

# THE HARD CASES

## Eliminating Civilian HEU in Ukraine and Belarus

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*Many countries received Soviet-origin highly enriched uranium (HEU) for civilian nuclear research purposes. Because of inadequate nuclear security at a number of the research sites, U.S. policy has sought to remove or otherwise safely dispose of their HEU stocks as quickly as possible. Although the pace of HEU disposition has accelerated significantly in recent years, several sites have posed formidable technical, economic, and political challenges. This article identifies the major obstacles to HEU removal at two key installations—Kharkiv in Ukraine, and Sosny in Belarus—and recommends a strategy for overcoming these impediments. Key components for a successful disposition strategy include: treating these cases with the urgency they deserve, expanding potential compensation packages, explicitly addressing the institutional and political issues involved, engaging high-level political leaders, working with third parties, and promoting these efforts as part of a nondiscriminatory initiative to phase out HEU in the civilian nuclear sector globally.*

**KEYWORDS:** Highly enriched uranium; Ukraine, Belarus; proliferation; civilian nuclear sector

Highly enriched uranium (HEU) is the likely nuclear material of choice for terrorists seeking to fabricate the simplest kind of nuclear explosive. At least seventeen countries reportedly received HEU-fueled reactors and HEU from the Soviet Union for civilian nuclear research purposes. A number of sites in these recipient countries are at risk from the standpoint of nuclear security due to inadequate physical protection measures and practices. At such locations, removing the HEU and converting it to low-enriched uranium (LEU) usually represents the best option for protecting the material from loss or theft.

HEU removal and repatriation, however, often is not an easy task and may pose formidable technical, economic, and political challenges, as illustrated by prior U.S. operations to dispose of Soviet-origin material, beginning with Project Sapphire in Kazakhstan in 1994. Although the pace of HEU disposition has accelerated significantly in recent years, success has been achieved mainly in the relatively easy cases in which the host country did not substantially resist the removal of HEU. Little headway, however, has been made at one site containing significant quantities of HEU—Kharkiv, Ukraine—and signs of progress have only recently become evident at another—Sosny, Belarus.

There are major obstacles to HEU removal at Kharkiv and Sosny; this article identifies them and suggests a strategy for surmounting them. These recommendations include treating hard cases with the urgency they deserve, recognizing the nontechnical

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dimension of the problem, expanding potential compensation packages, engaging high-level political leaders, making greater use of third-party partners, and promoting HEU removal in Ukraine and Belarus as part of a nondiscriminatory initiative to minimize civilian HEU use worldwide.

### **The Nature of the Threat**

The threat of nuclear terrorism is not new, but it has grown considerably in recent years as terrorists have demonstrated both an increased interest in the acquisition of weapons of mass destruction and a readiness to inflict enormous violence. Although nuclear terrorism can take a variety of forms, arguably the one posing the greatest risk in terms of the likelihood and consequences of occurrence involves the theft or purchase of fissile material leading to the fabrication and detonation of a crude nuclear weapon—an improvised nuclear device (IND).<sup>1</sup>

The most difficult challenge for a terrorist organization intent upon making an IND would likely be obtaining the requisite fissile material. The corresponding challenge for the international community is preventing this material from falling into the hands of terrorists. The problem of protecting fissile material globally has many dimensions, the most significant of which is the vast quantities of HEU and plutonium situated at hundreds of sites throughout the world.<sup>2</sup>

### **Efforts to Reduce Global Stocks of HEU**

The international community has taken a number of steps during the past three decades to reduce the proliferation and terrorism risks posed by global stocks of fissile material. Many of these efforts have been directed at securing, consolidating, and reducing HEU in the civilian nuclear sector.<sup>3</sup> These measures include a U.S. initiative known as the Reduced Enrichment Research and Test Reactors (RERTR) program launched in 1978 to convert HEU-fueled reactors to LEU; the Materials Consolidation and Conversion program begun by the Department of Energy (DOE) in 1999 to reduce the amount of HEU in potentially vulnerable locations in Russia by converting HEU to LEU and consolidating storage of remaining HEU in fewer, more secure facilities; and a series of largely ad hoc measures between 1994 and 2003 to remove and downblend to LEU Soviet-origin HEU from sites in Kazakhstan, Georgia, the former Yugoslavia, Romania, Bulgaria, and Libya.<sup>4</sup>

More recently, in May 2004, the United States unveiled the Global Threat Reduction Initiative (GTRI), a program coordinated by the DOE and designed “to minimize and eventually eliminate any reliance on HEU in the civilian fuel cycle, including the conversion of research and test reactors worldwide from the use of HEU to the use of LEU fuels and targets.”<sup>5</sup> Under the GTRI, the United States pledged to return all Soviet-origin fresh (i.e., unirradiated) HEU to Russia by the end of 2005 (a date subsequently extended to the end of 2006), all Soviet-origin HEU spent fuel to Russia by 2010, and all U.S.-origin HEU spent fuel to the United States by 2014.<sup>6</sup> The United States also committed to the conversion of all U.S. civilian research reactors to LEU by 2013, a date subsequently extended to 2014.<sup>7</sup> Consistent with the GTRI pledges, DOE reports that, as of May 2008, approximately 604

kilograms (kg) of Russian-origin HEU fuel has been removed from research reactors in ten countries and transported back to Russia.<sup>8</sup> Shipments include:

- approximately 3 kg of fresh HEU reactor fuel transported from the Institute of Nuclear Physics of the Academy of Sciences of Uzbekistan, near Tashkent, to Dimitrovgrad, Russia, in September 2004, and four additional shipments of spent fuel from January to April 2006;
- 6 kg of HEU returned to Russia from the Czech Nuclear Research Institute near Prague in December 2004;
- 3 kg of HEU returned to Russia from the Nuclear Research Center in Salaspils, Latvia, in May 2005 and a second and final shipment of 14.4 kg in May 2008;
- a second shipment of 14 kg of HEU sent from Prague to Russia in September 2005, and a shipment of 360 kg of spent fuel from the Nuclear Research Institute Rez in December 2007;
- 268 kg of fresh HEU removed from a civilian nuclear facility at Rossendorf in the former East Germany and sent to Russia in December 2006; and
- shipments of fresh HEU from Libya in July 2006, Poland in August 2006 and August 2007, and Vietnam in September 2007.

Although the United States has taken the lead in initiating and funding almost all aspects of the various HEU reactor conversion and removal efforts, increasingly Russia and the International Atomic Energy Agency (IAEA) have partnered with Washington in implementing GTRI projects. A number of additional states—most notably Norway and Kyrgyzstan—also have taken on leadership roles in promoting an international initiative in the context of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) review process to eliminate the civilian use of HEU as soon as technically feasible. This initiative found expression in a working paper on HEU elimination submitted to the 2005 NPT Review Conference by Norway on behalf of itself and three other states, and also was in evidence in deliberations before and during the IAEA General Conference in Vienna in October 2005.<sup>9</sup>

### *Soviet-Origin HEU*

It has been reported that at least seventeen countries received HEU-fueled reactors (and HEU fuel) from the Soviet Union for civilian nuclear research activities.<sup>10</sup> A number of sites in these countries are high risk from the standpoint of nuclear security in terms of the lack of adequate material protection, control, and accounting (MPC&A) measures. Some of the sites are located in countries without independent nuclear regulatory bodies or rules, regulations, and practices consistent with a meaningful nuclear safeguards and security culture. In such instances, removing the material to secure storage elsewhere and/or downblending the HEU to LEU represents the best option for protecting the material from loss or theft.

