

Economic conditions in Russia in the wake of the August 17, 1998 devaluation of the Russian ruble have substantially increased the risk of theft at the dozens of former Soviet nuclear sites containing an estimated 650 metric tons of weapons-usable “fissile” material. Until the crisis, many Russians believed that their financial system might provide the means to climb out of the post-Soviet economic depression. The fact that this belief is no longer widely shared has already changed calculations among Russia’s nuclear guardians regarding the merits of performing nuclear security duties, and may eventually change calculations of the risks and benefits of stealing fissile materials. The diversion of just tens of kilograms of plutonium or highly enriched uranium (HEU) to a hostile state or terrorist organization would have disastrous political and military effects for the United States, Russia, and the international system.

The August 1998 crisis also demonstrated that the Russian government will for the foreseeable future be incapable of financing a substantial proportion of its nuclear material protection responsibilities. In this sense, the proliferation threat posed by the Russian economic meltdown is more dire than the threat that was posed after the dissolution of the Soviet Union in 1991 created uncertainties about the control of Soviet nuclear weapons. Then, the United States was able to help facilitate an unprecedented political transition by assisting with the security and safe transport of Soviet nuclear weapons to Russian territory, which it followed with “Nunn-Lugar” assistance to protect nuclear warheads and dismantle former Soviet nuclear weapon delivery vehicles.

By contrast, today’s situation requires that the United States tailor its assistance both to the technology-related problems of protecting and accounting for Russian fissile materials, and to the personnel-related problems of assuring that Russian nuclear material guardians will stand by their posts and resist the temptation to sell bomb-ready materials to outsiders.<sup>2</sup> Addressing the “human factor” at Russian nuclear sites is essential because

Russian nuclear guardians’ patriotic attachment to non-proliferation goals has, so far as we know, played a key role in preventing a proliferation catastrophe.<sup>3</sup> The United States must now integrate short-term efforts to address this human factor with its original goal of helping

Russians rapidly install security upgrades at all fissile material storage sites, and with the increasingly urgent goal of helping Russia consolidate and downsize its vast nuclear weapons complex.

The US entity responsible for US-Russian cooperative nuclear materials security efforts, the Department of Energy’s (DOE) Materials Protection, Control, and Accounting

(MPC&A) program, has taken some steps to address these problems. The program is continuing to install security systems at facilities within all 40 known Russian fissile material sites, while also providing some short-term assistance to those sites experiencing crisis-induced security lapses.<sup>4</sup> By the end of 1998, the program had provided a range of targeted emergency assistance, from purchasing winter coats and space heaters for guards to accelerating payments to scientists and guards for the testing of installed nuclear material security systems. Program managers expect to provide some level of emergency assistance to all Russian MPC&A sites by winter’s end. Program officials have also initiated discussions with their Russian counterparts on a multi-year strategy to help consolidate Russia’s fissile material stockpiles.

The Russian economic and humanitarian crisis extends far beyond getting through the winter of 1998-99 however.<sup>5</sup> In November 1998, a Russian deputy minister for labor and development warned that “44 million people, or around 30 percent of the [Russian] people were living below the poverty line.”<sup>6</sup> The Russian fi-

**VIEWPOINT:  
SECURING RUSSIAN  
NUCLEAR MATERIALS:  
THE NEED FOR AN  
EXPANDED US RESPONSE**

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nancial crisis means that a Russian economic recovery within the next several years is very unlikely, and that conditions could just as easily worsen in the years to come,<sup>7</sup> even if large-scale Western economic assistance efforts are resumed.<sup>8</sup>

The relationship between Russia's chronic economic difficulties and the Russian proliferation threat has long been poorly understood within US governmental circles. Indeed, the August crisis initially prompted few changes in the US cooperative nuclear security agenda. No emergency MPC&A measures were taken, and the effects of the crisis on the already serious problem of protecting Russian fissile materials was in no way acknowledged at the September 1998 Clinton-Yeltsin summit in Moscow.

One reason for the inadequacy of the initial US response to the crisis was that the nearly decade-old specter of "loose nukes" had made it difficult to distinguish between new and pre-existing problems within the Russian nuclear complex. However, the main reason for inaction within DOE was the fear that launching new initiatives commensurate to the threat at hand could attract right-wing US congressional opposition similar to the kind that has been directed at other US-Russian cooperative nuclear security programs. The political need to work within the constraints of DOE and Office of Management and Budget (OMB) budget processes also prevented DOE officials from better articulating growing MPC&A program funding needs.

These needs were well known by October 1998, when DOE officials received a staff report indicating that US-installed security systems were at risk of failure at dozens of sites. When DOE failed to act, several non-governmental organizations (NGOs) wrote DOE and made the case that inaction could provoke a political backlash in Congress far worse than the one that might emerge on the heels of higher MPC&A budget requests. Finally, emergency measures were formally approved in December, and for the first time, DOE officials obtained commitments from OMB to sustain program funding at fiscal year (FY) 1999 funding levels, rather than reduce them by as much as one third, as originally anticipated.

In January 1999, President Clinton used his State of the Union address to make the case for substantial increases in funding for the full range of US-Russian cooperative nuclear security measures.<sup>9</sup> This speech will make it easier for the administration to argue that it has

responded adequately to the Russian proliferation threat. However, MPC&A program proponents will need to continue pressing DOE, the administration, and Congress to protect MPC&A budgets, and to convert the urgency represented by the president's budget request into an enduring, high-level political commitment to the US-Russian cooperative nuclear security agenda. Without such a commitment, the US approach to Russian nuclear proliferation dangers will continue to suffer from diplomatic disputes over the terms of US assistance and interagency turf battles that prevent better programmatic coordination.<sup>10</sup>

This viewpoint describes the origins, accomplishments, and shortfalls of the MPC&A program. It concludes with seven detailed recommendations about what the program's priorities should be and how they can best be advanced. These recommendations address both near-term emergency needs and the long-term goal of institutionalizing Russian nuclear materials security.

#### **THE ORIGINS AND EVOLUTION OF THE MPC&A PROGRAM**

The US-Russian cooperative nuclear security effort was initiated in 1992 with the creation by Senators Sam Nunn (D-GA) and Richard Lugar (R-IN) of the Pentagon's Cooperative Threat Reduction (CTR) or "Nunn-Lugar" program. At first, the newly independent states (NIS) nuclear material protection effort was part of the CTR's mandate. But attempts by the Pentagon to negotiate agreements with Russia's highly secretive Ministry of Atomic Energy (Minatom)—the ministry responsible for Russian nuclear materials and non-deployed warheads—were largely unsuccessful. Western concerns about early delays in implementing nuclear material security measures were overshadowed by the CTR's enormous success in helping to repatriate Soviet nuclear weapons to Russian soil and in helping three former Soviet Republics dismantle nuclear weapon delivery vehicles and join the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

