our governmental agencies that actually set the priorities for both the research and deployment of whatever technologies we have?

Now, those are actually two questions, so any of you, since nobody else is here, we do not have a time limit. Let's just have a conversation about this. Let me start with Dr. Oxford.

Mr. OXFORD. Mr. Chairman, if I could address that, and then ask Steve and Pete to jump in as necessary.

First of all, the overarching technology road map that helps construct the executive branch's response to this was actually done through the OSTP office within the White House, and we all contributed to the respective contributions to that.

I think regarding your former question, both Steve and I own what I call transformational research; I think he calls it foundational research; but we do de-conflict those. For example, when he goes out and solicits proposals from the National Laboratories, I contribute members of his team to do the selection and do the proposal review so we understand where each of us are investing and how that will either transition to later stages of development or how we can de-conflict that directly.

But our transformational research program is tied directly to our architecture, where he has broader objectives that allow him to address. We do take our transformational research program against our architecture as a backdrop for longer-term solutions that ultimately will lead to the system solutions that you referred to.

Chairman KYL. Dr. Aoki?

Mr. AOKI. Mr. Chairman, just to add a little bit to Vayl's comments, I think one way to think about this is that there really is sort of a core science base, and DOE does and has over the years contributed to maintaining that science base. But because the solution to this problem, as several of the witnesses have pointed out, requires not only the kind of integrated system that DNDO is developing for detection in this country and at our borders, but also the best use of our intelligence resources, and ultimately perhaps our military resources, one of the things that we do is provide a lot of support for some of the other agencies. And so we work very—you know, our R&D programs work very closely with the intelligence community. We work very closely with DOD. We actually do provide a lot of applied R&D that is directed at their missions as well as at some of our own specialty areas, like the Render Safe Teams and Emergency Response Teams.

So there may appear to be a certain amount of overlap. Some of that is inevitable because what you have here is a number of product lines, if you will, being built on top of a common substructure. We do work very hard at trying to coordinate, trying to get the priorities right, and trying to make sure that we are not keeping each other in the dark about what is going on. Some of that is informal; some of that is formalized.

Chairman KYL. And I should not have shorted DTRA's research role as well. Perhaps in the way I asked the question I did. I am sure Dr. Nanos will correct that.

Mr. NANOS. Well, sir, I would like to say that the National Labs are a treasure in this regard. I mean, in terms of the development of a lot of the detection technology, and even when we are engaged with the universities or industry development sources, they provide the people that help us sort it out and put sanity in the equation and understand what we have.

The DOD part of the equation, I think, I like to describe is a little bit different, and we may push on some technologies that would not—which might be being worked by others but would not necessarily be their first priority. If you think of Dr. Ikle's scenario and back it up to prior to when the material gets shipboard and you—first of all, you need to study the terrain, the background, and understand where the material—what pathways it might take because time is clearly of the essence and you need to get out there and find the material now before it gets too close, or even worse, if it were diverted and went after an important overseas target.

And so for that reason, we have to apply a long stand-off, potentially high-energy active sources to ferret out the material, and some of that in the hazardous environment we would operate in and with the rules of engagement might not be suitable for use in the other agencies' scenarios, but would be perfectly acceptable in the combat conditions or near-combat conditions we would find ourselves in.

So we will be pushing predominantly in that direction and developing and hopefully sharing that technology, obviously, but we may be pushing it harder in that direction than others would do. But, of course, at the same time, we will be relying on the DOE laboratories to provide us the scientists to help us do that.

Mr. LEVI. Let me just make a couple comments. Two witnesses have pointed out that active interrogation technology, which, in particular, lets you deal with some shielding challenges, is acceptable in different ways in different situations. The hazards to people, to operators, and to enemy combatants are all judged in different ways. There is an in-between scenario also. If we have strong intelligence, not even after a single attack but strong intelligence that material has escaped, we might be willing to cross over other lines. But that requires a conversation now about what the rules are and what rules we would use in the future that can guide the technology development. It is not technology in a vacuum. It is technology within a context that we need to look at.

We are not going to develop the technology during the time frame between warning and possible attack. We have to look at it now.

We also talked a bit about a scenario where a state lets material go, where a state deliberately tries to attack covertly. And I think Steve Aoki's point earlier about the necessity of investing in attribution so that states cannot do this anonymously is incredibly important. And it is also important to understand that this is not primarily a technology effort to characterize the materials after an attack or before an attack. That is part of it. But the biggest shortfall right now is having fingerprints to match whatever we find to.

There are important things that have been done. There is more important analysis and more in the way of intelligence operations that could be done. And there also needs to be better integration across the U.S. Government.

I do not hold a clearance, but I have been told that there is poor sharing in some important cases between critical parts of the U.S. Government in what they know about foreign nuclear materials holdings. And I think that would be very important to investigate and to address if that problem genuinely does exist.

Chairman KYL. Dr. Ikle?

Mr. IKLE. The useful distinction that we can see percolating through these good responses is really peacetime prevention, which DNDO is rightly focused on, enormously important, and wartime response with DTRA, for which DTRA has to equip the Department of Defense. And different rules apply. Different rules can be used. It is really almost an entirely different world if you think of the full consequences that we get into in a world after a nuclear weapon has been used.

Having said that, I am little bit troubled occasionally by the use of the word "architecture." It sounds kind of good, purposeful building of a big program, a big structure. But architects normally know their building materials. They know what the beams can carry. They know what the roofing can do. And so even for the most ambitious structures, they know what they work with.

In this area, it is the very materials, the tools, the detection equipment that is in flux, that should be greatly improved. And as we improve it, the architecture will change. So this has to be an iterative process. Otherwise, it is like you were trying to build an air force architecture with the bases, the hangars, the logistics department, training of the pilots, but you do not want the airplanes are like. And that is a bit the situation we are in here.

So we have to think more of an iterative process where we get better tools and we can do different things with the structure, the deployment, or call it the architecture, based on these different tools.

Finally, a very brief word on attribution, which was properly raised by Dr. Levi. That is a deep problem, and as was indicated, it gets into classified areas. I do not know whether your Committee wants to have a closed hearing on that sometime, but it is a big problem area. That is all I can say now.

Chairman KYL. Well, and it would be wonderful if we could say someday soon in an unclassified way that our scientists have now figured out a way, going back to the genomic kind of projects in biology, to figure out the source of every nuclear emission should there be some kind of material released from an explosion. And so whoever you are thinking about doing it, just like the FBI and the fingerprints, we will find you because we know what each of you have.

It would be nice to be able to use that as a deterrent, so if you have that capability, it is one that you probably want to announce in advance.

Mr. IKLE. Mr. Chairman, I think it is around the corner, and we hope will have it before the first attack.

Mr. LEVI. You can also go partway to disclosing your capabilities in order to achieve a meaningful deterrent. There is an analogy here. When states like India and Pakistan developed nuclear weapons, they did not release all the details of what they were doing, but they published limited amounts in technical journals to show that they had certain capabilities.

I have encouraged DOE scientists to try to look at doing something similar—publishing enough to get the other guy worried, but not enough so that he can evade your defense.

Chairman KYL. And, of course, I think it is obvious that there is much about this entire area that is classified and obviously has to remain classified.

One of the undercurrents to the testimony here is the relative priority of spending on near-term detection devices and programs that enable us to meet a potential current threat, on the one hand, versus the kind of research that has got to be done for more robust activity. To some extent, that also breaks down between the non-military and military, although to some extent, while you might consider the military the more active or robust threat, it does not necessarily have to be.

And so I am wondering how each of you would evaluate—and, in particular, I will put this to Dr. Oxford, too—how we evaluate our spending priorities with the kind of spending reductions that I talked about in my opening statement and what kind of impact that has and what we can do about that.

Now, I know you did not come here to complain, so I am eliciting this information from you under penalty of something.

Mr. OXFORD. Mr. Chairman, I understand the budget pressures that we are all under, and I will try to not make this sound like a complaint.

First of all, getting to the basis for your question, we think right now, given the sparsity of what this country has been investing in this area, we have got to have a balance between near-term and future capabilities. For example, the contracts that I mentioned that were awarded on the 14th of this month will be our next-generation technologies for probably 10 years. The upgrades to those systems in the passive detection arena are going to come primarily in two areas: upgraded software, which can be immediately downloaded in the fielded systems so the hardware investment is not wasted, because we have actually already set up a national algorithm team that consists of national experts from the laboratories as well as industry to constantly improve the algorithms in which these detectors will give us the answers. So I think that becomes a very cost-effective solution.

Separately from that, both DOE and ourselves, and I am sure Dr. Nanos ultimately—I am not sure what his program looks like right this minute—will be investing in advanced detector materials. Now, based on our design philosophy, at least for the domestic systems, we are building these in a way that we can retrofit. So if we come up with a replacement to sodium iodide—for example, lanthanum bromide is one of the detector materials that is being looked at pretty hard—we would have a design methodology where we could retrofit our systems, just like we will the software, to upgrade those systems as new materials become available.

So that kind of balance allows us to do things now without waiting for the future necessarily, so we get what we call capability and coverage, expecting then improvements to come over time.

Now, there are long-term challenges that we just do not have capabilities for right now, and that is why we still need that balance in the longer-term R&D. As Dr. Nanos has mentioned, and in my opening statement I mentioned, stand-off distances for detection is problematic, and we need to aggressively look at what we can do in that arena.

Regarding the reductions that are currently in the Senate mark, there was $35 million of a $100 million reduction in our transformational research program that will affect many of the programs that we expected to start next year. Specifically, the academic research program, which we think is the future for this country in this area, was essentially zeroed out. That will hurt our ability to get the universities and colleges engaged in this topic to bring the best and the brightest to the forefront, you know, in the 5- to 10-year horizon.

So we think in the transformational side that we need to work with the Senate in the conference process to see if we can restore that.

Likewise, some of the other reductions will affect our ability to start working with our major urban areas to help them provide detection systems to protect them against a weapon that could be developed inside this country. So just looking outwards from the border may not be an effective solution, especially for a dirty bomb, where the materials could come from a domestic source and essentially be transported directly into one of our major urban areas.

So there are a variety of things like that. The shielding problem that we have talked about, that program was cut in half in the 2007 mark. That will be our next-generation capability to actually automatically identify shielding in cargo. So we think those become critical vulnerabilities as we go forward over time.

Chairman KYL. Okay. Thank you.

Others? Dr. Nanos?

Mr. NANOS. I would like to emphasize something that

Mr. Oxford said, the system aspects of what we are talking about. You know, a detector, an individual detector, is a component of an overall system, and if you think of the radar now to the transmitter-receiver processing software and that sort of thing, each mission has sort of a system aspect to it that we have to develop. And as new technologies come along, you do not throw away the system. You introduce it to the system. And I think that is an important point.

And I think that part of this effort and a very important part of it is to work the system aspects of this and then to optimize the components for these systems.

The detection business 10 years ago was largely one that was based on protection of people and some detection of events, but not trying to prevent smuggling or not trying to locate material the way we are today in the field. So some of the—although we did a lot of work on detectors, we did not do it in the system context. And I think that is probably—Vayl, I don't know if you agree with that, but I think that is probably one of the biggest sea changes that we are undergoing right now.

Mr. OXFORD. Mr. Chairman, if I could add to something, Dr. Ikle mentioned something, that there has been probably a 50/50 split in the technical community as to whether we are at our physical limits on understanding this problem or being able to do something about it. Let me just give you one analogy that suggests that we are not.

I would contend that the detector community has never met the signal processing community, so what Pete is saying I think is absolutely true. There are things we can do in the signal processing area, just like we did in the ASW business for years, that will allow us to start to take some of these signatures that are buried in a cluttered environment and extract them.

The detector community did not necessarily worry about that. They worried about the physical detector and not necessarily the system solution, as Pete is saying. So when you get a group of just physicists in the room who do not think about signal processing, you would get that same kind of argument. We think there is a different approach.

Chairman KYL. Well, go ahead, and I will add one more question for Dr. Ikle.

Mr. IKLE. It is a very important question you raise, Mr. Chairman, the question you raised about near-term and more advanced or longer-term tools and investments. I would think, if you look at the other large budget allocations, particularly in the Pentagon, quite a bit of it is certainly for the long term. The more than 1,000 times larger budget—and we are talking about for DTRA, the F-35 is really more for the long term. The very important ballistic missile defense project is also rather long term. It has made some progress, but it has still quite some way to go.

So it makes sense to compliment these long-term efforts, which I think are mostly necessary for our military capability 10, 20 years hence, in this area as well.

A very encouraging idea that Dr. Oxford mentioned is the retrofitting of currently deployed things with improved equipment. And to the extent that that can be provided in advance, it would help a great deal. So it remains a difficult balance, long-term life versus short term.

There is another balance we have not touched on, and that is the enormity or the damage of the event that we want to prevent. There is a lot of talk about dirty bombs. They are nasty. Scattering of medical isotopes could do similar things. One of the best decisions, I thought, of Homeland Security Secretary Chertoff was to raise the radiation level tolerable after a dirty bomb to the level that you encounter every time you fly to Arizona. It was a ridiculously low level. Of course, you have to evacuate a city for a century or whatever. So there are flexible ways of handling the dirty bomb that is, as we all realize, much, much less dreadful than a full-scale nuclear explosion.

There is the risk of chemical plants, often mentioned in Congress, being attacked by terrorists, and some of these could be terribly nasty because there is a dirty bomb probably in there, the damage they do. So these less bad or lesser dangers probably do deserve less attention.

Chairman KYL. Dr. Levi?

Mr. LEVI. First, let me say I think Dr. Ikle's comments on radiological weapons, dirty bombs, are right on the point. In particular, adjustments to the radiation threshold levels were very smart to do.

Let me try to give you yet another perspective on the near-term versus long-term thinking. Our near-term investments are defending us against some subset of the threat. They are not going to defend us against the—they are not going to give us high confidence against the worst-case threats, but they are going to give us meaningful defense against some of the lesser threats. Let me give you an example of a situation I would not like to see happen.

We look at all the radiation detection technologies, decide that they can't detect well-shielded highly enriched uranium that has been properly cast and so on. So we say we are not going to deploy the lesser systems.

Then a group comes along, a terrorist group that is really good a stealing things, but not good at technical measures, not good at recruiting scientists. They break into a weapons facility, get the material. They cannot do much to hide it, let's say. They try to bring it into the country, and we do not have the detection systems capable of detecting it because we have only looked at the worst-case threat. I think that is a situation we want to avoid.

What we want to be doing—and I think this is one way to think of the near and long term—is to use a capabilities-based approach. This is the way that the Defense Department has been doing planning for the last 5 years or so, where we look at a range of capabilities, both of the potential opponents and of the defense, and try to simply cover as much of that space as possible, to have good capabilities against whatever we can defend against, and then in an evolutionary way try to improve that.

It is the way the Defense Department has been heading. They have been developing better ways to actually do carefully planning under that. And it is probably the right framework for thinking about this as well.

Chairman KYL. Well, a good example of that is in the area of missile defense. There is controversy about it, but it makes sense given the fact that there is some potential threat today. In the case of terrorism, it makes even more sense, it seems to me, because there is a very real threat of terrorism today. But concomitant to that is what is the relative prioritization in spending research dollars if there is a potential—again, the predicate here is that this is the worst calamity that we can imagine and, therefore, we probably ought to be setting aside some concomitant amount of research dollars to deal with it.

Is there a need for a Manhattan-style effort here that would eventually enable us to have a pretty good chance to protect against this ultimate threat to our citizenry? Dr. Ikle?

Mr. IKLE. Some of us, especially you, Mr. Chairman, have argued for kind of a Manhattan Project and made that case at high levels of the executive branch, and at the time, the executive branch was close to that but then went off in a different direction.

The advantage of the Manhattan Project, as I would see it, is not just the perhaps somewhat larger budget, but that the scientists interact more vigorously than if we have to parcel out contracts to different universities and the four or five laboratories and agencies and so on, and it becomes more parceled. And I do hope that DNDO under Vayl Oxford's leadership will be able to pull these many excellent contracts that they are letting out intellectually together and have a system that the overall reinforcement and interaction of these ideas of different physicists, be they at universities, at the labs, or wherever, that can mutually reinforce each other, as was the case at the Manhattan Project the way it was led.

Chairman KYL. Mr. Oxford?

Mr. OXFORD. let me address that a little bit. I take a similar view, but maybe a different pathway. For example, when I inherited DNDO, before it actually was formalized, the total budget within DHS to deal with both the acquisition and the R&D account was about $173 million. We are operating this year with a total budget of $318 million. The President's budget request in 2007 is $535 million. We are on the right trajectory.

I think there are cases where you could throw too much money too quickly until the community is ready to accept it; otherwise, we would be sitting here in front of you next year wondering why we had wasted a billion dollars when the community was not ready to effectively spend it.

So I think we are looking—whether it is a Manhattan Project or just a very prudent planning and execution strategy to deal with threat, I think we are on that right trajectory. And I think if you look at our 5-year projections, we will be over a billion dollars within the next several years if we get the support not only through the White House but the Congress as we go forward.

So the trajectory is right. We are getting the priorities established. We could have thrown too much money too soon had we not gone through some of this planning phase.

Chairman KYL. Yes, Dr. Aoki?

Mr. AOKI. I guess I would just want to add one comment to that, that is, this is not only a science and technology issue, but also—you know, we used the word "architecture" occasionally in the testimony, but what architecture is really all about is the flow of information. And what we are trying to do in designing the system that Vayl is responsible for is to make sure that not only do we have better detectors in the sense of better physics packages that go out and sense radiation at border crossings or in the hands of policemen or wherever, but also a better ability to synthesize and utilize that information and make sure that if somebody picks up something that is a warning sign, that information gets to someone who can appreciate it and analyze it and draw the proper conclusion.