Removal of HEU from these sites and its conversion to LEU, however, often poses formidable economic, technical, and political challenges. These difficulties were illustrated in the first three efforts to remove Soviet-origin HEU from vulnerable locations in

Kazakhstan, Georgia, and the former Yugoslavia. In the first case, Project Sapphire, several years of planning were required and intense interagency battles were fought before it became possible in 1994 to remove 581 kg of HEU from the Ulba Metallurgical Plant in Kazakhstan to Oak Ridge National Laboratory. One consequence of the bureaucratic battles fought in Washington over the removal of the Kazakh HEU was the disinclination of the U.S. government to respond positively to inquiries by Ukraine immediately following Project Sapphire about removing HEU from its territory.<sup>11</sup> Indeed, it took another four years before the United States was prepared to embark on Operation Auburn Endeavor, a joint U.S.-British operation that in 1998 removed slightly more than 13 kg of fresh and spent nuclear fuel, most of it HEU-based, from the IRT-M research reactor in Mtskheta, Georgia to the Dounreay Nuclear Complex in Scotland.<sup>12</sup> The British were involved because the United States didn't want to incur the political costs that might have resulted had it sought to move the HEU and spent fuel to the United States. Yet another four years and equally pitched interagency battles were required before the third HEU removal effort was consummated—a joint project undertaken by the United States, Russia, Serbia, and the IAEA, with support from the Nuclear Threat Initiative, a nongovernmental organization (NGO). In this instance, after the United States, the United Kingdom, and France all declined to take the Soviet-origin HEU, the 48.2 kg of weapons-usable material was moved from Vinca, near Belgrade, to secure storage and subsequent downblending at the Russian Institute of Atomic Reactors in Dimitrovgrad.<sup>13</sup>

The pace of Soviet-origin HEU repatriation accelerated considerably after the successful removal of fresh HEU from Vinca in 2002. What previously resembled a largely ad hoc approach to HEU elimination gained momentum with the formalization of the GTRI. As Philipp Bleek, one of the few analysts who has carefully examined HEU elimination efforts, notes, prior to the GTRI, "in each case, sites were discovered accidentally or arose on the agenda haphazardly."<sup>14</sup> Bleek maintains that from 1994 to 2004, "there is no evidence of any systematic U.S. government effort to identify sites with dangerous materials or to conduct a 'vulnerability assessment' of sites that have been identified."<sup>15</sup> Nevertheless, although the new program succeeded in removing HEU at a faster pace, it did so largely by focusing on what personnel in the DOE and State Department referred to as the "low-hanging fruit"—the relatively easy cases in which there was not substantial in-country political resistance to HEU repatriation. The most difficult cases involving large stocks of Soviet-origin HEU in Kharkiv, Ukraine, and in Sosny, Belarus, were not ignored, but they were given less attention than those facilities where prospects for relatively early progress seemed better.<sup>16</sup>

### *The Hardest Remaining Cases: Kharkiv and Sosny*

The largest amount of Soviet-origin HEU outside of Russia today remains in Kazakhstan. Most of that material, however, is at the very low end of HEU (under 26 percent enrichment). Kazakhstan, moreover, has displayed a readiness to downblend much of this material at its Ulba Metallurgy plant in Ust-Kamenogorsk. Although it may still prove difficult to accomplish a total cleanout of HEU from Kazakhstan—especially if the political leadership decides to pursue an indigenous uranium enrichment capability—one does not

encounter the same political resistance to HEU elimination in Astana as one faces in Kyiv and Minsk.

The precise nature of this resistance will be analyzed below. Here it is sufficient to note that in Ukraine, most of the opposition is directed at the stockpile of HEU located at the Kharkiv Institute of Physics and Technology (KIPT). This facility, under the auspices of the National Academy of Sciences of Ukraine, reportedly houses up to 75 kg of uranium enriched to 90 percent uranium-235 (U-235).<sup>17</sup> Although Ukraine to date has not agreed formally to the removal of much smaller stocks of HEU at nuclear research facilities in Kyiv and Sevastopol, it repeatedly has shown far more determination to keep the material at Kharkiv. Indeed, an interagency deliberation initiated by the Ukrainian Security Service in 2004 and also involving the Ministry of Foreign Affairs, the Ministry of Defense, the Ministry of Fuel and Energy, and the Academy of Sciences, adopted the common position that the HEU at Kharkiv was needed for the country and that Ukraine should not part with it.<sup>18</sup>

An even larger quantity of HEU is retained at the Institute of Energy Problems at the Sosny Science and Technology Center approximately 10 miles from Minsk, Belarus. Although estimates of the amount vary, it is reasonable to assume that there is at least 170 kg of fresh HEU fuel, 40 kg of which is weapon-grade.<sup>19</sup> Much like Ukraine's stance toward the material at Kharkiv, Belarusian President Alexander Lukashenko reportedly stated during a visit to Sosny in 2003 that the HEU there was a national treasure with which Belarus would never part.<sup>20</sup> Recently, however, an agreement in principle has apparently been reached to ship Sosny's fresh fuel for its Pamir reactor to Luch in Russia for downblending, and meetings to discuss the spent Pamir fuel are scheduled for the spring of 2008. The disposition of Sosny's considerable stock of bulk HEU has not yet been raised with Belarusian authorities, but if current negotiations go well, then this issue is likely to be the next item on the agenda.<sup>21</sup>

The United States typically has sought to define the obstacles to material elimination in technical terms and has explored technical solutions to the problems. Although there is a technical dimension to the impediments at both sites, the most important obstacles are of a political, bureaucratic, and economic nature. DOE staffers recognize that addressing these cases will eventually raise policy issues requiring interagency attention and, very probably, higher-level political intervention as well. But until these broader impediments are better understood and appropriate inducements developed to overcome them, it is unlikely that efforts to repatriate or otherwise remove the HEU from the hard cases will be successful. The remainder of this article attempts to identify the specific factors impeding the removal of HEU at Kharkiv and Sosny and to recommend steps that the United States and its international partners might pursue to achieve its stated GTRI objectives with respect to these two facilities.

## **A Framework for Analysis**

The United States on occasion has been successful in removing HEU under very difficult and complex circumstances. Most notable in this regard were the operations to extract large quantities of fissile material from Ust-Kamenogorsk, Kazakhstan (Project Sapphire)

and from Vinca, Serbia. Case studies of these two operations demonstrate the degree to which creative technical solutions were required—especially for Project Sapphire because of the quantity and variety of HEU involved and the novelty of the exercise at the time—and the extent to which political, economic, and bureaucratic factors in both the United States and the target country possessing the HEU complicated and delayed the completion of these exercises.<sup>22</sup> Project Sapphire also is instructive as it has been the only HEU removal effort to date to enjoy sustained political awareness, support, and diplomatic engagement at the highest levels in Washington—the kind of engagement that may be required in other difficult cases.<sup>23</sup>

A review of prior HEU elimination successes also points to the need to have a variety of incentives available for application to what often are very country-specific impediments and requirements. These obstacles include sometimes highly charged national and local political issues associated with the removal of the HEU, the political relationship between the current possessor of fissile material and the proposed recipient state, assurances of supply of nuclear fuel for the converted reactor, financial compensation for the loss of HEU and the possible restructuring of nuclear research and commercial activities, fear of exclusion from international nuclear science projects, and demands for removal and/or cleanup of associated spent fuel and radioactive waste products.

The record of prior removal efforts suggests the importance on occasion of engagement by third parties, be they the IAEA, Russia, an alternative recipient country, or an NGO such as the Nuclear Threat Initiative. These parties, by virtue of their relationship to the target country and their economic and technical resources, may be useful in facilitating the negotiation, financing, and actual implementation of the HEU removal effort. By the same token, failure to creatively engage third parties may result in missed opportunities and serious delays.<sup>24</sup>

Based on a review of prior successful HEU removal efforts and a familiarity with a number of unresolved cases, one can compile an extensive list of factors for which one would wish to have information in order to ascertain the obstacles to HEU removal. They include:

#### *Facility-specific factors*

- Amount and technical characteristics of fresh and spent fuel at the facility
- Vulnerability assessment of the facility
- Purpose of current and recent use of HEU, if material is actually used (e.g., production of radioactive isotopes)
- Alternative research and commercial activities performed at facility
- National organization to which facility reports (e.g., Academy of Sciences, Ministry of Education, etc.)
- Financial health of facility
- Additional facilities in country able to perform similar research/commercial functions
- Linkages between facility and facility staff to other national or international nuclear research projects
- History of U.S. cooperation with or assistance to facility

- History of facility/staff receipt of funds through International Science and Technology Center (ISTC)-related bodies

#### *Nation-specific factors*

- Target country support for NPT-related obligations and institutions, including comprehensive safeguards and the Additional Protocol
- Perspectives on HEU holdings of key individual actors in target country (including but not limited to the nuclear research facility director, national president, head of nuclear regulatory body, director of atomic energy committee, director of arms control, head of academy of sciences, and ministers of foreign affairs, defense, interior, and energy)
- Interest in and engagement on the HEU removal issue of high-level political players in the target country, as well as in the United States
- Key organizations with stakes in HEU and nuclear research in target country (including but not limited to the presidential administration, nuclear regulatory body, atomic energy committee, academy of sciences, parliament, national security council, nuclear research facility, and ministries of foreign affairs, defense, interior, and energy)
- Perspectives of key U.S. organizations with interests in HEU elimination (including but not limited to the Office of Global Threat Reduction in the DOE, the Office of Policy and Regional Affairs in the State Department, and the National Security Council)
- Current and recent historical relations between the United States and the target country
- Current and recent historical relations between the target country and Russia

#### *Current international factors*

- Prospective third parties that could facilitate negotiations, financing, receipt, and downblending of material, including but not limited to the IAEA, European Union (EU), Sweden, Nuclear Threat Initiative
- Global initiatives related to HEU reduction and elimination
- Additional mitigating, complicating, or facilitating factors (e.g., the Russian-Ukrainian dispute in early 2006 over the supply of natural gas and a similar dispute between Russia and Belarus in 2006–2007)

### **U.S. Policy Making for HEU Disposition**

The current U.S. strategy for disposition of Soviet-origin HEU outside of Russia was developed by the DOE and finds expression in the GTRI. This strategy, which is endorsed by the National Security Council (NSC) and supported by the State Department, has embodied a step-by-step approach to GTRI implementation guided by the dictum: focus on the easier cases first, and then turn to the hard ones. The strategy does not assume that the entire set of policy objectives can be treated merely as technical matters—U.S. government staffers, for example, recognize that some cases will raise political issues requiring interagency attention and, at some point, higher-level political intervention.

