The Stanley Foundation

policy analysis brief

Innovative approaches to peace and security from the Stanley Foundation

Creating a 21st-Century Nuclear Material Security Architecture

November 2010

Kenneth N. Luongo

Luongo is founder and president of the Partnership for Global Security. From 1997-2004 he was a Senior Visiting Fellow and Visiting Research Collaborator with Princeton University's Program on Science and Global Security. Prior to that, Luongo was Senior Advisor to the Secretary of Energy for Nonproliferation Policy and Director of the Office of Arms Control and Nonproliferation at the US Department of Energy (DOE). In addition, Luongo was Director of the Department of Energy's Russia and Newly Independent States Nuclear Material Security Task Force and Director of DOE's North Korea Task Force. He is also cochair of the Fissile Materials Working Group.

The April 2010 Nuclear Security Summit (NSS) in Washington, DC, drew international attention to the threat of nuclear terrorism and the need to adequately protect weapon-usable nuclear material around the globe. It was an unprecedented event: the first such gathering of political officials to discuss the subject. It featured the top leaders from 47 nations and 3 international organizations. The summit was a success in the sense that the attendees agreed to take steps to fully implement the existing elements of the nuclear material security regime.[1] A second nuclear security summit is set for 2012 in the Republic of Korea (ROK), and this should incentivize nations to act on their commitments, since there is likely to be a report on implementation at that meeting.

However, the scope and results of the summit also raised an important question—are the current components of the nuclear material security architecture, even if fully and rapidly implemented, sufficient to protect the global stockpile of fissile material from terrorist exploitation? This question was neither asked nor answered, in part because of differences of opinion among the participating nations, including on the need for compliance with all of the current regime elements. As a result, the final commitments produced at the summit were all voluntary and included no new initiatives.

Despite the limited scope of the summit and the voluntary nature of the commitments, the April 2010 NSS solidified the foundation of the current nuclear material security regime and served as a starting point for the development of a stronger nuclear material security architecture, one that is capable of responding to the evolving nuclear terrorism threat. The two years between the past summit and the next one needs to be used not just to ensure that 2010 summit commitments are implemented but also to reframe the nuclear material security debate and initiate some key changes in strategy.

The global objective should be to define a cohesive and effective future policy structure and to generate sufficient support from international experts and the private sector to persuade even reluctant governments to accept a new international order for nuclear material security. Creative new thinking is required to develop a stronger, more flexible next-generation global nuclear material security architecture that can adapt to international developments while surmounting the inevitable bureaucratic obstacles and establishing its broad and deep international legitimacy.

The Nuclear Security Summit's Achievements

Four sets of commitments were made at the April summit. First, the participants issued a communiqué highlighting the global importance of preventing nuclear terrorism. Second, they agreed to a work plan accompanying the communiqué that focused on improving and universalizing existing nuclear security agreements and programs. Third, 30 countries committed themselves to improving nuclear material security at home. Finally, some nations made financial commitments.

The Communiqué

The participants issued a communiqué highlighting the global importance of preventing nuclear terrorism and

endorsed President Obama's goal of securing all vulnerable nuclear material within four years.[2]

Additionally, it underscored the importance of maintaining effective security over all nuclear material in their territory; encouraged the conversion of reactors that use highly enriched uranium (HEU), a weapon-usable nuclear material, to low-enriched uranium (LEU); and recognized the importance of the Convention on the Physical Protection of Nuclear Material as amended and the International Convention for the Suppression of Acts of Nuclear Terrorism as essential elements of the global nuclear material security regime.

Finally, the communiqué emphasized the need for international cooperation on this agenda including the importance of capacity building and responding to requests for assistance in order to secure nuclear material globally.

The Work Plan

The work plan accompanying the communiqué focused on improving and universalizing existing nuclear material security agreements and programs.[3]

The work plan noted the need to fully implement UN Security Council Resolution 1540, and support the Global Initiative to Combat Nuclear Terrorism (GICNT) and the G-8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (Global Partnership). It also recognizes the continuing importance of the role of the International Atomic Energy Agency (IAEA) and its nuclear security guidelines.

The document underscored the need for robust and independent nuclear regulatory capabilities in all countries, prevention of nuclear trafficking, and improvement in nuclear detection and forensics.

It highlighted the role of the nuclear industry in the nuclear material security agenda, particularly in sharing best security practices and the human dimension of nuclear material security.

The work plan's most ambitious objectives considered the consolidation of national sites where nuclear material is stored, the removal and disposal of nuclear material no longer needed for operational activities, and the conversion of HEU-fueled reactors to LEU fuels.

All of these objectives are voluntary.

Individual Country Commitments

In addition to the work plan, 29 countries committed to improving security at home.[4] Highlights of these commitments include:

- The removal of half of the HEU in Ukraine by the end of 2010, and its complete removal by 2012.
- Canada's return of a large amount of spent fuel containing HEU to the United States.
- A US-Russia announcement to implement their plutonium disposition agreement.
- The establishment of nuclear security centers of excellence in India and China.

Funding

The following funding commitments were made:

- A $6 million pledge by the United Kingdom and a $300,000 pledge by Belgium for the IAEA's Nuclear Security Fund.
- $100 million from Canada for security cooperation with Russia.
- A call by President Obama for an additional $10 billion for the G-8 Global Partnership.

All of the commitments were important steps forward, but it is unclear if all nations left the Washington summit convinced of the real urgency of the mission.

What is the Nuclear Terrorist Threat?

The NSS was designed around two goals: convincing nations that nuclear terrorism is a real threat, and prodding them to take preventive action. The threat aspect has been especially difficult for some developing nations to accept. They tend to view domestic social and economic issues as higher priorities, and some are convinced that terrorists would need state assistance to manufacture even the crudest nuclear device. However, developed nations, and the United States in particular, have a very different view.

The 2010 US Nuclear Posture Review and National Security Strategy identified nuclear terrorism as the most immediate threat to the United States.[5] Osama Bin Laden has stated that he considers it a religious duty to obtain nuclear weapons, and there is evidence that Al

Qaeda has pursued nuclear capability.[6] In January 2010, the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism and a former CIA official warned that Al Qaeda continues to seek nuclear material to use against the United States.[7]

The world's stockpile of fissile material has been estimated at 1600 metric tons of HEU and 500 metric tons of plutonium.[8] According to the IAEA, fissile material is located at 1131 facilities and locations; about half the world's fissile material is in military stockpiles and the other half is in civilian stockpiles.[9] (The margin of error for this estimate is +/- 300 metric tons.[10]) Even with these imprecise figures, there is certainly enough material to manufacture 100,000 to 150,000 nuclear weapons.[11]

HEU is of particular concern because it is used outside of military programs, and a crude HEU gun-type device is considered to be the easiest nuclear weapon for terrorists to make.[12] It would take an estimated 50-60 kilograms of HEU to make such a device.[13] The weapon would be large and heavy, but terrorists would need only basic infrastructure support, such as a machining capability, and no advanced knowledge, to create it.

A plutonium device would be much harder to develop without a more sophisticated technical infrastructure and expertise.