So I think one of the things that we need to focus on here is not only making sure that the science is properly funded, but also that within—that science is placed in the right operational context, which includes a great deal of time and attention placed to the management of the information, the connectivity between the different parts of the system, so that the very precious nuclear weapons expertise, for example, at Los Alamos National Laboratory can be brought to bear on the kinds of things that we—the signals we are getting out in the field and conclusions, proper conclusions drawn and sent back to the operators.

So some of this is not only about putting more money into R&D, it is also about, as I think several people have commented already, the systems aspects.

Chairman KYL. Dr. Levi?

Mr. LEVI. Let me expand on a couple of things that Dr. Ikle and Dr. Aoki have said. The labs have a very particular advantage in dealing with these things. In many cases, we are going to be trying to detect not just nuclear material but nuclear weapons. As far as I know, universities do not know details about what nuclear weapons—what forms nuclear weapons might take. Industry does not know that. The labs do. So they can take advantage of that knowledge.

Context—I think several people have emphasized it. Information flow. I think DNDO is to be complimented from one particular initiative, which is to make sure that facilities that we are helping acquire protection and accounting systems actually report to the United States when those systems detect something missing. That has not been a focus in the past, and DNDO should get as broad support as possible.

But let me also give you one more example of how thinking of this as a system matters. I doubt that technological advances will give us the ability to have ubiquitous radiation sensing along, for example, the border. Okay? But here is what it can do: If we have an ability to actually stop a significant number of people crossing the border, then the technological advance can help make detectors smaller and more portable so that if we have something like the catch-and-release policy we have now, at least we do not catch someone with plutonium and release them.

Those sorts of integrated concepts of operations are incredibly important, and if we have that context, these technological investments will be much more valuable.

Chairman KYL. Dr. Nanos?

Mr. NANOS. Sir, as a student of both the Manhattan Project and the Polaris, from my strategic system experiences, there is a part of it that is often not discussed, and that is the tremendous industrial base ground that was prepared during that time and the ability to do things concurrently. And I think it is probably too early now, but, you know, this story may ultimately be written in our ability to cost-effectively produce exotic materials that we have never produced before. In other words, as we look to some of the detector technologies creating high-purity crystals and things like that, and then being able to churn out many thousands of them at reasonable expense may end up being the biggest challenge we have in terms of our defense.

So as the S&T opens up the doors, we have to be aware of where the major industrial base challenges are and move on those very quickly because it does not do us any good to do the S&T and then not have the production capability or not be able to afford the result.

Mr. OXFORD. Mr. Chairman, could I add an exclamation point to that?

Chairman KYL. Sure. Before you do, let me just—first of all, I have a 3:30 meeting. Secondly, I promised some people we would finish within an hour or so, and we are a bit beyond that. And I do not want to impinge upon your time either. So what I would like to do is just conclude with Mr. Oxford and then, Dr. Ikle, if you had something, to conclude our hearing with that, but to make the point that—I mean, I could sit here all day and listen to you. The one thing that I do want to get out of this in terms of a written question to all of you—and I would like to submit a couple here—is any suggestions you have about this issue that has been now addressed directly and indirectly about the coordination of effort and the prioritization and the ultimate authority and responsibility for doing that so that we don't just end up with a Government that has a lot of capability and an industry with a lot of capability, laboratories, others with a lot of capability, some organizational structure in the Government to deal with it, but not having a very clear chain of authority that utilizes all of this in a sensible and ultimately responsible way.

Mr. OXFORD. If I could show you how this is working right now, for example, when we signed the Spectroscopic Portal program contracts, we have an agreement with NNSA that they will begin procurement from those contracts. So the systems they field overseas, where they can field these systems based on the host nation agreement, they will have the wherewithal to now buy from these contracts, therefore, hopefully reducing the unit costs for those contracts.

As Pete mentioned, one of the long poles in this tent is the fact that there is one sodium iodide manufacturing facility in this country. It is a French-owned company operating out of Ohio. So in this case, what we have done is we have gone out with a separate solicitation from the detector program to solicit bids from not only that company but also other companies within the U.S. to see if we can enhance the domestic production of sodium iodide crystals and to reduce the overall costs. Right now as a singular source, they are drawing about a 25-percent profit on the crystals. Those are the kinds of issues that Pete just raised that, as we start getting into the systems and the industrial capacity, we have to look forward because that becomes a long pole in terms of the production capacity.

Chairman KYL. Dr. Ikle?

Mr. IKLE. Mr. Chairman, I think this hearing by itself helped integrating the thinking among the involved agencies and scholars. And I think more can be achieved just by your Committee pulling this—make sure this effort pulls together from the industrial side on the one hand, the scientific side on the other, what the laboratories can do, as Dr. Levi had pointed out, because, you know, weapons is quite different from what the university can do, and how do you fit these together so that the country as a whole will rapidly and greatly improve its capability in this important area.

Chairman KYL. Let me conclude by echoing something that Dr. Levi said, although he was too self-effacing here. I am humbled to be in the presence of people whose reputations I know and whose contributions to this country's security and prosperity are not, I am sure, nearly appreciated, not just in the room but elsewhere. We have got some tremendous talent in this country and people who have sacrificed, who have served the country in ways that did not perhaps provide as much remuneration as they could have acquired otherwise, but certainly their contributions to our society in the long run will make a much greater difference.

I just appreciate that and hope that the contribution that we in the policymaking area can make will match the kind of scientific effort that all of you have been responsible for.

To that end, I invite your comments, your suggestions. This is not just an end of a process here but I hope the beginning of a process. Dr. Ikle, as you pointed out, perhaps we can play a role in this with this Subcommittee, but not even just this Subcommittee, the Congress generally.

I will follow up with the questions that Senator Feinstein had for the panel, as well as a couple that I would like to ask, and really elicit any other advice or suggestions that you have, and then perhaps we can get together again.

I will just conclude by saying thank you to all of you, and thank you to those in the audience who I am sure share this appreciation for our panel here today.

This hearing will now be concluded.

[Whereupon, at 3:35 p.m., the Subcommittee was adjourned.]

Questions and answers and submissions for the record follow.]

QUESTIONS AND ANSWERS

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

September 20, 2006

The Honorable Jon Kyl
Chairman
Subcommittee on Terrorism, Technology
And Homeland Security
Committee on Judiciary
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

On July 27, 2006, Steve Aoki, Deputy Undersecretary for Counterterrorism, National Nuclear Security Administration, U. S. Department of Energy, testified regarding Detecting Smuggled Nuclear Weapons.

Enclosed are the answers to questions submitted by Subcommittee members for the hearing record.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Renee Wilhite, on (202) 586-7597.

Sincerely,

C. Anson Franklin
Director
Office of Congressional, Intergovernmental
and Public Affairs

Enclosures

QUESTION FROM SUBCOMMITTEE MEMBERS

Nuclear Detection

Q1. Some have suggested that America needs to approach nuclear detection like a mini-'Manhattan' project, with significantly increased funding designed to draw in the best people and achieve the desired results in the near to medium-term. Without asking you to address this specific argument, I was wondering if each of you could tell me:
a. What you would do if you woke up tomorrow and your agency suddenly had a 100% larger budget?
b. What technologies and capabilities would you buy?
c. What would you do now that budget restraints currently prevent you from doing?

A1a. While DOE's support for nuclear detection has been strongly supported by Congress, there are always possible areas for additional work, should resources be available. For example, investment in basic science research at the national laboratories offers the possibility for improvements in the performance of the detection systems used by all Federal agencies. We would also look at increasing funding for the recovery of radioactive materials.

Within DOE's Second Line of Defense program (which includes the Megaports Initiative), we would focus any additional efforts on accelerating the deployment of radiation detection systems at land borders, airports, and seaports in Russia and other high priority countries in eastern Europe, former Soviet republics, the Caucasus, and those foreign ports that account for the majority of container shipments to the United States. Additional funding would allow DOE to more quickly achieve its goal of installing radiation detection equipment at all ports where the Container Security Initiative (CSI) is operational. A larger budget would also allow DOE to move quickly to procure the newest advanced radiation detection equipment for locations overseas, including, advanced spectroscopic portals (ASP) and mobile detection technology.

A1b. DOE is currently working closely with DHS on emerging radiation detection technologies. For example, DOE is already partnering with DHS on the procurement of Advanced Spectroscopic Portals (APS). We are in the process of procuring a limited number of the ASPs and will be installing them at secondary inspection locations at select Megaports. With increased funding, we would be able to purchase more ASPs for secondary inspections at Megaports.

DOE is also exploring, where feasible, the deployment of mobile detection technology to screen containers for nuclear and other radioactive materials. This technology is particularly useful at high-volume transshipment ports where containers are unloaded from one ship, placed in the container stacks, and loaded onto a different ship without ever exiting the port. Indeed, transshipped containers have been the most difficult to screen with radiation detection equipment since a standard entrance/exit gate installation is not applicable. With additional funding, we would purchase more of these mobile systems and deploy this specialized equipment to those ports with little gate traffic but heavy transshipment.

There is also work that could be done to improve our ability to identify suspect materials once they are found. We could expedite the development of detection and identification systems used by our regional and nationally based assets that would incorporate additional capabilities such as directionality, real time spectral collection and analysis, shipboard interrogation and real time telemetry. Further, we might increase efforts to improve the packaging of the equipment that would improve ease of operation, such as field tools that are smaller, cheaper, operate at room temperature without the aid of liquid nitrogen, and still give acceptable resolution.

In addition to the equipment, better concepts of operations, training and exercises that focus on integrating tiered resources from local, state, regional and national teams into a single response structure should be developed. In circumstances where there is limited intelligence, technology can only be part of our response structure. Better training of responders, better concepts of operations, and regular exercising would, in most cases, be an effective use of additional funds.

A1c. DOE's current budget for the Megaports Initiative supports the deployment of radiation detection equipment to cover 13 "megaports" by the end of FY07. Additional funding would allow DOE to significantly expand the number of foreign ports with radiation detection capability and more quickly achieve our goal of installing radiation detection equipment at all CSI ports. DOE would be able to increase and expedite procurement and deployment of advanced technology, such as ASPs and mobile detection devices.

QUESTION FROM SUBCOMMITTEE MEMBERS

Nuclear Detection

Q2. Dr. Aoki's statement suggests that supporting concepts of operation may be as important as technology when it comes to preventing nuclear smuggling. In other words, the gear is a critical enabler, but we also have to figure out how we are going to employ it at the operational level.
a. Who in the Departments of Homeland Security, Energy, and Defense is working on supporting concepts of operation for nuclear detection?
b. How mature are those concepts?
c. How are they incorporated in doctrine, training, and exercises?
d. Who, if anyone, is ultimately responsible for integrating operational plans for nuclear detection across the government?

A2a. The Departments of Energy, Homeland Security, and Defense work closely with the Domestic Nuclear Detection Office (DNDO) to develop effective concepts of operations for each phase of integrated global detection architecture. As has each participating agency, we have provided personnel on detail to support DNDO's efforts in this area, specifically including support to ensure that the technical reach back procedures used to resolve alarms are fully integrated with the systems and methods used by our nuclear emergency response teams.

In our international cooperation programs, we work with host nations and other relevant stakeholders to develop site-specific operational procedures at each location where we provide nuclear detection equipment. Additionally, DOE is closely coordinating with the relevant organizations within DHS, DoD, and Department of State to develop operational procedures for responding to, assessing and reporting, if necessary, radiation alarms at overseas locations. It is critical that operational procedures be developed at each site with heavy input from the host government to ensure that the systems are operated properly in the long term.

A2b. DNDO's development of an overarching architecture for nuclear detection is well underway and, as previously noted; DOE is contributing to that effort. New protocols to be used within the U.S. to report the detection of potential nuclear explosive devices, fissile material, or radiological material have been in place for about six months. These protocols have been used successfully by local and Federal authorities to assist in the resolution of several real-world events within the U.S. We are working with other agencies to put in place standard procedures for the technical adjudication of nuclear or radiological alarms originating from USG-installed detection equipment abroad. These procedures will take account of concepts-of-operations already developed for DOE Megaports site installations that are very mature and include significant contribution and buy-in from host nation agencies. In addition, DOE maintains a Radiological Assistance Program that provides expert teams that are integrated with local, state and federal first responders on a regional basis to train, exercise and if necessary, search for suspected nuclear/radiological material.

A2c. Training is a core element of the Second Line of Defense Program. In addition to incorporating site-specific Concepts of Operations (CONOPS) into our training plans, DOE has begun to conduct "dry-run" exercises of the CONOPS with the host nation and relevant stakeholders in order to ensure that the ultimate CONOPS instituted does not impact port operations.

A2d. DHS' Domestic Nuclear Detection Office (DNDO) is responsible, per NSPD-43/HSPD-14, for establishing protocols and procedures for use within the U.S. to ensure that the detection of unauthorized nuclear explosive device, fissile material, or radiological material is promptly reported for appropriate law enforcement, military, emergency response, or other action.

Further, DNDO is responsible for establishing a global architecture focused on baselining the current detection capabilities, both domestically and internationally, and identifying the "gaps" where the establishment of detection or interdiction capabilities is required. According to the terms of NSPD-43/HSPD-14, the Departments of Energy, State and Defense remain responsible for the policy guidance and implementation of the portion of the global architecture outside the United States, which will be implemented consistent with applicable law and relevant international arrangements.

QUESTION FROM SUBCOMMITTEE MEMBERS

Nuclear Detection

Q3. We have heard detecting highly enriched uranium is significantly more difficult than detecting plutonium. I find this disturbing because, to me, a terrorist attack using HEU seems no less likely than one using plutonium. HEU is used in all sorts of commercial and military nuclear reactors worldwide, including those that make isotopes for medical treatments. In fact, the very difficulty of detecting HEU, versus plutonium, might make it the preferred nuclear material for terrorists. I want to ask Dr. Aoki:

a. Do you believe that it is scientifically possible, given adequate time and resources, to develop HEU detection systems that are safe enough for domestic use? In other words, is safe HEU detection a physical impossibility, or just a physics problem that we haven't solved yet?
b. If the latter, what is DNDO doing to develop better uranium detection capabilities?

A3a. First, we should emphasize the importance of reducing the availability of HEU worldwide. Through the Reduced Enrichment for Research and Test Reactors (RERTR) program, DOE has worked with reactor operators in the U.S. and overseas to replace HEU reactor fuel with low-enriched fuel that cannot be used to make a nuclear weapon. We have recently been working with partners in the Russian Federation and the IAEA to develop alternative fuels for Soviet-origin research reactors and to recover and eliminate excess HEU from these reactors.

Because the radiation emitted by HEU is only weakly penetrating, and therefore easily shielded from standard radiation detectors, DOE is funding research on alternate methods of detection. One promising example is the work on stimulated signatures for HEU often referred to as "active interrogation". The technique uses radiation from an external source as a probe to induce a unique characteristic radiation signature in Uranium, or U-235 specifically, which can be much more easily detected under various shielding scenarios. This stimulation of U-235 enhances the HEU signature by inducing the emission of more intense and highly penetrating radiation that can more easily be detected through shielding. The ultimate goal of this research is to develop techniques that yield both high sensitivity for the detection of small quantities of HEU and simultaneously high selectivity for discrimination between HEU and other materials. Because this approach involves subjecting the item being inspected to an external radiation source, there are safety issues that will need to be addressed, both for the public and for the equipment operators. Our ongoing research in this area is closely coordinated with similar work being sponsored by DHS and DoD.

A3b. DNDO sponsors research on techniques for detection of HEU. These activities are, as already noted, closely coordinated with DOE and other agencies.

QUESTION FROM SUBCOMMITTEE MEMBERS

Nuclear Detection

Q4. At the recent G-8 meeting in St. Petersburg, President Bush and Russia President Putin announced the Global Initiative to Combat Nuclear Terrorism. According to Bush and Putin's joint statement, the Global Initiative is designed to "prevent the acquisition, transport, or use by terrorists of nuclear materials and radioactive substances or improvised explosive devices using such materials, as well as hostile actions against nuclear facilities."
a. Could you explain what role DNDO, DOD, and DOE will play in this initiative?

A4. The Global Initiative (GI) is a recently announced Presidential initiative designed to provide a coordinated mechanism to promote nuclear counterterrorism efforts, develop better understanding and best practices for working with our global partners and develop a coordinated international approach to these efforts. The GI also provides a more formal structure for working with our partner Departments. With respect to nuclear detection, we expect that the GI will help to persuade partner nations to adopt procedures and capabilities that will enhance and support our own bilateral and multilateral efforts to combat the spread of nuclear materials and improve the protection of nuclear facilities and populations.

Structurally, the State Department will chair the GI interagency working group and work to facilitate foreign government outreach. All participating USG departments and agencies share in the coordination of GI related activities and programs. Within this framework, we see DOE's role in the Global Initiative as providing a base of nuclear technical expertise while maintaining and expanding upon the good working relationship with our technical counterparts around the world. DHS/DNDO will initially provide GI partner nations with an overview of how the U.S. is approaching the concept of a layered defense, socializing the concept of architecture to foreign partner nations, and offering suggestions and solutions that might help countries build their own regional architectures. Ultimately, the focus would not focused on the United States alone. Nuclear and radiological deterrent systems developed regionally would fit into a global architecture which will encompass aviation, land, and maritime security.

QUESTION FROM SUBCOMMITTEE MEMBERS

Nuclear Detection

Q5. In his written remarks, Michael Levi claims "U.S. efforts to defeat nuclear terrorism are insufficiently integrated across the federal government." He suggests that Congress should explore the utility of establishing a broader system integrator in the Executive Office of the President," and in particular, he suggests that "Congress should consider directing the NCTC [National Counterterrorism Center] to produce a strategic operational plan that prescribes and delineates responsibilities for defense against nuclear terrorism across the U.S. government, and to periodically assess the effectiveness of that plan."
a. Do you agree with this recommendation?
b. Other than the President and Vice President themselves, who is the person in this Administration most responsible for preventing nuclear terrorism in the United States?