Indeed, DOE officials have on occasion raised the problem of Kharkiv's HEU with their Ukrainian counterparts, including at periodic U.S.-Ukrainian bilateral meetings, and have undertaken physical protection upgrades at both Kharkiv and Sosny. But movement on HEU disposition at those sites has been slow. DOE's approach has thus reflected the judgment that focusing first on cases where prospects for early progress seem better will serve to develop the trust, political momentum, and constituencies necessary for realizing the more difficult objectives later.

This step-by-step approach also reflects the fact that the broad policy objectives of the GTRI are now not controversial within the government. As a result, once GTRI got under way there has been little perceived need for the NSC to intervene to resolve disputes or provide new guidance, as was the case in a number of prior HEU repatriation efforts. Perhaps most notable is the improvement in DOE-State Department relations at the working level on HEU issues. Extensive Center for Nonproliferation Studies (CNS) staff interviews with U.S. government officials in many departments uniformly praised the work being done by Andrew Bieniawski, the assistant deputy administrator at DOE with responsibility for GTRI, and commented positively on DOE's communications with other agencies. Bieniawski enjoys a particularly good relationship with his State Department counterpart, Anita Friedt, director of the Office of Policy and Regional Affairs (EUR/RPA). It also appears that the bureaucratic friction so pronounced during implementation of several of the early HEU cleanout projects has led officials to try, to the extent possible, to insulate the implementation of GTRI activities from the vagaries of the broader interagency agenda.

In practical terms, this approach has meant that responsibility for day-to-day implementation of the HEU disposition projects lies primarily in DOE's Office of Global Threat Reduction (NA-21) headed by Bieniawski. The office's two main points of contact in the State Department are the Office of Policy and Regional Affairs for policy and planning questions and the Office of Nuclear Energy, Safety, and Security on technical matters.

Besides DOE and State, the only other key organizational actor on Soviet-origin HEU disposition issues is the NSC. Although the NSC has on occasion rendered guidance on GTRI issues associated with Belarus, CNS staff members were informed that during the past few years there have been few contentious issues to thrash out and that most of the coordination has been of a "virtual" variety (i.e., e-mail and phone calls) rather than in-person interagency meetings.

Noticeable by its limited involvement in recent HEU disposition matters is the Department of Defense (DOD). DOE, State, and NSC have shown little desire to engage DOD more heavily, although there is recognition that its assets may need to be called upon to provide transport or other logistical support for whatever arrangements are finally agreed on with host countries. For their part, DOD officials—responsible for and thus preoccupied with the Cooperative Threat Reduction Program—have not given much attention to the HEU removal issue, and appear to have been comfortable with DOE leadership on this subject.

As is discussed in more detail below, although the step-by-step, technically oriented approach to removal of Soviet-origin HEU has been adopted for a number of good and understandable reasons, it also has one major liability: the focus on the less problematic

cases that tend to involve primarily technical issues has meant that little concentrated, sustained thinking has been done to date about what will be needed to resolve the more difficult sites. For this reason—and because of an apparent desire to avoid interagency friction—there has not yet been much attention to the development of incentive packages that cut across organizational responsibilities. As the hard cases also tend to involve more material and material that may be most at risk, there is the danger that the most significant nuclear terrorist threats involving HEU will not be addressed in a timely fashion.

At least until recently, mid-level officials have rarely pressed for high-level political intervention to jump-start stalled HEU removal efforts. This reluctance probably reflects both a desire to avoid interagency friction and the lack of attention to the development of incentive packages with diverse elements that cut across organizational responsibilities. As a consequence, to date one cannot speak about a truly integrated strategy for HEU disposition. In some cases, the absence of formal interagency deliberations also may result in failure to coordinate related but separate nonproliferation/counterterrorism initiatives.

### **The HEU Situation at Kharkiv**

Application of the aforementioned framework to the situation at Kharkiv suggests a number of significant impediments to removal of HEU at the Kharkiv Institute of Physics and Technology. According to open sources, KIPT houses about 75 kg of HEU in various forms, including uranium oxide powder and scrap. This material is in bulk form, unlike the research reactor fuel at Sevastopol and Kyiv. KIPT used these materials for a variety of experimental purposes during the Soviet era, particularly in the area of power systems for satellites and space vehicles. Security has been upgraded with U.S. assistance, but KIPT still retains one of the largest stockpiles of civilian HEU outside the United States and Russia. According to KIPT staff, the HEU is currently used very infrequently, owing to financial difficulties and the retirement of most personnel qualified to conduct experiments with it.

Interviews by CNS staff with a variety of Ukrainian nuclear industry and government officials indicate that the KIPT director, Ivan Nikludov, is very reluctant to give up the HEU at his institute. Nikludov's views hold additional sway due to the fact that he also serves as academic secretary of the National Academy of Sciences of Ukraine, a position that puts him in routine contact with other senior government officials. According to several Ukrainian sources, possession of HEU gives KIPT a special administrative status within Ukraine, which among other benefits makes it more difficult for the central authorities to cut off electricity to the institute even if bills are unpaid. The HEU has also been seen as a means to attract international attention to and funding for KIPT, including assistance to provide security upgrades.<sup>25</sup>

Some scientists at KIPT also entertain hope of reviving scientific work with the HEU at the institute, although funding for such research is all but nonexistent. Although the fact that the HEU is not of much immediate practical value to KIPT may afford some possibility to strike a deal for its removal, there is a widespread perception at KIPT and throughout much of the Ukrainian nuclear establishment that Ukraine must be very careful

to retain as much of its technical capability as possible, especially that which may be relevant to nuclear energy development.

U.S. efforts to persuade KIPT to part with its HEU have centered on a proposal to build an LEU critical assembly that could be used in place of HEU for experimental purposes. The United States reportedly has offered to spend \$4 million to construct the critical assembly.<sup>26</sup> While some KIPT staff have expressed the view that the new LEU technology would enable them to conduct the type of work they would otherwise carry out using HEU, they still appear to be unenthusiastic about the U.S. proposal. One KIPT staff member told a CNS associate that the project was a “fantasy” and argued that the critical assembly would not substantially benefit the institute unless it were integrated into a larger plan for the development of civilian nuclear research.<sup>27</sup> Although some KIPT staff initially hoped that the critical assembly would be part of a larger package, the staff now believes the United States is only interested in getting KIPT to remove the HEU and has no longer term plans for assistance or cooperation.<sup>28</sup> This perspective is reinforced by bitter memories of the so-called Kharkiv Initiative, when the United States, also in the interest of nonproliferation, prevailed upon Ukraine in 1998 to withdraw from what was widely perceived as lucrative involvement in the Bushehr nuclear reactor project in Iran. Ukraine complied with Washington’s request, which was sweetened by promises of humanitarian assistance to and economic investment in the Kharkiv region—assistance that many residents believe never came close to matching what was lost in industrial contracts and jobs.<sup>29</sup> The lingering distrust associated with the earlier Kharkiv Initiative was raised repeatedly by nuclear scientists, government officials, parliamentarians, and security analysts during interviews by CNS staff in Kharkiv and Kyiv.

