

# Securing the Bomb 2010

Securing All Nuclear  
Materials in Four Years

**MATTHEW BUNN**

PROJECT ON MANAGING THE ATOM  
BELFER CENTER FOR SCIENCE AND INTERNATIONAL AFFAIRS  
HARVARD KENNEDY SCHOOL  
HARVARD UNIVERSITY

COMMISSIONED BY THE NUCLEAR THREAT INITIATIVE

APRIL 2010

[www.nti.org/securingthebomb](http://www.nti.org/securingthebomb)

© 2010 President and Fellows of Harvard College

Printed in the United States of America

The co-sponsors of this report invite liberal use of the information provided in it for educational purposes, requiring only that the reproduced material clearly state: Reproduced from Matthew Bunn, *Securing the Bomb 2010* (Cambridge, Mass., and Washington, D.C.: Project on Managing the Atom, Harvard University, and Nuclear Threat Initiative, April 2010).



**HARVARD Kennedy School**  
**BELFER CENTER**  
for Science and International Affairs

Project on Managing the Atom  
Belfer Center for Science and International Affairs  
Harvard Kennedy School  
Harvard University  
79 JFK Street, Mailbox 134  
Cambridge, MA 02138  
Fax: (617) 496-0606  
Email: [atom@harvard.edu](mailto:atom@harvard.edu)  
Web: <http://www.managingtheatom.org>



Nuclear Threat Initiative  
1747 Pennsylvania Avenue NW, 7th Floor  
Washington, D.C. 20006  
Fax: (202) 296-4811  
Email: [contact@nti.org](mailto:contact@nti.org)  
Web: <http://www.nti.org>

A companion website to this report is available at <http://www.nti.org/securingthebomb>

# TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY</b>	<b>v</b>
The Threat of Nuclear Terrorism	vi
Nuclear Security Today	ix
Next Steps to Secure Nuclear Material in Four Years	x
Build the Sense of Urgency and Commitment Worldwide	x
Broaden the Consolidation and Security Upgrade Efforts	x
Get the Rules and Incentives Right	xi
Take a Partnership-Based Approach	xii
Broaden Best Practices Exchanges and Security Culture Efforts	xiii
Create Mechanisms to Follow Up and Build Confidence in Progress	xiii
Build a Multi-Layered Defense	xiv
Provide the Needed Leadership, Planning, and Resources	xv
<b>1. INTRODUCTION</b>	<b>1</b>
<i>Incidents Highlight the Global Threat</i>	4
Other Types of Nuclear and Radiological Terrorism	7
Cooperation, Not Confrontation, is the Answer	10
A Note on Sources—and the Need for Accountability	10
Plan of This Report	11
<b>2. THE CONTINUING DANGER OF NUCLEAR THEFT AND TERRORISM</b>	<b>13</b>
Some Terrorists are Seeking Nuclear Weapons	13
<i>International Statements on the Threat of Nuclear Terrorism</i>	15
Some Terrorist Groups Might be Able to Make Crude Nuclear Bombs	16
Terrorists Might be Able to Get HEU or Plutonium	17
<i>Suitcase Nukes Probably Not on the Loose</i>	18
Nuclear Smuggling Is Extremely Difficult to Interdict	18
<i>Nuclear Terrorism and the Nuclear Energy Revival</i>	19
<i>North Korea, Iran, and the Risk of Nuclear Terrorism</i>	20
Nuclear Thieves Could Strike in Any Country	22
Nuclear Terrorism: The Good News	22
<b>3. GLOBAL NUCLEAR SECURITY TODAY</b>	<b>23</b>
Global Distribution of Nuclear Stockpiles	25
Pakistan	28
Extensive Security Measures	28
Extraordinary Insider and Outsider Threats	30
Russia	31
Dramatically Improved Nuclear Security	31
Insider Threats	32
<i>Progress in Nuclear Security Upgrades in Russia and the Eurasian States</i>	33
Outsider Threats	34
Sustainability	36
Consolidation	36
Regulation	37
Security Culture	39