A5a Preventing nuclear terrorism necessarily requires us to deploy the full range of policy tools available to the United States government, including diplomatic, military, intelligence, homeland security, and technical capabilities. Given the need to engage across a broad front, policy coordination and planning is appropriately vested in the National Security Council and the Homeland Security Council, under the overall supervision of agency Principals and Deputies. Within the NSC/HSC policy structure, the National Counterterrorism Center does develop operational plans for action to prevent nuclear terrorism that are integrated with other national-level plans to implement the President's strategy in the War on Terrorism.

A5b Countering the threat of nuclear terrorism necessarily involves action by multiple U.S. government agencies on a daily basis. The Secretaries of State, Defense, Treasury, and Energy and the Attorney General all participate actively in determining strategy and administration priorities and implementing Counterterrorism measure at home and abroad. The President's National Security and Homeland Security Advisors, as well as the Director of National Intelligence are also major participants in the planning and policy coordination functions for this area. Under the Homeland Security Act, the Department of Homeland Security has lead agency responsible for terrorist incidents in the U.S. Interagency policy efforts are coordinated through a joint NSC/HSC Domestic Nuclear Defense Policy Coordination Council. The Department of Homeland Security has lead agency responsibility for serious terrorist incidents in the United States.

QUESTION FROM SUBCOMMITTEE MEMBERS

Nuclear Detection

Q6. As you note in your written statement, the Department of Energy has responsibility for disarming and disposing of any future terrorist device that may contain nuclear or radioactive materials,

a. How would the Department of Energy anticipation carrying out this responsibility in the context of a device that is found in the Washington, D.C. area?
b. Is there any truth to rumors that the DOE's plans for that scenario may include trucking the device on a highway across seven states to a test site in Nevada? If so, can you explain why this approach is feasible? If not, what are DOE's plans for this scenario?

A6. In accordance with the Department of Homeland Security National Response Plan's (NRP) Nuclear/Radiological Incident Annex, in the event that an improvised nuclear device (IND) is discovered within the United States, including the National Capital Region, the Department of Homeland Security would serve as the overall incident manager for such an "Incident of National Significance" (INS) and coordinate all U.S. government response efforts. The Federal Bureau of Investigation (FBI) would act as the lead law enforcement agency pursuant to its responsibilities for combating and investigating WMD terrorism under Federal law and Presidential directives. DOE would act as a technical support organization to the FBI and as a coordinating agency to DHS. DoD would, in accordance with the National Response Plan, provide required support as directed by the President or the Secretary of Defense.

DOE/NNSA maintains the program for training and equipping specialized response teams to deal with the technical aspects of nuclear and radiological terrorism. These capabilities include diagnostics and assessment of suspected nuclear devices; technical operations in support of render safe procedures, and packaging for transport to final disposition. The capabilities are drawn from the nation's nuclear weapons complex and are maintained through the integration of technology developed in NNSA's research and development programs and technical integration programs. Equipment and procedures are validated through departmental and interagency drill and exercise programs. These core capabilities are categorized in three areas:

- Core knowledge of U.S. Nuclear Weapons, RDD, and IND with specific specialties in spectroscopy, device modeling, radiography, and device assessment technology
- Core technical operations such as Explosive Ordnance Disposal procedures and techniques for device access, disablement, render safe, weapons recovery, and final disposition
- Core technical support requirements such as attribution, weapons effects, health and treatment capabilities, and the radiological elements of consequence management.

DOE/NNSA deploys crisis response teams to support the primary Federal agency, FBI or DoD for diagnostics and assessment of suspected nuclear devices, render safe procedures, and packaging for transport to final disposition. Response teams vary in size from a five person technical advisory team to a tailored deployment of dozens of searchers and scientists who can locate and then conduct or support technical operations on a suspected nuclear device. Specific attention is focused on providing the appropriate technical response to any IND/RDD emergency within the Department, the US and abroad. These experts include engineers, scientists, and other technical specialists from Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratory, the Remote Sensing Laboratory Nevada and the Pantex Plant. The specialized response teams include coordination, liaison, and advisory teams, search teams, technical operations teams and planning support teams. All teams and equipment are ready to deploy worldwide at all times.

The render safe process for an IND is divided into three phases. The purpose of Phase I is to conduct immediate procedures to isolate the device to make it safe to move to a less public location where render safe operations can continue. Technical advisory interface is provided by DOE/NNSA and a limited safety assessment is made to ensure that the device will not achieve criticality. During Phase II render safe operations continue until the device is made safe to ship using advanced diagnostics to further break down the device into essentially three components - arming and firing, high explosive, and special nuclear materials. Once the device is assessed and disassembled to the extent appropriate in the field, it would then be transported to the Nevada Test Site (NTS) for safe and rapid teardown of an IND to component parts. Transportation to the NTS is planned to be via military aircraft.

QUESTION FROM SUBCOMMITTEE MEMBERS

Nuclear Detection

Q7. We have primarily discussed our borders and ports, but some have suggested that a terrorist with a nuclear weapon would use unconventional means to enter our country.
a. How can we address, if at all, concerns about radiological material being shipped into the U.S. through our nearly 7,000 miles of open border areas, or flown into the U.S. in a private jet or plane?

A7. The Department of Homeland Security is statutorily responsible for stopping terrorists and their weapons from crossing our borders, coming through our ports, or exploiting our nation's aviation infrastructure. DNDO under the leadership of DHS recognizes that unsecured land borders and general aviation represent potentially attractive alternative pathways to introduce nuclear or radiological material into the U.S. It is developing strategies to address these issues within the overall global detection architecture.

Questions for the Record
Senate Judiciary - Terrorism, Technology & Homeland Security Subcommittee
"Detecting Smuggled Nuclear Weapons"
July 27, 2006
Domestic Nuclear Detection Office Director Vayl S. Oxford

<u>Questions from Senator Kyl</u>

1. Recently, the Senate passed its Fiscal Year 2007 Department of Homeland Security Appropriations Bill. In it the DNDO received $442 M, $94 M less than the President's FY07 request and $36 M less than what the House passed. This amounts to a cut of almost one fifth of the overall budget, and specifically cuts transformational research funds by 35%.

• How will these cuts specifically impact DNDO if enacted?

Response: The enacted cuts included in the FY 2007 Homeland Security Appropriations Bill will preclude DNDO from carrying-out all its planned activities assumed in the President's Budget. Specific program impacts include:

- Delays to the Cargo Advanced Automated Radiography Systems (CAARS) program of at least one year (or reduces the number of competing vendors, leading to increased programmatic risk), which is needed to increase the percentage of incoming cargo containers scanned from approximately 3% to approximately 50%;
- Delays to the development of decision protocols and integrated risk assessment algorithms needed to support integrated deployments at overseas ports similar to the Hong Kong Integrated Cargo Inspection System (ICIS);
- Inability to fully fund the transformational research and development (R&D) exploratory research program, a long term initiative aimed at delivering breakthrough capabilities for countering the threat of nuclear terrorism where gaps in current capabilities exist;
- Cancellation of Advanced Technologies Demonstration (ATD) in Long Dwell Detection and delay of ATD in Active Special Nuclear Material (SNM) Verification, which would provide solutions to long-term challenges in detecting threats in the aviation and shipping sectors and the direct detection of nuclear materials, respectively;
- Reduction of the Academic Research Program to re-energize academia's involvement in nuclear related sciences and research, further exacerbating a lean technical pool of future nuclear physicists;
- Delays in achieving initial operating capability for the Joint Analysis Center (JAC), which will provide real-time situational awareness of all U.S. Government (USG) deployed systems and the ability to mine vast quantities of data to improve overall probability of mission success; and
- Reduced red teaming capability and deferred completion of the first nuclear detection net assessment until late FY 2008 or early FY 2009.

Impacts limit DNDO's ability to focus on programs outside of deploying radiation portal monitors to ports of entry (POEs). There are many potential threat scenarios beyond the "nuke-in-a-box" scenario of smuggling threats through shipping containers. The global nuclear detection architecture consisting of a multi-layered, multi-phased plan designed to provide several opportunities to detect and interdict illegal movements of radiological and nuclear materials is necessary to improve the overall probability of success. Relying solely on detection assets deployed to POEs would leave gaps in the overall detection framework and reduces probability of success. As POE portals are installed, terrorists may be deterred from attempting those transit venues and turn to aviation or small boats. Thus it is important to balance our encounter and detection assets at venues other than POE.

• Assuming that some of these cuts could be restored, which would be your first priorities?

Response: Any restorations to the FY 2007 budget need to be allocated to ensure the greatest marginal improvement in overall mission success. In a highly simplified form, the DNDO measures overall risk-mitigation, and, hence, success, as a combination of several factors. Ultimately, to successfully prevent nuclear and radiological terrorism, authorities must be able to (1) encounter the adversary; (2) detect and identify successfully encountered threats; and (3) interdict successfully detected and identified threats. Resources must be balanced to improve each of these success factors.

Because funding reductions did not affect deployments of fixed and mobile detection assets, particularly to POEs, restoration of funds are critical to programs aimed at short-term technical improvements to technologies (handheld detection systems, radiography systems) and long-term development programs to deliver revolutionary detection capabilities (stand-off detection, SNM verification) to increase the probability of "detection and identification" continue to mature. Programs of this type are essential for the maturation of strategies to counter threats in non-POE venues, such as the aviation sector, small maritime craft, and State and local detection programs.

2. Some have suggested that America needs to approach nuclear detection like a mini-'Manhattan' project, with significantly increased funding designed to draw in the best people and achieve the desired results in the near to medium-term. Without asking you to address this specific argument, I was wondering if each of you could tell me:

• What you would do if you woke up tomorrow and your agency suddenly had a 100% larger budget?

Response: Any increases to budget would be allocated to ensure the greatest marginal improvement in overall mission success. In a highly simplified form, the DNDO measures overall risk-mitigation, and, hence, success, as a combination of several factors. Ultimately, to successfully prevent nuclear and radiological terrorism, authorities must be able to (1) encounter the adversary; (2) detect and identify successfully encountered threats; and (3) interdict successfully detected and identified threats. Resources must be balanced to improve each of these success factors.

Given this framework and the current state of technical capabilities, additional resources made available in the near-term would be best balanced across rapidly deploying proven detection technologies (such as fixed and mobile radiation portal monitors [RPMs]) to increase the probability of "encounter", while short-term technical improvements to technologies (handheld detection systems, radiography systems) and long-term development programs to deliver revolutionary detection capabilities (stand-off detection, SNM verification) to increase the probability of "detection and identification" continue to mature. Sustained increases in funding of this type would significantly accelerate the implementation of portions of the global architecture where viable solutions have been identified, while allowing for maturation of strategies to counter threats in non-POE venues, such as the aviation sector, small maritime craft, and State and local detection programs.

• What technologies and capabilities would you buy?

Response: The majority of acquisition funds would be used for the procurement and deployment of fixed and mobile RPMs—both current-generation systems and next-generation Advanced Spectroscopic Portal (ASP) systems. These technologies are well understood, and DNDO and Customs and Border Protection (CBP) have developed a joint deployment strategy that seeks to optimize effectiveness of all deployments while minimizing total system costs.

Additional funds would accelerate final development and testing, and subsequent procurement, of next-generation human portable (handheld and backpack) detection systems, which often serve as the only means of radiation identification (spectroscopy) for mobile units such as the U.S. Coast Guard (USCG) boarding teams, Border Patrol agents, and State and local operators.

• What would you do now that budget restraints currently prevent you from doing?

Response: Again, additional emphasis, beyond the acquisition programs highlighted in response above, would be focused on developing solutions for portions of the architecture beyond POEs. For instance, considerable opportunities remain to improve detection capabilities in the commercial and general aviation sectors and small maritime craft. In addition, investments in a unified global communications and reporting infrastructure that directly links deployed technologies to centralized reporting and analysis facilities would make substantial improvements in the overall probability of interdiction, and would ensure that all USG investments in detection technologies are being used properly and effectively. This would also ensure that any suspected illegal movements of radiological or nuclear materials are immediately reported, and the appropriate USG assets could be deployed in the event that threats were deemed to warrant such a response.

3. From everything I have seen and heard it is clear that our borders are broken. As the Senator from Arizona, my primary concern has been the ease with which people and goods can illegally transit the US-Mexico border. However, our Northern border is probably no more secure than our Southern one. For that reason, I am extremely interested to hear more about DNDO's cooperation with Customs and Border Protection.

• Specifically, how is the training of border patrol agents proceeding?

Response: All trainees at the Border Patrol Academy receive training for Personal Radiation Detectors (PRDs) in both lecture format and practical exercise.

U.S. Customs and Border Protection (CBP) also maintain a detailee in the training division within DNDO. This detailee is CBP's liaison for training coordination between CBP and DNDO. CBP's Office of Training and Development (OTD) maintains all training requirements and curriculum for CBP personnel, including Border Patrol agents. All new Border Patrol trainee agents receive Radiation and Nuclear Awareness training at its academy. This training discusses potential delivery systems, concealment methods, smuggling tactics, identification and safety related to nuclear/radiological materials and other subjects germane to the detection. Training for use of specific detection technology is conducted at the agent's individual station location prior to their deployment. OTD continually revises the training curriculum to ensure all CBP operational personnel receive the most current detection methods and operational protocols.

• How many agents have received nuclear detection training?

Response: All border patrol agents receive radiation detection training as a part of the basic academy. Training for Radiation Isotope Identification Devices (RIIDs) is done at the station level as a part of field training/post-academy training programs. In addition, over 4,000 Border Patrol Agents received more specialized training as part of CBP's curriculum that includes advanced nuclear concepts and instruction on the operation of specific equipment comprising CBP's layered detection approach.

• What is the eventual target for trained agents?

Response: As this training represents a skill that must be continually refreshed and updated, agents are trained prior to their assumption of duties where radiation detection equipment is used or where it is scheduled to be deployed. This training-as-required method ensures that the Agent-operators of this equipment apply the most current operational methods available.

The President's plan calls for the hiring of 6,000 Border Patrol agents by December 31, 2008. The Border Patrol Academy is planning on training up to 8,800 personnel to net the 6,000 agents specified under the Administration's plan. These new agents will be exposed to the nuclear and radiation awareness training in the academy and those who will be operating detection equipment will be trained in its use.

• How will nuclear detection devices be distributed among agents and crossings?

Response: CBP Border Patrol ensures that Personal Radiation Devices and Radiation Isotope Identification Devices are available at locations where Traffic Check operations are conducted, as the currently available detection technology best supports this application. Additional PRD's and RIID's are distributed in accordance with staffing levels, operational environment/duties being conducted, and intelligence estimates.

4. Dr. Aoki's statement suggests that supporting concepts of operation may be as important as technology when it comes to preventing nuclear smuggling. In other words, the gear is a critical enabler, but we also have to figure out how we are going to employ it at the operational level.

Questions for the Record
Senate Judiciary - Terrorism, Technology & Homeland Security Subcommittee
"Detecting Smuggled Nuclear Weapons"
July 27, 2006
Domestic Nuclear Detection Office Director Vayl S. Oxford

• Who in the Departments of Homeland Security, Energy, and Defense is working on supporting concepts of operation for nuclear detection?

Response: DNDO is presently involved with supporting and standardizing concepts of operation for nuclear detection. DNDO works very closely with its intra-agency partners (USCG, CBP, Transportation Security Administration [TSA], and Office of Grants and Training [G&T]) in coordinating and establishing standard and well-understood response protocols. Additionally, DNDO continually coordinates interagency efforts with the Department of Energy (DOE), Federal Bureau of Investigation (FBI), and Department of Defense (DoD) Defense Threat Reduction Agency (DTRA) relative to radiological detection. Further, through regional outreach programs, DNDO works directly with State and local agencies to establish supporting protocols for effective detection and interdiction.

The DNDO coordinates with all DHS and interagency offices that support operational radiation detection activities. These coordination efforts enable DNDO to gain a better understanding of the operational environments, logistical issues and challenges each operational agency confronts to deploy and utilize radiation detection technology and respond to detection alarms. The Federal agencies conducting radiation detection, as well as DNDO, recognize that while some elements of operations can be standardized, concepts of operation must be flexible and tailored due to differing operational environments and enforcement authorities.

• How mature are those concepts?

Response: Standardized operational protocols at the Federal level are very robust, and with few exceptions, function well. In an attempt to similarly standardize State and local response, DNDO has drafted a "generic response protocol," which provides stakeholders with three potential Federal support mechanisms to assist with radiation event resolution. Generally, these three avenues are via the DNDO, FBI, or DOE, all of which are reliable platforms for State and local agencies to utilize during a radiation event.

As part of legacy Customs, CBP established the concept of a multi-layered detection approach during the late 1990's with the introduction of the personal radiation detector (PRD) and the radiation isotope identification device (RIID). An interim radiation detection protocol was issued to ensure that all Customs inspectors utilized the radiation detection equipment properly and reported detections of concern. The interim protocol and the lessons learned were incorporated into the Radiation Detection Program Directive, issued December 2003. These protocols have been the basis for several other Federal agencies' radiation detection protocols. CBP continues to coordinate with other enforcement and response agencies, as well as DNDO, to ensure that the protocols remain current and address new/emerging requirements.

• How are they incorporated in doctrine, training, and exercises?

Response: Response protocols have been incorporated into the DNDO Preventive Radiation Detection curriculum. Through this specialized training, DNDO, in partnership with G&T, has trained 340 law enforcement personnel. Response protocols and concepts of operations (CONOPs) are included in this training as a dedicated 2 hour module. Additionally, DNDO is sponsoring various exercises to test and validate State and local detection and response capabilities. Specifically, DNDO is engaged with the State of New Jersey in an effort to test response protocols during a statewide exercise tentatively scheduled for October 2006. In addition, as part of the STC Initiative, DNDO is sponsoring a New York City and regional exercise which will test the region's detection CONOPs and capabilities. Similarly, the Southeast Transportation Corridor Pilot (SETCP) will exercise a regional approach to nuclear and radiological detection, focusing on interstate weigh stations.