The largest fissile material stockpiles are in the United States and Russia.[14] Other large stockpiles are also in Britain, France, China, and Japan. Around the globe, the security for nuclear material is uneven, especially in the civilian sector. This security vulnerability becomes even more serious in dangerous regions, where nations possessing the material lack strong governance. For example, 10 tons of HEU is used in civilian applications in nonnuclear weapon states, with the largest stockpiles in the developing or transition countries of Belarus, Kazakhstan, Ukraine, and South Africa.[15]

Nuclear smuggling is one window into the threat of nuclear terrorism. The IAEA has identified 1600 cases of illicit nuclear trafficking since 1993.[16] Of these, 18 cases involved the theft or loss of HEU or plutonium.[17] None of the HEU that was recovered had been reported missing.[18] More recently, there have been 3 cases of radiological sources being stolen and held for ransom.[19] In addition, two teams of armed men attacked a South African site that contained hundreds of kilograms of HEU in 2007.[20] Terrorists have been seen on reconnaissance missions near a Russian nuclear weapon storage site.[21] In January 2010, peace activists penetrated a Belgian air base where US nuclear weapons are believed to be stored.[22]

A radiological attack is thought to be a higher probability event than a nuclear attack.[23] A radiological device can be created simply by wrapping an explosive around a radiological source and detonating it to spread toxic radioactive materials. A radiological attack is much less sophisticated than a nuclear terrorist attack and would cause much less physical damage, but its impact on the global economy could be devastating.[24] There is a significant problem with the security of radiological sources around the world. The IAEA estimates that there are between 100,000 and 1 million radiological sources around the globe.[25] In China, alone, there are an estimated 400,000 sources.[26] The NSS only touched on the radiological issue, despite the desire of some of the attending nations to discuss in greater depth.

The status quo cannot prevent nuclear and radiological terrorism.

Components of the Current Nuclear Material Security Structure

The three major elements of the current nuclear material security regime are 1) the laws and regulations that govern security within national borders; 2) international agreements and United Nations resolutions; and 3) ad hoc, cooperative measures that nations voluntarily accept.

Domestic Activities

The first line of defense for the security of nuclear material resides with the country that manufactures and/or stores it. These materials are national possessions, and should be protected by national laws and regulations. This is why the NSS insisted that each nation possessing nuclear material has a duty to ensure the highest level of protection. It is the major reason why the NSS did not propose any new initiatives. The rationale was that security could be significantly improved if all nations took additional security steps at home and adhered to the international conventions and agreements that have been developed over the past 65 years. These domestic security protections can also be augmented by recommendations from

the IAEA, if a nation requests assistance. The IAEA's nuclear security advisory services include International Nuclear Security Advisory Service missions which identify a country's broad nuclear security requirements and ways to meet them; International Physical Protection Advisory Service missions which evaluate a country's physical protection arrangements; and IAEA State Systems for Accountancy and Control Advisory Service which recommends ways to strengthen a country's nuclear material accountancy and control systems.[27]

International Conventions and Agreements

A handful of major international agreements and conventions govern nuclear material security, along with others more directly applicable to WMD terrorism.[28]

Convention on the Physical Protection of Nuclear Materials and its Amendment. The Convention on the Physical Protection of Nuclear Materials (CPPNM) is the only legally binding international document on the physical protection of nuclear material. It requires its parties to protect civilian nuclear material while in transit. The CPPNM also criminalizes the theft, misuse, or threat of misuse of nuclear material and requires each state to designate a point of contact for information if material is stolen or diverted. The CPPNM was signed in March 1980 and entered into force in 1987.[29] As of August 18, 2010, there are 144 parties to the CPPNM.[30]

Because the original CPPNM only applied to the transport of nuclear material, an amendment was agreed upon in July 2005 to expand its physical protection regime. The 2005 Amendment requires countries to protect domestic nuclear facilities and material in use, in storage, and during transport. It also strengthens provisions to protect against theft, diversion, or sabotage, and expands cooperation to respond rapidly to these offenses. The 2005 Amendment, however, has not yet taken effect because only 41 of the state parties to the CPPNM have ratified it; two-thirds are needed.[31] At the 2010 NSS, Argentina, France, Germany and the United Kingdom pledged to ratify the 2005 Amendment.[32] To date, only the United Kingdom has done so.

International Convention for the Suppression of Acts of Nuclear Terrorism. The International Convention for the Suppression of Acts of Nuclear Terrorism (Nuclear Terrorism Convention) was adopted by the United Nations General Assembly in April 2005 to ensure that states would criminalize the illicit possession or use of nuclear material or devices by nonstate actors.[33] Under the Nuclear Terrorism Convention, states must enact laws to investigate possible offenses and to arrest, prosecute, or extradite offenders.[34] Countries are also called upon to cooperate and share information on nuclear terrorism investigations and prosecutions, protect radioactive material within their borders, and receive instruction on how to proceed if an illicit device or material is recovered from nonstate actors. Unlike the CPPNM, the Nuclear Terrorism Convention applies to civilian and military material. At the 2010 NSS, Armenia, Argentina, Australia, Georgia, and the United Kingdom pledged to ratify the convention.[35] To date, Georgia and the United Kingdom have done so.[36]

United Nations Security Council Resolutions: 1373, 1540, and 1887. In the weeks following the terrorist attacks of September 11, 2001, the UN Security Council (UNSC) unanimously passed Resolution 1373. Although it focused on general counterterrorism mechanisms and enforcement measures, it cites "the threat posed by the possession of weapons of mass destruction by terrorist groups" and "illegal movement of nuclear, chemical, biological and other deadly materials."[37] Because it was passed under the UNSC's Chapter VII authority, members are required to take measures to combat terrorism.

Despite its mandate for action, the shortcomings of the resolution were revealed by the discovery of an international nuclear proliferation network run by the Pakistani scientist A. Q. Khan. To close these loopholes, the UNSC unanimously passed Resolution 1540 (also under Chapter VII) in April 2004.[38] This resolution was intended to prevent weapons of mass destruction (WMD) terrorism by nonstate actors and for the first time bound UN member states to take and enforce measures against WMD proliferation. This included creating and implementing strict national export controls and security over all sensitive material and prohibiting financial or other assistance to nonstate actors seeking WMD or related material. Nations are also required to submit reports on their efforts, though the actual reporting has been very uneven.

In September 2009, President Obama chaired a session of the UNSC during which Resolution 1887 was unanimously adopted. It reaffirmed the threat of nuclear proliferation to global security and the need for multilateral action.[39] It highlighted the need for improving the security of nuclear material to prevent nuclear terrorism and expressed support for the April 2010 NSS, securing all vulnerable nuclear material around the world within four years, minimizing the civil use of HEU, and multilateral initiatives such as the Global Partnership and GICNT.

Ad Hoc and Cooperative Activities

With the collapse of the Soviet Union and the concern about "loose nukes," the nuclear nonproliferation regime in the 1990s expanded from consisting primarily of arms control treaties to include new, nontreaty based initiatives. The first of these initiatives was between the United States and Russia, and was subsequently followed by other multilateral initiatives.

