

The Four Faces of **Nuclear** Terrorism



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MEETING THE CHALLENGE

A PLAN FOR URGENT ACTION AGAINST NUCLEAR TERRORISM

The foregoing chapters have reviewed the dangers posed by the four faces of nuclear terrorism: the theft and detonation of an intact nuclear weapon, the theft or purchase of fissile material leading to the fabrication and detonation of a crude nuclear weapon, the attack on or sabotage of nuclear installations, and the dispersal of highly radioactive material by conventional explosives or other means. This analysis, while describing many initiatives under way to meet these growing dangers, also revealed significant gaps in these efforts. This chapter will distill these findings and highlight the most critical priorities in need of immediate attention by the United States and other concerned nations.

The foremost requirement, which underpins all of the specific recommendations made below, is the need for the United States to alter dramatically its ranking of threats to its national security and to that of its friends and allies. American thinking about nuclear dangers was forged during the tensions of the Cold War confrontation with another nuclear superpower and in the face of the disturbing, though relatively slow, spread of nuclear arms to additional nations. Today, the nuclear threat posed by other nuclear-armed states is being eclipsed by a new type of threat, that of nuclear instruments in the hands of non-state, terrorist organizations. This reality requires a profound change in the way the United States thinks about nuclear policy.

It is fair to conclude that at this point in history, terrorist organizations are the *only* entities that are seeking to rain nuclear destruction on the United States without regard to the potential consequences to them-

selves or to the innumerable innocent victims of such action. Moreover, even in those instances where nuclear assets in the hands of states cause U.S. policy makers deep concern, in virtually all cases the foremost source of their apprehension is not the possibility that the states, themselves, will use these assets against the United States, but that these assets may come into the hands of terrorist groups who are all too eager to do so.

Russia, President Bush has declared, is a partner, not an enemy; it is highly unlikely to use its nuclear capabilities against the United States. Rather, the principal U.S. concern in this setting is that because of poor security terrorists might gain access to Russian nuclear weapons, weapons-usable material, or extremely powerful radioactive sources and use these capabilities against U.S. targets.

Pakistani nuclear weapons and weapons material pose a danger not because Pakistan's current government might threaten the United States. Rather they constitute a grave threat because figures in Pakistan's nuclear or military establishment who are sympathetic to radical Islam may offer nuclear materials or assistance to terrorist organizations espousing an intensely anti-Western ideology—and because a coup or political instability in Pakistan may bring to power radical Islamists, who would inherit Pakistan's nuclear assets and who would be closely tied to terrorist groups.

Iran's acquisition of nuclear arms and of weapons-usable uranium, similarly, is particularly threatening because of the Iranian Revolutionary Government's links to terrorist organizations. Even North Korea, whose long-range nuclear missile program could well threaten the U.S. homeland in the future, is likely to be deterred from ever using such weapons against the United States. North Korea poses a more serious danger to the United States because of its possible sale of nuclear assets to state sponsors of terrorism or to terrorists themselves, who might act independently to wreak destruction in the U.S. homeland.

The new salience of the nuclear terrorist threat must transform the way the United States thinks about and responds to a range of nuclear dangers. During the Cold War, Russia's enormous intercontinental ballistic missile warheads were perceived to pose the gravest danger to the

United States. Today, however, Russia's *smallest* nuclear weapons pose the greatest threat. Deployed in part on Russia's front lines, often under questionable security, and sometimes lacking internal locks to prevent unauthorized use, Russia's tactical nuclear weapons are far more attractive to terrorists than less portable strategic warheads attached to long-range missiles in secure silos or well-protected mobile missile bases.

Similarly, during the Cold War, the knowledge that Russian nuclear-armed missiles could obliterate hundreds of U.S. cities overshadowed the lesser threats of sabotage of U.S. nuclear facilities and the use of radiological weapons. But when terrorism is the leading concern, what were once "lesser included threats" need to be appreciated as significant dangers in their own right. As noted in Chapters 5 and 6, the destruction of a nuclear power plant or the use of a potent RDD could make large areas uninhabitable and cause massive economic dislocation. Although such incidents would cause only a small fraction of the destruction of a single nuclear detonation, if repeated at multiple locations, they could cause widespread panic and, potentially, loss of confidence in the ability of the U.S. government to protect its citizens.