Beginning in 1993, reported thefts involving kilogram quantities of HEU and plutonium brought attention to the lack of security at NIS nuclear material sites, and underscored how little was known about former Soviet fissile material stockpiles.<sup>11</sup> By 1994, a US National Academy of Sciences (NAS) report declared that it was this unknown aspect of the problem that made the threat of nuclear leakage most "urgent."<sup>12</sup> Similar concerns

were voiced in the spring 1995 report of a presidential commission formed to assess the threats posed by Russian fissile materials.<sup>13</sup> Briefings on the report for President Clinton and Vice President Gore, subsequent joint statements by Gore and Russian Prime Minister Victor Chernomyrdin at periodic meetings of the US-Russian Joint Commission on Economic and Technological Cooperation, and additional statements by the US and Russian presidents and energy ministers, further highlighted the urgency of the nuclear material security problem and the feasibility of closer US-Russian collaboration.<sup>14</sup>

In September 1995, President Clinton signed Presidential Decision Directive 41 (PDD-41), entitled "US Policy on Improving Nuclear Material Security in Russia and Other Newly Independent States." PDD-41 established the securing of nuclear materials in the region as one of the United States' top national security priorities. The Directive also assigned formal responsibility for MPC&A activities to DOE,<sup>15</sup> which had demonstrated through US National Laboratory partnerships with Russian institutes, and through a series of reciprocal visits to closed nuclear facilities, its capacity to provide nuclear material security assistance to Russian facility managers.<sup>16</sup> By the time DOE formally became the executive agent for the US government's NIS MPC&A assistance effort in early 1996, program managers had laid the groundwork for pursuing MPC&A objectives through government-to-government (DOE-Minatomb) and laboratory-to-laboratory ("lab-to-lab") channels.<sup>17</sup>

Members of the DOE MPC&A Task Force and their US National Laboratory partners adopted an approach to Russian fissile material protection assistance that follows the three-step approach used in the US nuclear weapons complex: physical protection (alarms, sensors, barriers to deter and delay intruders); material control (locked vaults, portal monitors, camera monitoring, two-man rule); and material accounting (inventory controls on routine measurements of material arriving, leaving, or lost to waste).<sup>18</sup> Building on this approach, US policymakers introduced a "layered defense" concept to US-NIS assistance programs, thereby linking the DOE's MPC&A efforts to CTR strategic arms elimination efforts in a first line of defense, and establishing a second line of defense through the various export control assistance programs administered by several US agencies.<sup>19</sup>

By the mid-1990s, original sponsors of the CTR, including Senator Lugar, had concluded that the threat of

nuclear leakage had become "the greatest strategic challenge of our time,"<sup>20</sup> and they enthusiastically supported DOE's approach to Russian nuclear material protection. After this, budgets for all forms of US-Russian cooperative nuclear security activities increased rapidly, with MPC&A budgets growing from \$15 million in FY 1996 to \$152 million in FY 1999.<sup>21</sup> At the same time, the rapid expansion of US-Russian nuclear material security activities through the MPC&A lab-to-lab cooperative effort broadened MPC&A cooperation.

While in 1994 cooperative [MPC&A] arrangements at nine facilities were in place, this number quadrupled in two years and increased almost six-fold by 1998. By that time, DOE had identified over 150 facilities within 53 sites containing nuclear weapons-usable materials throughout the NIS, and had developed cooperative relations at some level with each site.<sup>22</sup>

The addition of MPC&A projects at Russian Ministry of Defense naval facilities, beginning in late 1997, pushed the number of facilities undergoing rapid physical security upgrades to well over 200. While US officials now believe that nearly all facilities have been identified, past failures to identify additional NIS fissile material stockpiles warrant continued vigilance.

### PRE-CRISIS EFFORTS TO SUSTAIN MPC&A

When the first US-sponsored physical security upgrades were completed in late 1994, it became apparent that US officials had underestimated the amount of effort that would be required to help Russian technicians and managers maintain and properly use their newly installed security and accounting systems. Growing concerns about the "erosion" of both the technological and human aspects of MPC&A upgrades prompted the US National Research Council to recommend that the sustainability of Russian MPC&A capabilities be pursued across the board.<sup>23</sup>

MPC&A managers responded to these concerns by enacting a number of measures intended to encourage Russian scientists, site managers, and bureaucrats to adopt a safeguards culture and otherwise "take ownership" of MPC&A systems and procedures.<sup>24</sup> To this end, the MPC&A program initially supported a range of "indigenization" efforts to create a domestic infrastructure that could enable Russia to provide its own MPC&A know-how and technology. For example, some projects sought to facilitate the purchase of indigenously pro-

duced Russian MPC&A equipment. The program also began supporting training activities for Russian regulators and MPC&A officials, and offered assistance for efforts to create a nationwide fissile material inventory database.

However, these and other indigenization strategies ran into obstacles ranging from the resistance of individual site managers to a seeming lack of Russian governmental concern for long-term MPC&A sustainability.<sup>25</sup> For example, the Russian government's inability or unwillingness to prevent the taxation of the US assistance effort prevented the more efficient use of US resources and created a potential political liability for the program in the United States. And the Russian government's willingness to allow Eleron, a Russian company that produces security sensors, to act as a monopoly and use its licensing powers to squelch competition has reduced near-term prospects for Russian MPC&A equipment indigenization.

On other fronts, a \$10 million US MPC&A investment in a project to create the basis for a Russian fissile material registry prompted a turf battle between Minatom and the newly formed Russian nuclear regulator Gosatomnadzor ("GAN") over appropriate inventory methods and which agency should supervise the effort. Minatom eventually wrested control of the project from GAN, and some Minatom institutes now wish to recreate the project from scratch, showing little regard for the substantial US investments already made in the effort. Attempts to create and indigenize a Russian commitment to Western-style MPC&A and nuclear regulatory practices by funding training programs for GAN and MPC&A officials have also encountered difficulties due, in part, to Russian site managers' aversion to incurring the expense of paying regulators.

Many of these problems have persisted because the Russian state is weak, so that the Russian government is often unable to control the bureaucratic and regional entities responsible for blocking key MPC&A initiatives. Indigenizing Russian MPC&A capabilities is still a worthy goal. However, experience to date demonstrates the difficulty of achieving this goal over the short term, and speaks to the need for a medium-term strategy of continued training and commercial institutional development that will contribute to the creation of an adequate MPC&A human and technological infrastructure over the long haul.

As prospects for the rapid indigenization of Russian MPC&A practice dimmed, MPC&A managers turned in late 1997 to the more immediate problem of sustaining the successful operation of installed systems at many of the small civilian nuclear sites where security upgrades were first completed. By this time, experience had shown how vulnerable these systems were to the economic deprivation common to many of these institutes. Soon afterwards, DOE officials began quietly acknowledging that roughly \$50 million per year would be required to sustain the US investment after all physical upgrades were installed by the projected completion date of 2003.

Despite these difficulties, MPC&A officials remained skeptical about the possible advantages of interagency cooperation in addressing the sustainability issue. In particular, the US government's inability to integrate its smaller scientist-to-scientist research and economic development programs with the goals of the MPC&A program precluded various indigenization possibilities. For example, between 1994 and 1997, individual US National Laboratory scientists obtained grants from the State Department's International Science and Technology Center (ISTC) and DOE's Initiatives for Proliferation (IPP) programs to collaboratively develop Russian or joint US-Russian ventures capable of producing and marketing the technologies needed for MPC&A upgrades. But ISTC and IPP program constraints, combined with MPC&A staff concerns that these small and underfunded programs were trying to "piggyback" on the larger and more successful MPC&A effort, prevented their further pursuit.<sup>26</sup>

Since then, IPP and ISTC staff have themselves demonstrated a remarkable capacity for cooperation. Recently, even traditionally territorial CTR officials have been able to take advantage of the synergies between CTR efforts to constrain Russian biological weapons technologies and related ISTC and IPP efforts to provide non-weapons employment for former Soviet biological weapons scientists. After initially encountering resistance from within DOE, MPC&A staff are now exploring ways to form a closer partnership with the ISTC.<sup>27</sup> The ISTC is especially well-suited to play a role in the MPC&A effort because it has established a reliable, tax-exempt system for assuring that funding is received by individual scientists.<sup>28</sup> Far from creating an additional layer of bureaucracy, the CTR-ISTC experience demonstrates that the ISTC is capable of targeting its resources in

a cost-effective and accountable manner, without placing undue burdens on other US programs.

