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NUCLEAR MATERIALS PROLIFERATION AND U.S. BORDER SECURITY

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Mr. Chairman and members of the committee, It has been 16 years since the issue of unsecured nuclear weapons and materials was identified as a significant threat to global security as a result of the dissolution of the Soviet Union. In the course of that time the problem has become more complex, not less and the challenges greater, not smaller.

The threat we face today is not limited only to nuclear weapons and fissile materials, but includes the dangers posed by millions of radiological and radioactive sources. The location of these at-risk radiological materials includes virtually every country on earth – including within our own borders.[1]

The terrorist attacks of September 11, 2001 foreshadowed the devastating dangers that could await the United States if unsecured nuclear technology and materials fell into the wrong hands. We have undertaken serious efforts to protect our country from this threat. But our approaches have flaws and the challenges are growing as nuclear technology and materials have continued to accumulate and spread around the globe. Gaps in the security of these materials could be exploited by terrorists that belong to no state and recognize no limits on their actions.

Numerous technical and policy recommendations have been made for improving our responses to the nuclear threats that we face. However, there is one that should be acted upon urgently. It is ensuring that all nuclear and radiological materials in every nation are secured to the highest standards possible and that vulnerable sources are protected or eliminated on an accelerated basis. This is the first and strongest line of defense against nuclear terrorism. If it is breached it makes the job of preventing nuclear and radiological attack much more difficult. We have taken steps to achieve this goal but they have been inadequate up to now.

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Globalization and the Nuclear Threat

The international system for controlling fissile and radiological materials is insufficient to deal with the current scope of global nuclear programs. The impact of economic and technological globalization is increasing the pressure on this already weakened structure. Energy demands are likely to increase the use of nuclear fuel in key regions of concern including Russia and the former Soviet states, South Asia, and the Middle East. Also, the demand for advanced medical and industrial technology in developing nations will increase the number of radioactive sources around the globe. The struggle to contain and secure these technologies and materials is at the forefront of the 21st century's nuclear challenge.

Globalization also has eroded the importance of national boundaries and has expanded the scope of the terrorist threat. It is well known that the lethality of terrorists has been facilitated in part by the global communications revolution. But the expansion of global commerce has also opened new pathways for the smuggling of lethal nuclear materials. And, as al Qaeda has demonstrated, these materials are in demand.

In the scope of nuclear security concerns, the radiological dispersal device (RDD) – or dirty bomb – is considered to be a more likely weapon for use by terrorists because the technological barriers to its construction and delivery are lower. Unlike the development, assembly, and detonation of an intact nuclear weapon, highly specialized expertise or facilities are not necessarily required for the use of a dirty bomb. This type of weapon can be assembled by combining radioactive material with a conventional explosive, such as dynamite.

In particular, the multiple means of transporting radioactive material – the core of a potential dirty bomb – across borders is alarming. It can be imported into the U.S. by shipping container, vehicle, vessel, and even aircraft. And, the delivery need not be clandestine. Legitimate commercial shipping activities are considered to be one path that can be significantly exploited.[2]

The radioactive materials needed for the construction of a dirty bomb also are more readily accessible compared to other more sophisticated nuclear devices. For instance, sources of RDD materials are found in medical devices (nuclear therapy, teletherapy, brachytherapy), industrial applications (gamma radiography, well-logging, sterilization, food preservation, radiothermal generators), commercial products (smoke detectors, luminescent dials), and radioactive waste.[3] Argonne National Laboratory designates nine key radionuclides as most suitable for RDDs: americium-241, californium-252, cesium-137, cobalt-60, iridium-192, plutonium-238, polonium-210, radium-226, and strontium-90.[4] In the U.S. alone, there are 21,000 licenses to use radioactive materials.[5] In addition, any nuclear reactor is capable of producing radioactive material. At present, there are 439 nuclear power reactors in operation around the world and 30 more under construction.[6]

There are various methods that can be used to disperse radiological material. A passive RDD involves the use of unshielded radiological material that is placed in a strategic location and designed to expose a large number of people to the intense radioactive source. An atmospheric RDD is a method whereby radiological material is converted into a form that is more easily transported by air currents.[7] An explosive RDD uses the

explosive force of detonation to disperse radioactive material. A simple explosive RDD consisting of a lead-shielded container with a kilogram of explosive attached could easily fit into a backpack.[8]

Even a small amount of radiological material, when packaged with an explosive, could have devastating effects. On the lower end of the scale a small package of explosives (<100 kg) could be wrapped around a small radioactive source (1-10 curies) and detonated in a crowded area. On the higher end, several tens or hundreds of thousands of curies of material could be a dispersed by a more sophisticated arrangement of conventional explosives.[9] If exploded in a high value area even a small RDD could have devastating effects, especially on economic activity. This is why RDDs are commonly referred to as "weapons of mass disruption" because they would likely create major societal upheaval and panic affecting commercial activities, schools, and municipal services.