Despite the recognition of the dangers of nuclear terrorism by President Bush and other U.S. leaders, numerous U.S. nuclear policies remain mired in the past and are impeding measures to reduce the nuclear terror dangers of today. Thinking about U.S.-Russian nuclear arms control arrangements, for example, requires extensive restructuring to give heightened prominence to the terrorist threat. The 2002 Moscow Treaty, which reduces nuclear deployments of strategic nuclear warheads by two-thirds, for example, will lessen the scale of an increasingly unlikely future nuclear exchange between Washington and Moscow. Its most important and most immediate contribution to U.S. national security, however, will more likely come from a factor that none of the negotiators gave thought to: the fact that the treaty will significantly reduce the number of warheads transported annually to and from Russian deployment sites on vulnerable rail links and through vulnerable rail transfer centers, thereby reducing the number of attractive targets for would-be nuclear terrorists. However, a shortcoming of this treaty is that it does not require any irreversible removal or destruction of nuclear warheads.

Each side is allowed to keep as many strategic nuclear warheads as it wants in storage, potentially raising the risk of terrorist acquisition of any portable strategic warheads kept in reserve.

In contrast, central features of the nonbinding 1991-1992 Presidential Nuclear Initiatives were specifically intended to reduce the proliferation dangers posed by U.S. and Russian tactical nuclear weapons, the weapons most attractive to terrorists. These understandings have led to the complete elimination in both the United States and Russia of certain classes of tactical nuclear weapons and provide that most categories retained in Russia will be placed in central storage, although this undertaking has yet to be fully implemented. If terrorism using nuclear weapons is, indeed, the paramount U.S. national security concern, future U.S.-Russian arms control agreements will need to follow the example of the 1991-1992 initiatives and incorporate measures aimed directly at reducing this danger—such as arrangements for the elimination of nuclear warheads—rather than leaving progress toward nuclear terror dangers to happenstance.

Multilateral arms control measures must also be reevaluated in terms of their potential contribution to reducing the nuclear terror threats. A global Fissile Material Cut-Off Treaty (FMCT), for example, which would prohibit the further production of fissile materials for nuclear weapons, was first envisioned nearly a decade ago as a nonproliferation measure that would cap the fissile material stocks of the nuclear-armed states and, thus, indirectly, the size of their nuclear arsenals. Although this goal is highly worthwhile in itself, today it is clear that such a treaty would serve a second, equally important objective: capping certain classes of fissile material and reducing the number of processing facilities that might be targets of terrorists seeking to develop an improvised nuclear device.¹ This crucially important, but heretofore overlooked, benefit of the treaty should spur the member states of the Conference on Disarmament in Geneva, where the treaty is to be negotiated, to put aside disputes over unrelated issues which have stalled negotiations and to begin this process in earnest.

Numerous additional U.S. nuclear policies of today that are discussed throughout this book and highlighted in the remainder of this chapter

are similarly tied too closely to past thinking and need revision based on the recognition that non-state actors seeking to cause nuclear mayhem represent the paramount threat facing the United States today. Among the policies that need reexamination are U.S. nuclear material security programs that do not give priority to the fissile material of greatest interest to terrorists—that is, highly enriched uranium; U.S. nuclear-weapon-security assistance programs that restrict aid for fear of supporting Russian nuclear weapon deployments and operations; the continued Cold War-era deployments of nuclear weapons in Western Europe; and the failure of any U.S. agency or international organization to champion alternative technologies that could reduce the use of hard-to-secure radioactive sources worldwide.