DOE officials have also traditionally shown a hesitancy to take advantage of potential synergies among their own nonproliferation programs in Russia. Aside from the few cases mentioned above, IPP projects have not consciously addressed MPC&A program needs. However, now that the human element of the Russian nuclear materials protection objective has become more generally acknowledged, there is growing receptivity within DOE towards using programs within IPP and the newly created Nuclear Cities Initiative (NCI),<sup>29</sup> programs designed to employ Russian scientists, to promote MPC&A training and technology development objectives as well.<sup>30</sup> However, the NCI itself is substantially underfunded and will have to accomplish some concrete gains in the nuclear cities before it can play a major role in helping sustain the MPC&A effort.

### EFFECTS OF THE AUGUST CRISIS

Although the United States had heretofore targeted Russian weapons scientists in its various efforts to protect fissile materials, the short-term effects of the August 1998 crisis were in fact most readily visible among Russian guard forces. In October 1998, a rash of violent incidents involving Minatom guards prompted President Yeltsin to initiate a probe into the security of Russian nuclear facilities.<sup>31</sup> In November, MPC&A staff and contractors traveling in Russia reported that Interior Ministry (MVD) guards responsible for security at Minatom's civilian nuclear institutes were not receiving adequate nutrition to perform their duties. In at least one instance, American MPC&A staff noted that institute guards had left their stations unmanned and were foraging for food on local roadways.<sup>32</sup> In other instances, institute scientists were sharing salaries with the guard forces to keep them on the job. At several facilities, MVD guards refused to go out of doors to patrol or respond to security incidents because they lacked appropriate winter clothing.<sup>33</sup>

The MPC&A program has responded to crisis-related problems in the Russian guard forces by providing direct aid. By the end of 1998, hundreds of winter coats and dozens of heaters had been distributed to Minatom and MVD guards and other site personnel.<sup>34</sup> The program also subsidizes institute commissaries to ensure that guards are fed while on the job.<sup>35</sup> Preliminary, anecdotal evidence suggests that this limited assistance is

having positive effects on the performance and morale of targeted guard forces, and that the DOE's bold decision to work with MVD officials<sup>36</sup> to assure close cooperation between MVD guards, Russian civilian nuclear institutes, and US MPC&A managers has paid remarkable short-term dividends. However, it is still unclear whether US and Russian bureaucratic obstacles to a widespread emergency assistance effort will be overcome in time to prevent further security lapses at Russian fissile material sites.

The effects of the August 1998 crisis on Russian nuclear scientists and engineers have not been as immediately visible as its effects on guard forces, in large part because conditions at many Minatom facilities had already reached critical levels by the mid-1990s. As was perhaps best illustrated by the 1996 suicide of the director of Chelyabinsk-70, the long-term effect of unpaid wages combined with the precipitous, post-Cold War decline of Russian nuclear scientists' social stature has had a profoundly deleterious effect on workforce morale. Indeed, the MPC&A program's remarkable successes and prospective opportunities for alleviating economic deprivation at MPC&A sites stem not only from the infusion of hard cash, but also from its ability to provide Russian scientists and engineers with work opportunities that require the extensive training and experience that was so highly valued during the Soviet period.

Despite these employment opportunities, financial circumstances at many Minatom sites remain dire. In 1997, Deputy Atomic Energy Minister Lev Ryabev noted that his ministry had received only 52 percent of its 1996 budget request, an amount threefold less than Minatom's 1991 allocation.<sup>37</sup> That year, Sarov Afansaiyev, director of the All-Union Scientific Research Institute of Experimental Physics (VNIIEF) at Sarav (Arzamas-16), noted that salaries at his institute had fallen to one-half subsistence level.<sup>38</sup> Months earlier, VNIIEF had been assigned responsibility for the development of nuclear safeguards at Minatom's warhead production and dismantlement facilities.<sup>39</sup> By the summer of 1998, the director of the Mining and Chemical Combine at Zheleznogorsk, formerly Krasnoyarsk-26, had notified Minatom leaders that wage arrears were creating social conditions in the closed nuclear city that had reached a "critical level" beyond which the consequences of economic deprivation were "unpredictable."<sup>40</sup> In September 1998, Atomic Energy Minister Evgeniy Adamov told

workers protesting an estimated \$400 million in back wages that the government owed the ministry over \$170 million and had not provided any resources in two months.<sup>41</sup>

In addition to wage arrearages and constant shortages of basic necessities, Russian facility managers and workers must also cope with a range of logistical problems that affect their ability to carry out the MPC&A mission. For example, the electricity required to run installed material protection hardware was shut off at one Russian institute because the institute was unable to pay its bills.<sup>42</sup> Since then, periodic electricity shortages have become common both at Russia's small civilian nuclear institutes and within closed nuclear cities. On other fronts, site managers must cope with the efforts of predatory Russian tax collection agencies to seize bank accounts to pay for institutes' tax arrears,<sup>43</sup> and also address a range of other difficulties associated with the dissolution of centralized political and economic authority.

MPC&A program staff and laboratory personnel have attempted to help Russian MPC&A managers and workers cope with these difficulties with a range of creative measures. In some instances, additional financial assistance has been provided through short-term contracts and performance bonuses. In other instances, MPC&A staff have intervened directly with Russian utility and bank managers and Russian Finance Ministry officials in attempts to assure, among other things, that institutes remain solvent and have the necessary electrical power to run installed security systems. It is too early to tell whether these interventions will have the desired long-term effect. But the successful resolution of many of these problems is unlikely without the active intervention of high-level US officials with their Russian counterparts.

### **Opportunities Created by the Crisis**

Although the effects of the August 1998 crisis have been overwhelmingly negative, the crisis has also created opportunities for the MPC&A program. Prior to the crisis, most Russian officials focused on the threat of outside attack, in part because they were trained in a Soviet system that directed its security efforts at preventing spies from gaining access to nuclear facilities. Thus, most Russian nuclear facilities still do not have effective detectors or "portal monitors" at their gates that would set off alarms if a worker or guard were to exit a facility with plutonium or HEU in his pocket.

However, it now appears that the effects of the crisis and of US efforts to emphasize the importance of the insider security threat are encouraging broader Russian cooperation on measures to address the risk of an internal diversion, and increasing the willingness of some site managers to focus more attention on the task of accurately accounting for all nuclear materials on hand.

Concerns about the insider threat, combined with a growing, crisis-induced receptivity to economic incentives, have also prompted some Russian site managers and high-level Minatom officials to examine more closely the feasibility of the site-to-site consolidation of nuclear materials. Until now, the MPC&A program had successfully consolidated materials at multiple facilities within major Minatom sites, but had been unable to pursue a more comprehensive approach to consolidation.