CBP's Radiation Detection Program was published in our directives in December 2003 with a requirement to officially review its tenets in December 2006. The information within the directive and the technical training necessary to effectively operate the detection equipment is incorporated into CBP's officer and agent academy training programs, specific equipment training classes as well as local refresher training materials. During all federal exercise training opportunities with nuclear-related scenarios, such as the TOPOFF series, PSI exercises, and interagency table top exercises, CBP has exercised the radiation detection protocols and polices.

• Who, if anyone, is ultimately responsible for integrating operational plans for nuclear detection across the government?

Response: The Departments of Homeland Security, Energy, and Defense work closely under the auspices of the DNDO to develop effective concepts of operations for each phase of integrated global detection architecture. According to the terms of NSPD-43/HSPD-14, the Departments of Energy, State and Defense remain responsible for the policy guidance and implementation of the portion of the global architecture outside the United States, which will be implemented consistent with applicable law and relevant international arrangements.

5. When we talk about how terrorists might smuggle nuclear weapons into our country, most scenarios involve container ships, 18-wheelers, or some other commercial means of transportation. It seems to me that it might be in the interests of many businesses to help you prevent nuclear terrorism using US and global transportation network.

• To what extent are you working with private industry, both transportation companies and those that rely heavily on them, as you move forward with the nuclear detection architecture?

Response: Prior to deploying radiation portal monitors (RPMs) to a given POE, CBP conducts an extensive outreach program designed to provide critical information to all key stakeholders. Additionally, private stakeholders are included within the design phase of the deployment process. CBP has learned that this involvement is necessary to ensure that all stakeholder requirements are addressed, while providing the program with key stakeholder buy-in and cooperation.

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In addition, DHS, CBP, and DOE Megaports program are reaching out to international maritime terminal operators, ocean carriers, and major shippers to dramatically improve the screening of seaborne cargo containers at overseas ports of departure. This effort should greatly improve the risk assessment capabilities of the USG, while minimizing impacts to legitimate trade.

• Is there anything the federal government should be considering with regards to standards or policies that would create a greater incentive for industry to cooperate?

Response: DHS, in concurrence with its operator agencies, has incorporated continual interaction with our industry partners and cooperative programs to ensure the security and safety of cargo moving through the transportation process. CBP established the Customs Trade Partnership Against Terrorism (C-TPAT) in November 2001 to work with companies to ensure certain supply chain security procedures are implemented throughout their import supply chain to assist CBP in protecting out supply chain from terrorist infiltration and other illegal activities that threaten the security of the United States. Continual support for programs like C-TPAT will provide for greater industry input and cooperation.

6. When your organization was created there was some criticism – both in Congress and from outside analysts – that the "Domestic" part of the name "Domestic Nuclear Detection Office" suggested misplaced emphasis. These critics argued that this country's efforts to prevent nuclear terrorism should be focused primarily abroad, on terrorist groups and their potential sources of nuclear material.

• Do you believe this criticism has any validity?

Response: The desire to detect illicit movements of radiological and nuclear materials as early, and as close to the source, as possible is certainly valid. Accordingly, the USG has provided, and continues to provide, considerable funding to securing materials abroad, and monitoring for the illicit transport of materials overseas.

However, the DNDO global nuclear detection architecture, which accounts for and advocates these programs, is built on a multi-layered detection approach. This approach is predicated on the assumption that no single layer of defense can detect all attempts at nuclear and radiological smuggling with one hundred percent effectiveness. Instead, the global nuclear detection architecture provides multiple detection and interdiction opportunities overseas, at U.S. borders, and within the U.S. to effectively increase the overall probability of system success.

• Is the emphasis of your organization strictly "Domestic"?

Response: No. DNDO's mission includes the development of a *global* nuclear detection architecture, or strategy. While DNDO will not have day-to-day oversight over other agencies responsible for implementing portions of the global architecture, it closely interfaces with agencies with responsibility for overseas implementation, including CBP, Department of Energy

(DOE), Department of Defense (DoD), and the Department of State (DoS) to ensure that programs are consistent with the vision of the architecture.

• If so, could you describe how DNDO interacts with those organizations that operate abroad?

Response: While DNDO has been primarily tasked to develop the global nuclear detection architecture, it will implement it with other agencies, such as CBP, Department of Energy (DOE), Department of Defense (DoD), and Department of State (DoS).

Because DNDO will not have primarily implementation responsibilities for many initiatives relating to the global architecture, considerable effort has been made to involve interagency partners like DoS in the development of proposed initiatives. DNDO's responsibilities are succinctly summarized as "centralized planning with decentralized execution and centralized reporting." Through this management construct, DNDO does not change any current roles, responsibilities, and functions of any Federal partner or infringe on the statutory responsibilities of partner agencies. For example, DNDO, in cooperation with DoS and others, will develop methodologies and agreements with international allies in order to improve and expand the ability to conduct systems assessments against the outer layers of the global nuclear detection architecture.

Technologies developed for domestic application often have parallel applications overseas. The first demonstrable example of this has been ASP detection technology. Concurrent with initial ASP contract awards, the DOE Megaports Initiative has indicated an interest in procuring ASP systems to pilot in overseas locations. DNDO will continue to encourage this type of interagency sharing of technologies to reduce duplication of development efforts.

7. As you know, nuclear detection here in the United States has more than one purpose. We are here today to talk primarily about America's capability to identify nuclear and radiological material being smuggled into, or through, this country for the purposes of launching an attack. However, nuclear detection technology would also be critical if an act of nuclear terrorism were to take place here. Policymakers would want to know the nature of the nuclear material used in the attack, and especially its origins, so that an appropriate response could be crafted. Without this capability to identify the source of the material used in any potential terrorist attack, we have no way of hoping to deter rogue nations from sharing such material with terrorists bent on doing us harm. My question is:

• Who, if anyone, has ultimate responsibility for this mission of post-detonation analysis of nuclear materials?

Response: Because nuclear detection is such a high priority of the Administration, a White House-led interagency effort has, since 2002, coordinated the development and enhancement of our Nation's technical nuclear forensics capabilities. Beginning in FY 2007, and based on interagency agreement, DNDO will stand up the National Technical Nuclear Forensics Center, which will provide national-level stewardship, integration, maintenance, and readiness of an enduring national capability for the collection and analysis of radiological and nuclear materials and associated evidence for the purpose of comprehensive and timely forensic analysis to contribute to attribution conclusions. Through DNDO's interagency structure and processes, Federal departments and agencies which provide an essential capability and role in technical nuclear forensics (both post- and pre-detonation) will support and further develop, improve, and enhance an integrated national technical forensics program. The focus will be to assure a responsive, rapid, accurate, and ready capability supporting the current and future needs of our Nation.

• How are the technological development efforts being undertaken by the organizations represented here at the table integrated into this mission?

Response: Technological development and improvement efforts are undertaken by each of the "capability providers" – DoD for post-detonation forensics, DHS for pre-detonation materials forensics, and DOE for pre-detonation device forensics. These efforts range from R&D in the prompt diagnostics of a nuclear event and in the scientific gaps in our forensics knowledge (led by the National Nuclear Security Administration [NNSA] to post-detonation ground debris collection tools (led by the Defense Threat Reduction Agency) to research into pre-detonation materials signatures (led by DHS). These efforts are vital, well-understood building blocks of the National Technical Nuclear Forensics program. The partner agencies regularly participate in inter-departmental program reviews, conferences and exercises to assure cohesion and integration and avoid duplication. Additionally, DNDO has organized its new National Technical Nuclear Forensics Center to include detailed staff members from the partner agencies (FBI, DoD, and DOE) in order to optimize integration and cohesion of federal efforts in the nuclear forensics arena.

8. One of DNDO's founding missions is to conduct aggressive evolutionary and transformational research and development programs to continually improve overall capabilities.

• Could you provide us insight into your office's role in this and its current programs?

Response: The DNDO has established a transformational R&D program to identify, explore, and develop scientific and technological solutions to dramatically improve the performance of nuclear detection components and systems. One of the primary motives for the establishment of the DNDO was to create a mechanism for significant and sustained funding into radiation detection technologies through innovative approaches. Historically, these efforts have been driven by the rise and fall of arms control treaties and nuclear weapons development. Today, the face of terrorism demands a long-term continuous effort to improve our abilities to detect the presence of dangerous nuclear materials in the midst of deliberate shielding.

In FY 2006, the DNDO funded exploratory research in four areas and disciplines that could have a dramatic impact on nuclear and radiological detection technology and performance. These research areas have been organized into the following broad categories: Innovative detection materials and concepts; Advanced SNM interrogation and verification; Algorithm development for components and systems; and Physics-based phenomenology studies.

Innovative detection materials and concepts: The DNDO solicited and funded research in the following areas: new detection materials (specifically scintillation materials and semiconductor materials); associated electronics and bonding technologies for use with existing materials; new fabrication/manufacturing techniques for producing higher purity materials at lower cost; directional detection technology for both small and large application venues; and innovative unconventional detection concepts that effectively measure the energy and direction of impinging photons and neutrons.

Advanced SNM interrogation and verification: The DNDO solicited and funded research that explored new concepts, approaches and signatures that will, if successful, have a significant impact on SNM detection and verification. The DNDO continues to invest in new concepts such as the nuclear resonance fluorescence (NRF) – a new signature – that could potentially turn an x-ray screening system into an isotopic discrimination device for the discovery and verification of HEU, plutonium, shielding material, explosives, or any other contraband of interest.

Algorithm development for components and systems: The DNDO solicited and funded algorithm development as follows: adapted and upgraded the leading Monte Carlo codes, which were developed by the National Laboratories over the past 50 years, for detection applications; developed new physics-based simulation codes to model detectors, devices and systems; and produced the next generation of decision algorithm codes used for spectral analysis and in radioisotope identification devices.

Physics-based phenomenology studies: The DNDO solicited and funded studies of physics-based phenomenology focused on the characterization of the "long-dwell, in-transit" radiation environment in large cargo-container ships. This type of research could lead to the development of cost-effective technologies with unprecedented discrimination capability. These technologies could, for example, lead to the creation of a detection system that could be integrated into supply chain security systems applicable in air, land, and sea transportation. In FY 2008, the results of this study will end in a solicitation for an Advanced Technology Demonstration (ATD) of long-dwell, in-transit detection prototypes.

Advanced Technology Demonstrations: In FY 2006, the DNDO will begin a 3-year prototype-development effort for intelligent personal radiation locators (IPRLs). Intelligent personal radiation locators are intended to ultimately replace the existing, ineffective radiation pager with a pocket-sized radioisotope identifier that will wirelessly communicate with similar devices in the vicinity, automatically combining data to increase sensitivity and triangulate directional information. These devices will have sufficient energy resolution and sensitivity to reliably discriminate between normally-occurring radioactive materials (NORM), background, and potential threats, and will be used by law enforcement, first responder, counterterrorism, and possibly intelligence agencies in routine activities and surveillance, maintaining constant vigilance at all defensive layers. This advanced technology demonstration stage will culminate in test and evaluation of the IPRL prototypes in early FY 2009.

• How is this important activity in DNDO organized?

Response: Three instruments will be used to implement the DNDO transformational R&D program. The first of these will be a series of well-funded, multi-year technical challenge areas that will span the technology needs and gaps in the Nation's nuclear detection architecture. Research participants will be selected through an open process, such as Broad Agency Announcements (BAA) or a national laboratory call, which will solicit proposals in each challenge area.

The second will be an Academic Research Initiative, based at universities, with institutions selected on a competitive basis. These institutions will develop a program that develops intellectual capital, while emphasizing the incubation of innovative ideas that may initially be small in scope, at an early stage of development, or that may be of high risk, but could result in high future payoffs.

The third will be ATDs. The ATD is the final stage of the transformational R&D program. A successful ATD will transition the technology to a systems development or acquisition program if a cost-benefit advantage is found in the detection architecture. Each ATD effort is expected to last for a pre-defined period of time, usually from two to four years, depending on the maturity of the technology.

• How will DNDO balance the needs between rapidly deploying detection systems and developing technologies that can best fulfill its mission?

Response: DNDO has, from its beginning, adopted the risk-based methodology espoused by the Secretary to support both short-term and long-term planning. In a simplified form, DNDO measures overall risk-mitigation, and, hence, success, as a combination of several factors. Ultimately, to successfully prevent nuclear and radiological terrorism, authorities must be able to (1) encounter the adversary; (2) detect and identify successfully encountered threats; and (3) interdict successfully detected and identified threats. Given the limited nature of resources, deployment and operational strategies must be employed with the realization that 100% success against all threats may never be achievable. Instead, available resources must be allocated in such a way as to achieve the highest utility given existing constraints.

Technology development is initially conducted under separately funded R&D efforts. The evolution to fielded systems is done through a comprehensive systems engineering approach that provides the opportunity for systematic revisions and upgrades as appropriate. New efforts will be considered if they demonstrate a capability to address gaps in current capabilities. As part of this process, DNDO has stated that all acquisition decisions will be informed by robust test and evaluation programs. DNDO has made a commitment to fully characterize all technologies prior to large-scale acquisition decisions, to ensure that DNDO understands all potential performance improvements and liabilities.

• How will the results of these many research projects be integrated into an overall detection system?

Response: DNDO has established a disciplined systems engineering process whereby a global nuclear detection architecture has been defined and analyzed to identify gaps in current capability and coverage. Capability gaps may require revolutionary technology solutions, which become the basis for transformational research and development activities. Promising technology development programs that achieve predefined performance expectations will be transferred into formal acquisition programs. Through the systems engineering process DNDO will work with end-user communities to jointly establish capability requirements and develop performance-based system specifications. New detection systems will be acquired through competitive procurements and deployed through joint programs with the user communities. The global nuclear detection architecture is continually re-assessed to account for newly developed and fielded detection systems and to focus future activities on remaining gaps in capabilities and coverage.

9. At the recent G-8 meeting in St. Petersburg, President Bush and Russia President Putin announced the Global Initiative to Combat Nuclear Terrorism. According to Bush and Putin's joint statement, the Global Initiative is designed to "prevent the acquisition, transport, or use by terrorists of nuclear materials and radioactive substances or improvised explosive devices using such materials, as well as hostile actions against nuclear facilities."

• Could you explain what role DNDO, DOD, and DOE will play in this initiative?

Response: DNDO was established to improve our Nation's ability to detect and report unauthorized attempts to import, possess, store, develop, or transport nuclear or radiological material for use against the Nation. One of the key elements of DNDO's core mission is to develop a comprehensive global nuclear detection architecture that offers a multi-layered, global system for detection of nuclear and radioactive materials. DNDO will continue to work very closely with the DOE, DoD, DoS, and other elements of the USG to build on existing nuclear detection capabilities, both domestic and globally, and identify and adequately address potential gaps in the global detection architecture. The new Global Initiative to Combat Nuclear Terrorism (GI) will be instrumental in DNDO and USG efforts to advance the overall concept of the global nuclear detection architecture with foreign counterparts at a very senior level. This global architecture incorporates a multi-layered, multi-phased approach that offers several opportunities for global nuclear detection and emphasizes rapid and accurate information sharing. It is a work-in-progress that will require continual refining to fully address the broad threat spectrum. GI will help provide the framework for those discussions, and will make foreign partners key stakeholders in our efforts to enhance our collective global security.

Specifically, DNDO will participate in GI through:

- Development of measures to enhance national nuclear and radiological detection capabilities;
- Cooperation with other nations on R&D efforts to combat nuclear terrorism, including those related to nuclear forensic science and analytic techniques; the development of systems, technology, and protocols;
- Development, implementation and operation of detection systems, algorithms, and information sharing and analytic techniques that support the goal of interoperable global detection architecture open to all partner nations; and
- Development of training and joint technical and operational exercises.

DHS defers to DoD and DOE to address their specific roles within GI.

10. Secretary Chertoff announced that DNDO had awarded contracts to acquire Advanced Spectroscopic Portals.

• Could you please explain how ASP technology differs from current generation technology?

Response: The primary benefit of the ASP technology, when compared to current-generation RPMs, is the ability to not only detect the presence of radiation, but to also identify the source material for the detected radiation.

More specifically, current equipment in the field is based on plastic scintillation technology using polyvinyl toluene (PVT) detectors. These PVT detectors can be made in large sizes and have fast response times. PVT-based detectors are adequate for large area and fast gross counting of gamma ray 'hits' within a specific time period. However, due to their low efficiency and poor energy resolution, spectral images provided by PVT systems are inadequate to determine if material causing an alarm is an actual threat or a normally occurring radioactive material (NORM) source.

Advanced Spectroscopic Portal (ASP) systems utilize thallium-doped sodium iodide (NaI) or high purity germanium (HPGe) crystals as the scintillation material. NaI and HPGe detectors have a much greater efficiency and better energy resolution, producing very clear source spectra. This improved resolution provides that added ability to quickly and accurately identify sources of detected radiation. This identification then allows system operators to determine if an alarm is an actual threat or naturally occurring radioactive material (NORM) source much faster, and causes less of an impact to commerce with no loss of screening efficiency and improved security to the Nation.

• Some have been critical of the cost of the ASP technology relative to its performance advantages over older, cheaper alternatives. Can you please discuss the process you went through to determine the optimal allocation of resources between alternative technologies?

Response: DNDO developed a Cost Benefit Analysis (CBA) for Next Generation Passive Radiation Detection of Cargo at the Nation's Border Crossings. This CBA evaluated five (5) competitive deployment alternatives that included different mixes of current-generation PVT-based systems and next-generation NaI-based ASP systems. Each alternative was evaluated on the basis of detection capability, impacts to commerce, and soundness of the investment for the USG. The CBA estimated the average procurement cost for a PVT system was $130,959, compared to $357,420 for a NaI-based ASP portal. When including installation and integration, the average costs are $349,959 for PVT and $576,420 for ASP. The preferred alternative recommended by the CBA was a hybrid approach consisting of ASP systems for primary screening at high volume/high NORM POEs, PVT systems for primary screening at medium and low volume POEs, and ASP systems for all secondary screening. This strategy effectively minimizes overall system costs while maintaining desired overall levels of systems effectiveness.

