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

[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.