One way to consolidate and eliminate the small, hundred-kilogram stockpiles of HEU at many civilian sites is to ship them to a facility where they can be blended down to low-enriched uranium (LEU). This approach may gain currency at some of the smallest sites, where the relatively small number of workers involved means that the outright purchase of the HEU may provide an adequate incentive to prompt site managers to forgo the benefits of future MPC&A funding. The reductions in operating and personnel costs created by eliminating even a handful of fissile material sites in Russia would greatly reduce the long-term costs of protecting remaining sites, and if managed correctly, would reduce the proliferation threat. In light of these potential opportunities, it would make sense for DOE to identify supplemental financing in 1999 for a comprehensive, multi-year Russian nuclear material consolidation incentives strategy.

### **The Need to Engage the US Congress**

Ironically, even though goals like nuclear material consolidation MPC&A sustainability create opportunities to garner additional MPC&A resources, DOE officials have traditionally believed that discussing these goals with Congress might undercut prospects for future funding. As a consequence, Congress was not informed until early 1999 that, even though MPC&A budgets had grown to maximum anticipated levels, the number and scope of new projects underway was bound to hamper the program's ability to devote adequate resources to all of its short- and long-term objectives.

DOE's "less is more" approach towards Congress on Russian nuclear security has been informed by fear that right-wing congressional attacks against the Department of Defense (DOD) CTR program and against DOE's own international nuclear power safety program could also be directed at the MPC&A program.<sup>44</sup> These fears have not been entirely misplaced, even though MPC&A program budgets have not by themselves been the subject of widespread controversy on Capitol Hill, and have in fact always been appropriated at levels equal to or higher than the amounts requested by the Clinton administration.

However, the quiet approach embraced by DOE and even some congressional MPC&A supporters may now entail significant political risks. The potential damage to the MPC&A program from a full-blown, albeit highly unlikely, congressional attack would arguably be much lower than the damage caused by a congressional backlash if it appeared that DOE had failed to adequately protect MPC&A investments or take advantage of new opportunities to control and consolidate Russian fissile material stockpiles. A proactive congressional strategy should, in fact, be viewed by DOE as an essential component of a broad effort to obtain the substantially larger MPC&A and other programmatic budgets that are required to prevent the Russian nuclear materials security situation from deteriorating faster than US-sponsored upgrades can be put in place.

To be sure, some in Congress will be opposed to substantial increases in MPC&A program spending and to giving greater priority to cooperative nuclear security in the US-Russian relationship. In the face of such opposition, the administration must consistently inform the public that congressional obstructionists are placing American global as well as regional nonproliferation imperatives at risk by reducing the effectiveness of US-Russian efforts to prevent proliferation. If Russia cannot prevent the dispersal of weapons-usable nuclear materials, the nuclear nonproliferation regime that it built in partnership with the United States during and after the Cold War will suffer a blow far more serious than the one caused by the 1998 Indian and Pakistani nuclear weapon tests, or even by Iran's eventual acquisition of sensitive Russian nuclear technologies.

## RECOMMENDATIONS

Rapidly changing circumstances in Russia mean that MPC&A planners must prioritize their objectives so that

the most pressing goals can be met as soon as possible. The most important short-term objective of the program is to assure that sites where US-installed security systems have been compromised receive adequate and targeted assistance so that these investments will not be lost. At the same time, given the growing proliferation danger and the unpredictable nature of the Russian political environment, US MPC&A planners must continue installing security upgrades as quickly as possible in the interim.

Meanwhile, MPC&A officials should take advantage of opportunities to reduce long-term proliferation risks and MPC&A program costs by helping reduce the number of Russian fissile material sites through the pursuit of a multi-year material consolidation effort. Finally, once DOE officials are certain that these needs can be met, a judicious, long-term effort must be launched, in collaboration with other cooperative nuclear security programs, to develop a Russian human and technology infrastructure sufficiently robust to sustain MPC&A upgrades without further outside assistance.

It appears that DOE officials and MPC&A program managers have already adopted a similar set of priorities. What remains lacking in DOE and in the administration as a whole is the political will to promote and implement specific measures required for the rapid realization of these objectives. On the US side, diplomatic efforts must be made to encourage Russian receptivity to an expanded nuclear materials security agenda. Just as important, Congress must be convinced that funding such an effort is a US national security imperative.

What follows is a set of general recommendations on how to better use a range of US diplomatic, congressional, and budgetary resources to improve the MPC&A effort. After this, specific programmatic recommendations are listed that might improve prospects for the success of emergency and medium-term MPC&A sustainability measures. Finally, a set of recommended measures to build and maintain US and Russian institutional capacities required to sustain the Russian MPC&A effort is provided.

### *(1) Prioritize Cooperative Nuclear Security in US Policy toward the NIS*

Above all, the president, the vice president, Energy Secretary Bill Richardson, and individual National Laboratory directors and scientists must publicly and repeatedly state to their Russian counterparts that the

United States intends to continue funding MPC&A work in Russia for the foreseeable future, and that the security of Russian fissile materials is a top priority of the US government. Announcing the extension of the MPC&A and other cooperative nuclear security programs beyond their scheduled shutdown dates would be of immense and immediate psychological value to beleaguered Russian nuclear facility managers, scientists, and guard forces.

All members of the US government must also make it clear to their Russian counterparts that the protection of Russian nuclear materials and warheads is the first nonproliferation priority of the United States in the region. Over the past several years, US concerns about Russian transfers of nuclear and missile technology to Iran, India, and other destinations have forced Russian nuclear material protection issues off of the priority list of discussion topics with Russian officials. Russian officials thus perceive the sustainability of US MPC&A investments in the region to be a lower US priority.

Specifically, US officials must make clear that the alleviation of unreasonable tax burdens on individual Russian institutes and on MPC&A assistance is a prerequisite for an expanded and sustained MPC&A assistance effort. US officials must also underscore the need for the Russian government to fulfill its responsibilities as a nuclear power by accounting for all of its nuclear materials at the federal level. The taxation and nuclear accounting issues require high-level Russian governmental intervention with the leaders of the Russian Finance Ministry and Minatom. Both of these issues will have to be addressed quickly if the Russian Federation is to hold out any hope of effectively utilizing outside assistance to consolidate its nuclear complex with a minimum impact on Russian nuclear workers.

A diplomatic emphasis on MPC&A issues does not mean that the US government should curtail its efforts in Russia to limit the proliferation damage of Russian-Iranian technology transfers and training.<sup>45</sup> In fact, a failure to dissuade the Russian government from pursuing these activities highlights, among other things, the vulnerability of the Russian nuclear complex to worsening economic circumstances. The direct purchase of fissile material by a country with nuclear weapons ambitions could lead to the emergence of a new nuclear weapon state in a matter of months, whereas the process of Russian-Iranian technology transfers would likely take years

to lead to Iranian nuclear weapons development.<sup>46</sup> The protection of Russian fissile materials must therefore be the United States' foremost nonproliferation objective in the region. In this vein, MPC&A funding must never be withheld as a means to punish the Russian government for its unwillingness to curtail its relationship with Iran or other countries of proliferation concern to the United States.