Ukrainian distrust of U.S. promises with respect to HEU removal extends beyond the Kharkiv Initiative. According to one senior Foreign Ministry official, Ukraine also had a bad experience related to the elimination of missile fuel at Pavlograd, an industrial town in the Dnepropetrovsk region. Ukraine, a CNS staff member was told, reached an agreement with the DOD with respect to Pavlograd, but Washington only was interested in cooperating up to the point that its objective was accomplished. As soon as that point was reached, Washington forgot the issue and its promises.<sup>30</sup>

It is difficult to discern clearly the extent to which the KIPT director and his senior staff still truly believe that the HEU in their possession is valuable primarily for research purposes, domestic bureaucratic politics, or as a bargaining chip to obtain more substantial international assistance. KIPT staff and other Ukrainian officials and analysts interviewed by CNS staff, for example, have suggested that the KIPT leadership probably could be persuaded to give up the HEU if a larger and more comprehensive package of compensation were put on the table. Such a package, they indicated, would need to include not just equipment, but also a program of work in the nuclear sector to accompany it. Otherwise they fear that giving up the HEU at Kharkiv would undermine the long-term ability of Ukraine to develop its civilian nuclear energy potential. One Ukrainian official suggested that an attractive compensation package might include financing for Ukrainian (and KIPT) participation in international research on thermonuclear (fusion) power. Another Ukrainian Foreign Ministry official proposed that an appealing package of inducements for some relevant Ukrainian parties could include energy assurances (e.g.,

long-term and reliable sources of nuclear fuel) and debt relief (e.g., from gas supplies).<sup>31</sup> Such assurances would appear to be a particularly attractive inducement to Ukrainian leaders in light of the recent volatility of prices for Russian natural gas and Russian attempts to use the supply of gas for political advantage. A number of officials also indicated that a potential means to allay Ukrainian fears of repeating the experience of the Kharkiv Initiative would be to assemble a multilateral compensation package involving countries (e.g., Sweden) and international organizations (e.g., the IAEA) in addition to the United States.

Many Ukrainian officials take exception to the notion that the HEU in Ukraine should be repatriated to Russia. The origin of the material, they emphasize, was the Soviet Union, which no longer exists. Why, they ask, should Ukrainian HEU, currently under IAEA safeguards, be sent to Russia, which has a history of inadequate fissile material protection and illicit nuclear trafficking? Ukraine, they maintain, has an excellent record with respect to nuclear nonproliferation, and most notably demonstrated its commitment to the NPT when it gave up the nuclear arsenal on its territory and joined the NPT as a non-nuclear weapon state. [For more on this, see Christopher A. Stevens, "Identity Politics and Nuclear Disarmament: The Case of Ukraine," *Nonproliferation Review* 15.1.] What is the logic, they ask, of fixating on the relatively small amount of HEU under safeguards on Ukrainian territory while there exists many times more material elsewhere, including in Russia and the United States?<sup>32</sup>

Related to Ukrainian concerns about an undue focus by the United States on HEU on Ukrainian territory is the perception by senior Foreign Ministry officials in Kyiv that a great asymmetry has existed between Washington's demands on Ukraine and Ukrainian requests to the United States. According to this perspective, the United States continues to add new items to what already is a long list of policy initiatives that it would like Ukraine to undertake. Washington, however, has been slow to respond to Kyiv's request to support Ukrainian accession to the World Trade Organization. There was also Ukrainian frustration with the Jackson-Vanik Amendment—now rescinded for Ukraine—because it impeded trade with the United States.<sup>33</sup>

More generally, Ukrainian government officials have often been inclined to de-emphasize the importance of nonproliferation threats relative to problems associated with economic development. As one senior diplomat put it, "after the [Orange] Revolution, nuclear proliferation is not the number one problem." Rather there are many other pressing demands in the economic and industrial spheres. As such, Ukraine is not sympathetic to the notion that there is an urgent need to remove HEU from its territory.<sup>34</sup>

To date, U.S. efforts to persuade Ukrainian officials to part with the HEU at Kharkiv have focused on the technical dimension of the issue, i.e., the potential for KIPT to remain engaged in meaningful nuclear research without reliance on HEU. A technical emphasis is not altogether unwarranted, given the perception by some Ukrainian scientists and Foreign Ministry officials that a persuasive case has yet to be made about the feasibility of replacing HEU with LEU for future scientific research purposes. According to one high-ranking Ukrainian official, the task of making this case has been complicated by the fact that several years ago the counter-argument was made by some U.S. scientists to their counterparts at KIPT.<sup>35</sup>

CNS interviews over the past several years with numerous Ukrainian scientists, government officials, parliamentarians, and foreign policy and nonproliferation experts convey a very consistent picture of the views of key Ukrainian organizational players regarding the stockpile of HEU at Kharkiv. This picture is one in which there is a significant convergence (although not complete consensus) of views that the HEU at Kharkiv is valuable for Ukraine and should not be removed. As noted previously, a formal governmental finding to this effect was reached in 2004 as the result of an extended interagency review involving the participation of five governmental bodies (the ministries of Foreign Affairs, Defense, and Fuel and Energy, along with the Security Service and the Academy of Sciences). According to CNS sources, although the review was instigated by the Security Service and although then-President Leonid Kuchma and his administration were the decisive players in the review process, the agencies did not differ substantially on the basic conclusions.<sup>36</sup>

There is no indication that this common perspective has changed significantly, despite the appearance of new leaders in most of the relevant organizations since the Orange Revolution. What may have changed, however, is the salience of the issue for some of the key players, the parameters for a possible resolution of the problem, and the potential for initiating an agreement with the United States given the evolving international political relationship among the United States, Ukraine, and Russia.

Unlike the situation in 2004, in which Kuchma had staked out a firm position opposing HEU removal, there is no indication that President Viktor Yushchenko has taken a stance on the issue. Indeed, according to one well-positioned Ukrainian official, Yushchenko is not well informed about the HEU situation.<sup>37</sup> Although there does not appear to have been a new interagency review of the material at Kharkiv, CNS interviews with relevant parties in 2005 indicate that the Academy of Sciences—most likely due to the leadership role in that body by KIPT Director Nikludov—has remained a strong advocate of retaining the HEU, and the Ministry of Foreign Affairs has continued to espouse the same basic position it adopted in 2004 in which it de-emphasizes the proliferation or nuclear terrorism threat posed by HEU in Ukraine.<sup>38</sup> The complex relationship between Ukraine and Russia has made it more difficult to persuade the Ukrainian Foreign Ministry that Ukrainian HEU should be moved to Russia if it is moved anywhere. More recent conversations have suggested that ministry opposition may be softening insofar as the stocks at Kyiv and Sevastopol are concerned, but not necessarily on Kharkiv's HEU. As one official pointed out, according to Ukraine's National Program for Nuclear Research (2004–2010), it is up to the National Academy of Sciences to determine whether Kharkiv needs HEU; it's not a Ministry of Foreign Affairs issue, he emphasized.<sup>39</sup>

The Ministry of Fuel and Energy seems traditionally to have taken a more flexible position on the issue of HEU removal. There are indications, for example, that this ministry previously has supported the removal of HEU from the nuclear research facilities at Kyiv and Sevastopol.<sup>40</sup> Although the United States previously underestimated the difficulty of removing this material, a U.S.-Ukrainian agreement-in-principle on at least the spent HEU at these two sites (but not Kharkiv) has apparently been reached.<sup>41</sup>

When the Ukrainian interagency group met in 2004 to consider what to do about the HEU at Kharkiv, they reviewed four basic options beyond retaining the material under then current conditions.

*Transfer the material to Russia.* According to the individuals interviewed by CNS staff, this option was unpopular before the Orange Revolution, and there are no signs that the situation has changed significantly since.<sup>42</sup> In early 2005, the view was expressed that opposition to “repatriation” might diminish over time depending upon economic circumstances and a perceived need to improve relations with Russia. But while economic circumstances today might encourage more flexibility on the part of Ukraine, the overall political relationship with Russia has worsened and makes agreement on movement of the Kharkiv material to Russia difficult.

*Move the material to the United States or another location in the West.* This option was unattractive because of the perceived need by the government agencies to seek the approval of the Ukrainian parliament (the Rada). Although parliamentary approval is not legally required, the actors in the interagency review believed that it was politically necessary because of the sensitivity of the issue.

*Move the Kharkiv material to Kyiv and/or Sevastopol.* There was opposition to this option—particularly by the Academy of Sciences—on the grounds that the material belongs in Kharkiv. Other agencies apparently didn’t care where the material resided as long as it didn’t leave Ukraine.

*Downblend the HEU to LEU in Ukraine and use the LEU as fuel for power reactors.* At one time this option appears to have been opposed by the Academy of Sciences and the leadership of Kharkiv. This may well be the most viable option, especially in light of the successful implementation of such a program by Kazakhstan, where a large stockpile of HEU was downblended in 2005 at the Ulba Metallurgy Plant in Ust-Kamenogorsk, Kazakhstan.<sup>43</sup> It is the approach currently favored by GTRI.