Cooperative Threat Reduction and Related US Programs. Congress created the US Cooperative Threat Reduction (CTR) program in 1991.[40] CTR was designed to address the leakage of WMD from the collapse of the Soviet Union. CTR and related programs protect and eliminate nuclear, chemical, and biological stockpiles; secure nuclear weapons-usable material; and eliminate delivery systems. The core of the nuclear material security initiatives is run by the National Nuclear Security Administration (NNSA), a semi-autonomous arm of the Department of Energy. In recent years, programs within the Department of Homeland Security (DHS), including DHS' Domestic Nuclear Detection Office (DNDO), charged with creating a global nuclear detection architecture, have contributed to these efforts.

Most of the nuclear material security funds have been spent in Russia and the former Soviet States. However, CTR programs are slowly trending toward more global targets. In 2004, NNSA created the Global Threat Reduction Initiative (GTRI) and the International Nuclear Materials Protection and Cooperation (INMPC) program to assist with material security in countries outside the former Soviet states. However, as a 2009 National Academy of Sciences report suggested, the effort needs to be upgraded from "CTR 1.0" to "CTR 2.0"[41] and the programs must become more agile, flexible, and globally responsive while retaining their cooperative, results-focused core.

By concentrating on joint problem solving and cooperative approaches to mitigating dangers, CTR has achieved nuclear material security improvements that would not have been possible otherwise, validating the importance of ad hoc approaches.

G-8 Global Partnership. The G-8 Global Partnership (Global Partnership) was established in 2002 as a multilateral corollary to the CTR effort. G-8 countries pledged $20 billion over ten years to support this work.[42] Under this agreement the United States would provide $10 billion and the remaining G-8 countries would contribute the other $10 billion. In practice, however, the United States' annual contribution to the Global Partnership is now approximately $1.5 billion, $500 million more than originally expected. Approximately $1 billion per year is spent in Russia and the former Soviet states with the rest being directed to other regions.[43] The Global Partnership, originally a G-8 initiative, now includes 23 partners: Australia, Belgium, Canada, Czech Republic, Denmark, European Union, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Republic of Korea, Russia, Sweden, Switzerland, Ukraine (recipient only), the United Kingdom, and the United States.[44] Most of the non-US funding supports nuclear safety work, submarine dismantlement, and chemical weapon destruction.

In 2008, the Global Partnership's geographical focus was expanded beyond Russia and the former Soviet states to allow multilateral efforts wherever terrorism and proliferation risks existed.[45] But the G-8 nations have had difficulty shifting from their focus on Russian needs, and the majority of the funds are still spent in Russia. The Global Partnership will expire in 2012, and at the April 2010 NSS, President Obama called for a ten-year extension of the Global Partnership, an expansion of its scope and mission, and another $10 billion in funding for new projects.[46] However, just weeks after the NSS, the G-8 declined to extend the Global Partnership until it had evaluated the program.[47]

Proliferation Security Initiative. The Proliferation Security Initiative (PSI) is a US-led multilateral initiative that was launched in May 2003 to

interdict WMD and related material in transit. PSI has grown from 11 to 97 participating states (as of June 2010).[48] Participating nations endorse the PSI Statement of Interdiction Principles and participate in meetings, workshops, and other exercises with other members to improve their capacities for breaking up black markets and detecting and intercepting material. PSI members rely on national and international legal authorities to impede WMD trafficking. In President Obama's April 2009 speech in Prague, he called for the transformation of PSI into a formal institution, though this has not happened to date.

Global Initiative to Combat Nuclear Terrorism. In October 2006, Russia and the United States created the Global Initiative to Combat Nuclear Terrorism (GICNT), a nonbinding forum for sharing nonproliferation expertise and information and for preventing nuclear terrorism. Since then, GICNT has grown from 13 to 82 member nations.[49] There are also four official observers: the IAEA, the European Union, INTERPOL, and the United Nations Office on Drugs and Crime. In 2009, members agreed to promote greater civil society and private sector involvement. Members have also conducted over 30 multilateral activities and five senior-level meetings in support of the initiative's objectives.[50]

In President Obama's April 2009 speech in Prague, he called for GICNT to be transformed into a formal institution, though it has yet to move in this direction.

Creating a New Nuclear Material Security Architecture

It is clear from the current state of the nuclear material security regime that there are serious security gaps, much activity that is left to the discretion of individual nations, and a lack of coherence and integration. There is, therefore, a need to harmonize and supplement the existing regime to create a more robust, effective, and flexible 21st-century nuclear material security architecture to keep fissile (and radiological) material from terrorists.

This mission will require actions beyond the 47 nations that attended the NSS, beyond the current regime, and beyond the four-year goal. The NSS scheduled for South Korea in 2012 opens a window of opportunity to build on the 2010 summit and to drive the nuclear material security agenda forward. However, the details of what else needs to be done must be spelled out, and leadership needs to be established and sustained. Ten principles can frame this new nuclear material security architecture:

- A comprehensive and convincing threat assessment, including the global economic consequences of a nuclear or radiological terrorist event.
- The discouragement of the production and use of fissile material.
- Political leadership in the developing world that can complement that of the developed world.
- A baseline for security that can drive actions and against which improvements can be measured.
- Greater transparency of actions to improve international confidence that security is adequate or improving (even if that transparency is limited to other governments and is kept confidential).
- Robust and multilateral long-term funding for nations and institutions in need of assistance.
- The promotion of best practices, education, and training.
- Flexibility and inclusiveness in meeting evolving threats.
- Embracing the contributions of all stakeholders.
- Protection of the peaceful uses of nuclear materials for energy and medicine.

One important way to align the existing and new policy elements is to organize them into a framework agreement before the 2012 ROK summit.

Transnational problems like nuclear material security require an institution, mechanism, or agreement around which countries can rally to drive the process forward. At least a dozen international agreements and initiatives offer guidance on nuclear material security. Many of these were referenced in the NSS documents, but they are not tied together and compliance is often voluntary. In addition, each nation has its own regulations and

laws. This lack of an international framework agreement on fissile material security means there has been no organizing force to drive the agenda.

A Fissile Material Security Framework Agreement would identify the threats to humankind from vulnerable fissile material, especially the threats posed by terrorists, and list the actions and commitments required to mitigate these threats. It would make the issue a high global priority and then require the adherents to fulfill the agreement's objectives.

The agreement should package all existing commitments and new initiatives into a unified, clear, and cohesive fissile material security norm. It should recognize the relevant conventions, agreements, and UNSC resolutions and legitimize the ad hoc nuclear security mechanisms including the CTR program, the Global Partnership, the PSI, GICNT, and others that may be developed. This agreement should be universal, but recognizing the potential sensitivities of some countries, it could begin with support from a coalition of the committed.

Models for the framework include prior UNSC resolutions, including amending Resolution 1540 to include this agreement, the United Nations Framework Convention on Climate Change, and others. This proposal will be difficult to sell to governments that view nuclear terrorism as a lower priority, and which struggle to meet existing security commitments and are concerned about new nuclear mandates in an environment where the international community accepts nations of unequal nuclear status. Although the proposal will probably not be ready in time for the ROK summit, its components need to be conceptually developed in advance of the summit in order to spur discussion of its necessity and value.