The United States is not the only state pursuing shortsighted nuclear policies, however. Russia, too, is a potential target of nuclear terror, but despite its growing hard currency reserves and budget surpluses it continues to spend only a pittance on securing its own nuclear resources, leaving the United States to provide the lion's share of the costs of multi-billion-dollar security upgrades.² In these circumstances, Russia's support for the recently adopted UN Security Council Resolution 1540, creating a legally binding requirement for all UN member states to provide for the security of their nuclear assets, is somewhat ironic.

Equally out of step with the new realities of international security are the decisions of a number of foreign governments to continue separating weapons-usable plutonium from spent nuclear power plant fuel when they have no practical program for using the separated material—reprocessing without a purpose. Although a number of states have responsibly abandoned this practice, it continues in the United Kingdom, which has no domestic plutonium use program. Japan, similarly, is paying to have civil plutonium separated in Great Britain and France; the separated material continues to accumulate there because domestic opposition, among other factors, has brought Japan's plutonium use program to a virtual standstill. Notwithstanding such reverses, Japan is also completing a massive plutonium separation plant at home. As for Russia, even as it accepts billions of dollars in foreign assistance to improve the protection of its nuclear-weapon-usable materials, it continues to

add to the nuclear terror danger by separating fresh plutonium from spent nuclear power plant fuel, with no current plans for its use.

In sum, virtually the entire spectrum of nuclear policy—including arms control, deployments, threat reduction assistance, civilian nuclear energy, and even medical and industrial uses of potent radioactive sources—needs reshaping in the United States and in many other countries to give full recognition to the paramount dangers of nuclear terrorism. Sadly, there is still far to go before, in each of these policy areas, countering nuclear terrorism becomes an aim point, not an afterthought.

Although such a new strategic vision lags far behind the dramatic shift in the threat environment, as earlier chapters have noted, numerous U.S. and international programs have been initiated to alleviate terrorist threats. The global war on terror has disrupted some terrorist organizations, removed certain safe havens, and interfered with some terrorist financing activities. The United States is also improving port and border detection of illicit trafficking of nuclear and radioactive materials into this country, work that will require years of additional effort to complete. New radiation sensors are being installed around certain cities considered likely terrorist targets, and commercial air travel security has been significantly tightened to reduce the risk that a commercial aircraft might be used as an instrument of a terrorist attack.

During 2004, a number of notable initiatives are likely to strengthen these efforts further. The adoption of Security Council Resolution 1540, noted above, requiring all UN member states to adopt measures to secure their nuclear assets, to adopt effective export controls on WMD material, and to criminalize actions by non-state actors to develop WMD is a major step forward, although its contribution to reducing nuclear terror dangers will be felt only once states fully implement its requirements. The Department of Energy's May 2004 Global Threat Reduction Initiative to sweep up all stocks of U.S. and Soviet/Russian-origin highly enriched uranium at vulnerable research centers around the globe is another signal development. Although this very positive initiative es-

tablished an ambitious and laudable deadline for completion of repatriation of Soviet- and Russian-origin fresh fuel (end of 2005) and for spent fuel (end of 2010), it is far from clear whether the U.S. government has crafted a workable plan with the necessary high-level institutional champions and financial resources to overcome the many bureaucratic obstacles that have long impeded implementation of less ambitious HEU initiatives in the past within both the United States and Russia. Moreover, the deadline for repatriating irradiated fuel containing HEU needs to be significantly shortened. The IAEA's increasing high-level attention to high-consequence nuclear terror threats, observed in new programs and in major addresses by IAEA Director General Mohammed ElBaradei, are also to be applauded. The agency, however, needs to reconcile these very prudent programs and pronouncements with an institutional culture that continues to support the export and use by member states of HEU-fueled reactors.