### *(2) Increase MPC&A Program Funding*

The pursuit of the programmatic measures described below will require substantially larger MPC&A budgets for at least the next several years. These budgets should be in the \$250 million range for the next several years, with \$50 to \$100 million budgets after this time, when security upgrades at all sites have been completed. Although a \$250 million budget represents a huge increase in anticipated FY 2000 MPC&A allocations, additional spending above the FY 1999 level of \$152 million is unlikely to exceed the MPC&A program's capacity to effectively absorb additional funding.<sup>47</sup>

Roughly half of the additional \$100 million should be used to sustain the current and future MPC&A investments through emergency and longer-term sustainability measures (see below). Since DOE officials were estimating in February 1998 that a robust, post-2002 MPC&A sustainability program could cost \$50 million annually, the MPC&A program could use combined emergency and medium-term sustainability budgets on this scale. Furthermore, it is estimated that another \$50 million in annual expenditures would be required to sufficiently fund a multi-year plan to consolidate fissile material stockpiles at a smaller number of sites.

These estimates do not take into account MPC&A needs for other US-sponsored fissile material control projects in Russia, such as the conversion of Russia's three plutonium production reactors and plutonium disposition. MPC&A costs for these projects should be taken into account during the planning process, and additional MPC&A funding should be provided accordingly.

### *(3) Assure a High-Level US Focus on Cooperative Nuclear Security*

The president, in consultation with cabinet officers responsible for various NIS cooperative nuclear security programs, should appoint an NIS nuclear materials

nonproliferation “czar.” This senior official should be vested with broad authority to negotiate with Russian officials and work directly with Congress. Given the close cooperation of the relevant cabinet secretaries over the past several months in this issue area, a consensus might be easily reached as to who might best fulfill this vital function.

The State Department is now officially charged with coordinating all US-NIS activities. State Department officials perform an invaluable role in helping cabinet-level secretaries coordinate their long-term Russian fissile material policy objectives through the budget-making process. But State Department officials, like their DOD and DOE colleagues, have their own preferred approaches to the cooperative nuclear security agenda, and are incapable of maintaining pressure on Russian officials to remove roadblocks to the MPC&A agenda and other important fissile material control initiatives. For their part, National Security Council (NSC) officials are prevented by staffing constraints from working on a day-to-day basis with the Russian government or Congress on MPC&A objectives and other Russian fissile material policy issues. Most importantly, neither the NSC nor the State Department have the staff time to broker chronic interagency conflicts in a timely fashion.

The justification for an NIS fissile material nonproliferation czar is therefore straightforward. As suggested by experts appointed by Congress to better organize the US nonproliferation effort,

The normal NSC interagency process ... orchestrated by a senior National Security Council staff director, works well when there is a crisis. But the inter-agency process is less well suited to influence and resolve day-to-day issues and resource allocation questions, including the assignment of lead responsibility and elimination of duplication of effort among various agencies.<sup>48</sup>

An NIS nuclear nonproliferation czar could expedite the resolution of roadblocks to improved MPC&A efforts on the US side, and improve US leverage in negotiations with Russian officials.

The Clinton administration did in fact recently take this issue-specific approach to nonproliferation leadership to heart. In October 1998, former Secretary of Defense William Perry accepted President Clinton’s request to oversee US cooperative nuclear security activities with North Korea. Given the agreement among cabinet-

level principals on the urgency of the Russian proliferation threat that led up to the president’s request for additional cooperative security resources, there is no reason why consensus could not be reached on the appointment of a senior official to oversee US cooperative nuclear security activities with Russia and other NIS states. This official could work directly through the US-Russian Joint Commission on Economic and Technological Cooperation, thereby creating a constant, high-level presence in the area of Russian fissile material controls. A presence of this kind might be especially helpful in brokering interagency disagreements, like those that have emerged in the past over issues like the removal and consolidation of NIS HEU stockpiles.

#### *(4) Strengthen Congress’s Role*

The president should begin regular, cabinet-level meetings with a bipartisan group of US senators to keep them apprised of administration efforts. Such meetings could build upon the success of past meetings involving the DOE and DOD secretaries. The Senate’s leadership role in the area of nuclear material security matters could also be acknowledged by administration efforts to liaison with Senate task forces, such as the one recently formed by Senator Pete Domenici (R-NM) on Russian plutonium disposition. Alternatively, a group of interested senators could be regularly consulted on Russian fissile material security matters much in the way that Senate arms control observer groups were consulted during US-Soviet arms control negotiations.

Although the US Senate has taken the lead in creating and sustaining funding for US-Russian cooperative nuclear security activities, the House has often attempted to block new and existing initiatives. The administration should urge the House to create a panel similar to the one created by then-House Armed Services Committee Chairman Les Aspin (D-WI) that deliberated during the late 1980s on issues related to the DOE’s management of the US nuclear weapons complex. Chaired by Representative John Spratt (D-SC), the “Spratt Panel” included members of the Subcommittee on Energy and Water of the House Appropriations Committee. The Energy and Water Subcommittee appropriates funds for cooperative nuclear security programs that are authorized by the House National Security Committee. The increased attention that such a panel would bring to MPC&A and other NIS nuclear security issues would allow members to cast more informed votes on policy and funding matters, and reduce frictions between House

authorizers and appropriators as well as between House and Senate conferees who make decisions about cooperative programs.

*(5) Supplement and Extend MPC&A Emergency Sustainability Measures*

If the United States is serious about its long-term nuclear security commitment to the region, the DOE, through its MPC&A program, must do its utmost to prevent Russia's economic deprivation from lowering the effectiveness of the MPC&A effort. This means that other agencies capable of providing food, clothing, electrical generators, and other forms of assistance, such as the Departments of Defense and Agriculture, must contribute to this effort by providing supplies where needed.

More importantly, as a matter of policy, DOE must integrate short-term emergency measures with longer-term sustainability goals. This is not simply a matter of realizing the greatest possible economic efficiency. It would also represent at least an implicit recognition of the fact that the Russian crisis is likely to endure for some time to come. The following seven measures should be implemented or expanded to serve this goal:

- First, MPC&A funding should be provided for conducting realistic tests of the performance of sites' MPC&A systems in dealing with both insider and outsider threats, and for correcting weaknesses identified in those tests. Top nuclear security experts have long recommended iterative testing programs under real world circumstances.<sup>49</sup> Over time, US-funded performance testing could also improve US access to Russian fissile material sites. US demands for greater access to already-installed MPC&A systems often heighten suspicions among some Russians that the MPC&A program is really a pretext for Americans to either collect intelligence or criticize the Russian nuclear power industry. However, the results of performance tests could legitimize genuine US concerns about the operability of Russian security systems, and thus help overcome suspicions that the US demand for access is a stalking horse for other objectives.<sup>50</sup>
- Second, the MPC&A program should expand its efforts so that it pays for two to three years of operating and maintenance costs for the facilities or sites where upgrades are planned.<sup>51</sup> Many facilities still lack basic security measures such as permanent fences or operational security cameras.<sup>52</sup> Expanding the current "system warranty" approach would create a financial

incentive for site managers who are otherwise likely to forsake the goal of installing and sustaining these basic security measures. Creating opportunities for site managers to apply for US-sponsored, low-interest loans could also help lend some degree of budgeting predictability to site managers facing immediate financial difficulties.<sup>53</sup>