While the president has taken an important step forward in making global fissile material security a top international objective, this mission will require additional actions and an international consensus. Several new policy initiatives will be required to achieve this objective and broaden the scope of the framework agreement.

Identify the Financial Consequences and Costs of the Mission

One central element of the framework must be to place the fissile material security issue in a modern context, so that all nations can appreciate and understand its importance and consequences. Since the international economy, and not international security, seems to be the prism through which most leaders view the world today, it is important to underscore the indispensable role of nuclear material security in ensuring the long-term growth of the global economy.

A single nuclear terrorist incident in a key city or country would have a serious impact on the global economy; so would a radiological terrorist attack with a high-intensity source in a densely populated city. When over $50 trillion in global economic activity is at stake,[51] an annual investment of a few billion dollars to ensure that it is not crippled is not just prudent; it is very wise.

Some studies have been done on the economic impact of a more traditional nuclear attack from a state actor. Another assessed the economic impact of a nuclear explosion at a major port.[52] There is also a US government assessment of the economic impact of a radiological attack, and its staggering cost conclusions led to its classification. However, there are no widely available unclassified reports on how a terrorist nuclear attack would affect the global economy, particularly the secondary impacts on countries that depend on trade. It would be very sobering if an analysis of this cost was provided to the assembled nations and the media at the next NSS.

The focus should extend beyond the immediate economic impacts on the city or country in which the detonation occurs; it also needs to examine the global economic ripple effects, particularly on the developing world, in order to underscore nations' common stake in preventing this event. Ideally, this assessment should be completed before the ROK summit.

In addition to the economic consequences, the cost of preventing this kind of an event must be examined. According to most estimates, not enough money is being spent, but there is resistance both in the United States and abroad to increasing this funding. Within weeks of the Washington NSS, the G-8 nations decided not to extend or expand the Global Partnership program, and they entrusted it to a group of government experts. This resistance was led by some highly developed nations, and the reasons were domestic and regional financial pressures, a lack of understanding of how the Global

Partnership could operate outside of Russia, and what the accounting rules would be for non-Russia and Ukraine contributions. On this last issue, nations that contribute to the Global Partnership only get credit for their financial assistance to these nations. In a truly global mission, however, security improvements anywhere should be counted. In addition, it was difficult to convince the US Congress to support the Obama administration's request for increased nuclear material security for fiscal year 2011. This reluctance may grow in coming years as US budget deficits and long-term recession recovery continue to squeeze federal spending.

There needs to be a global fund for WMD security that totals $2.5-3.0 billion per year over the next ten years. The majority of this should be spent on nuclear security projects, with biological security as the second priority. The United States is already paying over $1.5 billion per year of this proposed amount and that figure likely will increase over the next several years if Congress approves the administration's out year budget. If that is the case, the rest of the G-8, its 15 partners in the Global Partnership, and all other nations would have to pick up $500 million to $1 billion per year. The G-8 together account for over 44% of total global gross domestic product (over $25 trillion), and they should view this expense as a small investment in securing their future economic growth. In addition, the G-20 nations, individually and as a group, are doing virtually nothing on nuclear security. If a nuclear terrorist attack occurs, the cost of the response alone will dwarf the cost of prevention.

Some nations question the necessity for such a global fund. They question whether mechanisms like the Global Partnership can be extended effectively beyond their traditional focus on Russia. At the G-8 meeting in Canada in June 2010, the lack of satisfactory answers to these questions led to a decision to reassess the Global Partnership before deciding to extend it.

This decision is troubling, because it left the future of an important multilateral funding source in limbo and because it reflected a serious lack of imagination and understanding about how the funding could best be used. There are at least four ways to redirect the funding to important activities.

First, the accounting rules for the Global Partnership should allow all nuclear security contributions—both domestic nuclear material security improvements (above current levels) and international assistance (including voluntary contributions to the IAEA)—to be credited against the $2.5-3.0 billion global fund. Countries should be able to take credit for in-kind contributions while supporting their domestic economy and improving the global nuclear security situation.

Second, the Global Partnership should analyze the non-Russian and non-Soviet successor state opportunities to improve WMD security. This should begin with a public inventory of what Global Partnership members are doing and then identifying what else needs to be done. It should offer funding to assist developing countries to meet their UNSCR 1540 reporting requirements. Another funding target is to offer financial incentives to nations in exchange for reducing and eliminating their stockpiles of fissile material. This has been done with some success in Russia, but there are other nations with stockpiles of HEU, particularly those that are used for civil purposes, that may need an economic incentive to realize the full value of abandoning their use of HEU. In addition, there may have to be initiatives to encourage suppliers of uranium enrichment services to stop offering to produce HEU.

Third, based on the success of PSI, establish a multilateral rapid reaction force to be deployed in case of a nuclear emergency. Roles and responsibilities could be assigned to participating nations and funding dedicated for operations, transport, and training. Legal authorities should be in place to allow for the rapid protection, extraction, and return of nuclear material and technology. Integrated civilian and military operations have recently been used extensively in Iraq and Afghanistan, so there is precedent for this proposal.

This new initiative should also have a domestic US corollary that identifies policy objectives, funding needs, specific agency responsibilities, and success metrics. It should assign roles and responsibilities to individual agencies for emergency/contingency operations. For example, the Department of Defense could be required to provide and pay for airlift in a timely fashion and identify national laboratory technical specialists for missions.

Fourth, radiological sources, which are in use in all of the world's major metropolitan hospitals, are dangerous in the wrong hands. The NNSA's pilot project with the Hospital of the University of Pennsylvania secured all of the hospital's radiological sources and initiated cooperation with the local law enforcement and other authorities. In the United States, approximately 500 major metropolitan hospital buildings use radiological sources. At a cost of roughly $250,000 per building, the total cost of securing all of them would be about $125 million. The United States should commit to this course of action, and its international partners should take similar actions.

There also are political benefits to continuing multilateral funding, including convincing the US Congress that the United States is not disproportionately shouldering this burden and allowing other nations to be the interface for assistance in locations where a US presence would be unwelcome.

Strengthen the Mandate of the IAEA

The NSS underscored the need for the IAEA to do more in support of international nuclear material security. However, its nuclear security activities are gravely underfunded. The current budget is roughly $5 million per year, but what is needed is closer to $50 million per year.

The IAEA is a central international repository of knowledge and assistance for nuclear nonproliferation, and it has deep international legitimacy. It also does not have enough technical staff and is ill-prepared to fulfill increased demands in the future. Expanding the formal IAEA nuclear security budget is difficult, in part because the Board of Governors' budgeting process is very political and developing nations will want any increase matched by an equal increase in the technical cooperation budget. In addition to assessed contributions, the IAEA can accept voluntary contributions. The United States makes a voluntary contribution each year. These funds can be earmarked for specific security purposes without being subject to the regular board approval process.