One major effect would be the radioactive contamination of the area in which the RDD was detonated. The detonation of a device in a city has the potential to contaminate thousands of people. One analysis speculates that an explosion dispersing powdered cesium-137 in lower Manhattan could result in the contamination of approximately one quarter of the island which could be uninhabitable for months to years if the area could not be adequately decontaminated.[10] A truck bomb with 220 kg of explosive and 50 kg of one-year-old spent fuel rods could produce a lethal dosage zone with a radius of about one km.[11]

This committee and the Congress as a whole should recognize that the danger of nuclear or radiological attack upon the U.S. or other nations is a real probability even though, thankfully, to date it has not occurred and with luck and perseverance may never occur. But, illicit nuclear trafficking and handling errors are an enduring reality.

According to a recent International Atomic Energy Agency (IAEA) report, based on the Agency's Illicit Trafficking Database (ITDB), 1,080 confirmed incidents of illicit trafficking and unauthorized activities involving nuclear and radioactive materials were recorded during 1993-2006. Just in 2006, 150 incidents of illicit trafficking and unauthorized activities involving nuclear and radioactive materials were reported.[12] The statistics below capture the nature of these most recent incidents:[13]

- 14 incidents involving unauthorized possession and criminal activities. The majority involved sealed radioactive sources such as cesium, cobalt, americium, and strontium. The cases regarding nuclear materials included natural uranium, depleted uranium, and thorium.
- 85 incidents involving thefts, losses, or misrouting of nuclear or other radioactive materials. These incidents involved industrial radioactive sources, including cesium, americium, and iridium, as well as radionuclides with medical applications, such as molybdenum, iodine, technetium, and palladium. Further, in 73% of the cases, the lost or stolen materials have not been recovered.
- 51 incidents involving unauthorized activities such as the recovery of sources, discovery of orphan sources, and detection of materials disposed of in an unauthorized way.

Protecting the United States

In the global context U.S. security is challenged by many external nuclear dangers, including emerging and growing nuclear weapons programs, and the globally dispersed nuclear and radiological materials I have mentioned. But, the U.S. also has internal nuclear challenges particularly those from industrial and medical radiological sources and the non-military use of fissile materials, such as highly-enriched uranium fuel in domestic research reactors.

There are several major U.S. government agencies tasked with protecting the nation from nuclear attack. They include the Departments of Homeland Security (DHS), Defense (DOD), Energy (DOE), and State (DOS).

The Department of Homeland Security (DHS) has a number of programs and initiatives focused on guarding against nuclear terror that are organized around three major missions: border security, radiological detection, and protecting against dangerous cargo.

Border Security

DHS has responsibility for managing the U.S. borders. For the purposes of this hearing I will focus on its activities on the northern border.

The U.S. border with Canada, at more than 4,000 miles, is the longest shared and undefended border in the world.[14] It stretches through 12 states with $1.3 billion of trade crossing it daily.[15] On September 11, 2001 there were less than 400 border agents patrolling the U.S. northern border; whereas, the southern border had 8,000 agents for 1,933 miles. That is 20 times the number of agents for less than half the distance. DHS has made an improvement to this ratio over the last 6 years with approximately 1,000 border patrol agents presently stationed in the north. Additionally, more than $122 million in technology has been deployed in the north since 9/11, including $8.7 million in tactical communications and $60 million in Radiation Portal Monitors.[16] Custom and Border Protection (CBP) inspectors have more than doubled and CBP air and marine branches have been opened (or are in the planning stages) in Washington, New York, Montana, Michigan, and North Dakota.[17] Fourteen Integrated Border Enforcement Teams (IBETs), joint American-Canadian border patrols, have expanded to cover strategic locations along the border.

These improvements to northern border security are well advised yet insufficient to deal with the dangers that vast miles of unprotected border pose for the U.S. While immigration issues involving Mexico have raised the specter of a terrorist slipping in through the south, there is evidence to suggest that the northern border also is a significant threat as a terrorist point of entry.[18] In June 2006, the Canadian Security Intelligence Service (CSIS) had its greatest anti-terrorism success since Canada's Anti-Terrorism Act was instated after 9/11. The Royal Canadian Mounted Police executed a sting operation arresting 12 adults and 5 suspects under the age of 18 for attempting to buy three tons of ammonium nitrate, a bomb making material. The group had planned to execute a string of "attacks inspired by al Qaeda."[19] Events such as this highlight the ongoing security challenges to the north.