While the GAO recently released a report questioning some of the assumptions included in the CBA, such as the prices quoted for PVT systems, its is important to note that the DNDO also conducted a sensitivity analysis around many of these assumptions. Even if the assumed cost of PVT systems was decreased by 50%, the results of the CBA were unchanged. The DNDO has long planned to conduct a second round of testing in the coming months to evaluate the improvements made to systems since the initial testing, and against the assumptions included in the CBA. These results will be used to validate assumptions in the CBA prior to a full-scale production decision.

11. Secretary Chertoff recently announced a program entitled "Securing the Cities".

• What roles will your respective organizations play in this program?

Response: As part of the STC Initiative, DNDO is sponsoring New York regional exercises to test and enhance detection CONOPs and capabilities. The objective of the STC Initiative is to dramatically improve the capacity of State and local authorities to encounter, detect, and identify illicit nuclear and radiological materials through operational support, systems development and demonstrations, and additional analytical support.

• How will this new initiative interface with existing efforts?

Response: DNDO will continue to partner with the regional law enforcement agencies to accomplish the goals of the STC Initiative through the following activities:

- Research, development, test, and evaluation to tailored to specifically meet State and local requirements;
- Logistics and training support required for the implementation of regional architectures;
- Development of strategies and architectures for initial deployments;
- Integration of State and local deployments with the global architecture; and
- Assistance to State and local agencies in the grant process.

12. In his written remarks, Michael Levi claims that "U.S. efforts to defeat nuclear terrorism are insufficiently integrated across the federal government." He suggests that Congress should explore the utility of establishing a broader system integrator in the Executive Office of the

President," and in particular, he suggests that "Congress should consider directing the NCTC [National Counterterrorism Center] to produce a strategic operational plan that prescribes and delineates responsibilities for defense against nuclear terrorism across the U.S. government, and to periodically assess the effectiveness of that plan."

• Do you agree with this recommendation?

Response: With regard to the recommendation, the Administration established DNDO through HSPD-14/NSPD-43 to serve as a broad system integrator for Departments and agencies.

With regard to the recommendation that a strategic operational plan that delineates responsibilities across the U.S. government be developed, DNDO agrees with the value of such a plan. As such, DNDO was directed through HSPD-14/NSPD-43 to do develop a global nuclear detection architecture, and to enhance and coordinate the nuclear detection efforts of Federal, State, local, and tribal governments and the private sector. This architecture is currently being integrated into larger U.S. counterterrorism efforts – efforts which are currently coordinated by the National Counterterrorism Center (NCTC).

• Other than the President and Vice President themselves, who is the person in this Administration most responsible for preventing nuclear terrorism in the United States?

Response: As outlined in the Homeland Security Act of 2002, the Secretary of Homeland Security, as the head of the DHS, has the responsibility to "prevent terrorist attacks within the United States", including acts of nuclear terrorism. However, the Attorney General is the Executive Branch official charged with coordinating all law enforcement activities undertaken to detect, prevent, preempt, and disrupt terrorist attacks against the United States, including acts of nuclear terrorism.

13. Approximately 90% of maritime trade travels through containers. Approximately 11 million such containers enter our ports each year – a rate that has been growing by 10% a year. Many security experts have warned that a weapon of mass destruction is most likely to be smuggled into our country by a marine container. Yet recent estimates suggest that the United States currently inspects only about 5% of these containers, and that less than 40% of our seaports have basic radiation detection equipment.

• What percentage of our seaports currently have basic radiation detection equipment?

Response: One hundred percent of seaports are equipped with basic radiation detection equipment consisting of Personal Radiation Detectors and/or Radiation Isotope Identification Devices. Additionally, U.S. Customs and Border Protection has deployed 261 RPMs in domestic seaports, which represents approximately forty-two percent of the high priority locations that have been scheduled to receive RPMs. These additional RPMs allow CBP to screen seventy percent of all arriving containerized seaborne cargo. Domestic ports of entry, which include seaports, are equipped with PRDs and RIIDs.

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• Is it still true, as GAO reported in March, that deployment of portal monitors at our seaports and southwest border crossings are about two years behind schedule? If not, please provide an update.

Response: As stated in the testimony, the RPM deployment strategy calls for the screening of ninety-eight percent of containerized cargo at the southern border by the end of this fiscal year, ninety-three percent at the northern border by 2007, ninety-eight percent of cargo coming into our seaports by the end of 2007, and full deployment of the portal monitors by FY2013 (these targets presume sufficient funds are appropriated to support the schedule).

The program has experienced delays, however, caused by scheduling delays prompted by coordinating with CBP stakeholders and available funding. Although the negotiations required to reach these agreements have delayed the deployment schedule, the American public has benefited from this coordination and cooperation. For example, the coordination between the federal government and private sector have changed two seemingly mutually exclusive tasks (i.e., enforcement versus facilitation) into a process that permits the accomplishment of both tasks with minimal impact on both. Additionally, the program's deployment strategy was rebaselined to reconcile existing financial resources to the scope of work. As a result of the scheduling extension, the program was able to continue deployment of portal monitors at a steady pace, keep valuable employee resources engaged, maintain fiscal responsibility, and maintain the support and confidence of CBP stakeholders.

14. GAO reported in March 2006 that DHS may face a cost overrun of $340 million, and deployment of portals that may not be completed before 2014. In a later hearing that month before a Senate subcommittee, however, Mr. Oxford testified that DNDO was working with Customs and Border Patrol to propose a deployment strategy that would result in the screening of 98% of containerized cargo at the southern border by the end of this fiscal year, 93% at the northern border by 2007, and 98% of cargo coming into our seaports by the end of 2007.

• Has this new strategy been proposed? Are we now on track to achieve these stated goals?

Response: The DNDO and Customs and Border Protection (CBP) are in the process of finalizing the details of the portal monitor deployment strategy. As Mr. Oxford testified, DNDO worked with Customs and Border Protection to develop a deployment strategy that achieves the screening of 98% of cargo at the southern border by the end of this fiscal year, 93% at the northern border by 2007, and 98% of containerized cargo coming into our seaports by the end of 2007. This strategy is documented in the Project Execution Plan (PEP). Work is on track, consistent with the PEP, to achieve the stated goals.

The DNDO and Customs and Border Protection are in the process of finalizing the details of the portal monitor deployment strategy. At the current deployment pace, and barring major national incident requiring realignment of resources, achieving the RPM deployment strategy goals is anticipated on or very near the specified timeframe.

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• What is the current target date for fully deployment of radiation portals?

Response: Full deployment of radiation portals will be achieved at the end of FY 2013, contingent upon the availability of projected funding. At that point, all cargo entering the U.S. will be screened in accordance with the joint DNDO/CBP deployment plan. This will include the deployment of ASP units at high and medium volume ports to reduce the impact on commerce and increase the overall sensitivity of the border screening layer.

• How does DHS respond to GAO's suggestion of a $340 million cost overruns? How does the recent $1.2 billion in contract awards affect this figure?

Response: DNDO does not expect a project-at-completion overrun for the current scope of work outlined in the PEP. Specifically, this program is made up of many small projects – 374 at this time. In prior years, a significant amount of the schedule variance, or project delays, could be attributed to the delay of funding transferred to Pacific Northwest National Laboratory (PNNL), as the Government Accountability Office (GAO) has noted in a prior report. The other major item contributing to project delays has been the underestimation of the time required to gain stakeholder concurrence/ agreement regarding site design and operational considerations. These impacts noted, cost and schedule concurrency can still be significantly increased because the physical deployments, 374 separate projects, are mutually exclusive and, therefore, are not dependent on one another. As a result of added concurrency and the anticipation of improving the timely availability of funds, the likelihood of a project-at-completion cost and schedule overrun is not projected. The recent ASP awards are consistent with programmed funding. The combined value of the three ASP contracts is up to $1.157 billion over five years, depending upon how DNDO allocates the orders for the mix of detection systems between the three companies. The companies are effectively in competition during the design and testing of each ASP system configuration. This approach provides DNDO with management tools control cost and performance.

15. DHS's new generation radiation detectors will reportedly cost $330,000 - $460,000 per portal, compared to the $50,000 - $60,000 cost of existing portals. The total contracts just awarded add up to $1.2 billion. Yet GAO reported in March 2006 that "the prototypes of these portals have not been shown to be more effective than the portals now in use," and that "it is not clear that the dramatically higher cost for this newer equipment will be worth the investment."

• Do you agree or disagree with GAO's evaluations?

Response: DNDO disagrees with the GAO evaluations. DNDO prepared an initial ASP CBA on May 31, 2006 which disagrees with the GAO conclusion stated in the question. DNDO held several meetings with the GAO to discuss the findings and methodology used by the GAO. DNDO prepared two additional versions of the CBA to incorporate comments and suggestions offered by the GAO upon review of the CBA. Throughout these meetings, DNDO maintained that the CBA clearly demonstrated that investments in ASP systems are outweighed by the subsequent benefits conferred.

• Why did DHS decide to proceed with its recent contracts notwithstanding GAO's warnings?

Response: The observed performance of the prototypes of the winning ASP contractors during initial testing at the Nevada Test Site (NTS) demonstrated adequate detection and identification capability to continue with the procurement. ASP performance will continue to improve through development and testing. DHS will deploy ASP systems in both primary and secondary portal screening applications based upon clearly demonstrated performance advantages over existing capabilities.

• What additional prototypes, or additional tests, if any, were obtained and relied upon by DHS before entering into its recent $1.2 billion in contracts?

Response: No additional tests or prototypes were necessary to support the decision to award FY 2006 contracts for engineering development and low rate initial production. Initial ASP contract awards totaled approximately $45 million. Additional testing will be done prior to decisions to enter into full rate production. The total potential award of $1.2 billion will be made over many years, with annual re-evaluation of awards based upon performance and availability of funding.

• Please provide any documentation that discusses or analyzes these GAO statements, or explains why DHS decided to proceed despite them.

Response: As was discussed during the initial presentation of the CBA to the GAO, the existing contract for purchasing PVT systems will expire at the end of the calendar year. It is uncertain what future costs for PVT will be, but it was known that they would be higher than under the existing contract. The GSA schedule pricing was a cost that was documented and certain. Please find below the detailed cost estimate for PVT used in the CBA. Note that $20,000 of the estimated cost for a PVT system is represented by the addition of 4 neutron tubes to make the PVT system comparable to an ASP system.

AT-980 ARPM Detector System	**$85,476**	**x1**	**$85,476**
- 4 detector panels - PVT detector with photomultiplier tube and electronics (2,200 cu in) - He-2 neutron tube and electronics - 1 portal control box - 1 annunciator			
AT-900S Detector Stands	**$11,848**	**x2**	**$23,696**
Additional Neutron Tubes	**$5,000**	**x4**	**$20,000**
- 1 He-3 neutron tube and electronics per detector			
Uninterruptible Power Supply	**$1,787**	**x1**	**$1,787**

Base RPM System	**$130,959**

The CBA also performed a sensitivity analysis on the PVT procurement cost and evaluated the model at ± 50% of PVT procurement costs. ***Therefore, the model was evaluated at a PVT cost of $65k per system; even at this cost the hybrid alternative was selected.***

• How do you respond to the House Government Reform Committee's recent staff report criticizing DHS's national security-related spending in areas such as nuclear detection devices?

Response: DNDO recognizes the performance limitations of current-generation radiation portal monitors, particularly in high-volume ports where high secondary referral rates are particularly problematic. In response, DNDO launched the ASP program to address these limitations.

However, DNDO disagrees with the assessment of the GAO that ASP systems "have yielded mixed results" because "although the new monitors were able to identify and dismiss most naturally occurring radioactive material, they were no better than the current monitors at detecting smaller amounts of radiation." This assessment disregards the benefits of identification of radiation sources, the exact issue which ASP systems were designed to address.

The primary technical issue with current-generation systems is not their sensitivity. They are, in fact, highly sensitive. However, they are sensitive to both threatening and non-threatening materials. The House Report itself states that "the radiation portal monitors supplied by SAIC are so highly sensitive to radiation that they cannot distinguish between weapons-grade nuclear material and items that naturally emit radioactivity, including cat litter, granite, porcelain toilets, and bananas." DNDO does not disagree with this assessment. However, when secondary referral rates require "that customs officials… decrease the machines' sensitivity levels," this sensitivity is lost. Radiation identification capabilities allow detectors to continue to operate at recommended sensitivity levels without the corresponding nuisance alarms.

Therefore, DNDO agrees that "the new monitors were able to identify and dismiss most naturally occurring radioactive material" and that, when current-generation systems are operated at their highest sensitivities, ASP systems may be "no better than the current monitors at detecting smaller amounts of radiation." However, these should not be interpreted as "mixed results." These two statements represent only a partial story that dangerously discounts operational realities that in many high-volume ports limit the ability of current monitors to detect smaller amounts of radiation. DNDO has conducted an extensive cost benefit analysis of ASP systems that clearly demonstrates that the benefits of deploying ASP systems as a primary screening tool to high volume ports and as a secondary screening tool to all ports significantly outweigh the additional costs for these systems.

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16. In 2004, ABC News revealed that they had placed uranium in a lead pipe and smuggled it through the Port of Los Angeles. Others have also noted concerns that radioactive materials could be smuggled in a lead casing.

• After DHS spends this $1.2 billion for new radiation portals with transformational technology, will we have a device that will alert when faced with a marine container that holds a nuclear bomb encased in lead shielding? Or uranium smuggled in a lead pipe through Los Angeles?

Response: The $1.2 billion that is referenced in the question is for the development and acquisition of the passive ASP systems. ASP systems can detect and identify many forms of radiological materials legitimately and illicitly placed in the stream of commerce. ASP systems can detect unshielded or lightly shielded special nuclear material, but would not be able to consistently detect a nuclear bomb encased in lead shielding or uranium smuggled in a lead pipe, unless the sources were unusually large. This is the case for all passive detection systems, and is not indicative of shortcomings in ASP technical capabilities.

To address this vulnerability, DNDO plans to award multiple contracts for CAARS in September 2006. CAARS is an active technology system that will complement ASP and automatically detect both shielding material and special nuclear material which has been heavily shielded. Because of resolution limitations of CAARS when quickly scanning an entire cargo trailer or container, passive portal systems will still be required in concert with CAARS to detect small unshielded sources.

17. Some have described as a model the Integrated Cargo Inspection System, or "ICIS," now being piloted by private industry in Hong Kong, and which scans containers not just for radiation but also for large dense objects – such as a bomb shielded in lead casing.

• I understand that there may be benefits in both systems, but why did DHS decide to spend $1.2 billion now on a new type of radiation detection equipment, rather than focusing our immediate efforts on accelerating development of the ICIS model?

Response: The ICIS pilot at Hong Kong Modern Terminal utilizes currently available technology that is not optimized for radiation detection. DHS has sent teams to observe the ICIS pilot and determined that the technology they have used has potential, but still faces significant limitations.

The principal conclusion to date has been that while ICIS shows considerable promise, as deployed, is not an operational system. The current implementation of ICIS serves as a good model for data collection, but disregards the substantial challenges that must be overcome in analyzing the large amounts of data generated. In particular, considerable challenges remain to address how data collected by ICIS or an ICIS-like system could be analyzed and provided to foreign officials in time to affect load/no-load decisions. If these challenges cannot be addressed, then ICIS remains an interesting demonstration, but provides little additional operational advantage.

At the same time, the Department strongly agrees with the need for an integrated system approach to deploy passive detection systems such as RPMs (and, eventually, ASPs) in concert with active imaging, or radiography, systems. This integrated approach provides the ability to directly detect unshielded nuclear and radiological materials (using RPMs), as well as materials that could be used to shield nuclear and radiological materials (using radiography systems). The DNDO is currently investing in programs to improve the capabilities of each these technologies—the ASP program to improve identification capabilities in RPMs and the CAARS program to provide improved penetration and automated processing for imaging systems. In both cases, automated data processing will substantially alleviate many of the operational burdens that have, to date, plagued the ICIS concept.

18. In FY 2005, only about 5% of all containers coming into the U.S. were actually inspected. In Hong Kong, by contrast, the ICIS system is apparently able to screen all containers upon entry to the port, and without impeding the flow of commerce. Its software can also collect data so that it can be compared against future containers that may be out of the ordinary or in later forensic analysis if a problem arises.

• Again, why did we make the decision not to prioritize ICIS?

Response: The current implementation of ICIS serves as a good model for data collection, but disregards the substantial challenges that must be overcome in analyzing the large amounts of data generated. Considerable challenges remain to address how data collected by ICIS or an ICIS-like system could be analyzed and provided to foreign officials in time to affect load/no-load decisions. If these challenges cannot be addressed, then ICIS remains an interesting demonstration, but provides little additional operational advantage.

At the same time, the Department strongly agrees with the need for an integrated system approach to deploy passive detection systems such as radiation portal monitors (RPMs) in concert with active imaging, or radiography, systems. This integrated approach provides the ability to directly detect unshielded nuclear and radiological materials (using RPMs), as well as materials that could be used to shield nuclear and radiological materials (using radiography systems). Equally important is the quality and resolution of information collected by detectors. The greater the information content, the more able the USG is to conduct integrated risk analysis quickly and accurately – current generation components included in ICIS provide very little information content. The DNDO is currently investing in programs to improve the capabilities of each these components—the Advanced Spectroscopic Portal (ASP) program to improve identification capabilities in RPMs and the Cargo Advanced Automated Radiography System (CAARS) program to provide improved penetration and automated processing for imaging systems. In both cases, automated data processing, utilizing improved information content, will substantially alleviate many of the operational burdens that have, to date, plagued the ICIS concept.