- Third, a broad-based effort must be made at each facility to train guards and younger scientists and technicians on the proliferation-related policy ramifications of their nuclear material protection missions.<sup>54</sup> Even under normal economic circumstances, the young conscripts who guard many facilities cannot be expected to exercise the necessary vigilance if they know little about the practical ramifications of their work. Short courses should be taught by or in conjunction with Russian nonproliferation experts on the absolutely critical security importance of preventing the theft of weapons-usable material.<sup>55</sup>
- Fourth, existing programs for funding technical MPC&A and regulatory training for Minatom and GAN scientists, engineers, and regulators should be enhanced. These programs should provide stipends for trainees from each fissile material site if candidates are otherwise in short supply. Over time, an ever greater emphasis should be placed on the MPC&A program's "train the trainers" efforts, which are intended to indigenize Russian safeguards and safety training practices as quickly as possible. These and other programs should also work more closely with Minatom's own leadership training programs in order to help assure the emergence of a cadre of Minatom leaders.
- Fifth, in order to assure that regulatory training and related US assistance endures, DOE officials must find a way to continue funding for US Nuclear Regulatory Commission (NRC) work with GAN. This program is designed to help establish independent nuclear safety and material control procedures that did not previously exist. Funds for these activities originally came from the CTR, but are nearly depleted. Alternatively, NRC staff could be integrated into an MPC&A-led effort to assure the creation of an indigenous regulatory enforcement program.

To be sure, both the current weaknesses of the Russian central government and the dominance of Minatom within its own facilities<sup>56</sup> create substantial

obstacles to the emergence of effective Russian regulatory structures. But a genuine effort must nonetheless be made if the United States wishes to prevent Russian public opposition to the MPC&A program and other US-sponsored fissile material security projects. Local and regional opposition to some CTR projects has already demonstrated the Russian public's skepticism about the ability of US or US-sponsored Russian entities to take safety concerns into account. Unless the United States makes a good faith effort to sustain Russia's nascent regulatory structures, US institutions may be further tainted by this skepticism.

- Sixth, although some sites have or will soon launch economic development projects through the IPP, the ISTC, the NCI, and other US-sponsored programs, there is no systematic effort to create indigenous sources of income at fissile material storage sites. Given their role in helping Russian site managers identify technologies for MPC&A upgrades, MPC&A program staff are ideally situated to identify site-specific resources that might be of interest to outside investors or to US-sponsored projects to create an indigenous MPC&A technology manufacturing base. Small business loans could also be used to encourage the creation of promising ventures.

- Finally, without taking funds from the MPC&A mission, the DOE should expand, to the maximum extent possible, its "Second Line of Defense" Russian customs and export control assistance programs. Although the installation of modern detectors at the estimated 500 major border crossings in Russia would be prohibitively expensive, a pilot project that covers the largest border points would be a worthy investment, and require a tripling of the current \$6 million annual investment in the initiative.<sup>57</sup> Russian receptivity to this kind of assistance cannot help but improve the chances of intercepting a significant fissile material diversion, and a US-Russian presence might help reduce the influence of regional criminal networks that have recently been active at key border points.

#### *(6) Improve US MPC&A Capabilities in Russia*

In order to maximize the potential nonproliferation gains afforded by the MPC&A program, the United States must also make better investments in its own managers and technology experts. The indefinite extension of the MPC&A program recommended above would go

a long way towards attracting career-minded scientists and managers to the program, both in Washington and at the various National Laboratories. Attracting and training additional staff in specific skill areas is essential, due to the rapid expansion in the number and scope of MPC&A projects.

However, there are considerable differences of opinion within DOE and within and between various National Laboratories as to the availability of qualified safeguards and program management specialists required for the MPC&A effort. DOE should ask an independent, scientific organization to evaluate the numbers and kinds of trained personnel available for these tasks throughout the US government and the National Laboratories, as well as in private industry. If there are deficiencies in any skill area, DOE could contract with private US and Russian companies that have safeguards or operational expertise in the installation and servicing of MPC&A equipment. This is an especially useful approach in the United States, since many of the most highly trained and innovative American specialists have moved to the private sector since the end of the Cold War.

On the Russian side, MPC&A installation and servicing contracts could be awarded to Russian scientists and managers as part of a broad strategy that rewards excellence in the installation and maintenance of MPC&A security and inventory upgrades. Both DOE and DOD already contract with Russian entities to perform physical protection upgrades at nuclear warhead dismantlement facilities where Russian nuclear scientists request security assistance, but do not desire an American presence for fear that nuclear material or weapons secrets might be disclosed. This approach would, of course, also enhance the US objective of indigenizing the safeguarding of Russian fissile materials.

#### *(7) Improve Information Sharing*

The United States should also institute measures to improve lateral communications within the various cooperative nuclear security programs and among programs from US agencies and organizations. An analytical unit within DOE or within a National Laboratory should be funded by Congress to monitor all US and multilateral cooperative nuclear security activities at all sites. Analysts in this unit would have a strong background in Russian area studies and nuclear

nonproliferation. These experts could be consulted by all US heads of delegation before they leave for Russia, so that US programs would be better coordinated and program officials could better leverage US NIS nonproliferation assistance.<sup>58</sup>

Opportunities should also be identified to promote the more efficient sharing of MPC&A “lessons learned” within and between US agencies responsible for Russian and NIS nuclear security programs. A US national research institution or scientific society could be funded by Congress to sponsor semi-annual conferences for staff and mid-level US cooperative nuclear security officials. NGOs could sponsor components of such conferences, or be funded to hold related seminars at regular intervals. Also, National Laboratories or research institutes could publish regular newsletters and maintain websites containing comprehensive listings of information about US-Russian cooperative nuclear security projects.<sup>59</sup>

#### **PROMOTING A STRENGTHENED MPC&A EFFORT**

The MPC&A program is at a crucial turning point. Just as it was reaching maturity, changing conditions in Russia and an unresponsive, overly cautious political mindset in the United States forced program managers to make difficult choices without the benefit of an overarching strategic vision that matched conditions in Russia. The August 1998 crisis provided the catalyst for DOE leaders to at least recognize the necessary elements of a US strategy that addresses these conditions, and to make sufficient inroads with administration and congressional officials to prevent a precipitous decline in MPC&A funding.

However, the administrations’s FY 2000 request of \$145 million will still force MPC&A program managers to choose between different program priorities. Almost inevitably, regulatory and safeguards-related training programs will get short shrift, since these and other difficult-to-accomplish indigenization strategies represent less pressing needs than measures designed to preserve existing MPC&A investments, or to rapidly complete planned upgrades at all 40 Russian sites. Under current funding projections, the program is also likely to face longer-term funding constraints that may well undermine the scope of site-to-site nuclear material consolidation efforts.

As in the past, the continued dominance of politics over substance as regards MPC&A spending can be traced to the absence of sustained, high-level leadership in the area of Russian fissile material controls. The politics of the budgeting process have already reduced anticipated increases in the administration’s overall request for cooperative security activities with Russia. The same is true for DOE. Since Congress has required DOE to fund the NCI using FY 1999 appropriations for other DOE national security accounts, DOE officials have instructed MPC&A program managers to hold back \$12 million of the \$152 million FY 1999 MPC&A budget for the NCI. This situation typifies the absence of a strategic planning process at the highest level of the US government that would presumably preclude trade-offs between DOE’s “loose nukes” and “brain drain” programmatic objectives.