Guard Forces	39
<i>Progress in Consolidating Nuclear Stockpiles</i>	40
HEU-Fueled Research Reactors	43
Nuclear Stockpiles in Other Contexts	45
<i>Progress and Delays in Reducing Nuclear Material Stockpiles</i>	49
The International Nuclear Security Framework	53
<b>4. GOALS FOR NUCLEAR SECURITY AT THE END OF FOUR YEARS</b>	<b>61</b>
A Pakistan Example	62
<i>Nuclear Security Cooperation after the Four-Year Effort</i>	63
Multiple Methods -- and not Doing it All Ourselves	64
Consolidation	64
Nuclear Security Improvements	66
<i>How Much Might it Cost to Secure Nuclear Materials Worldwide?</i>	68
<b>5. METHODS FOR JUDGING PROGRESS</b>	<b>73</b>
Input Measures	75
Output Measures	76
Outcome Measures	76
<i>Nuclear Security: How Would We Know?</i>	78
<b>6. PROGRESS SO FAR IN THE FOUR-YEAR NUCLEAR SECURITY EFFORT</b>	<b>81</b>
Leadership and Planning	81
Funding	82
Inaction in FY 2010	82
Requested Budget Increases for FY 2011	83
Personnel	86
<i>The Nuclear Security Summit</i>	86
Outputs and Outcomes	88
<b>7. NEXT STEPS TO SECURE NUCLEAR STOCKPILES</b>	<b>91</b>
2010: A Critical Year	91
Build the Sense of Urgency and Commitment Worldwide	93
Broaden the Consolidation and Security Upgrade Efforts	95
<i>Why is This Hard?</i>	96
Get the Rules and Incentives Right	99
Take a Partnership-Based Approach	102
Broaden Best Practices Exchanges and Security Culture Efforts	103
Create Mechanisms to Follow Up and Build Confidence in Progress	103
Build a Multi-Layered Defense	106
Provide the Needed Leadership, Planning, and Resources	109
A Daunting But Essential Road	111
<b>ABOUT THE AUTHOR</b>	<b>113</b>
<b>ACKNOWLEDGEMENTS</b>	<b>113</b>
<b>ABOUT THE PROJECT ON MANAGING THE ATOM</b>	<b>115</b>

## EXECUTIVE SUMMARY

As President Barack Obama has said, the danger that terrorists could get and use a nuclear bomb remains “the most immediate and extreme threat to global security.” Incidents around the world make clear that urgent action is needed to improve security for nuclear stockpiles around the world and to keep nuclear weapons and the materials needed to make them out of terrorist hands. That is the purpose of both the global effort to secure all nuclear weapons and weapons-usable nuclear material within four years that President Obama has initiated, and the nuclear security summit he is hosting in Washington on 12-13 April 2010.

Although the Obama administration has made progress toward this goal, much more needs to be done. Today, the world is not yet on track to succeed in achieving effective security for all stockpiles of nuclear weapons and weapons-usable nuclear materials within four years. To meet that objective, the nuclear security summit must be only the first step in a broader campaign to shift the global nuclear security effort onto a faster and broader trajectory.

### THE THREAT OF NUCLEAR TERRORISM

Several facts frame the danger:

- Al Qaeda is seeking nuclear weapons and has repeatedly attempted to acquire the materials and expertise needed to make them.
- Numerous studies by the U.S. and other governments have concluded that it is plausible that a sophisticated terrorist group could make a crude

nuclear bomb if it got enough of the needed nuclear materials.

- There have been over 18 documented cases of theft or loss of plutonium or highly enriched uranium (HEU), the essential ingredients of nuclear weapons. Peace activists have broken into a Belgian base where U.S. nuclear weapons are reportedly stored; two teams of armed men attacked a site in South Africa where hundreds of kilograms of HEU are stored; and Russian officials have confirmed that terrorist teams have carried out reconnaissance at Russian nuclear weapon storage facilities.
- The immense length of national borders, the huge scale of legitimate traffic, the myriad potential pathways across these borders, and the small size and weak radiation signal of the materials needed to make a nuclear bomb make nuclear smuggling extraordinarily difficult to stop.

No one knows the real likelihood of nuclear terrorism. But the consequences of a terrorist nuclear blast would be so catastrophic that even a small chance is enough to justify urgent action to reduce the risk. The heart of a major city could be reduced to a smoldering radioactive ruin, leaving tens to hundreds of thousands of people dead. Devastating economic consequences would reverberate worldwide. America and the world would be changed forever.

Making plutonium or HEU is well beyond the plausible capabilities of terrorist groups. Hence, if all the world's stockpiles of these materials can be secured from falling into terrorist hands, nuclear

terrorism can be prevented. Improved nuclear security is the single point on the terrorist pathway to the bomb where government policies can do the most to reduce the danger. After a nuclear weapon or the material needed to make one has been stolen, every later step on the terrorist pathway is easier for terrorists to take and harder for governments to stop.

## **NUCLEAR SECURITY TODAY**

Today, nuclear weapons or the separated plutonium or HEU needed to make them exist in hundreds of buildings and bunkers in dozens of countries. Each country where such stockpiles exist is responsible for securing them, and the specific approaches, procedures, and rules for securing and accounting for nuclear stockpiles vary widely. There are no binding global rules that specify how much security these stockpiles should have.