To ensure that the IAEA has the tools and resources needed to meet 21st-century nuclear material security challenges, two actions should be taken. First, developed countries should commit to increase their voluntary IAEA contributions for the next several years and earmark the funds for nuclear security. The goal could be to provide $50 million per year from voluntary contributions. Second, they could agree to train a specific number of additional nuclear security specialists for assignment at the IAEA to fill the positions that the additional voluntary contributions would create.

Establish a Baseline for Nuclear Material Security

Despite the detailed technical information the IAEA provides for the securing of nuclear facilities and the domestic regulations and international conventions that govern nuclear material protection, there is no universally accepted standard for securing nuclear material and weapons.

There are national sovereignty and security reasons why the nuclear material security system is not standardized, but the question is whether those rationales are still optimal. The need for more standardized methods to implement nuclear material security and to judge its effectiveness merits further examination in advance of the next summit.

The Obama administration, in the wake of the Washington summit, is reluctant to press for actions beyond the existing foundation of the material security regime. Today's challenges, however, demand that the United States maintain its leadership in this area by continuing to innovate and implement new, creative initiatives to address current nuclear dangers and convince allies to join them. Therefore, the United States, in collaboration with one or more international partners, should serve as a catalyst and call for the establishment of a baseline nuclear security standard. There has been some suggestion that the IAEA staff would welcome the establishment of minimum nuclear and radiological security standards.[53] South Korea, in fact, may see an opportunity to make its own contribution to this issue area, especially given the growing global prestige of its nuclear industry.

At the same time, there should be at least one developing nation that will be a strong political partner in this effort, and this is where the G-20 nations and those seeking nuclear power need to play a role. Key G-20 nations, including India and China, are among the world's leaders in increasing their nuclear power output. They consider energy essential to their economic growth. But, like with G-8 nations, increased global economic clout

should be linked to greater global security responsibility. Developing nations have shown a curious lack of concern about nuclear terrorism, in part because they see it as a manifestation of the developed world's threat-focused mindset. A nuclear terrorist attack, however, will not spare any major economy.

Building Confidence Through Transparency

There is very little information sharing among nations on nuclear material security best practices. Some cooperation has emerged, particularly between the United States and Russia, but in other countries and regions of concern, collaboration in this sensitive area is guarded, with governments asserting sovereignty and national security rationales. But without transparency of both best practices and improvements, it is very difficult to understand the state of security in key nations that possess significant amounts of fissile material.

There are some precedents for greater transparency in the nuclear sector. For example, the IAEA manages an Incident and Emergency Centre to monitor nuclear reactor safety around the globe, but the reporting is not done in real time. This allows for sharing information on nuclear dangers, but precludes rapid reaction to threats. This concept could be expanded to the nuclear material security mission.

This model could include the installation of satellite uplinks on all portal monitors and perimeter security equipment that would provide real-time reporting on its operational status and immediately log security alerts and breaches at all civilian facilities that are monitored by the IAEA. The information could be downloaded to a monitoring center staffed by rotating international experts. The goal would be constant real-time monitoring of all nuclear facilities under safeguards and rapid global alerting and response to security breaches.

This idea could be expanded to nuclear weapons states that are not subject to IAEA monitoring. Because of the sensitive location of much of the security equipment in these states, the information could be downloaded to a monitoring center established by the five permanent members of the UNSC that could be staffed jointly by specialists from all five nations. As a first step, a pilot effort could use unclassified and nonsensitive information to demonstrate the value and effectiveness of the uplink system.

The satellite uplink effort could be supplemented with a multi-party nuclear security hotline that would allow for immediate communication surrounding suspicious incidents. Such a connection already exists between the United States and Russia to reduce the risk of a nuclear exchange stemming from accident, miscalculation, or surprise attack. These proposals are likely to meet stiff resistance from the nuclear bureaucracy in many states but that should not deter action in support of greater nuclear material security.

Expand Training and Education Opportunities

The NSS documents emphasized the need for the expansion of best practices for nuclear material security. This will be an important element of a new framework agreement, but it should be complemented by additional education and training initiatives. Best practices efforts have been launched by governments, the IAEA, and private sector and nongovernmental organizations. These are all important efforts that should be maintained and expanded.

At the same time, training, research, and capacity-building activities could be undertaken. For example, partnerships have been established between the US government and research universities to fund basic science research. A similar fund could be established to support US government partnerships with NGOs and universities for nuclear material security and nonproliferation analysis and provide support for the next generation of nonproliferation and technical nuclear material security experts. The education and training support could be in exchange for some government service by the recipient. This project could begin with a modest initial investment of $25 million. This proposal could be expanded internationally by individual governments, through an IAEA initiative or by utilizing Global Partnership funds.

Additionally, the framework should endorse the expansion of nuclear material security centers of excellence. These centers are just getting traction in some key parts of the globe. The United States and Russia have been using such centers in their joint work in Russia. Building on this concept, the United States recently proposed the creation of a new center of excel-

lence outside the former Soviet states.[54] Despite some questions, the US Congress seems likely to provide the funding to establish this center in 2011. In addition, at the NSS, India announced the creation of a new center of excellence.[55] China and the United Kingdom also are in the process of creating their own centers.

Related to these centers is the need for more than governments or international organizations to participate in the training and education process. For example, the World Institute for Nuclear Security (WINS) has assumed responsibility for bringing nuclear material security best practices to the nuclear industry. At the same time, additional steps should be taken to ensure that the nuclear energy industry becomes a strong partner in the improvement of nuclear material security. The nuclear industry held its own conference on nuclear security the day after the official summit: "The Role of the Private Sector in Securing Nuclear Materials."[56] This meeting sought to identify how the nuclear industry could become a more robust partner in achieving this objective.

One idea for further integrating the industry into the material security agenda is to have them contribute to a nuclear material security fund. President Obama has already proposed $54 billion in loan guarantees for nuclear power construction. A small percentage of the underwriting costs (0.1%) of those guarantees could be devoted to nonproliferation funding, similar to the nuclear waste fee that industry now pays. Such a requirement would bring the nuclear industry into the security debate, increase the pool of nuclear security funding, and offer a reputational benefit to the power sector. Of course, the industry may have other equally important alternative ideas, and its input should be solicited.

A final education and training area that a framework agreement should include is related to nuclear forensics. While aimed at attributing the source of the nuclear material that is used in a terrorist attack, aggressive research in this area could have a sobering effect on nuclear material security. For example, if the science were sufficiently advanced, nations might come to believe that if their nuclear materials were diverted, stolen, and used in an attack, they would suffer military retaliation and economic sanctions if they were identified as the source of the materials. At present, the science of nuclear forensics is not sufficiently accurate.[57] As an example, an international database for forensics could be created under the proposed framework requirements that could ensure the highest levels of fissile and radiological material security worldwide. This proposal, like others, will likely be very controversial with officials and nuclear experts.