The benefits from these initiatives, both those directed at countering terrorism and those directed more specifically at protecting nuclear assets, are cumulative and mutually reinforcing, and in time, they will develop into a "defense in depth" that will reduce the overall danger of nuclear terrorism to acceptable levels. In this respect, it is worth reemphasizing that very few terrorist organizations known today have the capabilities to execute the most complex nuclear terror scenarios, those involving the theft of nuclear weapons or materials in the former Soviet Union or South Asia and the subsequent detonation of a nuclear explosive in the United States. Thus, locating and obstructing terrorist groups can have a significant impact on thwarting the gravest nuclear terror dangers, and further enhancements of this and all elements of the layered defense approach to this threat deserve strong support. However, the United States and its international partners can make the most rapid advances by taking specific, urgent actions to secure nuclear weapons, fissile material, nuclear facilities, and high-risk radioactive sources.

The crucial first step, however, is to recognize the preeminence of nuclear terrorism, in all of its manifestations, as the leading national security challenge facing the United States and its friends and allies.

URGENT PRIORITIES

Our fundamental conclusion is that the United States must work immediately to *reduce the probability of nuclear terror acts with the highest consequences and mitigate the consequences of the nuclear terror acts that are the most probable.*

Because terrorist attacks with nuclear explosives would have devastating consequences, urgent and immediate changes are needed in U.S. efforts to secure nuclear weapons and materials abroad. At the same time, because we conclude that terrorism involving radioactive materials is virtually inevitable, it is crucial that the United States prepare now to deal with such an event and its aftermath, even as efforts to control and secure high-risk radioactive sources are intensified. Steady progress must also continue in protecting nuclear facilities against attack or sabotage. With this in mind, we have identified the most urgent practical steps toward these twin objectives, measures that could make a significant difference in the next year to 18 months. Without abandoning other valuable efforts, these need to become the focal point of U.S. and international action in the immediate future—the leading edge of global efforts to reduce the nuclear terror danger.

Reducing the Probability of Nuclear Terrorism with Nuclear Weapons or Improvised Nuclear Devices

We believe the United States must reprioritize its efforts to prevent the terrorist detonation of a nuclear device by dramatically intensifying its focus on three key policies: putting HEU first; reducing nuclear terror risks in South and Central Asia; and securing vulnerable Russian nuclear weapons.

Put HEU First

The United States must dramatically revise U.S. efforts to protect fissile materials abroad so as to make securing, consolidating, and eliminating *highly enriched uranium* the leading and most urgent task, taking clear precedence over addressing the dangers posed by plutonium, which must, nonetheless, remain an important priority. The overarching principle guiding policy should be to move toward a world in which fewer countries retain HEU, fewer facilities within countries possess HEU, and fewer locations within those facilities have HEU present. Specifically, we urge that the following steps be implemented as rapidly as possible.

- *Put HEU at the head of the queue, when securing nuclear materials.* The Department of Energy must establish clear priorities in its extensive Material Protection, Control, and Accounting (MPC&A) program in Russia that unambiguously place sites containing HEU at the top of its list, and it must aggressively pursue the completion of security upgrades at these locations, with the goal of finishing the implementation of “rapid upgrades” within one year.
- *Renew the U.S. initiative to accelerate down-blending of Russian HEU.* The United States should redouble its efforts to accelerate the down-blending of Russian HEU to the non-weapons-usable enrichment level, as recommended by the U.S. National Academy of Sciences. In 2003, the United States gained Russian agreement to increase the down-blending of HEU by 1.5 tons annually, with the resulting low-enriched uranium to be placed in a strategic reserve in the United States. The U.S. Congress refused to fund the initiative, however. The president should make this an urgent priority in the current budget cycle, citing the need to reduce the threat of nuclear terrorism, while also pressing Russia to enlarge further the annual amount

of down-blended HEU. The costs would be modest in the context of the overall budget for material protection, consolidation, and elimination and could be partially recouped at some point in the future when the material might be gradually sold off in a way that did not perturb the commercial low-enriched uranium market.