In addition, a 2002 report by the CSIS said that with the possible exception of the U.S. which is the principal terrorist target, "there are more international terrorist organizations active in Canada than anywhere else in the world."[20] The CSIS reports that terrorists from 50 different worldwide terrorist organizations have posed as refugees attempting to enter Canada.[21] Some known terrorist affiliations in Canada include al Qaeda, Hezbollah, Hamas, Armed Islamic Group (GIA), and Egyptian Islamic Jihad.

The most well known case of attempted terrorist infiltration from Canada involves Ahmend Ressam, an Algerian who entered Canada under a fake French passport claiming refugee status in 1994, and who belonged to a Montreal-based terrorist cell with connections to GIA and al Qaeda. Between 1994 and 1999, Ressam entered and exited Canada several times, once even traveling to Afghanistan to learn to manufacture bombs. In December 1999, Ressam was caught crossing the U.S.-Canadian border at Port Angeles, Washington with approximately 100 lbs of explosives in his trunk. He was en route to Los Angeles International Airport with the intention of carrying out terrorist attacks in conjunction with Year 2000 Millennium celebrations. Ressam was convicted in Los Angeles in April 2001 for conspiracy to commit terrorism, document fraud, and possession of deadly explosives.

Radiation Detection and Cargo Protection

The DHS Domestic Nuclear Detection Office (DNDO) is tasked with increasing U.S. nuclear and radiological detection capabilities to prevent the import, possession, storage, or transport of unauthorized materials. DNDO's objectives are as follows: develop the global nuclear detection and reporting architecture; develop, acquire, and support the domestic nuclear detection and reporting system; fully characterize detector system performance before deployment; establish situational awareness through information sharing and analysis; establish operation protocols to ensure detection leads to effective response; conduct a transformational research and development program; establish the National Technical Nuclear Forensics Center to provide planning, integration, and improvements to U.S. government nuclear forensics capabilities.[22]

DHS also has developed a number of programs aimed at preventing nuclear and radiological devises from being placed in cargo and transported to the U.S. Some of the key programs include:

- Custom-Trade Partnership Against Terrorism (C-TPAT) which includes over 7,000 businesses working with DHS to review security practices of both companies that ship goods to the U.S. and those companies that provide shipping services.
- Container Security Initiative (CSI) that is active in 52 seaports which account for 80% of all U.S. inbound cargo[23] and that has plans to include six additional ports by the end of 2007.
- Secure Freight Initiative under which radiation detection equipment, imaging machines, and optical character readers are being employed at an initial set of seven ports abroad. At three ports, Port Ortes (Honduras), Port Qasim (Pakistan), and Southampton (U.K.), 100% of incoming U.S. cargo will be scanned, as required by Section 231 of the SAFE Ports Act. At the four other ports, limited operational testing will occur.

In the U.S., over 1,000 Radiation Portal Monitors (RPMs) have been installed at critical seaports and land ports to detect radiation. DHS also has established a goal of tightening regulations for private aircraft and small vessels. There are over 17 million small boats entering U.S. ports each year and proposed regulations for private aircraft would bring their requirements more in line with that of commercial passenger airline screening and information requirements.

However, despite actions taken and programs implemented by DHS and other government agencies, as GAO will attest, U.S. borders are far from impenetrable. For example, radiation detection equipment is currently insufficient to detect the small amounts of radiation emitted by potential dirty bombs and shielding devices can be employed to mask radioactive elements.[24] In addition, some detection capabilities in use cannot differentiate between the presence of naturally occurring radiation and potentially dangerous materials such as highly enriched uranium.[25] Also, acute vulnerabilities lie within the known-and-trusted shipper and port framework created by the C-TPAT and CSI.[26]

An Internal Threat: Vulnerable Domestic Sources

While it is important to secure nuclear and radiological materials abroad, we must also turn a critical eye to the security of those same materials domestically.

The medical and industrial uses of radiological sources are important but the security of these materials is disturbing and sources are routinely lost. In addition, the coordination among the key agencies with responsibility for domestic radiological protection seems inadequate. For example, the licensing process is not as tight as it should be. A particular concern is cesium-137 because it is widely used in hospitals for cancer therapy machines and blood sterilizers and can be found in an easily dispersible form. In 1998, 19 vials of cesium-137 disappeared from a Greensboro, N.C. hospital.[27] An Op-Ed in the *New York Times* in August 2007 highlighted the dangers posed by cesium-137 and offered some useful remedial actions.[28] Another major concern is cobalt-60 which is used in agricultural applications.