The US failure to fully fund cooperative nuclear security emerges in large part from the Clinton administration’s inability to internalize lessons from their largely failed Russian economic assistance policies. To be sure, all administration officials agree that cooperative security programs should endure even in the absence of a comprehensive economic assistance package. However, few have deduced from their experiences that opportunities to pursue cooperative security measures might not endure indefinitely. Even fewer officials understand that MPC&A program managers have already experienced an erosion in their ability to access MPC&A sites. If they did, they might understand the urgency of pursuing every opportunity to secure Russian fissile materials now, especially since a cadre of Russian nuclear scientists that is amenable to financial incentives and sees nonproliferation to be in Russia’s own national interest remains in place.

Even if substantial progress could now be made on a whole set of issues ranging from site access to taxation, rapidly strengthening and expanding US-Russian relationships on a person-by-person and region-by-region basis would still be in the national security interests of the United States. These relationships can serve as an invaluable counterweight to the rising threat of regionally organized criminal networks that are demonstrating a growing potential capability to smuggle fissile materials.<sup>60</sup> Russian scientists who have a strong nonproliferation ethic are the last line of defense against fissile material diversion, and are thus America’s natural allies in the fight to secure Russian facilities. These

individuals should by no means be allowed to go hungry or cold.

To be sure, under present circumstances, a growing number of Russian nuclear guardians will become increasingly susceptible to outside offers of capital in exchange for sensitive Russian nuclear technologies. Indeed, Minister Adomov seems to be leading Minatom towards a more explicitly export-led commercialization approach to preserving Russia's nuclear industries,<sup>61</sup> attracting the ire of the United States. Nonetheless, US officials must recognize that Russia is a deteriorating state, and that the United States is likely to undermine its own interests by withholding MPC&A assistance in an attempt to change Russian export policies. The United States must instead coordinate an incentives system that rewards individual institutes and facilities that forego profits from questionable exports with added access to other resources channeled through the NCI, the ISTC, and the various US and multilateral lending and economic development institutions.

No one can predict with any certainty what future Russian governments, or even the Russian state itself, will look like in the years to come. Economic difficulties and political and social turmoil could persist in Russia for decades. However, there is no reason to believe that the MPC&A program cannot serve as the banner US program for establishing and maintaining islands of relative stability around Russia's fissile material sites. This goal is essential to the national security interests of both countries and may, over the short term, provide the necessary strategic anchor for an increasingly troubled US-Russian partnership. Over the longer term, personal and institutional ties established now may provide the basis for far more widespread assistance if some of the more dangerous possibilities related to the wholesale collapse of the Minatom complex cannot be avoided.

*ington Post*, December 26, 1998, pp. A1, A26.

<sup>3</sup> Elizabeth Rindskopf, "When Nuclear Peril Lies Waiting," *Chicago Tribune*, October 12, 1998.

<sup>4</sup> Bill Richardson, "Russia's Recession: The Nuclear Fallout," *The Washington Post*, December 23, 1998, p. A23.

<sup>5</sup> Mortimer B. Zuckerman, "Proud Russia on its Knees," *U.S. News & World Report*, February 18, 1999, pp. 30-36.

<sup>6</sup> ITAR-TASS, "Deputy Minister Says 44 Million Russians Live in Poverty," November 27, 1998.

<sup>7</sup> Clifford G. Gaddy and Barry W. Ickes, "Getting Realistic about Russia: No Time for Illusions," *Brookings Review* 17 (Winter 1999), pp. 44-48.

<sup>8</sup> Janine R. Wedel, *Collision and Collusion: The Strange Case of Western Aid to Eastern Europe 1989-1998* (New York: St. Martin's Press, 1998).

<sup>9</sup> David E. Rosenbaum, "Clinton to Push for Funds for Russia," *Moscow Times*, January 20, 1999.

<sup>10</sup> Jason D. Ellis, "Defense by Other Means: The Politics of US-NIS Threat Reduction and Nuclear Security Cooperation" (unpublished manuscript).

<sup>11</sup> Emily S. Ewell, "NIS Nuclear Smuggling Since 1995: A Lull in Significant Cases?," *The Nonproliferation Review* 5 (Spring/Summer 1998), pp. 119-125.

<sup>12</sup> National Academy of Sciences, Committee on International Security and Arms Control, *Management and Disposition of Excess Weapons Plutonium* (Washington DC: National Academy Press, 1994), pp. 1-3, 39-49, 229.

<sup>13</sup> President's Committee of Advisors on Science and Technology, *Cooperative US-Former Soviet Union Program on Nuclear Materials Proliferation Control and Accounting* (Office of Science and Technology Policy, Executive Office of the President, March 1995).

<sup>14</sup> A Progress Report on US Department of Energy Nuclear Protection, Control and Accounting Program," in *Partnership for Nuclear Security* (Washington, DC: Department of Energy, 1998), p. 1.

<sup>15</sup> The DOD gradually acquiesced and eventually concurred with a decision to transfer US governmental responsibilities for Russian MPC&A assistance to DOE. DOD transferred funding for MPC&A activities that helped supplement DOE's own MPC&A program budgets for the years FY 1994-FY 1997. Monterey Institute of International Studies and Carnegie Endowment for International Peace, "Nuclear Successor States of the Former Soviet Union," No. 5 (May 1998), pp. 37-74.

<sup>16</sup> "A Progress Report," p. 2. The MPC&A program can be traced to relationships established several years earlier between US National Laboratory and Soviet nuclear design institute officials. These relationships were initiated so that both countries could reach common scientific understandings about the verification and monitoring of explosive nuclear tests. "Los Alamos Science, Russian American Collaborations to Reduce the Nuclear Danger," Los Alamos National Laboratory, Report No. 24 (1996), p. 8.

<sup>17</sup> Katherine E. Johnson, "Sustaining Nuclear Threat Reduction Programs: The 'Bottom-Up' Approach," in John M. Shields and William C. Potter, eds., *Dismantling the Cold War: US and NIS Perspectives on Nunn-Lugar Cooperative Threat Reduction Program* (Cambridge, MA: MIT Press, 1997), pp. 231-250.

<sup>18</sup> Jessica Eve Stern, "Cooperative Activities to Improve Fissile Material Protection, Control and Accounting," in Shields and Potter, *Dismantling the Cold War*, p. 310.

<sup>19</sup> Jason D. Ellis and Todd Perry, "Nunn-Lugar's Unfinished Agenda," *Arms Control Today* 27 (October 1997).

<sup>20</sup> See remarks of Senator Richard Lugar, US Senate, Committee on Foreign Relations, *Loose Nukes, Nuclear Smuggling, and the Fissile Material Problem in Russia and the NIS*, S. Hrg. 104-253, 104th Cong., 1st sess., August 23, 1995.

<sup>21</sup> MPC&A Program Staff briefing, October 7, 1998.

<sup>22</sup> *Department of Energy, MPC&A Program Strategic Plan* (Washington, DC: DOE, January 1998); Jim Doyle, "Improving Nuclear Materials Security in the Former Soviet Union," *Arms Control Today* 28 (March 1998) pp. 12-14; Monterey Institute, "Nuclear Successor States," pp. 37-74.