- *Accelerate repatriation of Soviet/Russian- and-U.S.-origin HEU.* The Department of Energy must implement its new Global Threat Reduction Initiative at an accelerated schedule, especially with respect to HEU in the form of spent fuel. Highest priority should be given to removing HEU from Belarus, Kazakhstan, Ukraine, Uzbekistan, and the former Yugoslavia.³ Repatriation of all U.S.-origin HEU must be completed well in advance of the current target date, which is 2014. A policy to accomplish these objectives must be informed by an understanding of the significant bureaucratic, technical, economic, political, and national security impediments to HEU consolidation and elimination, and the development of compelling incentives to overcome these obstacles on a site-by-site basis.
- *Accelerate conversion of research reactors.* All civilian research reactors currently reliant on HEU should be converted to use low-enriched uranium fuel. In addition, efforts should be undertaken immediately to adopt legally binding prohibitions on the export of HEU-fueled research (and power) reactors.
- *Encourage Japan to build a strategic low-enriched uranium reserve, using material from Russian HEU, to increase the rate of HEU elimination.* The United States, through the G-8 Global Partnership to Combat the Proliferation of Weapons and Materials of Mass Destruction, should encourage Japan to build a strategic low-enriched uranium reserve composed of material down-blended from Russian weapons HEU, with the goal of increasing significantly beyond current levels the total amount of Russian HEU eliminated annually. Japan has long justified its plutonium separation program on the grounds that it will guarantee that country energy independence by providing a

domestic source of nuclear power plant fuel. The strategic low-enriched uranium would achieve this result far more rapidly. Equally important, it would permit Japan to defer the start-up of the Rokkasho-Mura reprocessing plant and avoid the terrorist risks associated with the accumulation of additional, currently unneeded stocks of plutonium.

- *Use the Mayak Fissile Material Storage Facility to secure HEU.* Simultaneously, the United States should press Russia to place 200 tons of HEU within the high-security Mayak facility, which was designed to accept this quantity of this material, until additional down-blending capabilities are available. If necessary, the United States should pay for the costs of transporting the HEU to the Mayak facility, an expense that would be offset by the reduced costs of securing the material elsewhere, under the MPC&A program,⁴ and by the savings from postponing the plutonium disposition program, discussed below.
- *Subordinate the Plutonium Disposition Program to focus diplomatic and financial resources more intensively on HEU.* With the opening of the Mayak Fissile Material Storage Facility, 25 tons of Russian weapons plutonium will be placed in highly secure storage over the next four years, greatly reducing the risk of terrorism involving this material and simultaneously reducing the urgency of the longer-term program to work with Russia to eliminate this material.⁵ Accordingly, we recommend that the United States temporarily subordinate the latter program, which has made minimal progress in the face of numerous bureaucratic and technical problems, to efforts to address the HEU danger. Rather than continuing to expend high-level political capital on this initiative with little result, the United States should concentrate its efforts on implementing the next phases of the HEU security, consolidation, and elimination program, which will have a far greater short-term impact in reducing the danger of nuclear terrorism. If new funding for such HEU efforts, to include the costs of transporting HEU to Mayak, cannot be added to the

federal budget, it would be a wise investment to shift monies from the Plutonium Disposition Program for this purpose.

We would also recommend that the premises underlying the Plutonium Disposition Program be carefully reexamined in light of heightened concerns regarding nuclear terrorism. While the long-term goal of eliminating separated weapons plutonium is laudable, the program as currently envisioned entails greatly increased shorter-term risks by removing plutonium from secure storage, introducing it into numerous additional facilities, and transporting it over considerable distances within Russia.

Reduce Nuclear Risks in South and Central Asia

The United States and its allies must recognize that for the moment, the locus of greatest nuclear terror danger is South and Central Asia, a zone where Islamic militant terrorist groups are very active and where the risk of their gaining access to nuclear materials—especially from unreliable elements within the Pakistan establishment or from certain vulnerable sites in Kazakhstan and Uzbekistan—is highest. Accordingly,

- It is of urgent importance to remove the relatively small but nuclear-terrorism- significant quantity of fissile material from Central Asia.
- The United States must implement a strategy of promoting internal and regional stability, while maximizing—consistent with the dictates of the Non-Proliferation Treaty—the sharing of unclassified technology to help Pakistan securely manage its nuclear assets.
- It is also critically important for the United States to develop contingency plans, potentially involving the use of American nuclear recovery teams or specialized military forces, to help secure Pakistani nuclear assets in the event of instability in that country, to ensure that these assets do not fall into the hands of terrorist organizations or their sponsors.