19. In your written submission, you note how your agency has "recently begun the Cargo Advanced Automated Radiography System, or CAARS, development program to deliver imaging systems that will automatically detect, within cargo, high-density material that could be used to shield threat materials from detection by radiation portal systems."

• What exactly has CAARS been tasked to do that ICIS is not already inn the process of developing? Is DHS working in conjunction with ICIS? If not, why is it that DHS decided to develop a new and different program? How are we taking advantage, if at all, of what ICIS has already done?

Response: CAARS is, from a technical standpoint, the next-generation of only one piece of the ICIS demonstration – the radiographic imaging system. The main difference between CAARS and this portion of the ICIS demonstration is that CAARS will be able to automatically detect high density material (i.e. lead used to shield SNM, SNM, and SNM that has been heavily shielded), as compared to an operator studying a radiographic image in ICIS. Additionally, CAARS will be operating at higher energy levels than imaging systems currently used in the ICIS demonstration. These higher energy levels will allow greater radiographic penetration, which will in turn yield a higher probability of detecting shielding or special nuclear material that has been heavily shielded.

20. Some have suggested that the ideal model for nuclear detection in containers would be a monitoring device built into each container.

• Some claim that these devices are technically feasible and economically viable now – do you agree?

Response: The monitoring of containers is a difficult problem. The main issue is the variability of the background. This makes accurate measurements difficult and the potential number of false alarms that would impede the flow of commerce. DNDO is studying the feasibility of this approach and other approaches as discussed in the response to below.

It should be noted that additional challenges relating to the transmission of detector data from within a ship's hull must also be addressed.

• What are we doing to develop this model?

Response: In FY 2006, the DNDO focused on the characterization of the "long-dwell, in-transit" radiation environment in large cargo-container ships. This characterization includes radiation background measurements aboard real cargo container ships in transit. This type of research could lead to the development of cost-effective technologies with unprecedented discrimination capability. These technologies could, for example, lead to the creation of a detection system that could be integrated into supply chain security systems applicable in air, land, and sea transportation. The results of this study will end in a solicitation for an Advanced

Technology Demonstration (ATD) of long-dwell, in-transit detection prototypes. The solicitation is anticipated in FY 2008.

21. The backbone of Customs' security assessment process is the Automated Targeting System or "ATS," which assigns a risk score to every shipping container bound for the U.S., allowing Customs to then prioritize the containers we may examine upon arrival. A March 2006 Congressional staff report, however, noted that the ATS scoring system had never been audited or validated to establish its effectiveness, and that it is not functioning as intended.

• The report called for ATS to be immediately refined or replaced. Has that been done? If not, why?

Response: Customs and Border Protection's Automated Targeting System (ATS) has been subject to extensive audits and reviews by the General Accountability Office (GAO) and the Office of the Inspector General (OIG) on an annual basis for several years. CBP has accepted the recommendations of these audits and has made significant progress in addressing the concerns raised by GAO and OIG. A GAO report issued in March 2006 recognized that CBP has taken positive steps to better implement the targeting strategy at seaports through the implementation of a testing and certification process, and to develop a new system which will record inspection results to facilitate automatic feedback mechanisms for targeting. Positive steps have also been made toward developing performance measures of effectiveness for targeting, along with the completion of a peer review and implementation of recommendations from that review. A more recent GAO report, issued in August 2006, further emphasized the importance of CBP fully implementing the various, responsive initiatives.

While GAO has been critical of certain aspects of ATS, those reports reflect a complex system with a strong ability to adapt and evolve. CBP does not have access to the "March 2006 Congressional staff report" referenced in this question and therefore cannot comment on that specific report.

CBP will continue to act on all positive recommendations and will continue to strive to refine and build new targeting and decision support systems that will enhance CBP's ability to keep the Nation safe.

22. After the much-publicized GAO undercover smuggling operation, assurances were provided by DHS at a March Congressional hearing that the weaknesses identified by the GAO undercover smuggling operation would be fixed within 30 days.

• Can you confirm that this has been done, and that Customs and Border Patrol officers now have access to the Nuclear Regulatory Commission's license database so that it can be used by the CBP officers to prevent such forgeries and verify that shippers of radiological material have actually obtained the necessary documentation?

Response: CBP has access to the Nuclear Regulatory Commission's (NRC) license databases, in addition to establishing protocols with the NRC on resolving any discrepancy detected. With the databases, CBP can substantiate the validity of the licensee and/or shipper information.

23. GAO has also expressed concern since at least 2003 about the NRC's licensing process. GAO has reported that the NRC allows license applicants to buy a license for up to 12 months before the NRC even checks on the applicant to determine whether the applicant is valid or not.

• Do you know if NRC has now modified its regulations to validate that an applicant applying for nuclear material was a valid applicant before issuing the license?

Response: The Nuclear Regulatory Commission (NRC) is presently examining several potential remedies for license application and license tracking. DHS defers to the NRC to provide specifics regarding these solutions.

24. We have primarily discussed our borders and ports, but some have suggested that a terrorist with a nuclear weapon would use unconventional means to enter our country.

• How can we address, if at all, concerns about radiological material being shipped into the U.S. through our nearly 7,000 miles of open border areas, or flown into the U.S. in a private jet or plane?

Response: In its baseline global nuclear detection architecture, DNDO identified these pathways as key gaps requiring additional attention. In addition to open land borders and private aviation, DNDO also highlighted small maritime craft as a similarly challenging pathway. These pathways have a common feature: they offer the adversary the opportunity to bypass POEs and the RPMs being deployed there.

To address these vulnerabilities, DNDO has performed a series of studies to identify and evaluate options and determine what can be done to address these gaps. Several promising options have been identified and are currently being analyzed in detail. Although these options are still being developed and are not expected to provide quick and simple fixes for all the identified vulnerabilities, DNDO believes they show considerable potential to reduce (but not eliminate) risk.

For the private aircraft (or "general aviation") scenario, DNDO is evaluating the concept of "international general aviation radiological/nuclear gateway airports." These would be airports located outside the continental U.S. where international general aviation flights would be required to stop and be screened for the presence of radiological and nuclear threats. Although this concept has many practical complexities, DNDO analyses to date indicate that it would be technically feasible and comparatively inexpensive. DNDO is currently conducting a detailed evaluation of how such a concept could be implemented.

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For the land borders between POEs, DNDO is working with the Office of Border Patrol to address radiological and nuclear threats in the context of the much larger array of border control issues that face our Nation. A defense-in-depth approach to the radiological/nuclear aspects of border security is being pursued, including unattended radiation detectors along the border, portable radiation detectors (both personal and vehicle-mounted), and relocatable radiation detection systems for use at tactical checkpoints (Border Patrol checkpoints located some distance inland along roadways leading away from the border). It should be stressed that the first step in securing the borders against radiological and nuclear threats is to identify all unauthorized crossings by people or vehicles, a task that poses many challenges beyond the task of radiological and nuclear detection. If vehicles or people can cross without detection, a radiological/nuclear vulnerability will remain. The only practical solution is to closely link radiation detection to the traditional border control challenge of identifying and interdicting unauthorized crossings.

DNDO is working closely with the USCG and other agencies to identify and evaluate options that reduce our vulnerability to maritime threats. DNDO and the USCG are pursuing a joint acquisition plan to obtain radiation detection equipment for maritime boarding teams. A wide range of additional options are being assessed, including the possibility of mobilizing additional personnel and resources across the maritime community and potentially equipping them with radiation detectors, training, and technical reachback resources. Prospective partners could include the Coast Guard auxiliary and industrial or commercial groups in key ports and coastal areas, as well as State and local government and law enforcement resources where appropriate.

Open border vulnerabilities can also be alleviated, in part, by building strong partnerships with our North American neighbors, Canada and Mexico. By stopping the threats as they arrive in Canada or Mexico, or as they transit through these countries, the risks associated with our land borders (as well as will the corresponding air and maritime pathways) will be reduced. This North American regional protection strategy is being pursued initially through the Security and Prosperity Partnership (SPP), a trilateral initiative by which the US, Canada and Mexico are working together on a wide range of economic and security issues. One key component of SPP is the installation of radiological and nuclear detection capabilities at all major ports of entry in all three countries. When fully implemented, SPP will significantly reduce the possibility of using Canada or Mexico as transit routes for radiological and nuclear threats, thus reducing our open border vulnerability. DNDO believes this North American regional rad/nuc detection strategy is a top priority for strengthening the overall global architecture, and we, along with our partners in other agencies such as DOE, CBP and State, are placing major emphasis on timely deployment of detection capabilities as part of SPP.

SUBMISSIONS FOR THE RECORD

Statement of Dr. Steven Aoki
Deputy Undersecretary of Energy for Counterterrorism
Before the
Senate Judiciary Committee
Subcommittee on Terrorism, Technology, and Homeland Security

July 27, 2006

Chairman Kyl, Senator Feinstein, and members of the Committee, thank you for the opportunity to appear before you today to discuss nuclear terrorism and, in particular, the Department of Energy's efforts to improve our nation's capabilities to detect, interdict, and attribute threats involving nuclear weapons or weapons-usable nuclear materials introduced covertly into our country.

First, the short answer regarding nuclear detection. Detection of weapons usable nuclear materials—that is, plutonium and highly-enriched uranium—by their radioactive decays is not a "silver bullet." Rather, nuclear materials detection is but one tool in the broad array of ongoing activities and emerging capabilities, systems, and architectures that comprise an overall national strategy to counter nuclear terrorism.

In the remainder of my statement, I address the threat from nuclear terrorism, the components of a national strategy to counter that threat, and the specific role that nuclear materials detection and related capabilities play in that strategy. I conclude with specifics about what the DOE is doing today to strengthen national capabilities for detection, interdiction, and attribution.

Countering Terrorist Nuclear Weapons Threats to the Homeland
In this post-Cold War world, nuclear terrorism may be the single most catastrophic threat that this nation faces—we must do everything we can to ensure against its occurrence. That threat could derive from two principal sources. First, state sponsors of terrorism could seek to employ indigenously-developed nuclear weapons covertly in the United States because of an inability, or an unwillingness, to deliver them via more traditional delivery means. Second, covert delivery by sub-national terrorist groups, either at the bidding of a state sponsor supplying the nuclear warhead or on their own via purchasing or stealing a warhead, is also a concern. With regard to terrorists there are three main threat variants identified below in decreasing order of likelihood, but increasing order of consequence in terms of deaths, injuries, cleanup costs, etc.:

- terrorists could acquire radioactive materials and construct devices for dispersal—so called radioactive dispersal devices or RDDs,
- terrorists could acquire special nuclear materials (SNM)—plutonium or highly-enriched uranium (HEU)—and build an improvised nuclear device of a few kilotons of nuclear explosive power,
- terrorists could acquire a nuclear weapon from a nuclear weapons state (few 10's to few 100's of kilotons).

The remaining discussion focuses on threats involving plutonium or HEU and the nuclear warheads or improvised nuclear explosive devices that employ these materials. These systems present the greatest threat and the greatest challenge in terms of detection.

The overall strategy to protect the United States from terrorist nuclear weapons threats has five components:

- prevent acquisition of nuclear weapons and special nuclear materials,
- deter the threat if possible,
- if prevention and deterrence fail, detect, interdict and render safe the nuclear device,
- identify the nature and source of the nuclear device,
- prepare for and respond to possible use.

We are working hard to prevent acquisition by:

- strengthening physical security of U.S. nuclear weapons and weapons usable materials[1],
- providing assistance to Russia to strengthen protection, control, and accounting of its nuclear weapons and materials,
- working with friends and allies to secure weapons-usable nuclear materials worldwide, and to strengthen security at civil nuclear facilities,
- taking more aggressive steps to interdict commerce in weapons-usable nuclear materials and related technologies via strengthened export controls, cooperation with other countries through DOE's Second Line of Defense and MegaPorts programs, and the Proliferation Security Initiative.

Earlier this month, Presidents Bush and Putin announced that they would join to create a Global Initiative to Combat Nuclear Terrorism aimed at strengthening cooperation worldwide on security for nuclear materials and the prevention of terrorist acts involving nuclear or radioactive substances. We continue to believe that keeping nuclear materials out of the hands of terrorists—and where possible, eliminating potentially vulnerable weapons-usable materials—is the most effective means of prevention.

Barriers to acquisition also provide an important element of deterrence. If terrorists believe that it will be extremely risky, or impossible, to acquire weapons or materials, they may seek other avenues of attack. While we of course want to prevent all types of terrorism, deterring a devastating nuclear detonation has particular urgency.

A U.S. capability to rapidly characterize and identify the source of nuclear warheads and weapons usable nuclear materials—either before or after an attack—is a key component of an overall strategy to counter nuclear terrorism. A state sponsor of terrorism may be deterred from conducting a covert nuclear attack or providing nuclear weapons to terrorist organizations if it believes that the U.S. has credible capabilities to attribute such devices to their source and the will to retaliate against both the state sponsor and any terrorists. An attribution capability will be

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[1] The Department of Energy is increasing efforts to secure its own sites which routinely store and transport war reserve nuclear warheads for the DoD and conduct R&D and manufacturing involving substantial quantities of plutonium and/or highly-enriched uranium. The increased threats to the physical security of weapons-usable nuclear materials, post 9/11, have led to significant increases over the past five years in the costs to secure the complex. In part to achieve an enhanced security posture at our sites, NNSA's planned transformation for the nuclear weapons complex involves consolidation of activities involving Category I and II quantities of SNM to fewer sites within the complex and to fewer locations within sites.

critical to actions taken in response to prevent follow-on attacks, and provide as well a means for law enforcement agencies to bring perpetrators to justice. A lot of hard work remains in fleshing out both the technical and policy dimensions of attribution. At DOE, the National Nuclear Security Administration is working with partners at the Department of Homeland Security, the Department of Defense, the FBI and other agencies to put in place the necessary technical tools and protocols.

But what if terrorists succeed in acquiring a nuclear device despite our best efforts? We cannot expect that they will be deterred by threats of retaliation. Indeed, the willingness of an organization such as Al Queda to sacrifice the lives of its members in suicidal attacks to achieve political objectives suggests that previous concepts of deterrence based on threats of punitive retaliation simply don't apply. We therefore need to strengthen our capability to interrupt a terrorist attack in the making. This includes both technical means to identify a nuclear weapon, nuclear materials, or other key components being transported to the United States, and close monitoring of intelligence collected against terrorist organizations interested in conducting a nuclear or radiological attack. A robust nuclear detection system not only protects the country directly, it could also convince our adversaries that any attempt of this sort is likely to fail.

Should we detect nuclear materials or a suspected nuclear device, DOE—through its national laboratory system—provides technical expertise to help identify the item in question. Working closely with partners at FBI and DoD, and in coordination with DHS, we deploy highly-trained teams of experts to support the disarming and eventual disposal of any terrorist device that contains nuclear or radioactive materials. In this regard, DOE has an applied R&D program to support its nuclear search and render safe mission and a complementary technology integration program that develops tools for use by its emergency response teams in the field. This work experienced a significant increase in funding in FY06; the Administration's FY07 budget request continues this funding level to ensure that the right technologies are available to operational teams and forces.

A nuclear materials detection system does not have to be perfect to be useful. And, we should not expect any nuclear detection system to be successful against all potential configurations of materials. Among other things, the low energy gamma rays emitted from U-235 can be easily shielded from radiation detectors—this reduces the standoff capability of detector systems and/or requires much greater detector time to acquire a signal. This may simply not be practical in many transportation scenarios. (Of course, the mass of shielding could itself tip off an inspector to examine a shipment more closely.) Other approaches—for example, neutron irradiation to cause fissions in U-235 which are more detectable—raise problems and policy issues including adding to the cost and complexity of the system, and possibly safety questions for both operators and the public. A detection system whose sensitivity is set very low in order to have high confidence of detecting nuclear material will have a correspondingly higher false positives rate from commonly occurring sources of radiation. Recent developments by the Domestic Nuclear Detection Office (DNDO), including installation of Advanced Spectroscopic Portals, are aimed at addressing this challenge. It is important to emphasize that developing appropriate procedures to be followed *after* an alarm is triggered—the so-called "concept of operations"—is as important to building a successful detection system as the physical characteristics of the detectors themselves.

For detection networks consisting of hundreds of thousands of detectors throughout the country, as some have proposed, the false positives problem could easily become cost prohibitive and seriously affect commerce. Detection systems employing gamma-ray imaging technologies, other advanced processing technologies, or technologies that allow rapid identification of specific isotopes offer potential for a reduced false positive rate and could be suitable, if produced cheaply, for widely-deployed detection networks. We are encouraged that the DNDO has been established to develop an overall architecture to detect and report attempts to transport or use radiological or nuclear materials and weapons. We are active participants in these efforts, as well as in DNDO research, development, test and evaluation programs.

With regard to long-term development of advanced nuclear materials detection technology, DOE/NNSA can draw on the science base established in its multi-faceted nonproliferation R&D program. Active efforts are underway in such areas as advanced radiation sensors and sensor systems development, identification and detection of alternative signatures for special nuclear materials, and advanced radiation detection materials development. These R&D activities are focused on enabling detection and identification of shielded HEU, stand-off detection of SNM, and higher confidence on SNM threat identification.

The country's best minds at the national laboratories, academia, and industry are exploring not only technology development for immediate deployment, but also the boundaries of science to determine if there are new technologies, techniques or methodologies that would provide a significant increase in nuclear detection capabilities. We are hopeful that these efforts will result in significant technological advances, but we must be mindful that all detection capabilities are constrained by the laws of physics. While we continue to work to extend conventional methods of radiation detection—that is, detection of neutrons and gamma rays from nuclear materials—we are also investing in unconventional and alternative concepts—for example, muon detection—to ensure that we cover areas that have typically been out of the mainstream.