Create a Scientific Council

The physics of nuclear material are not much in dispute, but the most effective ways of protecting them generate controversy. The framework could benefit from the inclusion, therefore, of a multinational scientific advisory council. This committee could review national plans and actions, make recommendations, evaluate new proposals, and coordinate among governments, the private sector, and civil society.[58]

The UN Framework Convention on Climate Change includes a Body for Scientific and Technological Advice that could serve as a model.[59] Its mandate is to offer advice on scientific and technical issues that are relevant to the substance of the convention. While the climate change convention limits the participants on the panel to governmental representatives, the nuclear material security version should include nongovernmental and private sector experts.

Several interesting aspects of the mandate of the climate change scientific panel could be relevant in the nuclear framework. For example, scientific experts can assess the effectiveness of measures taken to implement the convention and respond to technical questions. While that may not be an unusual charge, it requires the experts to identify innovative and state-of-the-art technologies and ways of promoting and transferring them to other nations. In addition, it provides a mandate for promoting international research and development cooperation and supporting capacity building in developing countries.[60]

All of these activities could be directly relevant to the nuclear material security area. This mandate fits very well with the proposed best practices and centers of excellence. It also could assess the more technologically adventurous ideas, such as the satellite uplinks from facilities, and test the means of protecting sensitive information.

No other elements of the existing nuclear material security regime require this type of scientific body or international scientific scrutiny. In fact, there are multiple sources of technical expertise that are provided by governments, national laboratories, the IAEA, and nongovernmental and private sector experts. This type of a scientific advisory body would not need to be imbued with overriding authority. It could be used to harness the technical talent that already exists around the globe.

Reduce and Eliminate Fissile Material

Of course the best way to minimize the nuclear material security burden is to reduce the amount of material, limit the number of locations where it is stored and used, and eliminate any excess. The NSS work plan endorsed these objectives in the abstract, but it did not delve into the details, partly because this work must be done on a country-by-country basis. This objective is integrally linked to the multilateral funding that is made available for nuclear security improvements.

The achievement of these objectives may come slowly, but they will be measured at the ROK summit and, as a result, countries will need to take these commitments seriously. The US government is building a database of the 53 commitments made at the Washington NSS and their implementation. The NGO community is also monitoring what countries are doing on their summit commitments as part of a compliance database.

Two other fissile material issues should be discussed before the ROK summit. The first is the phase out and ultimate ban of the civil use of HEU. The usefulness of this material in a terrorist nuclear device is well known. Twelve states operate enrichment programs, and of those, only Pakistan and India are presently enriching uranium for military purposes. A number of other countries continue to use HEU in civil applications. One way to approach this politically charged issue is to come at it from a softer perspective. One US NGO has developed the text of a Model HEU Code of Conduct that governments could accept.[61]

The second issue is to limit the reprocessing of spent nuclear fuel. Here, there are no easy answers. Reprocessing is often justified as a response to the need to manage spent nuclear fuel from civilian power reactors. As the use of nuclear power spreads, spent fuel management headaches will increase. However, plutonium separation should not be encouraged and should be phased out. In 2005, the IAEA estimated that there was about 165,000 tons of spent nuclear fuel stored from power reactors worldwide, and by 2015, that number could increase to 280,000 tons.[62] A single ton of spent fuel from a commercial light-water reactor typically contains enough plutonium for a Nagasaki-type bomb. While some believe that reprocessing is necessary to deal with reactor waste, the separated plutonium that reprocessing produces makes it a proliferation risk.

Here again, perhaps a less frontal political approach to this issue could be more productive. One possibility is to develop a statement of principles on spent fuel reprocessing that balances ideals with reality. This could be proposed for acceptance first by nongovernmental experts and then for governments. It could include criteria such as supporting a limit on reprocessing, encouraging countries to deal with nuclear waste, requiring strict security standards to reduce the proliferation risks if reprocessing is occurring, and not reprocessing spent fuel without a demonstrated need for the material from it. It also could advocate civil nuclear cooperation agreements that prohibit uranium enrichment or spent fuel reprocessing. Acceptance of these criteria would support a transition from reprocessing. This will be a difficult and sensitive issue for the ROK summit given the host country's desire to reprocess.

Partner Government, Industry, and NGOs on Nuclear Material Security

The responsibility for improving nuclear material security extends beyond governments, and both the nongovernmental community and the nuclear industry held complementary summits in Washington during the days surrounding the official NSS. These stakeholder communities need to be more engaged with each other and with governments in the nuclear material security discussion and in the drive for better solutions.

The NGO community in the United States and in other nations is comprised of nuclear technical specialists, policy experts, and former government officials. This community has had a positive

impact on global nuclear material security, particularly in the United States, and continues to work intensively on this agenda.

Nuclear energy industry leaders, having experienced the devastating blow that the Three Mile Island accident inflicted on nuclear power 30 years ago, understand the importance of robust material security for the continuation and growth of their business. As Energy Secretary Steven Chu underscored at the industry event in April, "Even a failed detonation of a nuclear device would have a devastating impact on public trust in nuclear energy."[63] Despite this understanding, however, the industry is also concerned about the impact of additional nuclear security requirements on its bottom line.

Government, civil society, and the private sector each play a vital role in responding to 21st-century nuclear proliferation threats, and each offers a vital contribution that the other sectors do not, but they need to work together. All indications are that the South Korean government is likely to welcome a continuation of the NGO and the nuclear industry events around their summit, and these efforts should be coordinated to maximize the value of the summit and the preparation period.

One solution is to bring the key stakeholders into more regular contact as part of a new, multidisciplinary nuclear material security "Iron Triangle." The NGO and industry events surrounding the 2010 NSS are examples of how this conceptual triangle is beginning to take form. However, even though each event was connected by content, each really existed to serve its own stakeholders, and they need to be more connected at the ROK summit. Before the ROK summit, the key stakeholders (NGO, industry, government) should coordinate their events in such as way as to be mutually reinforcing and conducive to ongoing dialogue. Such a forum for this dialogue could be a regularized Government-Industry-NGO Conference Against Nuclear Weapons Proliferation. A version of this idea was proposed as a government-industry forum in a new study's survey and was found acceptable by many of the industry respondents.[64]

Conclusion

The danger of nuclear terrorism is not abstract or unrealistic. There are substantial quantities of HEU and plutonium around the globe and radiological materials are in use in virtually every nation. The use of any of these materials in a terrorist attack would not only cause devastation at the point of impact, but generate secondary waves of economic destruction globally.

While the international community in general recognizes this danger, not all countries are taking the possibility seriously enough to do everything possible to ensure that their material is secured to the highest standards. The NSS raised the profile of this threat internationally, and 47 nations have agreed to fully implement elements of the existing nuclear material security regime. However, even if these elements are fully implemented, the current regime cannot keep pace with the evolving challenges.

In the 20th century, the stockpiles of fissile material in the declared nuclear weapons states were the major challenge, but production of this material has ended or trended downward; at present none of these nations produce material for weapons.[65] But there will still be growth in these stockpiles in the 21st century, particularly in regions where economic development is expanding and nuclear power and related technologies are of increasing interest. Beyond fissile material, radiological materials are used around the globe. A small but potentially lethal percentage of these materials are highly radioactive. While not as devastating as a nuclear terrorist attack, if exploded they will inflict clear economic damage and a psychological reaction that could inhibit economic expansion.