Secure Vulnerable Russian Nuclear Weapons

The last area that must be addressed to reduce the likelihood of high-consequence nuclear terrorism is securing Russia's most vulnerable nuclear weapons, in particular those tactical nuclear weapons that are forward deployed and portable and that may lack permissive action links.

- Specifically, the United States must encourage Russia to implement fully its pledges under the 1991-1992 Presidential Nuclear Initiatives, including the removal to central storage of all but one category of tactical nuclear weapons. Ideally, all tactical nuclear weapons should be stored at exceptionally secure facilities far from populated regions. In parallel, the United States should declare its intention to return to U.S. territory the small number of air-launched tactical nuclear weapons currently deployed in Europe. Although probably less at risk to terrorist seizure than tactical nuclear weapons forward deployed in Russia, there no longer is a military justification for their presence in Europe. The U.S. action, while valuable in its own right, might be linked to Russian agreement to move its tactical nuclear arms to more secure locations.
- In the meantime, the Bush administration must revamp its current policy prohibiting security assistance for Russian nuclear weapons that are operationally deployed and/or where such assistance might indirectly contribute to Russian nuclear operational capabilities. As President Bush has stressed, the greatest danger to the United States today comes from weapons of mass destruction in the hands of terrorists, not from Russia, which we no longer treat as an enemy. Protecting those sites where tactical nuclear weapons remain against terrorist access must be a priority goal.

Mitigating the Consequences of the Most Likely Nuclear Terror Acts

The use of radioactive materials to cause massive disruption and economic loss is by far the most likely nuclear terror act. Although loss of life and destruction of property would not begin to rival that from a nuclear detonation, the harm caused would be grievous, particularly if radiological attacks were launched in multiple locations. Given the significant quantities of radioactive material currently outside regulatory control around the world, the unambiguous evidence of terrorist interest in using these materials to cause harm, and the ease of carrying out a radiological attack, we believe that such an attack is all but inevitable. Thus, even as the United States pursues measures to reduce the availability of radioactive materials, it should greatly increase its preparations for a radiological terror event through the following measures.

Train Officials and Responders

Federal, state, and local governments need to plan and train extensively to cope with a radiological attack.

- These efforts must include: preparing public communications strategies, readying evacuation plans and escape routes, coordinating the deployment and application of monitoring and detection capabilities, stockpiling and preparing distribution plans for specialized emergency equipment, training first responders and law enforcement/traffic officials to operate in a radioactive environment, and preparing medical facilities to cope with injured individuals contaminated by radioactive materials and those, likely rarer, cases of illness due to radiation exposure.

Develop Decontamination Technologies, Post-Attack Therapies, and a New Consensus on Standards

The most damaging impact from most radiological attacks will be the contamination of property, destroying property values and disrupting employment patterns. If decontamination technologies were available

and rapidly put to use, such impacts could be significantly reduced. Similarly, if therapies were available for purging radioactive materials from the body, short- and long-term health effects from a radiation incident could be minimized. In both of these areas, much research is under way, but much remains to be done. The public must also have confidence in government pronouncements regarding the safety of decontaminated areas if they are to be restored to their prior economic uses.

- Research on and the development of decontamination technologies and post-event therapies must be greatly accelerated. They are the linchpin for meeting the threat of radiological attack because they not only mitigate the consequences of such attacks, but, if widely publicized beforehand, would reduce panic and assist in emergency management. Perhaps even more important, if these technologies are developed, they could reduce the likelihood of such attacks by making them less attractive to terrorists seeking massive disruption of our society.
- No less important is the need to develop workable standards for decontamination that effectively and credibly protect public health, while providing greater flexibility in the continued use of economic resources than would be allowed under current standards. A new consensus on this issue is urgently needed before an actual incident so that the public can be confident that the standards are based on scientific principles, not on expediency in the wake of a terrorist attack.