The nuclear detection R&D carried out in this program is peer reviewed to ensure high quality and relevance and is coordinated with other government-sponsored R&D programs working in related areas. Let me be a bit more specific about coordination because numerous government agencies are involved in related work on nuclear detection. The Counterproliferation Program Review Committee (CPRC), for example, co-chaired by DoD and DOE with members from DNDO, the Intelligence Community, the State Department and others, provides a yearly report to the Congress and works to ensure that technology development in this area is fully coordinated. Other working groups and committees meet routinely to deconflict agency budgets and programs for nuclear detection R&D.

When all is said and done, however, we must recognize that there is no single "silver bullet" in preventing acquisition or in detecting and interdicting terrorist nuclear threats. Rather, we believe the nation needs a comprehensive strategy that includes a broad range of initiatives, capabilities, and supporting research and development.

Thank you for your consideration of my remarks and I would be happy to take questions.

Prepared Statement of
Michael A. Levi
Fellow for Science and Technology, Council on Foreign Relations
Before the Committee on the Judiciary
Subcommittee on Terrorism, Technology, and Homeland Security
United States Senate
July 27, 2006

Chairman Kyl, Senator Feinstein, thank you for inviting me to speak with you about U.S. efforts to detect smuggled nuclear weapons. **Current programs to enhance detection of smuggled nuclear weapons are, despite some important flaws, making valuable contributions to national security. They are not, and will never be, the most powerful means of defense – that role falls to programs that secure nuclear weapons and materials at the source.** But assessed in the context of a much broader system aimed at reducing the likelihood of catastrophic nuclear attack, and judged against the full range of existing and potential adversaries, not only against worst-case scenarios, their value is undeniable.

There remains much room for improvement. **U.S. efforts to defeat nuclear terrorism are insufficiently integrated across the federal government, between federal, state, and local levels, with the private sector, and internationally.** This reduces the value of those detection programs that are currently underway. The Domestic Nuclear Detection Office (DNDO) has taken important steps to promote integration, but it cannot, and should not, do the entire job itself. It would be best for DNDO to focus on developing and deploying technology and on integrating radiation detection efforts, as it largely does today. **Congress should explore the utility of establishing a broader system integrator in the Executive Office of the President.**

An effective strategy to detect smuggled nuclear weapons would also benefit enormously from a far better understanding – a strategic intelligence assessment – of the covert nuclear threat. **We are not fighting the movement of radioactive materials – we are fighting states or organizations with their own internal limits that must acquire, possibly build, transport, and detonate a weapon, all with some strategic, political, or religious goals in mind.** Simply testing the sensitivity of our radiation detection instruments is thus insufficient alone for judging whether our investments are worthwhile. Without a better understanding of the enemy, we cannot adequately assess the value of our defensive investments. **Congress should support a concerted effort to produce a detailed strategic intelligence assessment of the covert nuclear threat, and use this assessment as the basis for judging investments in defense against nuclear smuggling.** This assessment should draw upon analysts with expertise in terrorism, rogue states, and nuclear technology, as well as on new intelligence operations as required.

You have also asked me to comment on the potential of "transformational" technology. **This is technology that could lead to "dramatic improvement in national capabilities in nuclear/radiological detection and verification." Physics imposes basic limits that must be acknowledged, but there is room for technological advance.** Congress should, in principle, support long-term transformational programs, which would benefit from increased funding and from better use of the national laboratories. Congress should, however, exercise oversight to ensure that resources are deployed in ways that complement broader defensive efforts.

Outline

The remainder of this testimony is divided into five parts:

1. Describes the broad system for defending against covert nuclear attack, of which direct defense against nuclear smuggling is a part, and makes recommendations for better integrating the system.
2. Makes the case for a new strategic intelligence assessment of the covert nuclear threat, as a basis for defensive planning and evaluation.
3. Assesses the potential of transformational radiation detection technology.
4. Describes the transformational potential for detection systems that integrate radiation detection with other detection tools.
5. Explains why traditional detection efforts will be less effective against covert nuclear attack by states, and stresses the importance of attribution and deterrence in these cases.

The Defensive System

Were we able to secure all nuclear weapons and materials, there would be no need for a broader effort to prevent nuclear smuggling. **Security at the source, including, most prominently, cooperative threat reduction, is the most powerful tool available, and would benefit from increased investment and attention. But it will never be sufficient alone.**

A system of defensive tools, including materials and weapons security, law enforcement, intelligence, border controls, consequence management, denial of sanctuary, targeting of terrorist financing, and disruption of terrorist recruitment, can work to significantly reduce the likelihood of a successful nuclear plot, and to dissuade terrorist groups from pursuing such plots in the first place. (Preventing covert state attack is very different from preventing terrorist attack. I discuss this challenge below under "Attributing Attacks".) **Even if no single defensive tool has a high probability of defeating a given terrorist attack, a combined defensive system can still be effective.** If, for example, twenty independent defensive measures each have only a 10% chance of defeating a terrorist plot, they would, combined, have a 90% chance of defeating that plot. If each defensive element forces a terrorist group to alter its plot, the effect is even more powerful.

Tools for detecting nuclear smuggling must be developed and assessed in this context. That a particular defensive tool cannot defeat all terrorist plots is not reason enough for rejecting it – so long as a defensive tool complicates terrorist plots, increases their probabilities of failure, and is pursued within a broad defense, it may deserve investment.

This way of thinking about nuclear terrorism – refusing to assess defensive elements except as parts of a system – must be institutionalized. DNDO was in part an attempt to do that, but it falls short. Though DNDO includes interagency mechanisms for coordination, its efforts have been principally focused on coordinating radiation detection programs. This is useful but insufficient, as the wide range of tools relevant to defense against nuclear terrorism, outlined above, suggests. It is, however, natural, and perhaps inevitable, for an organization whose funds are spent primarily on radiation detection. Ultimately, DNDO should be one (major) piece within a broader effort to defeat nuclear terrorism, directed from within the Executive Office of the President. The National Counterterrorism Center (NCTC), which is responsible for strategic operational planning against terrorist threats, appears to be the right place for such coordination. **Congress should consider directing the NCTC to produce a strategic operational plan that prescribes and delineates responsibilities for defense against nuclear terrorism across the U.S. government, and to periodically assess the effectiveness of that plan.** Such a scheme would help efforts to detect nuclear smuggling, and provide context for evaluating them.

Understanding the Enemy

It is meaningless to talk about the effectiveness of a defense without understanding the enemy that it faces. Yet we do not have a strong understanding of that enemy. In assessing detection of nuclear smuggling, we thus fall back against two poor substitutes. Sometimes, we adopt a narrow technical focus, evaluating technologies against quantitative goals that are at best loosely connected with careful study of terrorist plots. Here, our tendency is often to adopt goals simply because they are achievable. At the other extreme, we focus on the worst-case threat, a terrorist group that is so resourceful, flexible, and lucky that it can evade essentially any defense. This is what many would call the "Ten-Foot Tall Terrorist". **In reality, many terrorist groups have far more limited, though still very threatening, capabilities. These are the "Five-Foot Tall Terrorists". It is critical to understand these more limited threats, and to design defenses against them as well. As in military planning, defenses optimized against the worst-case threat are not necessarily the best possible defenses.** Instead, defenses designed to contend with a range of enemy capabilities have the potential to be far more effective.

What does this mean in practice? **The United States needs a new strategic intelligence assessment of potential covert nuclear plots.** That assessment should draw upon expertise in terrorism, rogue state behavior, and nuclear technology, and outline a range of terrorist capabilities, rather than simply estimate a worst-case or most-likely threat. Novel intelligence operations can help refine this estimate – for example, intelligence operatives posing as nuclear scientists could improve our understanding of how terrorist groups might recruit technically skilled assistance. As with the strategic operational plan, this intelligence assessment most likely should be led by the NCTC. This would provide an intimate connection between underlying intelligence and strategic operational planning. It would also help institutionalize the practice of assessing the value of U.S. programs against a realistic assessment of the threats they face.

Radiation Detection: Techniques, Targets, and Transformational Potential

Materials used in nuclear weapons – uranium and plutonium – emit radiation: neutrons and gamma rays. Detectors are designed to sense that radiation. To be useful, they must be able to distinguish radiation emitted by nuclear materials from naturally occurring radiation, which may come from the earth, from building materials, from space, and from other sources. In many cases, detectors must be able to do that in the presence of "shielding", material placed around the nuclear material that absorbs gamma rays or neutrons before they can reach a radiation detector.

Unfortunately, material used in nuclear weapons need not be highly radioactive, and hence may not emit many neutrons or gamma rays, making detection difficult. **Much has been made of the difficulty of detecting highly-enriched uranium, a challenge to which I will return later. It is important, though, not to focus narrowly on this worst-case threat. Many materials that**

terrorists might transport as part of a nuclear plot emit considerably more radioactivity, providing greater opportunities for detection. (There is no reason to believe that terrorists can be selective, rather than opportunistic, in acquiring nuclear materials, at least without making themselves more vulnerable to defeat.) These materials include highly-enriched uranium that is below weapons-grade, that it not metallic, or that has been extracted from used nuclear fuel (as much Russian nuclear-weapons material has been). They also include plutonium, in both metallic and non-metallic forms. And stolen weapons may incorporate large masses of depleted uranium, which substantially increases radiation emissions. Detectors that can spot some but not all potential weapons or materials – an accurate description for many detectors – can be valuable.

Many challenges still remain, both in detecting low-radioactivity materials (including weapons-grade uranium metal) and in detecting shielded materials. Here, at least four types of "transformational" technology make sense. It is too early to evaluate specific technologies, but it is useful to understand where the potential for advances exists, along with their limits.

Combined radiation detection and radiography, analyzed using new software, has the potential to substantially increase detection capabilities. Used in close proximity to a suspect source such as a cargo container (within a few meters), radiography, like an x-ray, produces an image that may be able to identify shielding material. Thus, if a terrorist group uses shielding to hide material from radiation detectors, radiography may be able to identify it. Intelligent data analysis algorithms can increase the combined value of radiation detection and radiography by automatically synthesizing data from both sources, a process that is currently labor-intensive, prone to human error, and slow. Indeed, it is this software, rather than any of the hardware used, which has the potential to be transformational, and that should be the focus of investments.

Active interrogation is also potentially transformational. Again, it must be used in fairly close proximity to a suspect source. Active interrogation bombards suspect objects with radiation. If those objects contain nuclear materials, they will, in turn, emit radiation that can be detected. In principle, such technology can be used to detect well-shielded material, so long as an intense enough radiation source is used. (Increasing the radiation source is, very crudely, like turning on a brighter light when searching for something.) However, such strong sources of radiation raise health concerns, since they can be dangerous to operators and to bystanders, among other problems. **It is thus essential that development of active interrogation systems be accompanied by careful evaluation of what radiation exposure is socially acceptable, a process that has not received the same attention as the technology has.** (This is a political process.) Current limits on radiation exposure may already be too low. Moreover, in a very high threat environment – for example, in the aftermath of a theft of nuclear material – society will likely be willing to accept much more hazardous means of inspecting cargo. Yet if we do not develop technologies in advance, we will not be able to exploit such situations. Ultimately, though, safety issues will place limits on the potential of active interrogation.

Detectors that are more efficient and that have better energy resolution than current models might also be transformational. (Their potential, however, is more limited than that of active interrogation, though they do not carry the same dangers.) What does this mean? Radiation detectors only detect a fraction of the radiation emitted by nuclear materials. That fraction is called their "efficiency". While we cannot change the fact that many nuclear materials emit little radiation – these are the "limits of physics" that many refer to – we can improve how much of that radiation we detect, allowing us to better find nuclear materials.

Radiation detectors are also characterized by their "resolution". Radiation varies in energy, and the energy of radiation can sometimes be used to distinguish nuclear material. If a detector can more effectively discriminate between different energies – if it has improved "resolution" – it will be better at identifying nuclear material. Think of energy as color, and the gamma rays emitted by a particular type of nuclear material as "red". A detector with poor energy-resolution is color-blind – it cannot use color to spot the nuclear material. Improving detector resolution is like improving ability to see in color, and thus to identify nuclear material.

A final potential for transformational radiation detection technology lies in integrating data from large numbers of detectors. This has both hardware and software components. It requires reduction in weight, cost, and power requirements for detection systems, so that large numbers can be deployed cost-effectively, and often in mobile configurations. It requires software to dynamically integrate data from a large number of detectors. One example of such a program might involve radiation detectors mounted on large numbers of police cars, transmitting data to a central location where it is continuously combined. Advances in computational power would also help advance these technologies.

These technological innovations might also be combined. For example, higher efficiency radiation detectors might be combined with radiography using advanced data analysis.

How should this affect American investments? In FY06, DNDO received $56.6 million for "Transformational Research and Development". In contrast, only one major program area at DARPA, which supports transformational research through the Department of Defense, was funded at less than $100 million during FY06. As DAPRA understands, ambitious, high-risk research requires funding many failures in order to yield a single success. **Transformational efforts would profit from expanded funding.**

Congress should consider earmarking such funds for the national laboratories, which are currently excluded from applying for several critical DNDO transformational R&D grants. (They may apply as subcontractors.) This occurs despite their having deep strength in relevant technologies. Moreover, if we are to direct efforts at detecting realistic nuclear weapons, rather than just generic samples of radioactive materials, we must exploit the understanding of weapons design that the laboratories have accumulated over more than half a century. DNDO has asserted that most of its transformational work will be unclassified; as a result, it will not be able to exploit this opportunity. The national laboratories will.

In the long term, transformational detection efforts should be assessed against a new, nuanced strategic intelligence assessment, and within the context of a broad strategic operational plan.

<u>Integrating Radiation Detection into a Broader System for Detecting Nuclear Smuggling</u>

Radiation detection is not the only way to spot nuclear smuggling, especially if terrorists decide to smuggle an assembled bomb. In many cases, explosives detection may play an important role, as might detection of the weight and bulk of a weapon or of nuclear materials. Automated systems that integrate data from multiple detectors would be particularly valuable.

Strategists should also explore automated means for integrating radiation detection with non-technical detection. For example, it would be useful to develop algorithms for airports and official border crossings that combine radiation data with passenger profile information to yield combined assessments of nuclear threats. A similar scheme could be useful for identifying suspect cargo containers, based on radiation detection and non-technical intelligence.

In many cases, radiation detection will play a supporting, rather than a leading, role. This is particularly notable in defending against nuclear smuggling at non-official points of entry, such as land, sea, and air borders. **Transformational schemes envisioning continuous and universal radiation monitoring of American borders are unrealistic. Instead, efforts aimed at identifying and interdicting terrorists attempting to enter the United States, regardless of whether they are involved in nuclear plots, will play the leading role, with radiation detection supporting them.**

Consider, for example, attempts to smuggle nuclear weapons or materials across the southern border. The probability of an illegal immigrant successfully crossing the border after one attempt is likely less than fifty percent; such low odds of success might well deter a would-be nuclear terrorist from attempting a crossing. What makes illegal immigration easier is the "catch-and-release" policy that affords would-be-immigrants multiple chances to attempt illegal entry. Portable radiation detection equipment can, however, be used to ensure that individuals caught at the border while carrying nuclear weapons or materials are not released. Here, radiation detection plays a critical but supporting role. Similar schemes might be applied to aircraft intercepted while illegally entering U.S. airspace. Applying this approach on the water presents greater challenges, as the United States currently has much weaker capabilities to detect illegal sea-based entry. Addressing this requires efforts to improve maritime domain awareness, and maritime interdiction capabilities, rather than to improve radiation detection. **This emphasizes the need for a broad defensive plan, and cautions that technical detection investments must not outpace other complementary, non-technical, homeland security needs.**

Intelligence can also multiply the effectiveness of radiation detection. If we know or strongly suspect that terrorists have acquired nuclear weapons or significant amounts of nuclear materials, a surged response is possible. Such detection begins at the source of nuclear materials and weapons. For over a decade, the United States has been helping other countries install systems for protecting their nuclear weapons and materials (so-called MPC&A systems). **If terrorists acquire materials or weapons, MPC&A systems will in many cases provide warning, allowing a surged response to any ensuing attempt at nuclear smuggling.** The United States should attempt to secure agreements with facilities that receive MPC&A assistance, requiring that they promptly share warning information. DNDO is already tackling this challenge, and should be strongly supported by other parts of the U.S. government. It would be wise to go beyond this and develop protocols and agreements for sharing warnings of theft, including from facilities secured without U.S. assistance.

Such warning may be the most powerful source of intelligence that can be leveraged by detection systems. Its value would be strengthened if the United States stockpiled equipment needed for a surged response, which could be deployed only when necessary. (Despite the high prices of many detection systems, the bulk of their costs come from the labor required to operate them.)

Other sources of intelligence should also be pursued. For example, if terrorists are caught attempting to bribe radiation detector operators, intensified interdiction efforts might be mounted. Advance development and stockpiling of detection equipment would be essential.

Attributing Attacks

Against states, which generally have deeper resources and more extensive military and intelligence capabilities than terrorist groups, American efforts to directly defeat nuclear smuggling are far less likely to be successful. In particular, states will have greater abilities than terrorists will to evade radiation detection and border control efforts. **Our best hope against these threats is to enhance deterrence by improving our ability to attribute covert attacks to their sponsors, thus allowing us to threaten retaliation.** (This is a form of detection, albeit post-attack detection.) Attribution would work through a mixture of traditional forensics and technical tools that exploit nuclear-specific signatures. The latter would operate primarily by analyzing samples of material dispersed in a nuclear attack, and comparing them to a database of "fingerprints" for various nuclear states. Our greatest current deficiency on this front is in the fingerprint database. Theoretical analyses of material produced by suspect facilities, along with intelligence operations to obtain foreign material samples, would be valuable. So would better coordination: multiple government agencies with strong capabilities in this area, such as the CIA and the DOE, are not fully sharing what they know with each other. International cooperation, done with appropriate consideration for secrecy, would also help enhance deterrence.