In addition to the radiological materials that pose a threat in the U.S., the continued use of highly-enriched uranium (HEU) in research reactors in the country is another serious vulnerability. There are seven research reactors in the U.S. that still use HEU fuel, in part because the replacement fuel is not yet ready. But while they await conversion, the security at these facilities has been judged to be substandard in past evaluations.

So, while our international and border security efforts are crucial, we have to remain mindful that it is possible terrorists might obtain and use our own radiological source material against us, effectively circumventing the detection equipment at our borders.

Evolving International Nuclear Threats

The numerous nuclear and radiological devices and stockpiles that exist around the globe clearly are a threat to U.S. security. Setting international standards for the protection of these materials would be an important step forward as would limiting their production

and use. But the reality is that nuclear material stockpiles are growing not shrinking and there are three regions that remain of significant concern to the U.S. given their potential to become sources of nuclear leakage. They are Russia and the former Soviet states, South Asia, and the Middle East.

Russia and the Former Soviet States

The U.S. has been working for almost 15 years to secure at-risk nuclear material in facilities in Russia and other former Soviet states, where the world's largest nuclear and radiological stockpiles exist. The Cooperative Threat Reduction (CTR) Program run by the Department of Defense along with several key programs managed by the departments of Energy and State are designed to assist with the elimination and control of nuclear dangers in that region. Totaling about $1 billion per year, these programs have made significant progress on the nuclear security problem in this region. But we have not solved this problem and the window for further cooperation is closing.

DOE in particular has engaged in an expansive range of activities to protect nuclear materials and eliminate radiological dangers in Russia and the former Soviet states. DOE has:

- Removed more than 5,000 curies of radioactive cobalt-60 and cesium-137 from Chechnya, and created secure storage facilities in Uzbekistan, Moldova, Tajikistan, and Georgia.
- Completed MPC&A upgrades at 39 Russian Navy nuclear warhead sites.
- Secured 92 buildings in the Rosatom Weapons Complex.
- Secured 374 Russian nuclear powered RTGs.

In addition on a global basis DOE has:

- Installed radiation detection equipment at 104 sites, including six Megaport sites.
- Converted 46 reactors from HEU to low enriched uranium (LEU).
- Secured more than 500 vulnerable radiological sources worldwide.

Going forward, it will be essential that Russia and the former Soviet states continue to maintain and operate on a sustainable basis the security systems that have been provided as part of their nonproliferation cooperation with the U.S. In addition, it is incumbent upon Russia now that it has financially stabilized and is prospering from high energy prices to further increase its nuclear security vigilance. This includes providing sufficient funding for the continued spread of technology-based security systems, training its workers in a culture that recognizes the importance of nuclear security, and ensuring that sufficient attention is paid to the issue at high levels of the government.

South Asia's Nuclear Growth

The nuclear landscape in the subcontinent centers on the rivalry between India and Pakistan. Both countries have growing nuclear arsenals and the proposed U.S.-India nuclear cooperation agreement is likely to add fuel to the burgeoning fissile material production race in that region. Current estimates indicate that Pakistan has enough HEU for up to 40 nuclear warheads,[29] and could assemble weapons "fairly quickly."[30] Pakistan continues to produce HEU and is also pursuing plutonium production and separation. India, which uses plutonium for its nuclear weapons, is believed to have 45 to 95 nuclear warheads, and also has the capability to assemble weapons quickly.[31] The

stockpiles of HEU and plutonium in these countries certainly will continue to grow in the coming decade, raising security concerns.

Nuclear power expansion also is an inevitability in both countries. Pakistan has a relatively small nuclear power program, with a 0.425 GW(e) capacity.[32] It currently operates two reactors and has a third under construction. It also has plans to construct an additional 10 to 12 nuclear power plants to increase this capacity by 8.8 GW(e).[33] India has one of the fastest-growing civilian nuclear energy programs in the world. Currently it has 15 small and two mid-sized nuclear power reactors in operation and six under construction. India expects to increase its national nuclear power plant capacity, which currently stands at a 4 GW(e) capacity by 10-17 GW(e).[34] India has also expressed interest in fast breeder reactors (FBR) which produce more plutonium than they consume and has a prototype FBR under construction.

Other countries in the region also have stated their intentions to pursue nuclear power.