The consensus generated at the NSS is a milestone in the prevention of nuclear terrorism. At the same time, it is just the beginning of a transition from the current regime to a more robust and aggressive architecture. At the heart of this new architecture must be the harnessing of all relevant tools: existing agreements, ad hoc programs, and new initiatives. They should be harmonized under a new international framework agreement that can both rationalize and improve the existing regime and drive the international community to a level of nuclear material security that maximally minimizes the risk of nuclear terrorism.

Endnotes

[1] Jesse Lee, "An Enormously Productive Day," White House Blog, April 13, 2010, *http://www.whitehouse.gov/blog/2010/04/13/enormously-productive-day*.

[2] "Communiqué of the Washington Nuclear Security Summit," White House, April 13, 2010, *http://www.whitehouse.gov/the-press-office/communiqu-washington-nuclear-security-summit*.

[3] "Work Plan of the Washington Nuclear Security Summit," White House, April 13, 2010, *http://www.whitehouse.gov/the-press-office/work-plan-washington-nuclear-security-summit*.

[4] "Highlights of the National Commitments Made at the Nuclear Security Summit," White House, April 13, 2010, *http://www.whitehouse.gov/the-press-office/highlights-national-commitments-made-nss*.

[5] Nuclear Posture Review, April 2010, *http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf*; National Security Strategy, May 2010, *http://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf*.

[6] Rolf Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality?" Belfer Center for Science and International Affairs, January 2010, *http://belfercenter.ksg.harvard.edu/files/al-qaeda-wmd-threat.pdf*.

[7] "World at Risk: The Report of the Commission on the Prevention of Weapons of Mass Destruction and Terrorism," January 2010, *http://www.preventtwmd.gov/report*; Rolf Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality?" Belfer Center for Science and International Affairs, January 2010, *http://belfercenter.ksg.harvard.edu/files/al-qaeda-wmd-threat.pdf*.

[8] International Panel on Fissile Materials, "Global Fissile Material Report 2009: A Path to Nuclear Disarmament," p. 8, *http://www.fissilematerials.org/ipfm/site_down/gfmr09.pdf*.

[9] Tim Andrews, "Strengthening Global Nuclear Security: The Role of the IAEA," Presentation to the Nuclear Security Conference, King's College London, February 18, 2010.

[10] International Panel on Fissile Materials, "Global Fissile Material Report 2009: A Path to Nuclear Disarmament," p. 8, *http://www.fissilematerials.org/ipfm/site_down/gfmr09.pdf*.

[11] Ibid.

[12] Matthew Bunn, "Securing the Bomb 2010: Securing All Nuclear Materials in Four Years," Belfer Center for Science and International Affairs, April 2010, p. 16, *http://www.nti.org/e_research/Securing_The_Bomb_2010.pdf*.

[13] Union of Concerned Scientists, "Weapon Material Basics," August 17, 2004, *http://www.ucsusa.org/nuclear_weapons_and_global_security/nuclear_terrorism/technical_issues/fissile-materials-basics.html*.

[14] International Panel on Fissile Materials, "Global Fissile Material Report 2009: A Path to Nuclear Disarmament" p. 13, *http://www.fissilematerials.org/ipfm/site_down/gfmr09.pdf*.

[15] International Panel on Fissile Materials, "Global Fissile Material Report 2009: A Path to Nuclear Disarmament" p. 13, *http://www.fissilematerials.org/ipfm/site_down/gfmr09.pdf*; Matthew Bunn, "Securing the Bomb 2010: Securing All Nuclear Materials in Four Years," Belfer Center for Science and International Affairs, April 2010, p. 44, *http://www.nti.org/e_research/Securing_The_Bomb_2010.pdf*.

[16] Tim Andrews, "Strengthening Global Nuclear Security: The Role of the IAEA," Presentation to the Nuclear Security Conference, King's College London, February 18, 2010.

[17] Conversations with IAEA officials, 2010.

[18] Ibid.

[19] Ibid.

[20] Michael Wines, "Break-In at Nuclear Site Baffles South Africa," *The New York Times*, November 15, 2007, *http://www.nytimes.com/2007/11/15/world/africa/15joburg.html*.

[21] Graham Allison, "Nuclear Terrorism: How Serious a Threat to Russia?," Belfer Center for Science and International Affairs, September/October 2004, *http://belfercenter.ksg.harvard.edu/publication/660/nuclear_terrorism.html*.

[22] "Peace Activists Trespass at Belgian Base Housing U.S. Nukes," *Global Security Newswire*, February 17, 2010, *http://www.globalsecuritynewswire.org/gsn/nw_20100217_5906.php*.

[23] "Radiological Terrorism Tutorial," Nuclear Threat Initiative, 2004, *http://www.nti.org/h_learnmore/radtutorial/chapter01_02.html*.

[24] Conversations with US government officials, 2010.

[25] Conversations with IAEA officials, 2010.

[26] Conversation with Chinese nuclear expert, 2010.

[27] "Nuclear Security Advisory Services," IAEA, *http://www-ns.iaea.org/security/advisory.htm*.

[28] "Nuclear Security Work Plan Reference Document," White House, April 13, 2010, *http://www.whitehouse.gov/the-press-office/nuclear-security-work-plan-reference-document*.

[29] "Background: Convention on the Physical Protection of Nuclear Material," IAEA, *http://www.iaea.org/Publications/Documents/Conventions/cppnm.html*.

[30] "Status: Convention on the Physical Protection of Nuclear Material," IAEA, August 18, 2010, *http://www.iaea.org/Publications/Documents/Conventions/cppnm_status.pdf*.

[31] "Status: Amendment to the Convention on the Physical Protection of Nuclear Material," IAEA, June 21, 2010, *http://www.iaea.org/Publications/Documents/Conventions/cppnm_amend_status.pdf*.

[32] "Highlights of the National Commitments made at the Nuclear Security Summit," White House, April 13, 2010, *http://www.whitehouse.gov/the-press-office/highlights-national-commitments-made-nss*.

[33] Rohan Perera, International Convention for the Suppression of Acts of Nuclear Terrorism, United

Nations, April 2005, *http://untreaty.un.org/cod/avl/ha/icsant/icsant.html*.

[34] Steven C. Welsh, "Nuclear Terrorism Convention: International Convention for the Suppression of Acts of Nuclear Terrorism," Center for Defense Information, May 17, 2005, *http://www.cdi.org/news/law/ntc.cfm*.

[35] "Highlights of the National Commitments Made at the Nuclear Security Summit," White House, April 13, 2010, *http://www.whitehouse.gov/the-press-office/highlights-national-commitments-made-nss*.

[36] "Status of International Convention for the Suppression of Acts of Nuclear Terrorism," United Nations Treaty Collection, September 9, 2010, *http://treaties.un.org/Pages/ViewDetailsIII.aspx?&src=IND&mtdsg_no=XVIII-15&chapter=18&Temp=mtdsg3&lang=en*.