Summary

Six points should be kept in mind when thinking about detecting smuggled weapons:

1. Securing nuclear weapons and materials at the source will always be the most powerful defensive tool.
2. Within the context of a broader defensive system, efforts to detect nuclear smuggling can be valuable.
3. It is essential to assess these efforts against a wide range of realistic threats, not only against semi-arbitrary numerical targets or worst-case scenarios.
4. Transformational technology has real potential but firm limits. It is as much about innovative software, concepts of operations, and leveraging intelligence, as it is about hardware.
5. Technology will often play a supporting role to traditional tools for controlling land, sea, and air borders. Those traditional tools must receive strong support.
6. Detection and interdiction are much weaker tools against covert state threats than against terrorist plots. Against state threats, enhancing attribution capabilities is critical.

Not for Publication

Until released

By the Senate Committee

on the Judiciary

Statement of

Dr. George P. Nanos

Associate Director

Research and Development Enterprise,

Defense Threat Reduction Agency

Before the

Subcommittee on Terrorism, Technology and Homeland Security

Committee on the Judiciary

United States Senate

Concerning U.S. Nuclear Detection Capabilities

July 27, 2006

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Introduction

Mr. Chairman, it is an honor to be here today to address the Defense Threat Reduction Agency's (DTRA) Radiation Detection program. I'm Dr. Pete Nanos, Associate Director for Research and Development (R&D) at the DTRA. As such, I am responsible for combating Weapons of Mass Destruction (WMD) by providing R&D capabilities to reduce, eliminate, counter, and defeat the threat of WMD and mitigate its effects.

DTRA is a combat support agency which means that the warfighter in the field is our customer and primary focus. Since its establishment in 1998, DTRA has been providing capabilities for the Department of Defense's (DoD) nonproliferation, counterproliferation, and consequence management programs; the three pillars of the President's National Strategy To Combat WMD. The agency's mission covers the complete WMD threat spectrum - chemical, biological, radiological, nuclear, and high yield explosives.

The President stated in the March 2006 National Security Strategy of the United States of America, "There are few greater threats than a terrorist attack with WMD." Radical terrorist groups have repeatedly stated their intention to seek and use weapons of mass destruction. The evidence indicates that they are aggressively pursuing chemical, biological, radiological, and nuclear materials to make good on those threats. We also face potential proliferation and direct military threats from WMD possessed by nations hostile to the United States.

The National Security Strategy provides the overarching guidance for combating WMD. This strategy states that countering the proliferation of WMD requires a comprehensive strategy involving strengthened nonproliferation efforts to deny these weapons and related expertise to those seeking them; proactive counterproliferation efforts to defend against, defeat and eliminate WMD and their means of delivery before they are unleashed; and effective consequence management to respond to the effects of WMD use, either by terrorists or nation-states.

The combating WMD strategy is developed in more detail by the National Defense Strategy, the National Military Strategy, and the National Strategy to Combat WMD, all reflecting the framework of the National Security Strategy.

Further, the Report of the 2006 Quadrennial Defense Review (QDR) provides additional emphasis on transforming capabilities to combat WMD. The

QDR and other national guidance state the need for the following types of capabilities:

1) "Capabilities to locate, tag and track WMD, their delivery systems and related materials, including the means to move such items";

2) "Capabilities to detect fissile materials such as nuclear devices at stand-off ranges";

3) "Interdiction capabilities to stop air, maritime, and ground shipments of WMD, their delivery systems and related materials";

4) "Persistent surveillance over wide areas to locate WMD capabilities or hostile forces".

The Department of Homeland Security Domestic Nuclear Detection Office (DHS/DNDO), with personnel from several Federal departments and agencies, has drafted an enhanced global nuclear detection architecture in which the Secretary of Defense retains responsibility for implementing DoD requirements within and outside the United States in accordance with the Domestic Nuclear Detection NSPD-43/HSPD-14. DoD is working with the other Federal departments specifically mentioned in NSPD-43/HSPD-14 to draft a Memorandum of Agreement to promote an integrated national research and development effort in nuclear and radiological detection. The DTRA Radiation Detection program will support implementation of the DoD components of the global nuclear detection architecture and will complement the radiation detection programs of the Domestic Nuclear Detection Office (DNDO) and the Department of Energy's National Nuclear Security Agency (DOE/NNSA). Our DoD-specific missions require mobile and transportable detection systems, some mounted on military vehicles, operated by Soldiers, Sailors, Airmen and Marines, and employed in fluid, potentially hostile situations. In contrast, a large portion of the DHS/DNDO mission is keyed to supporting the mission of Customs and Border Protection (CBP) aimed at border security, ports, portals, and cargo. Long dwell detection in transit, cargo inspection during border crossings, and vehicular monitoring at ports and borders are high priority DHS/DNDO missions. Unlike DoD missions, these tend towards fixed or controllable site installations in a relatively controlled environment. DOE conducts long term research to provide advance capabilities for nuclear detection and monitoring for the national and homeland security communities. It also supports near term applications for cooperative international efforts in safeguards and international security, in conjunction with its policy program. Many of the resulting technologies can be leveraged to support both DoD and DHS/DNDO missions. Military conflict (hostile environments) is not a part of DHS/DNDO or DOE/NNSA mission areas but is a key consideration for developing advanced capabilities for DoD. The ability to maintain operational tempo, the requirement to continue and complete the mission, and the need to operate at greater distances and shorter times are key DoD drivers. A key to the successful detection of threat materials is characterizing the radiation background in any operational theater. DoD must have the capability for rapid detection, identification, tracking, and interdiction of radiological items transiting that theater and the subsequent real time characterization of the theater following a nuclear or radiological incident, thus altering plans and movements as necessary to complete the mission. DoD must be able to find, fix, and finish potential adversaries, denying or taking away their potential threat to the United States.

All the respective Federal departments and agencies must work together to achieve a multi-layered defense strategy to protect the U.S. from a nuclear or radiological attack. I did not intend to imply no overlap between the missions of DTRA, DHS/DNDO, and DOE/NNSA in my earlier comments on contrasting DoD mission space with that of other Federal departments. DHS/DNDO is interested in mounting detectors onto vehicles for border monitoring activities geared more toward the continental United States (CONUS) and the domestic layers of the nuclear detection architecture including ports of entry; air, ground, and maritime pathways at unattended borders and coastlines; and regional, state, and local countermeasures. DNDO is also oriented towards cooperative international efforts and efforts at foreign ports in partnership with DOE/NNSA and CBP. Similarly, DoD needs to consider military installation protection globally, to include CONUS locations, and everyone is interested in larger standoff detection. We have frequent formal, informal, and semi-formal discussions with our interagency partners to de-conflict program activities, actively cooperate in testing or development of key technologies, and review each other's proposals, programs, and activities to ensure that we do not duplicate efforts. The goal is a coherent, coordinated national program to ensure that all national mission areas are met.

Conclusion

The Department has focused on the WMD challenge for many years now and we have been making steady progress in expanding our capabilities to combat WMD, and in building interagency partnerships. The QDR continues this momentum by providing specific near-term direction and longer-term guidance on capabilities and the required investments.

Mr. Chairman, this concludes my remarks. I would be pleased to respond to your questions.

Opening Statement

Of

Mr. Vayl S. Oxford

Director, Domestic Nuclear Detection Office

Department of Homeland Security

Before the Senate Judiciary Committee

Subcommittee on Terrorism, Technology, and Homeland Security

July 27, 2006

Introduction

Good afternoon, Chairman Kyl, Ranking Member Feinstein, and distinguished members of the subcommittee. I am Vayl Oxford, the Director of the Domestic Nuclear Detection Office (DNDO), and it is my pleasure to come before you today to discuss how we are responding to the threat of nuclear or radiological terrorism. I would like to thank the committee for the opportunity to share the progress we are making at the DNDO and within the Department of Homeland Security (DHS).

Nuclear weapons in the hands of terrorists are a grave threat. The magnitude of the destruction and casualties that would ensue is unique among potential threats facing the Nation. Today, I will discuss the formation of the DNDO and the role we play in protecting the nation, DNDO accomplishments in the past year, and some of our program priorities for the upcoming years. I will specifically touch upon how we are enhancing our detection capabilities through the use of next-generation technologies and how, what we call "transformational research and development," will help us overcome key, long-term challenges in our detection architecture.

Before describing our efforts, I would like to point out that protecting the United States from nuclear threats is a job that extends beyond the work of the DNDO and I would like to thank our partners, in particular the Departments of Energy (DOE), Defense (DoD), and State, as well as the Federal Bureau of Investigation (FBI) and the Nuclear Regulatory Commission (NRC) for their tireless dedication to this mission and for their contributions to our interagency office.

DNDO Founding and Mission

Combating the threat of catastrophic destruction posed by terrorists possessing nuclear or radiological weapons is one of the most critical priorities of not only DHS, but the U.S. Government. In order to integrate the Department's efforts against this threat under a singular direction, as well as coordinate these efforts with relevant partners across the government, the President signed a joint presidential directive NSPD-43/HSPD-14 on April 15, 2005, "Domestic Nuclear Detection," establishing the office. The DNDO was chartered to develop a global nuclear detection architecture that will form a robust layered defense for the Nation, coordinate nuclear and radiological detection technology development programs, and serve as the focal point of all radiological detection research and development collaboration between DHS, DOE, and other related Federal agencies.

It should be noted that the DNDO will not be responsible for implementing all, or even most, elements of the proposed architecture. We are responsible for implementing domestic components, but will work with other agencies, to include DOD, DOE, State, and the Department of Justice, to ensure the implementation of the entire architecture. Full-time detailees and liaisons from these agencies have provided invaluable expertise in all aspects of the DNDO mission. These detailees and liaisons enable us to maintain an open and productive dialogue with our interagency partners so that we may make strides towards the complete implementation of the proposed architecture.

Furthermore, the DNDO continues to work with partner agencies to ensure that research and development conducted by each agency is closely coordinated to avoid duplication of efforts. The DNDO supports the interagency Domestic Nuclear Defense Research and Development (DNDR&D) Working Group to develop a coordinated R&D roadmap that will enhance the breadth of domestic nuclear defense efforts to ensure a secure nation. This interagency working group addresses the coordination of: R&D strategies for domestic nuclear defense; the identification and filling of critical technology gaps, enhance efforts to develop and sustain critical capabilities through appropriate investments in the foundational science and research, interagency funding for necessary science and technology; and collaboration and exchange of vital R&D information.

DNDO Accomplishments

In the year since its founding, the DNDO has taken major steps towards achieving its stated mission. We completed the first ever global nuclear detection architecture analysis, which identified challenges and priority initiatives across Federal, State, and local governments. The architecture study was completed four months ahead of schedule and briefed to partner agencies and the White House in October and November of 2005. This architecture effort was funded and led by the DNDO, but involved considerable interagency participation, resulting in the delivery of a consensus strategy.

We have accelerated several technology development programs. The initial engineering development phase of the Advanced Spectroscopic Portal, or ASP, program is complete. This system development and acquisition program is improving current generation radiation portal monitors with the ability not only to detect the presence of radiation, but to identify the materials causing the alarms so that we can dismiss non-threatening sources. This enhanced capability will provide significant improvement for DHS Customs and Border Protection (CBP) secondary inspection operations, as well as greatly reduce secondary referral rates when operated as a means of primary inspection.

Last fall, these engineering development programs culminated in the first ever high fidelity test and evaluation campaign to measure the improvements in performance provided by these next-generation systems. The test data collected was used to support the selection of Raytheon, ThermoElectron, and Canberra to begin low-rate initial production (LRIP). We announced the ASP Contract awards on July 14th. The priority for the base year is development and testing of the fixed radiation detection portal that will become the standard installation for screening cargo containers and truck traffic. Full-rate production is expected to begin in 2007.

We have also recently begun the Cargo Advanced Automated Radiography System, or CAARS, development program to deliver imaging systems that will automatically detect, within cargo, high-density material that could be used to shield threat materials from detection by radiation portal systems like ASP. The automated image processing techniques envisioned for CAARS will also substantially improve throughput rates over current generation radiography systems. These improved throughput rates will, in turn, enable CBP and other operators to effectively scan a much higher portion of cargo. The

DNDO vision is to ultimately deploy ASP and CAARS systems together to ensure our ability to detect either unshielded or shielded materials across the entire threat spectrum.

While port security remains one of our top priorities, the DNDO is also taking steps to expand detection capabilities in the aviation and maritime domain and within the domestic interior. CBP deployments of radiation detection equipment at US airports are beginning, with a first pilot deployment at Dulles, to become a total of 30 airports. When completed, this will provide radiological and nuclear detection for air cargo upon arrival in the US. We are also engaging with the Coast Guard and State and local partners to address the challenges of doing radiation detection in the maritime environment. Specifically, the DNDO is committed to providing handheld and backpack radiation detection devices that enable the Coast Guard to successfully interdict radioactive material offshore.

Within our Nation's borders, we are leveraging and strengthening existing commercial vehicle inspection programs and surveillance capabilities to make domestic detection more effective. We have launched the Southeast Transportation Corridor Pilot program to deploy radiation detectors to truck weigh stations and other sites. These deployments will be at locations agreed to by our regional partners in accordance with the domestic detection architecture developed by the DNDO. Included in the pilot program will be the necessary training, technical reachback and operational protocols to ensure that detection technology is being operated properly and that alarms are escalated as appropriate. I will speak more about this alarm escalation process shortly.

As Secretary Chertoff officially announced two weeks ago, we have launched the Securing the Cities initiative, which will enhance protection and response capabilities in and around the Nation's highest risk urban areas. Using the New York area as the initial engagement region, the DNDO and regional partners will develop analytically-based detection architectures, to include all necessary planning, equipment, training, exercises, and operational support infrastructure. As these initiatives mature, the lessons learned will be exported to other regions and cities to enhance our overall protection against nuclear and radiological threats.

The DNDO also plans to support the training of approximately 1,500 State and local operators in the use of rad/nuc detection equipment through fiscal year 2007. Working with the Office of Grants and Training allows DNDO to oversee the design, delivery, evaluation, and continual improvement of preventative rad/nuc training curriculum. Because of the varying levels of resident expertise encountered in State and local venues, the DNDO has developed a modular training curriculum that can be easily and rapidly tailored to the appropriate audience. The training modules span a range of topics, and currently include modules that cover "radiation 101," nuclear threat awareness, response protocols and specific equipment operation. As State and local operations increase, the DNDO will continue to work with the DHS Office of Grants and Training to deliver additional training options, such as "radiation detection for commercial vehicle inspection" or "radiation detection surge programs."

I had previously touched upon the concept of the alarm escalation process, and I would like to explain the importance of this function within the detection architecture. The DNDO works with Federal, State, and local partners to refine the U.S. Government's approach to alarm response and adjudication with a focus on improving technical reachback capabilities to support operations. As alarms escalate, this program provides technical expertise to operators to ensure that alarms are resolved properly or, if necessary, that alarms are elevated to the appropriate response assets. As part of this operational support activity, the DNDO is leading an effort to develop a comprehensive U.S. Government process for alarm resolution that brings our procedures in line with the drastically altered security environment that we now face. This new alarm resolution process represents the first restructuring of the Federal alarm resolution and response protocols in over a decade.

Remaining Challenges - The Need for Transformational Research and Development

Even with all of the accomplishments I have outlined, there are still key, long-term challenges and vulnerabilities in our detection architecture that require a well-supported research and development program. These challenges include detecting threat materials from greater distances, in highly cluttered backgrounds, or in the presence of shielding and masking materials.

Our transformation research and development work is being translated into next-generation technologies that will address the current limitations of deployed systems. We are launching initiatives to develop technologies to meet these architectural challenges, as well as commencing a broad basic research program across private industry, the national labs, and academia to stimulate the entire field of nuclear detection sciences.

The transformational detection technologies that we are actively pursuing include a robust Exploratory Research Program, a dedicated Academic Research Program, and several upcoming Advanced Technology Demonstrations (ATDs). In December 2005, DNDO published a Call for Proposals to the National Laboratories soliciting novel detection approaches, materials, and advanced technologies. DNDO received over 150 proposals, and ultimately selected 44 for award, resulting in nearly $40 million in research programs. Similarly, DNDO released a solicitation in March 2006 for private industry and academia proposals in the same research topics. Over 200 white papers were submitted, and we are now in the process of evaluating full proposals for additional awards. Beginning in 2007, we anticipate a third solicitation, specifically focused on academic research. This program will provide a much needed emphasis in nuclear detection sciences, a field that has been in decline at American universities for years.

Building upon these research programs, we are launching several Advanced Technology Demonstrations, which will provide concept validation, leading to technology transitions to our Systems Development process. In April 2006, we solicited proposals for the first of these ATDs, the "Intelligent Personnel Radiation Locator." We received multiple proposals which are presently evaluating. Another technology that we are pursuing is the Stand off Detection ATD which aims to extend nuclear detection ranges beyond 100 meters. A solicitation on this topic will be released later this year. In 2007, we are hoping to solicit proposals in two additional ATD topic areas—active SNM verification and long-dwell detection in transit. We anticipate that active verification (AV) of SNM will be developed for secondary and primary screening at high throughputs to enhance detection and identification through development of gamma and neutron-based direct detection techniques. The long dwell detection in transit ATD is planned to explore our capabilities to exploit the time available during cargo transit to detect threat materials in cargo and conveyances.

Conclusion

In conclusion, the DNDO recognizes that the successful development of next-generation technologies must be done as part of a larger strategy, one that seeks to fill in gaps in our evolving architecture and extends to deployments executed by other agencies. Whether we are addressing the issue of port security and overseas screening or we are supporting the detection efforts of first responders, the systems that we put in place must be fully integrated and work within an environment that responds to information obtained from intelligence, counterterrorism, and law enforcement communities.

This concludes my prepared statement. With the committee's permission, I request my formal statement be submitted for the record. Chairman, Senator Feinstein, and Members of the Subcommittee, I thank you for your attention and will be happy to answer any questions that you may have.