In many countries, nuclear security today is substantially better than it was in the mid-1990s, as a result of national efforts and international cooperative programs. Security and accounting systems for all but a few dozen of the hundreds of buildings and bunkers in Russia and the Eurasian states have been substantially improved through cooperative efforts. Some 17 countries have eliminated all of the weapons-usable nuclear material on their soil. These successes represent, in a real sense, bombs that will never go off—and demonstrate the progress that can be achieved through cooperation.

But serious risks remain, as evidenced by recent incidents at nuclear sites and ongoing cases of theft or loss of weapons-usable nuclear material. Upgraded security systems will not last forever unless states provide the resources to sustain them and write and enforce rules that require sites and transporters to maintain

effective security and accounting systems. Strong security cultures—in which all relevant staff take security seriously, every day—are also an essential component of effective nuclear security.

Based on unclassified information on the quantity and quality of nuclear stockpiles around the world, the security levels in place, and the adversary threats these security systems must protect against, it appears that the highest risks of nuclear theft today are in:

- Pakistan, where a small and heavily guarded nuclear stockpile faces immense threats, both from insiders who may be corrupt or sympathetic to terrorists and from large-scale attacks by outsiders;
- Russia, which has the world's largest nuclear stockpiles in the world's largest number of buildings and bunkers; security measures that have improved dramatically but still include important vulnerabilities (and need to be sustained for the long haul); and substantial threats, particularly from insiders, given the endemic corruption in Russia; and
- HEU-fueled research reactors, which usually (though not always) use only modest stocks of HEU, in forms that would require some chemical processing before they could be used in a bomb, but which often have only the most minimal security measures in place—in some cases little more than a night watchman and a chain-link fence.

While these are the highest-risk categories, the risks elsewhere are very real as well. Transport of nuclear weapons and materials is a particular concern, as it is the part of the nuclear material life-cycle most vulnerable to violent, forcible theft, since it is impossible to protect the mate-

rial with thick walls and many minutes of delay when it is on the road. Reprocessing plutonium from spent fuel and recycling it as new fuel requires intensive security measures and creates risks that are not present when the plutonium remains in massive, intensely radioactive spent fuel assemblies that would be very difficult to steal. Nuclear security issues exist not only in developing and transition countries but in wealthy countries as well, some of which have no armed guards at nuclear facilities, or only protect these facilities against very modest threats. In the end, virtually every country where these materials exist—including the United States—has more to do to ensure that these stocks are effectively protected against the kinds of threats that terrorists and criminals have shown they can pose. Table ES-1 provides a summary of the state of nuclear security around the world today.

President Obama, building on programs launched by his predecessors, has taken a number of steps to accelerate nuclear security improvements, including launching the four-year nuclear security effort, hosting the nuclear security summit, creating new U.S. government positions to coordinate these programs, and requesting a significant increase in the budget for nuclear security improvement programs in fiscal year (FY) 2011 (though not, unfortunately, in FY 2010). Recent progress includes:

- During FY2009, security and accounting upgrades were completed at 29 additional weapons-usable nuclear material buildings in Russia, bringing the total for such buildings upgraded in Russia and the Eurasian states to 210, only 19 short of the target of 229 buildings to be completed through FY2012.

- Since President Obama launched the four-year nuclear security effort four countries have eliminated all the weapons-usable nuclear material on their soil, with U.S. help. To date, the United States has helped remove all the HEU from more than 47 facilities in countries around the world.
- Discussions about eliminating all HEU in several of the developing or transition non-nuclear-weapon states with the largest HEU stocks are well advanced.
- Cooperation to improve nuclear security is continuing in Pakistan, though the specifics are classified; the United States and Russia have greatly broadened their exchanges of best practices, efforts to strengthen security culture, and cooperation to ensure effective nuclear security will be sustained for the long haul; and detailed dialogue with China on improving nuclear security and accounting is continuing.

The nuclear security summit has elevated the issue of nuclear security to a far higher political level. If the summit succeeds, it will help build a new sense of urgency among the participants about taking action to prevent nuclear terrorism. Products of the summit are expected to include a communiqué from the assembled leaders, a more detailed expert-level work plan, and commitments to nuclear security actions that individual participating countries are likely to make. The success of the summit will be measured by whether it leads to real change in the pace and scope of nuclear security improvements on the ground in the months that follow.