Control Radioactive Materials

We have emphasized the need to prepare for a radiological attack because we fear that such an attack could occur at any time and is all but inevitable in coming years. Nonetheless, even as we prepare for this eventuality, it is essential to improve controls over radioactive materials so that over time, the likelihood of a radiological attack can be reduced. A comprehensive program requires positive regulation over radioac-

tive materials throughout their “life cycle” —from production, to use, to ultimate disposition. Currently, extensive efforts are under way in the United States, among the G-8 industrialized states (including the European Union), and at the IAEA to establish such comprehensive controls, but major gaps remain. For the near term, the following initiatives can have the greatest impact and deserve the most urgent attention.

- Locate and secure remaining radio-thermal generators in the former Soviet Union, arranging for substitute technologies in remote locations requiring electricity.
- In the United States and within the G-8 (including the EU), impose mandatory physical security and accounting controls over the most dangerous classes of radioactive sources, beginning with the most potent; use U.S.-G-8 regulations as a model to encourage comparable regulations globally.
- Impose rigorous domestic licensing and import and export controls over high-risk radioactive sources that include prelicensing determinations of credentials of end users; use U.S.-G-8 regulations as a model to encourage comparable regulations globally.
- In the United States and within the G-8 (including the EU), develop or accelerate programs to sweep up and store securely unwanted (disused) radioactive sources and provide for their ultimate safe and secure disposition, at interim sites if necessary, until permanent repositories are available. In the United States, fully fund and implement the U.S. Department of Energy Off-Site Source Recovery Program and extend it to all high-risk unwanted sources in this country. Encourage parallel programs globally.
- Actively promote the use of alternative technologies to radioactive sources, where appropriate. Subsidize substitution alternatives in states lacking adequate regulatory controls over radioactive materials.

Ensure that any radioactive sources and related equipment that are displaced by substitution are not introduced into a secondary market that may lead to their acquisition by states with inadequate regulatory controls.

Improve Protection of Nuclear Facilities against Attack or Sabotage

With certain qualifications, U.S. nuclear power plants pose considerable obstacles to successful terrorism leading to a major release of radioactivity. These facilities are built to withstand many physical challenges through the use of containment structures as well as redundant safety systems. The U.S. Nuclear Regulatory Commission required intensified security measures at U.S. nuclear power plants after September 11, 2001, and it has gradually formalized these requirements, which, we understand, are adjusted according to the level of terror threat identified by the U.S. Department of Homeland Security. The United States and other Western states are also reported to have enhanced security at other nuclear facilities with large inventories of radioactivity, including plutonium extraction plants and high-level nuclear waste facilities.

Important gaps in this improved security situation remain to be addressed, but we believe that these fixes, while important, do not require the extremely urgent priority that we would attach to our recommendations to improve the security of fissile materials and nuclear weapons and to address the dangers of a radiological attack. In this context, we recommend the following measures be implemented.

- We are not confident that the “design basis threat” adopted by the NRC (or reportedly by other regulatory bodies in other states) fully reflects the magnitude of the September 11 attack—19 motivated and well-trained attackers operating in four separate teams. Accordingly, we believe the United States should increase preparedness to address more demanding threats than incorporated in current regulations. Moreover, similar to the nuclear industry’s preparation for beyond design-basis accidents, the NRC and the nuclear industry must expedite preparedness for beyond design-basis attacks or sabotage of nuclear facilities.