[37] United Nations Security Council, "Security Council Unanimously Adopts Wide-Ranging Anti-Terrorism Resolution," Press Release SC/7158, September 28, 2001, *http://www.un.org/News/Press/docs/2001/sc7158.doc.htm*.

[38] "UN Security Council Resolution 1540," Department of State, *http://www.state.gov/t/isn/c18943.htm*.

[39] White House, "Fact Sheet on the United Nations Security Council Summit on Nuclear Nonproliferation and Nuclear Disarmament UNSC Resolution 1887," Press Release, September 24, 2009, *http://www.whitehouse .gov/the_press_office/Fact-Sheet-on-the-United-Nations-Security-Council-Summit-on-Nuclear-Nonproliferation-and-Nuclear-Disarmament-UNSC-Resolution-1887*.

[40] "Cooperative Threat Reduction," Department of Defense, *http://www.dod.gov/execsec/adr95/ctr_.html*.

[41] NAS, "Global Security Engagement: A New Model for Cooperative Threat Reduction," March 2009, *http://sites.nationalacademies.org/PGA/cisac/PGA_049673*.

[42] Bonnie Jenkins, "The Future Role of the G-8 Global Partnership: Combating Weapons of Mass Destruction," Stanley Foundation Policy Analysis Brief, June 2010, *http://www.stanleyfoundation.org/publications/pab/Jenkins_610.pdf*.

[43] Ibid.

[44] Ibid.

[45] "G-8 Global Partnership: Adapting to New Realities," Partnership for Global Security Press Release, July 9, 2008, *http://www.partnershipforglobalsecurity.org/documents/Press_Release_G8GP_Final.pdf*.

[46] Bonnie Jenkins, "The Future Role of the G-8 Global Partnership: Combating Weapons of Mass Destruction," Stanley Foundation Policy Analysis Brief, June 2010, *http://www.stanleyfoundation.org/publications/pab/Jenkins_610.pdf*.

[47] "G8 Muskoka Declaration Recovery and New Beginnings," G-8 Summit, June 26, 2010, *http://g8.gc.ca/g8-summit/summit-documents/g8-muskoka-declaration-recovery-and-new-beginnings;* Chris Schneidmiller, "G-8 Nonproliferation Program Faces Uncertain Future," *Global Security Newswire*, August 16, 2010, *http://www.globalsecuritynewswire.org/gsn/nw_20100815_3867.php*.

[48] "Proliferation Security Initiative Participants," Department of State, September 10, 2010, *http://www.state.gov/t/isn/c27732.htm*.

[49] "Global Initiative to Combat Nuclear Terrorism," Department of State, *http://www.state.gov/t/isn/c18406.htm*.

[50] Ibid.

[51] Gross World Product (GWP) was estimated to be $58 trillion in 2009 *https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html*.

[52] Charles Meade, Roger C. Molander, "Considering the Effects of a Catastrophic Terrorist Attack," RAND Center for Terrorism and Risk Management Policy, 2006, *http://www.rand.org/pubs/technical_reports/2006/RAND_TR391.pdf*.

[53] Off the record communications with author.

[54] "Experts Praise Proposed Nuclear Security Centers," Partnership for Global Security, February 3, 2010, *http://www.partnershipforglobalsecurity.org/PDFFrameset.asp?PDF=centers_of_excellence.pdf*.

[55] "Global Center for Nuclear Energy Partnership," Ministry of Science and Technology, Press Information Bureau, Government of India, August 13, 2010, *http://pib.nic.in/release/release.asp?relid=64718*.

[56] "NEI Brings Leaders Together to Discuss Industry Role in Nuclear Security," Nuclear Energy Institute, Press Release, April 14, 2010, *http://www.nei.org/newsandevents/nei-brings-leaders-together-to-discuss-industry-role-in-nuclear-security/*.

[57] "Nuclear Forensics: Role, State of the Art, and Program Needs," Joint Working Group of the American Physical Society and the American Association for the Advancement of Science, 2008, *http://cstsp.aaas.org/files/Complete.pdf*; "Nuclear Forensics: A Capability Risk," Committee on Nuclear Forensics, National Research Council, National Academies of Science, August 2010, *http://www.nap.edu/catalog.php?record_id=12966*.

[58] The International Panel on Fissile Materials (IPFM) is an independent group of arms control and nonproliferation experts from several countries whose mission is to "analyze the technical basis for practical and achievable policy initiatives to secure, consolidate, and reduce stockpiles of highly enriched uranium and plutonium." The IPFM performs some similar functions as the proposed Scientific Advisory Council but in a strictly nongovernmental capacity.

[59] "Article 9 Subsidiary Body for Scientific and Technological Advice," United Nations Framework Convention on Climate Change, United Nations, 1992, *http://unfccc.int/resource/docs/convkp/conveng.pdf*.

[60] Ibid.

[61] "Model HEU Code of Conduct," James Martin Center for Nonproliferation Studies, Monterey

Institute, January 2010, *http://cns.miis.edu/activities/100201_civilian_heu/media/model_heu_code_of_conduct_100129.pdf*.

[62] International Panel on Fissile Materials, "Global Fissile Material Report 2009: A Path to Nuclear Disarmament," p. 106, *http://www.fissilematerials.org/ipfm/site_down/gfmr09.pdf*.

[63] "NEI Brings Leaders Together to Discuss Industry Role in Nuclear Security," Nuclear Energy Institute, Press Release, April 14, 2010, *http://www.nei.org/newsandevents/nei-brings-leaders-together-to-discuss-industry-role-in-nuclear-security/*.

[64] John P. Banks, Charles K. Ebinger, Michael M. Moodie, Lawrence Scheinman, Sharon Squassoni, "Non-Proliferation and the Nuclear "Renaissance": The Contribution and Responsibilities of the Nuclear Industry," Brookings Institute, Policy Brief 10-01, page vii, May 2010, *http://www.brookings.edu/~/media/Files/rc/papers/2010/05_nuclear_renaissance_banks_ebinger/05_nuclear_renaissance_banks_ebinger.pdf*.

[65] However, France continues to reprocess spent nuclear fuel and stockpile civil plutonium. This is likely to continue and, therefore, increase the plutonium stockpile of nuclear weapons states. Additionally, China may continue to produce HEU for civilian purposes.

The Stanley Foundation

The Stanley Foundation is a nonpartisan, private operating foundation that seeks a secure peace with freedom and justice, built on world citizenship and effective global governance. It brings fresh voices and original ideas to debates on global and regional problems. The foundation advocates principled multilateralism—an approach that emphasizes working respectfully across differences to create fair, just, and lasting solutions.

The Stanley Foundation's work recognizes the essential roles of the policy community, media professionals, and the involved public in building sustainable peace. Its work aims to connect people from different backgrounds, often producing clarifying insights and innovative solutions.

The foundation frequently collaborates with other organizations. It does not make grants.

Stanley Foundation reports, publications, programs, and a wealth of other information are available on the Web at *www.stanleyfoundation.org*.

The Stanley Foundation
209 Iowa Avenue • Muscatine, IA 52761 USA
563-264-1500 • 563-264-0864 fax
info@stanleyfoundation.org