Despite this progress, the world is not yet on track to succeed in achieving effective security for all stockpiles of nuclear weapons and weapons-usable nuclear

**Table ES-1: Global Nuclear Security Today**

<b>Category</b>	<b>Assessment</b>
<b>Russia</b>	Dramatic progress, though major issues remain. Planned U.S.-sponsored security upgrades for both warhead sites and nuclear material buildings almost complete, though some warhead sites and material buildings not covered. Inadequate Russian investment to ensure sustainability, though signs of improvement. Questions on security culture. Poorly paid and trained conscript guards for nuclear material. Substantial threats from widespread insider corruption and theft, while material accounting and control measures remain weak in some cases. Substantial outsider threats as well, though suppressed by counterinsurgency in Chechnya. Major need for consolidation, as Russia still has the world's largest numbers of nuclear weapons sites and weapons-usable nuclear materials buildings, including the world's largest fleet of HEU-fueled research reactors.
<b>Developing states with nuclear weapons (Pakistan, India, China, North Korea)</b>	Pakistan has a small, heavily guarded nuclear stockpile. Substantial security improvements have been made in recent years, in part with U.S. help, but the specifics of this cooperation are classified. Immense threats in Pakistan from nuclear insiders with extremist sympathies, al Qaeda or Taliban outsider attacks, and a weak state. India also has a small nuclear stockpile, and reports that it requires its stocks to be protected against a range of outsider and insider threats, but has so far rejected nuclear security cooperation with the United States. China has a somewhat larger nuclear stockpile, believed to be protected by substantial guard forces. A broad U.S.-Chinese nuclear security dialogue is underway, and China appears to have modernized security and accounting measures at some sites, but little evidence that China has yet required such measures in its regulations. In North Korea, a very small nuclear stockpile and a garrison state probably limit the risks of nuclear theft.
<b>Developing and transition non-nuclear-weapon states</b>	Important progress in recent years, but some issues remain. U.S.-funded security upgrades completed at nearly all facilities with weapons-usable material in the Eurasian states outside of Russia, and in Eastern Europe. Belarus, Ukraine, Kazakhstan, and South Africa have particularly dangerous nuclear material: upgrades completed in Ukraine (though sustainability is an issue); upgrades nearing completion after a several-year delay in Belarus; South Africa (whose facility suffered a penetration of the outer perimeter by armed men in November 2007) is discussing cooperation on nuclear security. Upgrades completed for nearly all HEU-fueled research reactors that previously did not meet IAEA recommendations, but some upgrades would not be enough to defend against demonstrated terrorist and criminal capabilities.
<b>Developed Countries</b>	Significant progress in recent years, as several countries have strengthened nuclear security rules since 9/11. The United States has ongoing dialogues with key countries on nuclear security, but does not sponsor security upgrades in wealthy countries. Nuclear security requirements in some countries remain insufficient to protect against demonstrated terrorist or criminal threats. Additional efforts needed to consolidate both HEU and separated plutonium in fewer locations.
<b>United States</b>	Substantial progress in recent years, though issues remain. DOE has drastically strengthened its requirements for protecting both nuclear weapons and materials (especially from outsider attack) since 9/11. NRC has also increased its security requirements, though they remain less stringent than DOE requirements, and NRC-regulated research reactors fueled with HEU remain exempt from most NRC security requirements. Major progress in converting NRC-regulated reactors to low-enriched fuel, and in implementing voluntary security upgrades going beyond regulatory requirements at these sites. Recent incidents suggest an ongoing issue with security culture.



materials within four years. To meet that objective, the nuclear security summit and the efforts that follow will have to shift the nuclear security effort onto a faster and broader trajectory.

## **NEXT STEPS TO SECURE NUCLEAR MATERIAL IN FOUR YEARS**

The goal of the four-year nuclear security effort that President Obama has called for and that the UN Security Council has endorsed in Resolution 1887 should be to ensure that *all* stocks of nuclear weapons, plutonium, and HEU worldwide are *effectively* and *lastingly* protected.

*All* means that any nuclear material that could be used to make a nuclear bomb should be included, whether it is in a military or a civilian stockpile. It means the effort must ensure security not just for materials in developing or transition countries such as Russia, Pakistan, or South Africa, but also in wealthy countries such as Belgium and Japan—and the United States.

*Effectively* is a matter of risk—another way of stating the goal is that at the end of four years, all nuclear stocks should have a low risk of being stolen. That means they have to be reliably protected against the most plausible kinds of adversary capabilities (both outsider and insider) that they might face. In a world with terrorists with global reach, all nuclear weapons and weapons-usable nuclear materials should *at least* be protected against theft by a well-placed insider; a modest group of well-armed and well-trained outsiders, capable of operating as more than one team; or both together, and against a range of tactics such adversaries might use, from frontal assault to deception to covert infiltration. Countries facing more capable adversaries, such as Pakistan,

should put even more stringent security measures in place.

*Lastingly* means that countries have put in place the resources to sustain effective security and accounting measures for the long haul, and the regulations requiring operators to do so.

As with any government program, it will be essential to develop measures and indicators that provide a realistic assessment of the progress being made. Such measures might include, for example, the fraction of the total world number of sites with nuclear weapons or weapons-usable nuclear materials where all of those stocks have been eliminated, and the fraction that have demonstrated that their security systems are performing effectively, and could protect against a broad range of outsider and insider threats.

It would certainly not be possible for U.S.-funded upgrades to be negotiated and implemented for all relevant sites around the world in four years. Instead, the effort must combine U.S.-funded upgrades and material removals (or those funded by other donor states) with security improvements and material removals key countries carry out themselves, once they become convinced of the urgency of action. The administration must develop a clear set of metrics to be used in assessing progress in the four-year nuclear security effort—metrics that assess not just where equipment has been installed but what fraction of the sites where nuclear weapons and weapons-usable nuclear materials exist have effective nuclear security measures in place.

With the right leadership, sufficient resources, a comprehensive, prioritized plan, and a partnership-based approach, it is quite plausible that at the end of the four-year effort, the number of countries

where weapons-usable nuclear material exists could be cut in half or more; the number of sites could have been cut by 20-30 percent; and that all the countries where nuclear weapons or weapons-usable nuclear material still exists could put in place effectively enforced rules requiring all of their dangerous nuclear stocks to be protected against a robust set of outsider and insider threats. Such progress would dramatically reduce the danger that nuclear terrorism poses to global security. Nevertheless, it is clear that continued work to improve nuclear security—particularly the important but difficult specifics of accurate control and accounting of nuclear materials being processed in bulk—will still be needed after the end of the four-year nuclear security effort.

Achieving these objectives will require several steps beyond those already being taken.

### ***Build the sense of urgency and commitment worldwide***

The fundamental key to the success of the four-year nuclear security effort is to convince political leaders and nuclear managers around the world that nuclear terrorism is a real and urgent threat to *their* countries' security, worthy of a substantial investment of their time and money. If these programs succeed in building that sense of urgency, these officials and managers will take the needed actions to prevent nuclear terrorism; without that sense of urgency, they will not.

The United States and other countries should take several steps to build the needed sense of urgency and commitment, including: (a) *joint threat briefings* at upcoming summits and high-level meetings with key countries, where experts from both the United States and the coun-

try concerned would outline the very real possibility that terrorists could get nuclear material and make a nuclear bomb; (b) *intelligence agency discussions*, in which U.S. intelligence agencies would seek to convince their foreign counterparts—who are often their government's main source for assessments of national security threats—that the nuclear terrorism threat is a real one that must be addressed urgently; (c) *an "Armageddon Test,"* in which intelligence agents would attempt to penetrate nuclear smuggling networks and acquire sufficient nuclear material for a bomb, providing a realistic assessment of how difficult it is to do so; (d) *nuclear terrorism exercises* with policymakers from key states, which can sometimes reach officials emotionally in a way that briefings and policy memos cannot; (e) *fast-paced nuclear security reviews*, in which leaders of key states would pick teams of security experts they trust to conduct fast-paced reviews of nuclear security in their countries (with U.S. advice and technical assistance if desired), assessing whether facilities are adequately protected against a set of clearly-defined threats (as the United States did after 9/11, revealing a wide range of vulnerabilities); (f) *realistic testing of nuclear security performance*, in which the United States could help countries conduct realistic tests of their nuclear security systems' ability to defeat realistic insider or outsider threats; and (g) *shared databases of threats and incidents*, including unclassified information on actual security incidents (both at nuclear sites and at non-nuclear guarded facilities) that offer lessons for policymakers and facility managers to consider in deciding on nuclear security levels and particular threats to defend against.

### ***Broaden consolidation and security upgrade efforts***

Today, U.S.-funded cooperative nuclear security upgrade efforts are focusing pri-

marily on the former Soviet Union, South Asia, and a few HEU-fueled research reactors elsewhere. (Nuclear security cooperation with China has so far focused on dialogue and exchanges of best practices, not on U.S.-funded upgrades.) U.S.-funded consolidation programs focus primarily on converting HEU-fueled reactors and removing Soviet-supplied HEU and a fraction of U.S.-supplied HEU.

To secure all nuclear stockpiles in four years, both security upgrades and consolidation efforts must be broadened. The United States and other donor countries should plan to carry out security upgrades that are more extensive than those now planned, at more facilities, in more countries. These should include not only installing equipment, but also increasing each country's capacity and commitments to implement effective nuclear security on their own—through training, exchanges of best practices, improvements in regulation and enforcement, sustainability support programs, work on security culture, and more. This effort should include the regional nuclear security “centers of excellence” that President Obama and some European countries have proposed, which could provide central locations for training, demonstrating modern equipment, exchange of best practices, and the like.

Consolidation efforts should be expanded to include reducing the number of sites where nuclear weapons exist (particularly in Russia); limiting the accumulation of stockpiles of separated plutonium, and the number of places where plutonium is processed, stored, and used; and removing HEU from a far broader set of the sites where it now exists, with the goal of eliminating the HEU from the most vulnerable sites during the four-year effort, and eliminating all civil HEU within roughly a decade. The United States and other donor countries should offer additional incentives, structured to the needs of each

facility, to convince facilities to agree to convert to fuels that cannot be used in a nuclear bomb, or to shut down, and to give up their HEU or separated plutonium. The United States and other donor states should offer something in the range of \$10,000 per kilogram for modest stocks of excess HEU from any country willing to get rid of it and to agree not to make or buy more.

### ***Get the rules and incentives right***

Effectively enforced national rules for nuclear security and effective global nuclear security rules are both key elements of the effort to secure nuclear stockpiles around the world. As most nuclear managers only invest in expensive security measures when the government tells them they have to, effective regulation is essential to effective and lasting security. Hence, President Obama and other leaders seeking to improve nuclear security should greatly increase the focus on ensuring that countries around the world put in place and enforce effective nuclear security and accounting regulations, giving all facilities strong incentives to ensure those stockpiles are effectively secured. Regulators in each country must have the authority, independence, expertise, and resources needed to do their jobs effectively—and countries must ensure that operators have the resources needed to follow the rules. These rules should include requirements for realistic testing of the performance of nuclear security systems against intelligent and creative insider and outsider adversaries.

Nuclear security is only as strong as its weakest link. Hence, it is also important to seek effective global nuclear security rules that will help ensure that each country where stockpiles of nuclear weapons and weapons-usable materials exist puts effective national rules and procedures in place. Unfortunately, because of com-

placency about the threat, concerns over national sovereignty, and differing national approaches, past efforts to negotiate global treaties specifying how secure nuclear weapons or weapons-usable materials should be have not succeeded, and such a treaty-negotiation approach is not likely to succeed in the future. (There is a Convention on Physical Protection and a 2005 amendment to it that provide useful guidelines, but set no specific requirements for how secure weapons-usable nuclear material should be.)

The most promising approach to forging international standards is to make use of UN Security Council Resolution 1540, which already legally requires all countries to provide “appropriate effective” security and accounting for any nuclear stockpiles they may have. The United States should work with other states pursuing improved nuclear security to build a political-level consensus around what essential elements need to be in place for nuclear security systems to be considered “appropriate” and “effective,” and then work with other donor states to help (and to pressure) countries around the world to put those essential elements in place. The approach should be based on ensuring that all states provide protection against a plausible set of outsider and insider threats, while leaving flexibility for each country to pursue its own approach to accomplishing that objective. At the same time, the United States should certainly continue to work to get states to ratify the physical protection convention and its 2005 amendment and to strengthen the IAEA’s nuclear security guides and recommendations.

Incentives are as important as rules. Given the strong incentives to save money and time by cutting corners on nuclear security, states, agencies, facilities, managers, and staff must be given strong incentives

to focus on achieving high nuclear security performance. If the effort to build a sense of urgency around the world about the threat of nuclear terrorism succeeds, the desire to address real threats will provide the most important incentive. President Obama should also make clear to countries around the world that cooperating to ensure effective security for nuclear stockpiles and take other steps to prevent nuclear terrorism is essential to good relations with the United States, just as compliance with arms control and nonproliferation agreements has been for many years. At the same time, the United States should seek to ensure that each country with dangerous nuclear stockpiles establishes financial and other rewards for strong nuclear security performance (comparable, for example, to the bonus payments contractors managing DOE facilities can earn for high performance), and for those who identify nuclear security problems and propose practical solutions. The U.S. government should take the position that only facilities that can demonstrate that they maintain highly effective security will be eligible for U.S. government-funded contracts for cooperative R&D and related efforts, and should seek to convince other governments to do likewise. Ultimately, effective security and accounting for weapons-usable nuclear material should become part of the “price of admission” for doing business in the international nuclear market.

### ***Take a partnership-based approach***

To succeed, a global nuclear security improvement effort must be based not just on donor-recipient relationships but on real partnerships, which integrate ideas and resources from countries where upgrades are taking place in ways that also serve their national interests. For countries like India and Pakistan, for example, it is politically untenable to accept U.S. assistance that is portrayed as necessary



because they are unable to adequately control their nuclear stockpiles on their own. But joining with the major nuclear states in jointly addressing a global problem may be politically appealing. U.S.-Russian relations are still rocky despite President Obama's efforts to "reset" them, making a real nuclear security partnership with Russia difficult to achieve, but no less essential; shared U.S.-Russian interests in keeping nuclear material out of terrorist hands remain. Such partnerships will have to be based on creative approaches that make it possible to cooperate in upgrading nuclear security without demanding that countries compromise their legitimate nuclear secrets. Specific approaches should be crafted to accommodate each national culture, secrecy system, and set of circumstances. As a central element of this partnership-based approach, the Global Initiative to Combat Nuclear Terrorism should be reinvigorated, with a focus on building the international sense of urgency and commitment to action to reduce the risk of nuclear terrorism, and on meeting the four-year nuclear security objective.

### ***Broaden best practices exchanges and security culture efforts***

Opportunities for nuclear security operators to hear about and learn from the best security practices used in other facilities around the world—as offered, for example, by the new World Institute for Nuclear Security—can be powerful motivators for improvement. Targeted efforts to improve nuclear security culture, so that guards are no longer falling asleep on the job or turning off intrusion detectors, are also critical. As Gen. Eugene Habiger, former commander of U.S. strategic nuclear forces and former security "czar" at the U.S. Department of Energy once put it, "good security is 20 percent equipment and 80 percent culture." President Obama and other leaders seeking

to improve nuclear security should work with *all* countries where nuclear weapons and weapons-usable nuclear materials exist—as well as countries with major nuclear facilities that might be subject to sabotage—to exchange best practices and strengthen nuclear security culture. The ultimate goal should be to ensure that every facility and transporter handling nuclear weapons and weapons-usable nuclear material participates in programs to exchange best practices, and has a targeted program in place to continually assess and strengthen its nuclear security culture.

### ***Create mechanisms to follow up and to build confidence in progress***

Mechanisms to follow up on commitments made and to build confidence that they are being implemented—and that states are maintaining effective nuclear security systems—will be essential if the commitments of the nuclear security summit are to have a real and lasting impact.

First, each participating state should designate one or a small number of key officials to be responsible for implementing their states' efforts, and groups of these officials should meet regularly in the months and years after the summit to review progress and assess next steps. If initial approaches are not working, or particular cooperating countries identify gaps that need to be filled or unexpected problems that need to be solved, these officials should have the authority to modify the cooperative nuclear security efforts.

Second, it is important to build an international understanding of the work to be done. Through intelligence programs such as the Nuclear Materials Information Program, the United States is developing a more comprehensive classified understanding of the state of nuclear security around world. But a common under-

standing of the state of nuclear security around the world is needed, to provide a baseline against which to judge progress of the four-year nuclear security effort. While many of the specifics of nuclear security arrangements in different countries will inevitably remain shrouded in secrecy, the United States and other countries working to achieve the four-year nuclear security objective should seek to convince countries of the importance of sharing as much information as they can about how many sites with nuclear stockpiles exist in each country, what security measures are in place (at least in general descriptive terms), and the like.

Third, countries should work together to develop means, within the confines of necessary secrecy, to build international confidence that states are taking the steps they have committed to and putting effective nuclear security measures in place. International visits such as those that take place under U.S. nuclear supply agreements, IAEA-led peer reviews, and international cooperation on nuclear security upgrades are all effective mechanisms for expanding transparency to build confidence that effective nuclear security measures are in place, or are being put in place. But additional approaches will be needed for sites that are unlikely to welcome international visitors in the near future—from U.S. and Russian nuclear warhead assembly plants to nuclear sites in Pakistan and Israel. For example, countries might have their adversary teams who test nuclear security systems train together (to increase their understanding of the kinds of tests each participating country conducts)—and then report to each other, at least in general terms, the results of nuclear security tests. The United States, for example, already openly publishes data on what percentage of DOE facilities have received high ratings in DOE security inspections—and uses that percentage as a measure of the effective-

ness of ongoing steps to improve security. In the immediate term, until such measures can be agreed, states should do more to provide general descriptions of their nuclear security approaches, photographs of installed equipment, and related data that could be made public and help build confidence that effective nuclear security measures are being taken without providing data that could help terrorists and criminals plan their attacks.

### ***Build a multi-layered defense***

Nuclear security systems will never be perfect—and some nuclear material may already have been stolen and never recovered. Hence, a multilayered effort to block the terrorist pathway to the bomb is needed, with nuclear security as the first and most important layer. The United States and other countries seeking to reduce this risk should expand police and intelligence cooperation focused on identifying and countering terrorist groups with nuclear ambitions and seeking to interdict nuclear smuggling. They should work to ensure that countries around the world have criminal laws in place imposing heavy penalties for any participation in efforts to steal or smuggle nuclear material or any assistance to nuclear terrorists—and that states have units of their national police trained and equipped to deal with such cases. They should create new tip lines and reward programs to encourage participants in such conspiracies to blow the whistle. While the likelihood that hostile states would consciously decide to transfer nuclear weapons or the materials needed to make them to terrorists is already low, the United States and its international partners should seek to lower it further, in particular by putting together international packages of carrots and sticks large enough and credible enough to convince North Korea and Iran that it is in their national interests to verifiably abandon their pursuit of nuclear

weapons—and by making crystal clear the consequences that any state found to have intentionally transferred such items to terrorists would face.

***Provide the needed leadership, planning, and resources***

Achieving effective security for all the world's stockpiles of nuclear weapons and weapons-usable nuclear materials poses an extraordinarily difficult challenge. Sustained high-level leadership will be needed to overcome a maze of obstacles posed by complacency about the threat, secrecy, political disputes, sovereignty concerns, and bureaucratic obstacles. Intense engagement from presidents and prime ministers in the months and years following the nuclear security summit will be needed, not just occasional statements of support. Leaders will have to be willing to change outdated rules, overrule officials standing in the way of nuclear security cooperation, invest additional funds in nuclear security, and more.

First, President Obama, building on the structure he has put in place, should give the National Security Council clear direction and authority to take the needed actions to move this agenda forward, and to keep this effort on the front burner at the White House every day. The staff focused on this topic need to wake up every morning thinking “what can we do today to prevent a nuclear terrorist attack?” President Obama should also encourage Russia and other key countries to put similar top-level structures in place, so that it is clear which officials other countries should talk to about nuclear security and nuclear terrorism.

Second, President Obama should direct the NSC staff to further develop a comprehensive, prioritized plan for preventing nuclear terrorism, integrating steps from

implementing nuclear security upgrades to expanding intelligence cooperation focused on the nuclear terrorist threat to building the sense of urgency around the world. This plan will have to be continuously modified as circumstances change.

Third, President Obama and the Congress should work together to provide sufficient resources to ensure that steps that could significantly reduce nuclear terrorism risks are not slowed by lack of money. Achieving the four-year nuclear security objective will require doing more, faster, than in the past, which will inevitably require an increase in budgets. Yet nuclear security is eminently affordable: the sums spent on cooperative threat reduction each year are a tiny fraction of the budgets of the Departments of Defense, Energy, and State. As part of providing sufficient resources, the leaders at the 2010 G8 summit should agree to extend the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction for another ten years, with a continuing flow of funds, and target it on helping states around the world provide effective nuclear security and meet their other obligations under UNSCR 1540. In addition, the United States and other countries should expand their efforts to strengthen the IAEA's nuclear security efforts, increasing their budgets and shifting them to the regular budget rather than relying almost exclusively on voluntary contributions.

Fourth, President Obama should take action to ensure that his administration has the information and analysis it needs to support effective policymaking, including (a) directing U.S. intelligence agencies to place high priority on all aspects of the nuclear terrorism problem, from assessing and penetrating terrorist conspiracies and nuclear smuggling networks to assessing nuclear security measures around the world; and (b) working with Congress

to fund non-government institutions to provide independent analysis and suggestions that can help strengthen these programs.

Fifth, President Obama should work to put the United States' own house in order, continuing the effort to convert U.S. HEU-fueled research reactors to use low-enriched uranium (LEU) fuel that cannot be used in a nuclear bomb, going farther in consolidating U.S. stockpiles, and working to strengthen security at U.S. HEU-fueled research reactors (which are exempted from many of the most important U.S. nuclear security rules). Convincing foreign countries to reduce and consolidate nuclear stockpiles, to put

stringent nuclear security measures in place, or to convert their research reactors will be far more difficult if the United States is not doing the same at home.

The obstacles to accelerated and expanded progress are real and difficult. But with sustained high-level leadership, a sensible strategy, partnership-based approaches, adequate resources, and good information, they can be overcome. The actions President Obama has already taken open new opportunities. Now is the time to seize them. President Obama still has an enormous opportunity and an obligation, to reduce the danger of nuclear terrorism to a fraction of its current level during his first term in office.