- In August 2007, it was reported that the Bangladesh Atomic Energy Commission (BAEC) was to present proposals to the government for the construction of two 500 MW(e) nuclear power reactors in Rooppur.[35]
- In July 2007, Indonesia and South Korea signed a preliminary deal for South Korean assistance in building Indonesia's first nuclear power plant.
- In June 2007, Thailand stated plans to build a 4000 MW(e) nuclear power plant.[36]
- Vietnam has announced plans for a 2000 MW(e) nuclear power plant by 2020, though in this case U.S. and Vietnamese scientists will collaborate on reactor operation, safety and related issues. [37]
- The Philippines is reviewing its nuclear options.

The Potential for a Nuclear Middle East

States can get very close to producing a bomb via uranium enrichment and plutonium reprocessing programs if they declare their activities, pledge not to use them to build weapons, and allow periodic inspections. But, as North Korea demonstrated, once a state obtains these key nuclear technologies, there is nothing to keep it from withdrawing from the Nonproliferation Treaty (NPT) and exploiting that information for weapons purposes. The current situation in Iran underscores this danger in the Middle East.

Iran has constructed, with Russian assistance, a 1 GW(e) reactor at Bushehr that awaits a load of LEU to become operational. It also has five research reactors. It has a uranium enrichment facility at Natanz, a pilot uranium enrichment plant at Natanz, and a test uranium enrichment facility at Kalaye. It has a small plutonium reprocessing facility at the Tehran Nuclear Research Center (TNRC), heavy water production facilities near Arak, and uranium mining and processing facilities.[38] Iran's defiance of the U.N. Security Council's resolutions that it suspend and end its uranium enrichment activities are well known and the fear is that Iran is determined to become a nuclear weapons possessing state.

Compounding this concern is the possibility that the Iranian nuclear program may cause a nuclear domino scenario to emerge in the region. A number of countries in the Middle East have signaled an interest in nuclear energy in the past year.

In December 2006, the Gulf Cooperation Council (GCC) – comprised of Saudi Arabia, Kuwait, United Arab Emirates, Qatar, Bahrain, and Oman – commissioned a study on establishing a shared civilian nuclear program. Saudi Arabia has taken the lead in this effort and the IAEA has agreed to provide technical expertise to them.[39] Egypt has announced its intention to construct three domestic nuclear power plants by 2020 with plans to generate a total of 1.8 GW(e).[40] In addition, Jordan has expressed interest in pursuing nuclear power and has plans to have a nuclear plant operating by 2015.[41] Turkey has stated plans for three nuclear plants.[42] Tunisia, Libya, Morocco, and Algeria have all announced intentions for developing nuclear power.

Conclusion

Mr. Chairman, the focus of today's hearing is on how to keep nuclear and radiological materials from being used to damage the United States and its interests. Many analyses have been done on this subject and numerous recommendations have been offered to policy makers. Certainly we need multiple layers of protection, cutting edge technology, and continued vigilance at our borders and ports.

But, I would like to leave the committee with one key message. The best way to defend the U.S. from nuclear terrorism is to ensure that all nuclear and radiological materials are afforded the highest level of protection where they are stored and that vulnerable sources and stockpiles are protected or eliminated as rapidly as possible. This first line of defense is one that needs to be strengthened globally and it will take leadership to convince other countries to accept the financial and technical challenges that this goal requires. While the U.S. has taken many commendable steps to improve global nuclear and radiological security, it has not provided sufficient top level leadership to make this an international priority. If we don't act urgently on this challenge it will make the task of defending our borders and shores against nuclear and radiological threats much more difficult in the years to come.

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Mr. Luongo is the Executive Director and founder of the Partnership for Global Security. The Partnership is an independent, non-governmental organization dedicated to the effective control and elimination of nuclear and biological threats and to analyzing the convergence of the international security, global economic, and advancing technological issues that will shape the 21st century. From 1997- 2004 he also was a Senior Visiting Fellow and Visiting Research Collaborator with Princeton University's Program on Science and Global Security. Prior to these positions, from 1994-1997, Mr. Luongo served as the Senior Advisor to the Secretary of Energy for Nonproliferation Policy and the Director of the Office of Arms Control and Nonproliferation at the U.S. Department of Energy. In addition, Mr. Luongo served as the Director of the Department of Energy's Russia and Newly Independent States Nuclear Material Security Task Force and as the Director of DoE's North Korea Task Force. Prior to these positions, he served as a professional staff member in the U.S. Congress with the House Armed Services Committee, Senator Carl Levin (D-MI), and Senator William Proxmire (D-WI). Mr. Luongo was also the Senior Washington Representative for Arms Control and International Security with the Union of Concerned Scientists and as a Senior Program Associate at the American Association for the Advancement of Science.

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