Final decisions about the disposition of Kharkiv’s HEU will clearly require high-level political approval. CNS interviews indicate, however, that there is some uncertainty in Ukraine about how and by whom the relevant decisions will be taken. Some saw it as an issue for the president to decide, which would entail a major role for the National Security and Defense Council; others thought that a Cabinet decision would suffice.<sup>44</sup>

There was in particular some uncertainty as to whether parliamentary approval would be necessary. Although the participants in the 2004 Ukrainian interagency review process were very sensitive to the views of the Rada, U.S. efforts to negotiate the removal of HEU from Ukraine to date have largely ignored the Ukrainian parliament. Even if formal parliamentary agreement proves unnecessary, it seems likely that any decision to remove HEU from Kharkiv will, as a practical political matter, require at least the tacit consent of key factional leaders. The United States will thus need to factor in the Rada’s perspective(s) as it devises a strategy to engage the Ukrainian political elite. In the past, significant opposition to HEU removal has been most apparent among the Communist and

nationalist factions. Although it is difficult to predict the orientation of the new Rada elected in the fall of 2007, many current and past members believe that Ukraine made a bad decision when it agreed to give up the nuclear weapons it inherited following the collapse of the Soviet Union.<sup>45</sup> It is likely that this perspective will find expression among many parliamentarians in a reluctance to part with what many regard as a precious national asset that could possibly be needed for future defense purposes. It is also conceivable, however, that with the Jackson-Vanik Amendment having finally been rescinded, parliamentarians may be more sympathetic to HEU removal—especially if it is linked to a larger package of concrete inducements.

CNS interviews with a wide range of Ukrainian scientists and officials from different ministries suggest that while it will undoubtedly be desirable to overcome resistance by the Kharkiv administration and the Academy of Sciences to HEU removal, support from these organizations is unlikely by itself to alter the government's stance on the issue. Instead, a very high-level, top-down initiative, most likely emanating from the president with strong support from the prime minister, will be required. Given Yushchenko's reported lack of attention to and limited understanding of the issue, absent a sea change in the Rada's orientation and/or a strong push from the government of new Prime Minister Yulia Tymoshenko, sustained engagement by high-level U.S. officials—and perhaps personal intervention by the U.S. president or secretary of state—will be necessary to get the process under way. Prior efforts relying upon the U.S. ambassador as the conduit for communications on the subject to very senior Ukrainian officials have not produced the desired result.

### *A Strategy for Kharkiv*

As the preceding analysis reveals, there are many impediments to the expeditious removal of the Kharkiv HEU. Among the most serious are a desire by the KIPT administration to retain the material, a near-consensus view by other relevant Ukrainian organizational actors to hold on to the Kharkiv material, wariness by Ukrainian officials of "returning" Soviet-origin HEU to Russia, considerable distrust by many Ukrainians that the United States would provide adequate compensation were Kyiv to agree to a plan for HEU removal, lack of appreciation of why HEU removal serves Ukrainian interests, and the absence of a well-developed U.S. strategy for disposing of the HEU at KIPT.

There are no easy means to overcome these obstacles. That being said, one can identify a number of components for an HEU disposition strategy that should have a reasonable prospect of success. Key elements for such a strategy include: (1) a decision to focus immediately on the hard case of Kharkiv; (2) redefinition of the problem of HEU removal and its potential solution in terms of a wider set of political and economic considerations; (3) development of a creative compensation package; (4) political intervention at the highest level of the U.S. government; (5) engagement of interested third parties; and (6) promotion of the strategy in the context of a broader, nondiscriminatory initiative to eliminate HEU in the civilian nuclear sector worldwide.

*Focus on Kharkiv now.* Washington must raise its sights beyond Sevastopol and Kyiv. In particular, building on the apparent progress in addressing HEU stocks at those two sites, it should develop a strategy to engage the new Ukrainian government on the more difficult Kharkiv case. Failure to devote considerable time and energy immediately to analysis of the Kharkiv problem may result in future missed opportunities to remove the HEU from the KIPT facility. The absence to date of more serious attention to the difficult case of Kharkiv may have already led to some lost opportunities after the ouster of Kuchma. Additional personnel may need to be allocated to the DOE GTRI team to enable it to undertake the necessary preparatory work on the most difficult cases at the same time that it proceeds to implement HEU removal operations in host countries that are more cooperative.

*Redefine the problem and its potential solution.* The U.S. government needs explicitly to address the important nontechnical obstacles to HEU removal at Kharkiv. An effective HEU disposition strategy will require a much better appreciation of the political, economic, historical, and bureaucratic factors underlying the prevailing Ukrainian perspective. Technically proficient DOE staff may require greater input from country experts in the State Department and the intelligence community. One also should explore non-traditional modes of eliminating the terrorism threats posed by Soviet-origin HEU at Kharkiv. Although most prior HEU disposition operations have entailed the movement of the material out-of-country, in Ukraine it may be more politically palatable to downblend the HEU in-country. A possible model for this activity is the downblending of HEU undertaken recently by Kazakhstan at Ust-Kamenogorsk.<sup>46</sup> The United States also needs to do a much better job of understanding Ukrainian priorities and explaining why removal of the material at Kharkiv serves Ukrainian security interests as well as those of the United States.

*Expand the parameters of the compensation package.* The leadership at KIPT and the Academy of Sciences may insist upon research equipment such as an LEU-fueled critical assembly as compensation for the removal of HEU from Kharkiv. An attractive package of inducements, however, also will likely need to address concerns of the Ukrainian political leadership about the country's ability to retain an active nuclear research establishment. International opportunities for collaborative research (perhaps including projects connected with the development of fourth-generation nuclear power reactors), access to nuclear trade publications, and travel to scientific meetings may be important but relatively inexpensive incentives. It also may be possible to craft a multilateral compensation package that includes both energy supply assurances (e.g., long-term and reliable sources of nuclear fuel) and/or debt relief. As noted previously, this kind of package is apt to be viewed more positively in Kyiv due to the escalating dispute with Moscow over gas prices. To the extent that a compensation package includes diverse political, economic, and technological components, it will require greater interagency attention, as well as that of higher-level policy makers.

*Engage political leaders at the highest levels.* The removal of HEU at Kharkiv will probably require approval by the Ukrainian Cabinet of Ministers and certainly will depend on an affirmative decision by the president of Ukraine. Although the current president may be more inclined than his predecessor to depart from the interagency recommendation made in 2004 to retain the HEU, such action is unlikely to transpire without direct intervention with him by the U.S. president or, possibly, the secretary of state—neither of whom to date has availed themselves of meetings with Yushchenko to make the case for HEU removal. The United States should have initiated such action in 2005 and would be remiss not to do so with the new government at the earliest opportunity. More concerted action will be required by the individuals working the HEU disposition issue in DOE, State, and the NSC in order to get the item on the agenda for the U.S. president and/or secretary of state.

*Use third parties to good advantage.* Past U.S. efforts to remove Soviet-origin HEU from a number of countries have been facilitated by the assistance of other countries, international organizations, and private foundations. U.S. efforts to address the situation at Kharkiv, however, have not fully exploited the good offices of third parties. In particular, little if any effort appears to have been made to engage European countries with whom Ukraine has good political relations. In addition to offering the prospect of obtaining more resources for a compensation package, a multilateral initiative could go a long way in reducing Ukrainian mistrust borne of prior U.S. nonproliferation deals (e.g., the Kharkiv Initiative). Expressions of interest by Swedish government officials and parliamentarians in collaborating to solve the Kharkiv problem should be followed up on in particular. Sweden is particularly attractive as a collaborator due to the high standing it enjoys in Ukraine for its past assistance in the areas of nuclear safety and security.

*Demonstrate the logic of HEU elimination by one's own behavior.* Ukraine, like most non-nuclear weapon states, tends to be skeptical of U.S. nonproliferation and nuclear terrorism initiatives that appear to entail little sacrifice by the nuclear weapon states, and especially the United States. Why, Ukrainian officials reasonably may ask, should Ukraine part with HEU when Russia has yet to eliminate fissile material at a single nuclear research facility among the dozens it possesses? Recent U.S. support for a Norwegian-led international initiative to combat nuclear terrorism by eliminating HEU in the civilian nuclear sector globally—including the United States and Russia—should be used to promote HEU disposition at Kharkiv. It has the great virtue of being nondiscriminatory in its application and, if appreciated by U.S. negotiators at DOE and State, could strengthen their hand in deliberations with their Ukrainian counterparts.

### **The HEU Situation at Sosny**

It is far more difficult to obtain data relevant to HEU removal in Belarus than in Ukraine. Belarus is opaque and difficult for an outsider to navigate. As a consequence, the picture that emerges has been pieced together from two brief visits by CNS staff to Belarus in 2006 and 2007, interviews with Belarusian officials abroad, input gleaned from a Swedish

colleague's frequent interactions with very senior Belarusian officials, discussions with U.S. government experts who follow Belarusian developments, and a database on Belarusian nuclear issues long maintained by CNS.

As best one can determine from open sources, the Institute of Energy Problems (IEP) at the Sosny Science and Technology Center outside of Minsk retains at least 170 kg of fresh HEU fuel.<sup>47</sup> This material, some of which is enriched to 90 percent U-235, was provided to fuel a Soviet-manufactured IRT research reactor, a working model of a mobile nuclear power reactor (Pamir), and two critical assemblies.<sup>48</sup> The research reactor has been out of operation since 1989, Pamir was shut down following the Chernobyl accident, and the critical assemblies are not in operation. Nevertheless, knowledgeable IAEA officials suggest that the senior administration at Sosny remains more committed to research than is the case at Kharkiv.<sup>49</sup> This view is consistent with the start-up in June 2005 of the Yalina-B subcritical assembly in Sosny, which uses metallic and dioxide uranium fuel with enrichment levels of 90 percent and 36 percent U-235, as well as uranium dioxide fuel pins with a 10 percent enrichment level.<sup>50</sup> Scientists at IEP also continue to maintain close contacts with Russian nuclear scientists, and some reportedly are engaged and/or are seeking funds for long-term nuclear research projects involving HEU.<sup>51</sup> Although Belarusian officials with whom CNS staff spoke did not reject the removal of HEU out of hand, they emphasized that an assurance of continued nuclear research at Sosny was an important prerequisite for overcoming opposition to HEU removal. They also acknowledged, however, that there was a "nationalist dimension" to the issue of HEU disposition.<sup>52</sup>

According to both U.S. and some Belarusian government officials, current physical protection measures at IEP are obsolete. This recognition is reflected in six visits made by U.S. experts to Sosny during an eighteen-month period in 2004–2005 for the purpose of undertaking a new vulnerability assessment, and regular visits since then.<sup>53</sup> A program to upgrade Sosny's physical protection system is now being implemented, based on DOE funding channeled to the International Science and Technology Center office in Minsk.

U.S. efforts to effect the removal or other safe disposition of Sosny's HEU began several years ago. According to one senior Belarusian Foreign Ministry official, when the United States initially approached Belarus with a Project Sapphire-like proposal, the Ministry of Foreign Affairs was amenable to the idea, but the IEP administration opposed it.<sup>54</sup> An IAEA official, however, reported that President Lukashenko has personally expressed opposition to removal of the fresh HEU, a stance that one might anticipate given his general antipathy toward U.S. policy initiatives and a nostalgia for the nuclear weapons that previously were stationed on Belarusian territory.<sup>55</sup>

Although senior GTRI officials periodically have identified Sosny as a high priority for HEU removal, their ability to work the issue has been impeded by strained U.S.-Belarusian relations since shortly after Lukashenko assumed office in the mid-1990s, and wariness on the part of the U.S. government to negotiate directly with Belarus. The Bush administration also has been reluctant to offer a compensation package that might be misinterpreted as rewarding a regime that it has characterized as "Europe's last dictatorship," and Congress has placed sharp limits on any U.S. government assistance to Belarusian state institutions.<sup>56</sup> As a consequence, DOE has sought Russian assistance in working the HEU

issue at Sosny and limited its engagement to purely technical deliberations involving GTRI officials and scientists at IEP.

According to one U.S. analyst with good ties to Russian nuclear industry officials, representatives of the Ministry of Atomic Energy (Minatom) expressed interest in helping the United States to repatriate Soviet-origin HEU at Sosny as early as June 2002.<sup>57</sup> At the time, however, the State Department was reluctant to pursue the offer, which had been raised through nongovernmental channels. In early 2004, however, after initially opposing a Russian initiative to send a trilateral (Russia, United States, and IAEA) "fact-finding" team to Sosny, State (and the NSC) agreed to the plan.<sup>58</sup> Interactions between DOE experts and their counterparts at IEP and the National Academy of Sciences of Belarus during 2004 and the first half of 2005 resulted in little headway on the HEU issue, deliberations that may have been negatively affected by the defection of a senior Belarusian official who was one of the key U.S. interlocutors at the Sosny Science and Technology Center in early 2005.<sup>59</sup>

DOE sought Russian assistance in engaging Belarus with respect to the Pamir HEU in mid-2005 and is expected to request similar assistance from Moscow with regard to the larger stockpile of HEU after a feasibility study on converting to LEU has been completed. The DOE had been optimistic about this approach because Lukashenko was believed to have sought Russian help in returning the Pamir fuel two years earlier.<sup>60</sup> In late 2005 Belarus reportedly had agreed to a proposal for a technical meeting about the Pamir material with Russian experts (and a DOE representative) but sought to limit discussions to technical matters. At least until recently, Belarusian officials also indicated that while they were prepared to ship spent fuel to Russia, they were reluctant to return fresh fuel—or even to discuss the issue.

In light of these constraints, and as is the case with Ukraine, the DOE approach to HEU removal in Belarus has been of a step-by-step nature in which the easier issues are approached first. In Belarus, this strategy has entailed first trying to take care of the stockpile of fresh and slightly irradiated fuel from the decommissioned and disassembled Pamir reactor (originally fueled with uranium enriched to 45 percent U-235) before tackling the very highly enriched uranium that was associated with the modified IRT research reactor and one of the two critical assemblies. Again, as was the case at Kharkiv, DOE has cast the potential solution to the problem in technical terms by funding a feasibility study intended to demonstrate that LEU can be substituted for HEU in the research activities of interest to IEP scientists, supplemented by an offer to provide refabricated fuel for Sosny's research.

This approach appears at last to be producing some encouraging results. In late 2007, for example, the National Academy of Sciences of Belarus reportedly agreed to a plan for the disposition of Sosny's Pamir fuel. The plan is said to call for the fresh Pamir fuel (44 kg) to be sent to Luch in Russia for downblending and then returned to Sosny as LEU for use in a new critical assembly there. The U.S. government would pay the costs and arrange for a new ISTC-supported research project for Sosny's scientists. The 41 kg of spent Pamir fuel would be sent separately, based on a separate agreement with Russia. This agreement has not yet been settled. But the Belarusians have indicated that they are prepared to dispose of the spent Pamir fuel, and a meeting has been scheduled for mid-2008 to discuss the matter.<sup>61</sup>

If all goes well and the understanding concerning Sosny's Pamir fuel is in fact implemented, then the next step would be to deal with bulk fuel used in the Yalina subcritical assembly. The prospects for securing Belarusian agreement to remove this material are highly uncertain, to say the least.

CNS experts have lacked the kind of access in Belarus that was available to them in Ukraine. U.S. government interactions with Belarusian officials with respect to HEU removal similarly have been limited to a narrow set of individuals with technical backgrounds. As a consequence, it is difficult to speak with confidence about the key individual and organizational actors relevant to a decision on HEU disposition or their personal or organizational perspectives. At a minimum, one can assume that in addition to Lukashenko and his presidential administration, significant institutional players include the Ministry of Foreign Affairs, the Intelligence Service, the Academy of Sciences, and the senior administration of IEP.

CNS experts have been told that within the Ministry of Foreign Affairs, the Department of Humanitarian, Ecological, and Scientific-Technical Cooperation has responsibility for nuclear security issues, including the fate of the HEU at Sosny.<sup>62</sup> It also is known that Foreign Minister Sergei Martynov, formerly Belarusian ambassador to the United States, was personally aware of U.S. interest in the removal of HEU and, in discussions with a senior Swedish parliamentarian, had expressed hope that the issue could be resolved between the United States and Belarus.<sup>63</sup> Martynov, who was head of the Belarus arms control office during the Soviet period, is knowledgeable about nuclear issues and previously supported nonproliferation initiatives, but it is unclear how much leeway he has enjoyed on the issue of HEU elimination.

It is almost certain that Ural Latypov was involved in internal deliberations over the disposition of HEU at Sosny—until he was removed from his post as head of the presidential administration in late 2004.<sup>64</sup> Latypov, a former KGB officer who rose quickly under Lukashenko to become minister of foreign affairs, deputy prime minister, and state secretary of the Security Council, was a specialist on terrorism, having written a thesis on the subject. He was knowledgeable about nuclear nonproliferation issues and was very familiar with IEP nuclear activities.<sup>65</sup> Given his background, it is likely that he would have been sympathetic to a U.S. initiative regarding HEU elimination, had it been cast in terms of combating nuclear terrorism and presented as nondiscriminatory (i.e., not focused primarily on Belarus). Although this approach was recommended to senior officials in the U.S. government since 2000, no action on the information appears ever to have been taken.

CNS interviews with Belarusian Foreign Ministry officials and with Swedish colleagues who have been in close contact with members of the National Academy of Sciences of Belarus indicate that senior Belarusian nuclear scientists share the perspective of their Ukrainian colleagues about the need to retain a strong civilian nuclear infrastructure. This view was first conveyed several years ago by a Belarusian nuclear science delegation that met with Swedish counterparts in Stockholm. The senior nuclear scientist, a vice president of the Academy of Sciences, indicated that Belarus was eager to discuss a variety of nuclear issues, including the security of HEU at Sosny and future development of a nuclear energy program in Belarus.<sup>66</sup> The Belarusian scientist reportedly

expressed concerns about the adequacy of physical protection of nuclear material at Sosny, similar to concerns voiced previously to CNS staff by a Foreign Ministry official. The scientist recalled that in the mid- to late 1990s Sweden had provided very useful assistance in upgrading physical protection at IEP and indicated that Belarus would now welcome similar help. Sweden appears poised to offer assistance, and is aware of the broader U.S.-Russian initiative to remove HEU from Sosny. But, beyond discussions at the technical level, current U.S. policy is to isolate Belarus, not to engage it, and Sweden appears not to have been contacted by U.S. officials about the possibility of joining a multilateral HEU removal effort.<sup>67</sup>

According to Swedish interlocutors with the Belarus delegation to Stockholm, Lukashenko would like to reduce Belarus's energy dependence on Russia. In this context, presumably, Belarus has announced that it intends to pursue an indigenous nuclear energy program, an energy option that was effectively abandoned following the 1986 Chernobyl accident. Although neither Sweden nor the United States is apt to be enthusiastic about this objective, it needs to be factored into U.S. considerations of a possible package of inducements for Belarus to agree to part with its HEU.

### *A Strategy for Sosny*

Devising an effective strategy to remove HEU from Belarus is inhibited by the lack of information about a number of the facility- and nation-specific variables in the framework for analysis developed in this study. Although some of the principal actors have been identified, there may be other important institutional and individual players about whom little is known. Information about Lukashenko's views on the subject is very limited, and although there is reason to assume that he is not supportive of HEU removal, the depth of his conviction and the basis for his opposition are not clear. Also murky, but relevant to the development of a disposition strategy, is the evolving political relationship between Belarus and Russia, as well as the potential for the United States to proffer any meaningful compensation package to a political regime that is regarded by the U.S. political establishment with great disdain.

The very poor state of U.S.-Belarusian relations is an additional complicating factor, as is the reluctance of the U.S. government to date to engage with Belarus in political deliberations of any kind. Indeed, the current severe deterioration in U.S.-Belarusian (and EU-Belarusian) relations mitigates against new initiatives. But neither this aversion to a political approach, nor the congressional strictures concerning financial assistance to Belarusian governmental institutions, should stifle creative thinking about a way out of the HEU removal conundrum.<sup>68</sup>

Based on available information, it appears that a number of the impediments to HEU removal in Belarus resemble those at Kharkiv. They include a desire by the IEP administration, and probably the Academy of Sciences, to retain the material as part of Belarus's nuclear portfolio and with an eye to future nuclear research. Given recent approaches to Sweden, it seems clear that some officials regard the HEU as a means to attract broader international assistance in the nuclear sector—including help in constructing a civilian nuclear power plant. In addition, as in Ukraine, there is sentiment,

reportedly shared by Lukashenko, that Belarus was foolhardy in relinquishing nuclear arms on its territory following the collapse of the Soviet Union—in the case of Belarus without even seeking or obtaining much compensation for its admirable nonproliferation behavior.

As with Kharkiv, there are no simple means to overcome the impediments to removal of HEU at Sosny. Any strategy with a realistic prospect of success will probably need to include the following basic elements, most of which resemble the ones recommended for Kharkiv: (1) a decision by the U.S. government to treat Sosny as a high priority; (2) readiness to engage on political and economic as well as technical matters, including development of a compensation package not limited to nuclear research equipment; (3) reconstitution of the interagency process; (4) engagement of Sweden as part of a multilateral effort; (5) inclusion of the issue on the Group of Eight (G-8) agenda; and (6) promotion of the HEU removal effort at Sosny as part of a nondiscriminatory and global initiative.

*Treat Sosny with the urgency it deserves.* The large stockpile of Soviet-origin HEU at Sosny arguably poses a higher risk for nuclear terrorism than any facility outside of Russia. Approximately 40 kg of the HEU is weapon-grade and is stored under conditions that both Belarusian and U.S. authorities regard as inadequate from the standpoint of physical protection. It is imperative for the U.S. government to invest the intellectual, political, and financial capital commensurate with the threat and to do so urgently.

*Expand the range of options under consideration.* A study of the technical feasibility for replacing HEU with LEU in the research activities of the IEP is not a substitute for a comprehensive plan that addresses the full range of technical, economic, and political factors related to HEU disposition in Belarus. It is particularly important to explore political moves that may facilitate resolution of the HEU issue without compromising other significant U.S. foreign policy objectives. One low-cost option is for Washington to reconsider its opposition to Belarus's efforts to gain membership in the Nuclear Exporters Committee, better known as the Zangger Committee, a body that consists of thirty-five states whose purpose is to harmonize implementation of the NPT's requirement to apply IAEA safeguards to nuclear exports. As a country in good standing with the NPT, Belarus would appear to be as qualified for membership as a number of other Zangger Committee members, and the United States could justify the linkage of the two issues in nonproliferation terms. Given the history of close interactions between Belarusian and Russian nuclear scientists, the United States also should explore with Russia the possibility of supporting joint Belarusian-Russian civilian nuclear research activities of mutual interest to both countries' nuclear establishments.

Other possible inducements with potential nonproliferation benefits might also be considered. For example, Belarusian officials have at various times expressed interest in assistance in such areas as the establishment of a nuclear forensics laboratory at Sosny, construction of a national storage facility for radioactive sources, the decontamination of Belarus's former missile silos, and the modernization of Belarus's export control system.<sup>69</sup>

*Reactivate the interagency process.* DOE's ability to put together a creative compensation package that includes items beyond those of a strictly technical nature will require approval by the NSC and most probably interagency attention and blessing. As part of the process of reactivating more formal interagency deliberations, it would be advisable to gain higher-level political support in the State Department and NSC for a broader approach to the Sosny problem. Otherwise, a very cautious U.S. Embassy in Minsk that is not focused on nuclear terrorism issues, and like-minded mid-level officials at State and NSC, are likely to succeed in blocking any change in current U.S. policy that might be interpreted as political engagement with the Lukashenko regime.

*Engage Sweden as a partner vis-à-vis Belarus.* There are a number of practical reasons for engaging Sweden as soon as possible as a potential collaborator on HEU removal from Sosny. In addition to repeated and clear indications from senior Swedish political figures of their readiness to be of assistance and recent signals from Belarus that it would welcome Swedish involvement at Sosny, engaging a country such as Sweden may provide the United States with a means to put together a more comprehensive strategy for Sosny, given the constraints on more direct U.S. political engagement with Belarus. The United States should at least explore more fully Swedish perspectives on the situation in Belarus and the prospects for concerted policy initiatives there. CNS has provided U.S. government officials at DOE and State with precise contact information to initiate such discussions.

It should be recognized, however, that any serious initiatives to deal with the HEU at Sosny—even assuming a de facto division-of-labor with Sweden and other actors—will almost certainly entail a degree of U.S. engagement with Belarusian governmental bodies. The administration will need first to persuade itself that, in light of the seriousness of the potential terrorism and proliferation threat the HEU poses, such engagement is defensible, and then be prepared to explain its decision inside and outside the government. Indeed, there is a strong case to be made, rooted in core U.S. security concerns. But the government will need to be prepared to make it.

*Explore a role for the G-8 in HEU removal.* Both Belarusian and Ukrainian officials have expressed interest to CNS staff about expanding the current set of countries involved in negotiations about HEU removal. Although they have expressed particular enthusiasm for involvement of Scandinavian states, one also should examine the potential for engagement by the G-8. Russian presidency of that body in 2006 offered an opportunity to exploit apparent interest in Moscow for G-8 action on the nonproliferation/antiterrorism front and might have facilitated the development of a compensation package that better satisfies both U.S. and Belarusian objectives and constraints. Unfortunately the possibilities were not pursued at that time, but the G-8 remains a body where significant multilateral political support for an initiative in Belarus could be obtained. More generally, the G-8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction also could be of assistance in this regard.

*Promote HEU removal as part of a global initiative.* The political leadership in Belarus, even more so than in Ukraine, takes exception to the idea that it should be singled out by the United States for remedial nonproliferation/counter-nuclear terrorism action. As such, U.S. efforts to remove HEU from Sosny are much more likely to be received positively (or at least not negatively) if they are clearly identified as part of a global and nondiscriminatory initiative to eliminate HEU in the civilian nuclear sector. GTRI should emphasize this characteristic of its program and promote its HEU removal activities in Belarus and elsewhere in terms of the global antinuclear terrorism initiative led by Norway and supported by an increasing number of non-nuclear weapon states.

## Conclusion

The problem of protecting fissile material globally is enormous, due in large part to the vast quantity of material scattered across the globe. Fortunately, there are few commercial purposes for HEU and even fewer uses in which LEU cannot be substituted for HEU. As a consequence, there is growing international recognition that an important means to combat the threat of nuclear terrorism is to minimize use of HEU in the civilian nuclear sector.

U.S. efforts under the Global Threat Reduction Initiative to remove Soviet-origin HEU for the purpose of downblending the material to LEU are consistent with this global principle, and significant progress has been made recently in the implementation of the GTRI. In order for that program to be truly successful, however, it will need to devise means to induce all countries possessing Soviet-origin HEU to part with the material. It is particularly urgent to remove HEU from those sites housing weapon-grade material and/or in need of MPC&A upgrades.

The stakes are high, and time is not on our side. To paraphrase former Senator Sam Nunn (Democrat of Georgia), it simply is not enough to take a step in the right direction. Speed is of the essence.<sup>70</sup> Such timely action, in turn, will require senior U.S. political leaders, including the president, to provide sustained attention to the issue and to commit the resources necessary to ensure that high-level bureaucrats at home and abroad appreciate the priority the United States attaches to HEU removal.

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## NOTES

1. For an analysis of different nuclear threats, see Charles D. Ferguson and William C. Potter (with Amy Sands, Leonard S. Spector, and Fred L. Wehling), *The Four Faces of Nuclear Terrorism* (New York: Routledge, 2005).

2. See David Albright, "Global Stocks of Nuclear Explosive Materials: Summary Tables and Charts," Institute for Science and International Security, July 12, 2005, revised September 7, 2005, <[www.isis-online.org/global\\_stocks/end2003/summary\\_global\\_stocks.pdf](http://www.isis-online.org/global_stocks/end2003/summary_global_stocks.pdf)>.
3. A number of important initiatives also have been undertaken to secure and reduce stocks of HEU in the military sector, including the Nunn-Lugar Cooperative Threat Reduction Program and the "Megatons to Megawatts" HEU Purchase Agreement.
4. For a discussion of the successes and limitations of the RERTR program, see Robert Civiak, *Closing the Gaps: Securing Highly-Enriched Uranium in the Former Soviet Union and Eastern Europe* (Washington, DC: Federation of American Scientists, 2002). See also Philipp C. Bleek, "Global Cleanout of Civil Nuclear Material: Toward a Comprehensive, Threat-Driven Response," *SGP Issue Brief*, No. 4, September 2005, p. 4. The Materials Consolidation and Conversion program is discussed in Cristina Chuen, "Reducing the Risk of Nuclear Terrorism: Decreasing the Availability of HEU," CNS research story, May 6, 2005. For analyses of the various HEU removal and repatriation efforts involving Soviet-origin HEU prior to 2004, see William C. Potter, "Project Sapphire: U.S.-Kazakhstan Cooperation for Nonproliferation," in John M. Shields and William C. Potter, eds., *Dismantling the Cold War: U.S. and NIS Perspectives on the Nunn-Lugar Cooperative Threat Reduction Program* (Cambridge, MA: MIT Press), 1997, pp. 345–362; and Philipp C. Bleek, "Global Cleanout: An Emerging Approach to the Civil Nuclear Material Threat," Belfer Center for Science and International Affairs and Managing the Atom, Harvard University, September 2004.
5. DOE, "Department of Energy Launches New Global Threat Reduction Initiative," press release, May 26, 2004.
6. DOE has not formally altered the target dates, although they have not been fully met. As discussed below, the three notable exceptions with respect to fresh fuel are Vietnam (completed in 2007), Belarus (still unmet), and Ukraine (still unmet). The target dates for spent fuel remain intact, although DOE currently distinguishes between fuel stored outside of reactors (2010 target) and fuel remaining in reactors (2014). DOE official, interview with CNS staff, February 7, 2008. This interviewee and most others cited below were granted anonymity due to the sensitivity of the subjects discussed.
7. See Alexander Glaser and Frank N. von Hippel, "Global Cleanout: Reducing the Threat of HEU-Fueled Nuclear Terrorism," *Arms Control Today* 36 (January/February 2006).
8. National Nuclear Security Administration (NNSA), "GTRI: More Than Three Years of Reducing Nuclear Threats," fact sheet, September 2007; NNSA, "All Highly Enriched Uranium Removed from Latvia," press release, May 16, 2008.
9. See "Combating the Risk of Terrorism by Reducing the Civilian Use of Highly Enriched Uranium," Working Paper submitted to the 2005 Review Conference of States Parties to the NPT by Iceland, Lithuania, Norway, and Sweden, NPT/CONF.2005/MC.III/WP.5, May 2005.
10. See IAEA, "Management of High Enriched Uranium for Peaceful Uses: Status and Trends," IAEA TECDOC-1452, June 2005.
11. For a discussion of these bureaucratic battles, see Potter, "Project Sapphire."
12. See "Georgia: Operation Auburn Endeavor," CNS Nuclear Profiles Database, <[www.nti.org/db/nisprofs/georgia/auburn.htm](http://www.nti.org/db/nisprofs/georgia/auburn.htm)>.
13. See NTI, "NTI Commits \$5 Million to Help Secure Vulnerable Nuclear Weapons Material," press release, August 23, 2002; Philipp Bleek, "Project Vinca: Lessons for Securing Civilian Nuclear Material Stockpiles," *Nonproliferation Review* 10 (Fall/Winter 2003), pp. 1–23. See also William C. Potter et al., "Tito's Nuclear Legacy," *Bulletin of the Atomic Scientists*, March/April 2002, pp. 63–70.
14. Bleek, "Global Cleanout: An Emerging Approach," p. 22.
15. *Ibid.*
16. In recognition that early disposition of the HEU at Sosny and Kharkiv was unlikely, DOE has undertaken significant programs to implement physical protection upgrades at both sites.
17. See Jon Wolfsthal, Cristina Chuen, and Emily Ewell Daughtry, *Nuclear Status Report: Nuclear Weapons, Fissile Material, and Export Controls in the Former Soviet Union* (Monterey, CA: Monterey Institute of International Studies, June 2001), p. 169. Another report based on a trip to Kharkiv in 2002 suggests that in addition to weapon-grade HEU, the Kharkiv Institute may retain 30–40 kg of HEU as "scrap" at enrichment levels of 20, 25, and 36 percent. Source from 2002 has requested anonymity.

18. Ukrainian officials, personal interview with CNS staff, January 5 and 10, 2005. Ukrainian officials sometimes make the distinction between HEU reactor fuel at Kyiv and Sevastopol, which they regard as negotiable under GTRI, and the "bulk HEU" at Kharkiv, which is not reactor fuel.
19. See Wolfsthal, Chuen, and Daughtry, *Nuclear Status Report*, p. 158; and A. Mikhalevich, A. Iakoushev, A. Batalov, and Yuriy Sivakov, "Ensuring Physical Protection of Nuclear Materials in Belarus," Center for Nonproliferation Studies, Monterey Institute of International Studies, June 1995.
20. Senior IAEA official, personal interview with CNS staff, Vienna, February 6, 2004.
21. DOE personnel, interview with CNS staff, January 2008.
22. See Potter, "Project Sapphire," and Bleek, "Global Cleanout: An Emerging Approach."
23. See Bleek, "Global Cleanout: An Emerging Approach," p. 24 on this point. Vice President Al Gore was personally engaged in Project Sapphire.
24. On this point see Bleek, "Global Cleanout: An Emerging Approach," p. 25.
25. KIPT officials, interviews with CNS staff March 11, 2005.
26. U.S. "non-paper" on HEU repatriation in Ukraine, 2005; DOE officials, interviews with CNS staff member, March–July 2005.
27. Critical assemblies can be used to mock up power reactors and perform various experiments, among other applications.
28. One concern expressed by KIPT staff is that current Ukrainian regulations require a critical assembly to be built several kilometers away from the nearest inhabited area, effectively ruling out such an assembly at KIPT. KIPT interviews with CNS staff, March 11, 2005.
29. See Cristina Chuen, "Russian Nuclear Exports to Iran: U.S. Policy Change Needed," March 27, 2003.
30. Kharkiv Institute official, interviews with CNS staff, