

Securing the Bomb 2008

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EXECUTIVE SUMMARY

The U.S. president who takes office in January 2009 will face a world in which the danger that terrorists could get and use a nuclear bomb remains very real. The purpose of this report is to outline the danger of nuclear terrorism, assess what has and has not been done to reduce it, and suggest an agenda of actions that could reduce the risk dramatically. While the probability that terrorists could get and use a nuclear bomb can never be reduced to zero, the goal must be to get as close to zero as possible, as quickly as possible.

Terrorists are still seeking nuclear weapons—and al-Qaeda is reconstituting its ability to plan and conduct complex operations in the mountains of Pakistan. If a technically sophisticated terrorist group could get the needed nuclear materials, it might well be able to make at least a crude nuclear bomb—capable of turning the heart of a modern city into smoldering ruins. The horror of a terrorist nuclear attack, should it ever occur, would transform America and the world—and not for the better.

But despite substantial progress in improving nuclear security, some stockpiles of potential bomb material remain dangerously insecure. In Russia, there have been major improvements in nuclear security—the difference between the security in place at many nuclear sites today and the security in place in 1994 is like night and day. But Russia has the world's largest stockpiles of nuclear weapons and materials, located in the world's largest number of buildings and bunkers; some serious security weaknesses still remain, ranging from poorly trained, sometimes suicidal guards to serious under-funding

of nuclear security; and the upgraded security systems must face huge threats, from insider theft conspiracies to terrorist groups who have shown an ability to strike in force, without warning or mercy. In Pakistan, a relatively small nuclear stockpile, believed to be heavily guarded, faces even more severe threats, both from nuclear insiders with violent Islamic extremist sympathies and from outsider attack, potentially by scores or hundreds of al-Qaeda fighters. Some 130 nuclear research reactors around the world still use highly enriched uranium (HEU) as their fuel, and many of these have only the most modest security measures in place—in some cases, no more than a night watchman and a chain-link fence.

The break-in by armed attackers at the Pelindaba site in South Africa in November 2007—a site with hundreds of kilograms of weapon-grade uranium—is a reminder that nuclear security is a global problem, not just a problem in the former Soviet Union. And incidents such as the inadvertent flight of six nuclear warheads to Barksdale Air Force Base make it clear that nuclear security requires constant vigilance, and that every country where these stockpiles exist, including the United States, has more to do to ensure that they are effectively secured.

Programs sponsored by the United States and other countries are making major progress in addressing these dangers, representing an excellent investment in U.S. and world security. There is no doubt that the risk of nuclear terrorism today is substantially less than it would have been had these programs never existed. But much more must be done to reduce the risk.

Tables ES-1, ES-2, ES-3, and ES-4 summarize the current state of progress and the work remaining to be done on improving security for nuclear warheads and materials; consolidating those stockpiles into fewer locations and removing them

from vulnerable, difficult-to-defend sites; and putting in place the international and domestic policy frameworks needed to achieve effective and lasting nuclear security worldwide.

Table ES-1: Strengthening Nuclear Security: Progress by Category of Country

Category	Assessment
Russia	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. Substantial outsider threats as well, though suppressed by counterinsurgency in Chechnya.
Developing states with nuclear weapons (Pakistan, India, China, North Korea)	Progress in some areas, not in others. Significant cooperation with Pakistan, but specifics classified. Severe threats in Pakistan from nuclear insiders with jihadist sympathies, al Qaeda or Taliban outsider attacks, and a weak state. India has so far rejected nuclear security cooperation. Broad dialogue with China, but little evidence yet that this has led to substantial improvements on the ground. No effort yet to engage with North Korea on nuclear security cooperation, but very small stock and garrison state probably limit risks of nuclear theft.
Developing and transition non-nuclear-weapon states	Some progress. Upgrades completed at nearly all facilities with weapons-usable material in the Eurasian states outside of Russia, and in Eastern Europe. Belarus, Ukraine, 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 hosted an IAEA security review team after the Pelindaba break-in, but has declined nuclear security cooperation with the United States. Upgrades completed for nearly all HEU-fueled research reactors that previously did not meet IAEA recommendations, but most upgrades would not be enough to defend against demonstrated terrorist and criminal capabilities.
Developed Countries	Some progress. 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. The Global Initiative to Combat Nuclear Terrorism and the newly established World Institute for Nuclear Security (WINS) may provide fora for discussing nuclear security improvements in developed countries.
United States	Substantial progress, 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 requirements for NRC-regulated facilities with large quantities of HEU are far below those at DOE. NRC-regulated research reactors fueled with HEU remain exempted from most NRC security requirements.

Source: Author's estimates.

Table ES-2: Consolidating Nuclear Stockpiles: Progress by Category of Country

Category	Assessment
Russia	Limited progress, major obstacles. Nuclear weapon sites reduced during 1980s-1990s pullbacks – but nuclear weapons continue to be stored at dozens of separate sites, with no apparent movement toward further consolidation. Russia has the world’s largest number of HEU-fueled research reactors, and has largely refused to engage on converting them to Low Enriched Uranium or shutting them down. The Russian Navy has greatly reduced its sites with HEU, and at least one facility has given up all its HEU as part of the Materials Consolidation and Conversion program. Russia has closed down nuclear weapons work at several sites, and some of the remaining sites have moved nuclear material into a smaller number of buildings. But potential bomb material still exists in over 200 buildings, and the Russian government appears unwilling to pursue large-scale consolidation.
Developing states with nuclear weapons (Pakistan, India, China, North Korea)	Limited progress – but these countries have small nuclear stockpiles at small numbers of sites, so less consolidation is needed. China has joined the reactor conversion effort and has converted three research reactors and shut down one more. India is planning to convert one HEU-fueled research reactor to LEU without U.S. help. Growing nuclear arsenals may be stored at larger number of sites in the future. China and India are both pursuing civilian plutonium programs that may eventually lead to widespread use of plutonium fuels.
Developing and transition non-nuclear-weapon states	Substantial progress, but a great deal more to be done. Global Threat Reduction Initiative has accelerated the pace of converting HEU-fueled research reactors to LEU and of shipping Soviet-supplied HEU back to secure sites in Russia; the pace of returning U.S.-supplied HEU has not increased, however. Twelve U.S.-supplied countries and four Soviet-supplied countries (Latvia, Georgia, Iraq, and Bulgaria) have had all their HEU removed. Ukraine has a particularly dangerous stockpile of HEU, which it has agreed in principle to downblend. Belarus and South Africa, which also have particularly dangerous HEU stockpiles, have not yet agreed to eliminate those stocks. Reactors in Ukraine and South Africa have been converted to LEU fuel.
Developed Countries	Some progress, but a great deal more to be done. GTRI has accelerated the pace of converting HEU-fueled research reactors to LEU, and GTRI’s “gap materials” effort has brought tens of kilograms of fresh HEU back to the United States from countries such as Canada, Belgium, and the Netherlands. Only a small portion of HEU in these countries is currently targeted for removal, however, and many facilities have little interest in giving up the use of HEU. No programs are in place to minimize the locations where plutonium fuels are used, and the current approach to the Global Nuclear Energy Partnership (GNEP) may have the opposite effect.
United States	Substantial progress, though issues remain. U.S. nuclear weapons are now stored at a small number of sites, though tactical bombs remain at several sites in Europe. NNSA is funding the conversion to LEU of several U.S. HEU-fueled reactors per year. DOE is substantially consolidating its sites and buildings with potential bomb material, though not as quickly or comprehensively as some experts have recommended. The planned MOX program for plutonium disposition would add a small number of reactors to sites with material of concern, and the current approach to GNEP, if funded, could lead to expansion of such sites.

Source: Author’s estimates.

Table ES-3: Building International Policy Frameworks: Progress by Category of Effort

Category	Assessment
Building the sense of urgency and commitment worldwide	Some progress, but major obstacles still to overcome. Global Initiative to Combat Nuclear Terrorism and expanded dialogues with foreign intelligence agencies have helped heighten international awareness of the threat. Many nuclear officials and policymakers in key countries, however, continue to believe that it would be almost impossible for terrorists to get the material for a nuclear bomb or to make a bomb from it if they did get hold of it.
Creating a fast-paced global nuclear security campaign	Some progress, but important gaps remaining. The Global Initiative to Combat Nuclear Terrorism has highlighted the threat with many countries, but has focused more on issues such as law enforcement, radiation detection, and emergency response. The Global Partnership Against the Spread of Weapons and Materials of Mass Destruction has moved slowly and spent very little on upgrading security for nuclear stockpiles. Most countries with nuclear stockpiles not yet focused on rapidly improving the security for these stocks and helping other countries to do the same. WINS will help exchange nuclear security best practices, and may help focus attention on the threat.
Forging effective global nuclear security standards	Limited progress. Neither the amended physical protection convention nor the nuclear terrorism convention set standards for how secure nuclear stockpiles should be. UN Security Council Resolution 1540 legally obligates all states to provide “appropriate effective” security and accounting for nuclear stockpiles, but there is no agreed definition of what essential elements are needed to meet this requirement. Discussions of a revision to IAEA physical protection recommendations that might provide more specific standards are under way.
Building strong nuclear security partnerships	Some progress, more to be done. The Global Initiative to Combat Nuclear Terrorism, co-chaired by the United States and Russia, has put Russia in the role of joint leader of a global effort, rather than only recipient of assistance. Since the Bratislava summit, U.S.-Russian discussions have included more genuine exchanges of approaches and best practices. But souring U.S.-Russian relations in the aftermath of the conflict in Georgia may make new cooperative agreements and real partnership more difficult to achieve – though existing nuclear security cooperation has not been cut back. Russia is still under-investing in nuclear security at home (relying heavily on U.S. funding at many Russian sites), and refusing to invest in upgrading security or consolidating stockpiles elsewhere. U.S. decisions on issues such as Georgia, missile defenses in Europe, NATO expansion, and Kosovo are being taken with limited consideration of the potential impact on nuclear security cooperation. Efforts to begin building nuclear security partnerships with other countries are just beginning.
Achieving Sustainability	Significant progress in Russia, limited progress elsewhere. U.S. and Russian governments have reached accord on sustainability principles, are working to lay out sustainability plans for each site – but Russia still investing less than is likely to be needed. In other countries, there have been less extensive upgrades and less focus on putting in place the resources, organizations, and incentives needed to ensure that high levels of nuclear security are sustained.
Strengthening security culture	Some progress in Russia, limited progress elsewhere. U.S. and Russian governments have established a security culture pilot program at 10 facilities in Russia, and developed a joint methodology for security culture assessment, but much more remains to be done. The IAEA’s first document providing guidance on assessing and strengthening security culture has just been issued, after years of delay. Many nuclear managers and staff remain convinced that security threats are minimal and further measures are not required. WINS should provide a forum for exchanging best practices in strengthening security culture.

Source: Author’s estimates.

Table ES-4: Building Domestic Policy Frameworks: Progress by Category of Effort

Category	Assessment
Putting someone in charge	Little progress. Congress passed, and President Bush signed into law, legislation requiring the appointment of a full-time White House official to lead efforts to prevent nuclear, chemical, and biological proliferation and terrorism, but no such official has been appointed.
Developing and implementing a comprehensive, prioritized plan	Little progress. Congress passed, and President Bush signed into law, legislation requiring the development of a comprehensive plan to ensure that all nuclear weapons and all stocks of plutonium and HEU worldwide were sustainably secured against demonstrated terrorist and criminal capabilities by 2012. To date, however, there is no public indication that the administration will do more than stapling together the pre-existing plans of various programs focused on nuclear security, which, even in combination and even if wholly successful, would not cover all stocks of plutonium and HEU worldwide. The Nuclear Materials Information Program is working to collect and analyze the data on nuclear materials and their security worldwide that would provide the basis for such a plan.
Providing sufficient resources, matched to priorities	Significant progress, but more to be done. Spending on programs to reduce the risk of nuclear terrorism has increased substantially, and money is now a less important constraint than cooperation for most programs. No consistent process in place, however, to assign funds to the highest-priority efforts or to reassign funds as new opportunities arise. Some programs could accelerate progress now if provided additional funds. If other policies could break through the political and bureaucratic obstacles to cooperation, more money would be needed to implement an accelerated program.
Overcoming bureaucratic impediments	Significant progress, but more to be done. Congress has removed the threat-reduction certification requirements that slowed progress, and has consolidated some reporting requirements. Cumbersome contracting procedures, difficulties between NNSA and DOD and their labs and contractors, and other issues continue to impede progress.
Building a sustainable coalition of support	Significant progress, but more to be done. Broad support for most nuclear security programs on Capitol Hill and from both presidential candidates. But in many cases, pro-active initiatives still depend on a tiny handful of members of Congress. Little active support from private industry, as there are no large firms that get more than a few percent of their revenue from these programs. Broad public support is unfocused and results in little active pressure for expanded and accelerated efforts.

Source: Author's estimates.

This report focuses primarily on efforts to secure and remove nuclear weapons and the materials needed to make them, in order to keep them from being stolen, for these steps offer the most effective means to reduce the risk that terrorists will get and use a nuclear bomb. The complexities

of producing nuclear bomb materials from scratch are beyond the plausible capabilities of terrorist groups. Hence, if all the stockpiles produced by states can be reliably kept out of terrorist hands, nuclear terrorism can be reliably prevented. But once nuclear material has been stolen,

it could be anywhere, and all the subsequent layers of defense, unfortunately, are variations on looking for needles in haystacks.

Nevertheless, a comprehensive approach to reducing the risk of nuclear terrorism would also include efforts to block other steps on the terrorist pathway to the bomb, including new efforts to disrupt terrorist nuclear plots and their financing and recruitment; to interdict nuclear smuggling; to prevent and deter conscious state decisions to transfer nuclear weapons or materials to terrorists; to impede terrorist recruitment of nuclear experts; to reduce global stockpiles of nuclear weapons and fissile materials, and to end new production; and to place these stockpiles under international monitoring.

Quantitative indicators of progress in securing nuclear stockpiles can never be more than rough suggestions of the state of a more complex picture, as difficult-to-measure questions can also be central to effective nuclear security, from how effective the guard force is to the degree to which the staff at a site cuts corners on nuclear security rules. Nevertheless, these indicators make clear that while a great deal has been accomplished to secure nuclear material around the world, a great deal more remains to be done. As of the end of fiscal year (FY) 2008, comprehensive security upgrades had been completed for roughly 75 percent of the buildings in the former Soviet Union that contain weapons-usable nuclear material, and U.S. and Russian experts were rushing to complete agreed upgrades by the end of 2008. At the same time, however, while the Department of Energy's (DOE) Global Threat Reduction Initiative (GTRI) has greatly accelerated security upgrades, conversion to low-enriched uranium, and HEU removals at HEU-fueled research reactors, some three-quarters of these

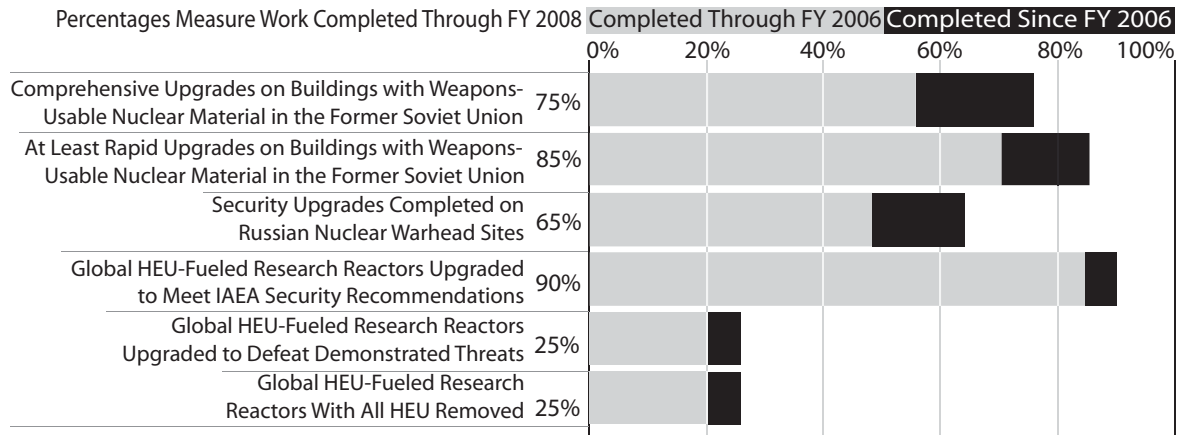
facilities have not yet had their HEU removed or had their security upgraded to a level that would provide effective protection against demonstrated terrorist and criminal threats. Figure ES-1 provides a summary of these quantitative indicators.

Most programs intended to reduce the risk of nuclear terrorism are constrained more by limited cooperation (resulting from secrecy, complacency about the threat, concerns over national sovereignty, and bureaucratic impediments) than they are by limited budgets. Nevertheless, the fact that the entire budget for all programs to prevent nuclear terrorism comes to less than one-quarter of one percent of the defense budget makes a clear statement about whether this effort is really a top priority of the U.S. government—and makes clear that the U.S. government could easily afford to do more, if more effort is needed. For FY 2009, the Bush administration requested \$1.083 billion for all programs to improve controls over nuclear weapons, materials, and expertise overseas, an 18 percent reduction from the FY 2008 appropriation. Several programs, particularly GTRI, have opportunities to make more rapid progress if they had additional funds: GTRI in particular would require an increase of \$200 million or more to seize all the opportunities to reduce nuclear terrorism risks it now has available—though managing such a rapid expansion in the program's efforts would be a significant challenge.

PREVENTING NUCLEAR TERRORISM: AN AGENDA FOR THE NEXT PRESIDENT

Preventing a terrorist nuclear attack must be a top international security priority—for the next U.S. president, and for leaders around the world. While the obstacles to accelerated and expanded progress are real and difficult, with sustained high-level leadership, a sensible strategy, and

Figure ES-5: Progress of U.S.-Funded Programs to Secure Nuclear Stockpiles



Source: Author's estimates. (See Chapter 3 for details).

adequate resources, they can be overcome. The next U.S. president has an historic opportunity—an opportunity to reduce the danger of nuclear terrorism to a fraction of its current level during his first term in office.

Achieve effective and lasting nuclear security

Launch a fast-paced global nuclear security campaign. The next U.S. president, working with other world leaders, should forge a global campaign to lock down every nuclear weapon and every significant stock of potential nuclear bomb material worldwide, as rapidly as that can possibly be done—and to take other key steps to reduce the risk of nuclear terrorism. This effort must be at the center of U.S. national security policy and diplomacy—an issue to be raised with every country with stockpiles to secure or resources to help, at every level, at every opportunity, until the job is done. The Global Initiative to Combat Nuclear Terrorism is a first step, which has been valuable in focusing countries' attention on the issue of nuclear terrorism and building legal infrastructure, capacity for emergency response, law enforcement capabilities, and more—but it

has not focused on rapid and substantial security upgrades for nuclear stockpiles, and demands little of countries to count as partners. A modified approach—focused on locking down all stocks of nuclear weapons, plutonium, and HEU to high standards—is likely to be necessary to create the kind of fast-paced nuclear security campaign that is needed. To succeed, such an 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 have gone into a tailspin since the conflict in Georgia, making a real nuclear security partnership with Russia far more 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.

Seek to ensure that *all* nuclear weapons, plutonium, and highly enriched uranium are secure. Terrorists will get the material to make a nuclear bomb wherever it is easiest to steal. The world cannot afford to let stovepipes between different programs leave some vulnerable stocks without security upgrades—the goal must be to ensure effective security for *all* stocks worldwide. Today, security upgrades in Russia are nearing completion, and there is significant progress in Pakistan, but the promising nuclear security dialogue with China does not yet appear to have led to major improvements in nuclear security there, and India has so far rejected offers of nuclear security cooperation. Upgrades in Belarus were delayed for years by poor political relations (though they are now nearly completed), and South Africa has not yet accepted nuclear security cooperation, despite the break-in at Pelindaba (although it did host an IAEA-led nuclear security review team after that incident). Except for occasional bilateral dialogues, U.S. programs largely ignore stocks in wealthy developed countries, though some of these, too, are dangerously insecure. Sustained high-level leadership is needed to close these gaps. While specific tactics are likely to differ—achieving security upgrades in wealthy countries may be more about convincing them that action is needed than it is about paying for it ourselves—it is urgent to get past the assumption that everything in wealthy countries is adequately secured.

Expand and accelerate efforts to consolidate nuclear stockpiles. The next U.S. president should place higher priority on

working with countries to reduce drastically the number of sites where nuclear weapons and the materials to make them exist, achieving higher security at lower cost. The goal should be to remove all nuclear material from the world's most vulnerable sites and ensure effective security wherever material must remain within four years or less—and to eliminate HEU from all civilian sites worldwide within roughly a decade. The GTRI has greatly accelerated the pace at which research reactors are being converted from HEU to low-enriched uranium (LEU) that cannot be used in a nuclear bomb, and the pace of removing HEU from these sites to secure locations. But here, too, there are gaps that should be closed. New incentives should be offered so that much of the more than 13 tons of U.S.-origin HEU not covered in current GTRI removal plans will be sent back or otherwise eliminated. A new program should be established to give unneeded reactors incentives to shut down (an approach which may be cheaper and quicker than conversion, especially for difficult-to-convert reactors). Over time, the United States should seek an end to all civil use of HEU. New efforts should be undertaken to limit the production, use, and stockpiling of weapons-usable separated civilian plutonium—including renewing the nearly-completed late-1990s effort to negotiate a 20-year U.S.-Russian moratorium on plutonium separation. And as nuclear energy expands and spreads, the United States should not encourage that spread to be based on approaches that involve reprocessing and recycling of plutonium, as some of the approaches envisioned in the Global Nuclear Energy Partnership (GNEP) would do; even the proposed GNEP processes that do not separate “pure plutonium” would tend to increase, rather than decrease, the risk of nuclear theft and proliferation compared to not reprocessing this fuel.

Gain agreement on effective global nuclear security standards. As nuclear security is only as strong as its weakest link, the world urgently needs effective global nuclear security standards that will ensure that all nuclear weapons and weapons-usable materials are protected against the kinds of threats terrorists and criminals have shown they can pose—at a bare minimum, against two small teams of well-trained, well-armed attackers, possibly with inside help, as occurred at Pelindaba. (In some countries, protection against even more capable threats is needed.) UN Security Council Resolution 1540 legally requires all countries to provide “appropriate effective” security and accounting for all their nuclear stockpiles. The time has come to build on that requirement by reaching a political-level agreement with other leading states on what the essential elements of appropriate effective security and accounting systems are, and then working to ensure that all states put those essential elements in place. 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.

Build sustainability and security culture. If the upgraded security equipment the United States is helping countries put in place is all broken and unused in five years, U.S. security objectives will not be accomplished. The next U.S. president should step up efforts to gain top-level commitments from Russia and other countries to sustain effective nuclear security for the long haul with their own resources. He should also intensify programs to work with countries around the world to build strong security cultures, putting an end to staff propping open security doors for convenience or guards patrolling with no ammunition in their guns. Building strong security cultures is a difficult policy challenge; the most

important single element is convincing nuclear managers and all their security-relevant staff of the urgency of the threat (see “Leadership and Commitment,” below). 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; the next U.S. president should greatly increase the focus on ensuring that countries around the world put in place and enforce effective nuclear security and accounting regulations.

Beyond nuclear security

Beefing up nuclear security, so that nuclear material cannot be stolen and fall into terrorist hands, is the single step that can most reduce the risk of nuclear terrorism—the critical chokepoint on the terrorist pathway to the bomb. Once potential bomb material is outside the gate of the facility where it is supposed to be, it could be anywhere, and the difficulty of stopping a terrorist nuclear plot increases dramatically. Nevertheless, theft-prevention efforts cannot be expected to be perfect; an integrated system of approaches to stopping terrorist nuclear plots is needed.

Disrupt: counter-terrorism efforts focused on nuclear risks. The next U.S. president should work with other countries to build an intense international focus on stopping the other elements of a nuclear plot—the recruiting, fundraising, equipment purchases, and more that would inevitably be required. Because of the complexity of a nuclear effort, these would offer a bigger and more detectable profile than many other terrorist conspiracies—although, as U.S. intelligence officials have pointed out, the observable “footprint” of a nuclear plot might be no bigger than that of the 9/11 plot. The best chances to stop such a plot lie not in

exotic new detection technologies but in a broad counter-terrorist effort, ranging from intelligence and other operations to target high-capability terrorist groups to addressing the anti-American hatred that makes recruiting and fund-raising easier, and makes it more difficult for other governments to cooperate with the United States. In particular, the United States should work with governments and non-government institutions in the Islamic world to build a consensus that slaughter on a nuclear scale is profoundly wrong under Islamic laws and traditions (and those of other faiths)—potentially making it more difficult for those terrorists wanting to pursue nuclear violence to convince the people they need to join their cause.

Interdict: countering the nuclear black market. Most of the past successes in seizing stolen nuclear material have come from conspirators informing on each other and from good police and intelligence work, not from radiation detectors. The next U.S. president should work with other countries around the world to intensify police and intelligence cooperation focused on stopping nuclear smuggling, including additional sting operations and well-publicized incentives for informers to report on such plots, to make it even more difficult for potential nuclear thieves and buyers to connect. The United States should also work with states around the world to ensure that they have (a) units of their national police forces trained and equipped to deal with cases of smuggling of nuclear materials and weapons-related equipment, and other law enforcement personnel trained to call in those units as needed; (b) effectively enforced laws on the books and making any participation in real or attempted theft or smuggling of nuclear weapons or weapons-usable materials, or nuclear terrorism, crimes with penalties comparable to those for murder or treason; (c) a commitment to catching and prosecuting those involved in such

transfers; and (d) standard operating procedures, routinely exercised, to deal with materials that may be detected or intercepted. The next U.S. president should develop an approach that offers a greater chance of stopping nuclear smugglers at lower cost than the current mandate for 100 percent scanning of all cargo containers, focusing on an integrated system that places as many barriers in the path of intelligent adversaries attempting to get nuclear material into the United States by *any* pathway as can be accomplished at reasonable cost, and work with Congress to get the modified approach approved. (In particular, it is important to understand that neither the detectors now being deployed nor the Advanced Spectroscopic Portals will have any substantial chance of detecting HEU metal with even modest shielding.)

Prevent and deter: reducing the risk of nuclear transfers to terrorists by states. Conscious state decisions to transfer nuclear weapons or materials to terrorists are a small part of the overall risk of nuclear terrorism; hostile dictators focused on preserving their regimes are highly unlikely to hand over the greatest power they have ever acquired to groups they cannot control, in ways that might provoke retaliation that would destroy their regimes forever. Nevertheless, this risk is not zero, and steps should be taken to reduce it further. The international community must convince North Korea and Iran to verifiably end their nuclear weapons efforts (and, in North Korea's case, to give up the weapons and materials already produced). At the same time, the global effort to stem the spread of nuclear weapons should be strengthened significantly, reducing the chances that other states might someday gain nuclear weapons that might fall into terrorist hands. The United States should also put in place the best practicable means for identifying the source of any nuclear attack—including not just

nuclear forensics but also traditional intelligence and law enforcement means—and announce that the United States will treat any terrorist nuclear attack using material consciously provided by a state as an attack by that state, and will respond accordingly. This should include both increased funding for R&D and expanded efforts to put together an international database of material characteristics. Policymakers should understand, however, that nuclear material has no DNA that can provide an absolute match: nuclear forensics will complement other sources of information, but will rarely make clear where material came from by itself.

Respond: global nuclear emergency response. The next U.S. president should work with other countries to ensure that an international rapid-response capability is put in place—including making all the necessary legal arrangements for visas and the import of technologies such as the nuclear detectors used by the nuclear emergency search teams (some of which include radioactive materials)—so that within hours of receiving information related to stolen nuclear material or a stolen nuclear weapon anywhere in the world, a response team (either from the state where the crisis was unfolding, or an international team if the state required assistance) could be on the ground, or an aircraft with sophisticated search capabilities could be flying over the area.

Impede: impeding terrorist recruitment of nuclear personnel. The next U.S. president should maintain existing scientist-redirection programs, but should reform them to use a broader array of tools and to focus on a broader array of threats, including not only top weapons scientists but workers with access to nuclear material, guards who could help steal nuclear material, and people who have retired from nuclear facilities but still have critical knowledge. The United

States is not likely to have either the access or the resources to carry out this broader mission by itself, but must work closely with partner countries to convince them to take most of the needed actions themselves. The next U.S. president should also work with key countries such as Russia and Pakistan to strengthen control of classified nuclear information and ensure that they monitor contacts and behavior of all individuals with key nuclear secrets—and should work with a broader set of countries to monitor and stop recruitment attempts at key sites, such as physics and nuclear engineering departments in countries with substantial Islamic extremist communities.

Reduce: reducing stockpiles and ending production. The United States, Russia, and other nuclear weapon states should join in an effort to radically reduce the size, roles, and readiness of their nuclear weapon stockpiles, verifiably dismantling many thousands of nuclear weapons and placing the fissile material they contain in secure, monitored storage until it can be safely and securely destroyed. Very deep reductions in nuclear stockpiles, if properly managed, would reduce the risks of nuclear theft—and could greatly improve the chances of gaining international support for other nonproliferation steps that could also reduce the long-term dangers of nuclear theft. As a first step, the next U.S. president should launch a joint program with Russia to reduce total U.S. and Russian stockpiles of nuclear weapons to something in the range of 1,000 weapons, and to place all plutonium and HEU beyond the stocks needed to support these low, agreed warhead stockpiles (and modest stocks for other military missions, such as naval fuel) in secure, monitored storage pending disposition. In particular, the United States and Russia should launch another round of reciprocal initiatives, comparable to the Presidential Nuclear Initiatives of 1991-1992, in which

they would each agree to: (a) take several thousand warheads—including, but not limited to, all tactical warheads not equipped with modern, difficult-to-bypass electronic locks—and place them in secure, centralized storage; (b) allow visits to those storage sites by the other side to confirm the presence and the security of these warheads; (c) commit that these warheads will be verifiably dismantled as soon as procedures have been agreed by both sides to do so without compromising sensitive information; and (d) commit that the nuclear materials from these warheads will similarly be placed in secure, monitored storage after dismantlement. The next U.S. president should also reverse the Bush administration's misguided opposition to a verified fissile material cutoff treaty, and lead work with other governments to overcome the obstacles to negotiating such a treaty—while also seeking to end all production of HEU for any purpose, and to phase out civilian separation of weapons-usable plutonium.

Monitor: monitoring nuclear stockpiles and reductions. The next U.S. president should work with Russia to revive efforts to put in place a system of data exchanges, reciprocal visits, and monitoring that would build confidence in the size and security of each side's nuclear stockpile, lay the groundwork for deep reductions in nuclear arms, and confirm agreed reductions in nuclear warhead and fissile material stockpiles. Such a system should ultimately be expanded to cover other nuclear weapon states as well. In particular, the next U.S. president should seek Russian agreement, before the 2010 Nonproliferation Treaty (NPT) review, that each country will place large quantities of excess fissile material under IAEA monitoring.

Leadership and commitment

A maze of political and bureaucratic obstacles must be overcome—quickly—if the world's most vulnerable nuclear stockpiles are to be secured before terrorists and thieves get to them. This will require sustained and creative leadership at many levels—at the highest levels of key governments around the world; in nuclear ministries and regulatory agencies; among intelligence, police, customs, and border control agencies; and at every nuclear facility or transport organization that handles nuclear weapons, plutonium, or HEU. Leadership from the next U.S. president will be particularly critical, for the United States is the single country most focused on reducing the threat of nuclear terrorism. Several steps will be critical to overcoming the obstacles to expanded and accelerated progress in reducing the risk.

Building the sense of urgency and commitment worldwide. The fundamental key to success 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—something many of them do not believe today. 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. Some of this case is already being made, especially in the context of the Global Initiative to Combat Nuclear Terrorism and in discussions between key U.S. intelligence officials and their foreign counterparts, but much more needs to be done. 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) *nuclear terrorism exercises* with policymakers from key states, which can sometimes reach officials emotionally in a way that briefings and policy memos cannot; (c) *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); (d) *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 (e) *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.

Putting someone in charge. The steps needed to prevent nuclear terrorism cut across multiple cabinet departments, and require cooperation in highly sensitive areas with countries across the globe. They will require sustained effort, day-in and day-out, from the highest levels of the U.S. government—and other governments. Yet today, there is no one in the U.S. government with full-time responsibility for all of the disparate efforts to prevent nuclear terrorism. The president who takes office in January 2009 should appoint a senior White House official who has the president's ear—probably a Deputy National Security Advisor, though the specific title would depend on the person and the structure of the NSC—whose sole respon-

sibility will be to wake up every morning thinking “what can we do today to prevent a nuclear terrorist attack?” Keeping this issue on the front burner at the White House day-in and day-out will be crucial to success. The next U.S. president should also lean on Russia and other key countries to do the same.

Developing a comprehensive, prioritized plan. Today, the U.S. government has dozens of programs focused on pieces of the problem of preventing nuclear terrorism, each of which has its own plan for its own piece—and no comprehensive, prioritized plan. There is no systematic mechanism in place for identifying the top priorities or where there may be gaps, overlaps, or inefficiencies. One of the first priorities of the new senior official dedicated to preventing nuclear terrorism must be to put in place a comprehensive, prioritized plan—and then continuously modify it as circumstances change.

Assigning adequate resources. Nuclear security is affordable: a level of security that could greatly reduce the risk of nuclear theft could be achieved for all nuclear stockpiles worldwide for roughly one-percent of annual U.S. defense spending. The next U.S. president and the U.S. Congress should act to ensure that lack of money does not slow or constrain any major effort to keep nuclear weapons and the materials needed to make them out of terrorist hands. In particular, since new opportunities to improve nuclear security sometimes arise unexpectedly, and difficult-to-plan incentives are sometimes required to convince facilities to give up their HEU or convert a research reactor, Congress should consider an appropriation in the range of \$500 million, to be available until expended, that can be spent flexibly on high-priority actions to reduce the risk of nuclear theft as they arise. Such a flexible pool of funds would give the new administration the ability to

hit the ground running with an expanded and accelerated effort.

Providing information and analysis to support policy. Good information and analysis on where the greatest risks, opportunities, and obstacles to progress lie will be crucial to preventing nuclear terrorism. The next U.S. president should act to ensure that U.S. and international policies to reduce the risk of nuclear terrorism are informed by the best practicable information, from intelligence, other information collection, and analysis—including independent analysis and suggestions from non-government institutions. The highest-leverage area for information collection and analysis is likely to be supporting policy efforts to improve security for nuclear stockpiles—answering questions ranging from which sites have particularly large and vulnerable stockpiles, to which nuclear facilities have poorly paid staff or corrupt guards, to which research reactors are underutilized, underfunded, and might be convinced to shut down with a modest incentive package.

Putting the United States' own house in order

The most urgent nuclear security vulnerabilities are largely in other countries. But there is much more that can and should be done within the United States itself as well, as recent incidents in the U.S. Air Force make clear. Convincing foreign countries to reduce and consolidate nuclear stockpiles, to put stringent nuclear security measures in place, or to convert their research reactors from HEU to LEU fuel will be far more difficult if the United States is not doing the same at home. DOE should continue providing funding to convert U.S. research reactors to LEU. Congress should provide funding for DOE to help HEU-fueled research reac-

tors, or research reactors that pose serious sabotage risks, to upgrade security voluntarily. At the same time, Congress should direct the Nuclear Regulatory Commission (NRC) to phase out the exemption from most security rules for HEU that research reactors now enjoy, and provide funding for DOE to help these reactors pay the costs of effective security. Congress should also insist that NRC revise its rule exempting HEU that is radioactive enough to cause doses of more than one Sievert per hour at one meter from almost all security requirements, as recent studies make clear that this level of radiation would pose little deterrent to theft by determined terrorists. The NRC's requirements for protection of potential nuclear bomb material should be strengthened to bring them roughly in line with DOE's rules for identical material (particularly since the NRC-regulated facilities handling this material are doing so mainly on contract to DOE in any case, so DOE will end up paying most of the costs of security as it does at its own sites). Congress should also provide incentives to convert HEU medical isotope production to LEU, without in any way interfering with supplies, by imposing a roughly 30 percent user fee on all medical isotopes made with HEU, with the funds used to help producers convert to LEU. This would give producers a strong financial incentive to convert, and since the isotopes are a tiny fraction of the costs of the medical procedures that use them, would not significantly affect the costs or availability of these life-saving procedures.

Finally, no matter what is done to prevent nuclear terrorism, it is essential that the United States get better prepared should such a catastrophe nevertheless occur. While some steps have been taken to prepare for the ghastly aftermath of a terrorist nuclear attack, a comprehensive plan and approach is needed. The United States needs a rapid ability to

assess which people are in the greatest danger and to tell them what they can do to protect themselves. Better capabilities to communicate to everyone, when TV, radio, and cell phones in the affected area may not be functioning properly are also needed, as are much better public communication plans for the critical minutes and hours after such an attack. The U.S. government needs to do a much better job encouraging and helping people to take simple steps to get ready for an emergency. The United States also needs to put in place a better ability—including making use of the military’s capabilities—to treat many thousands of injured people, along with more effective plans to keep the government and economy functioning while taking all the steps that will be needed to prevent another attack. (In particular, Congress has not yet acted to put a plan in place for reconstituting itself should most members of Congress be killed in a nuclear attack.) Many of these steps would help respond to any catastrophe, natural or man-made, and would pay off even if efforts to prevent a terrorist nuclear attack succeeded.

Coping with the danger of nuclear terrorism will pose a fundamental challenge for the next president and the next Congress. With a sensible strategy, adequate resources, and sustained leadership, the risk of nuclear terrorism can be dramatically reduced during the next president’s first term. American security demands no less.