<sup>23</sup> National Research Council, Committee on Dual-Use Technologies, Export Controls, and Materials Protection, Control and Accountability, *Proliferation Concerns: Assessing US Efforts to Help Contain Nuclear and Other Dangerous Materials and Technologies in the Former Soviet Union*, (Wash-

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<sup>2</sup> David Hoffman, "Cure for Russia's Nuclear 'Headache' Proves to be Painful: Crisis, Spotty Data Hobble Bid to Secure Bomb Material," *The Wash-*

ington, DC: National Academy Press, 1997).

<sup>24</sup> Doyle, "Improving Nuclear Material Security," p. 14.

<sup>25</sup> C. Ruth Kempf, "The Russian Nuclear Material Protection, Control, and Accounting Program: Analysis and Prospect," *Partnership for Nuclear Security*, pp. 39-45.

<sup>26</sup> Author's interviews with ISTC and IPP program managers and US National Laboratory officials, December 1997 and January 1998. Note: Before 1997, the IPP was called the Industrial Partnering Program.

<sup>27</sup> Due to US ISTC program managers' efforts to promote "dual-use" projects that simultaneously employ Russian weapons scientists and achieve nuclear security objectives, US contributions to the multilaterally funded ISTC are already helping the MPC&A effort in small ways. See N.V. Nikiforov, "Achievements, Current Status, and Prospects for Russian/American Cooperation in Nuclear Material Physical Protection, Control, and Accounting, 1998," in *Partnership for Nuclear Security*, pp. 7-15.

<sup>28</sup> For a complete review of ISTC projects, see Victor Alessi and Ronald Lehman III, "Science in the Pursuit of Peace," *Arms Control Today* 28 (June/July 1998), pp. 16-22.

<sup>29</sup> For an explanation of the NCI and for a compendium of related official documents, see Kenneth N. Luongo and William E. Hoehn III, *The Nuclear Cities Initiative: Status and Issues*, Russian-American Nuclear Security Advisory Council, January 1999.

<sup>30</sup> US National Laboratory official (name withheld by request), interview with author, Washington, DC, January 20, 1999.

<sup>31</sup> Bill Gertz, "Yeltsin Orders Probe of Security for Nukes," *Washington Times*, October 21, 1998.

<sup>32</sup> Michael R. Gordon, "Special Report: Hard Times at Russia's Once-Pampered Nuclear Centers," *The New York Times*, November 18, 1998.

<sup>33</sup> US Department of Energy official (name withheld by request), interview with author, Washington, DC, December 22, 1998.

<sup>34</sup> Kenneth Sheely, Deputy Director, MPC&A Task Force, interview with author, Washington, DC, December 18, 1998.

<sup>35</sup> Richardson, "Russia's Recession."

<sup>36</sup> Ibid.

<sup>37</sup> Stenographic Record of the Parliamentary Hearings on the Topic "Issues Concerning the Security of Hazardous Nuclear Facilities," *Yaderny Kontrol* 5 (Fall 1997), pp. 12-19.

<sup>38</sup> Ibid.

<sup>39</sup> Oleg Bukharin, "Security of Fissile Materials in Russia," *Annual Review of Energy and Environment* 21 (1996), p. 489.

<sup>40</sup> Gordon, "Special Report: Hard Times at Russia's Once-Pampered Nuclear Centers."

<sup>41</sup> David Hoffman, "Russia's Nuclear Force Sinks with the Ruble: Economic Crisis Erodes Strategic Arsenal," *The Washington Post*, September 18, 1998.

<sup>42</sup> Ibid.

<sup>43</sup> US Department of Energy official (name withheld by request), interview with author, Washington, DC, December 2, 1998.

<sup>44</sup> Ellis and Perry, "Nunn-Lugar's Unfinished Agenda," pp. 18-20.

<sup>45</sup> Carla Anne Robins and Andrew Higgins, "Fission for Cash: Money Hungry Russia Finds a Foreign Market for Nuclear Knowledge," *Wall Street Journal*, December 15, 1998, pp. 1, 4.

<sup>46</sup> Russian estimates vary as to the length of time that it would take, under current circumstances, for Iran to produce an indigenous supply of fissile material using, in part, Russian know-how. In a November 1998 press conference on Russia's nuclear exporting policies in which he appeared with former Minatom Minister (and now Deputy Minister) Victor Mikhailov, Russian nuclear security analyst Vladimir Orlov of the independent PIR Research Center concluded that "Israel's estimates to the effect that Iran is going to acquire nuclear weapons in two three years are rather exaggerated." Later during the press conference, Mikhailov suggests that this period of time could not possibly be less than seven to eight years. PIR Press Conference with First Deputy Ministry of Nuclear Energy, Victor Mikhailov, Official Russian R-I, November 30, 1998.

<sup>47</sup> The term "absorptive capacity" is defined here as "the limited size of the cadre of people at the individual sites who can effectively be employed in designing and implementing upgrades for nuclear security" beyond which no further budgetary allocations are necessary. Matthew Bunn and John P.

Holdren, "Managing Military Uranium and Plutonium in the United States and the Former Soviet Union," *Annual Review of Energy and the Environment* 22 (1997), pp. 403-86.

<sup>48</sup> Commission to Assess the Organization of the Federal Government to Combat the Proliferation of Weapons of Mass Destruction, "Revised Initial Commission Framework," November 18, 1998.

<sup>49</sup> Kempf, "The Russian Nuclear Material Protection, Control and Accounting Program," p. 45.

<sup>50</sup> Matthew Bunn, Harvard University, telephone interviews with author, November 1998.

<sup>51</sup> Ibid.

<sup>52</sup> David Hoffman, "Russian Nuclear Security Called Lax: Easy Access to Fuel, Failure to Pay Wages Alarms US Experts," *Washington Post*, November 27, 1998, pp. A1, A45.

<sup>53</sup> Kenneth N. Luongo and Matthew Bunn, "A Nuclear Crisis in Russia," *Boston Globe*, December 29, 1998.

<sup>54</sup> William C. Potter, "Draft MPC&A Policy Recommendations," December 2, 1998.

<sup>55</sup> Ibid.

<sup>56</sup> Murray Feschback, "A Different Definition of National Security: Environmental Issues In Russia and Their Impact in the West," Center for Russian and Eastern European Studies (CERES), Georgetown University, September 11, 1998.

<sup>57</sup> David Mosher and Geoffrey Forden, "Cooperative Approaches to Halt Russian Nuclear Proliferation and Improve the Openness of Nuclear Disarmament," Congressional Budget Office Memorandum, February 1999.

<sup>58</sup> Glenn Schweitzer, interview with author, January 20, 1998.

<sup>59</sup> C. Ruth Kempf, telephone interviews with author, mid-December 1998.

<sup>60</sup> Yuriy A. Voronin, "Organized Crime: Its Influence on International Security and Urban Community Life in the Industrial Cities of the Urals," Woodrow Wilson International Center for Scholars, *Project on Urbanization, Population, the Environment and Security* 17 (March 1998), pp. 15-17.

<sup>61</sup> Igor Khripunov, "Russia's Nuclear Industry in the Aftermath of the August 1998 Crisis," unpublished paper, December 24, 1998.