- Certain vital nuclear safety systems, such as reactor control rooms and some types of spent fuel pools, are potentially vulnerable to attack from the air or from stand-off weapons because they are outside of nuclear power plant containments. A variety of cost-effective measures for hardening these plant elements have been proposed; these should be evaluated on an urgent basis and steps taken rapidly to mitigate these potential vulnerabilities. The United States should also encourage Great Britain and Russia to maintain high security at nuclear power plants without containments.
- The NRC currently is too dependent on a compliance-based approach for evaluating nuclear power plant security. It must implement a performance-based system of evaluation in which design basis threats are continually tested.
- Research reactors, though containing only a fraction of the radiation inventory of a nuclear power plant, are often located in urban settings. Many of the low-power research reactors do not use containment buildings, and even the high-power research reactors that do, have much weaker containment structures than found at commercial power plants. A formal U.S. government assessment of the risks posed by these facilities and of any measures needed to secure them against attack or sabotage is urgently needed.

Educate the Public

One of the most dangerous elements of a radiological attack is the panic that it can spur, which would likely lead to more immediate casualties than the ionizing radiation itself triggered by the attack.

- It is imperative that the public be *psychologically immunized* against the radiological attack threat, through an extensive public education campaign that leads citizens to understand (1) that such attacks rarely pose immediate threats to life, (2) that the decision to shelter or flee will depend on the circumstances of the event and that minimizing risk to personal health will depend on rapidly receiving and

adhering to guidance from governmental authorities, and (3) that proper treatment can greatly reduce long-term health effects in many cases.

SUSTAINING THE EFFORT

The action plan enumerated above provides a blueprint for significantly reducing the most salient risks stemming from the four faces of nuclear terrorism. However, neither these urgent steps nor the more comprehensive measures listed in previous chapters will eliminate these risks completely. The dangers of nuclear terrorism will continue to confront the United States and other nations as long as nuclear weapons, weapons-useable nuclear material, and high-risk radioactive sources continue to exist. Recognizing this, the United States allies must develop a sustained defense-in-depth against nuclear terrorism. At the global level, states and international organizations must consistently weigh the risks of nuclear terrorism in making decisions on the development and use of nuclear assets and radioactive materials. At the national level, deployment patterns and storage arrangements for nuclear weapons, decisions to produce nuclear weapons materials for civilian purposes, choices regarding nuclear power plant designs, and decisions to use radioactive sources or substitutes, must all take the risk of nuclear terrorism into account.

Nuclear weapons offer terrorists the ultimate means of inflicting mass destruction. A combined strategy of enhanced intelligence, disruption of terrorist organizations, protection of nuclear weapons and material, and emergency preparedness is required to combat this threat. The United States and its allies must therefore give high priority to a coordinated and sustained effort to reduce the risks of nuclear terrorism as an essential element of the worldwide struggle against terror.



¹ Under the FMCT, as many now envision it, states would be required to place under IAEA inspection any fissile material they produce to ensure it will not be used for nuclear weapons; fissile material production under such IAEA safeguards for peaceful purposes could continue. With one important use for fissile materials eliminated, it is assumed that total stocks would grow at a slower rate than would otherwise be the case and, presumably, certain production facilities would be closed, reducing potential terrorist targets. It may be noted,

however, that in a number of countries, the treaty, as a practical matter, might end the production of certain forms of particularly dangerous fissile material altogether—for example, weapons-grade HEU and weapons-grade plutonium. HEU enriched to lower levels and reactor-grade plutonium would present added challenges to terrorists seeking to use them for improvised nuclear devices.

² Matthew Bunn and Anthony Wier, *Securing the Bomb: An Agenda for Action*, Project on Managing the Atom, Harvard University, Report Commissioned by the Nuclear Threat Initiative, May 2004.

³ Although nearly 50kg of fresh HEU fuel was removed from Vinca (outside of Belgrade) in 2002, a large quantity of equally dangerous HEU in spent fuel remains on site.

⁴ It may be noted that much of the HEU in question appears to be located currently at highly classified Russian sites where the United States has had difficulty gaining access and implementing MPC&A measures. The Mayak option would have the added benefit of removing the HEU from locations where security is of uncertain quality to one where it is known to be very high.

⁵ The Mayak facility would hold 25 tons of the 34 intended for ultimate disposition and could be expanded to hold additional quantities if Russia chose to make them available.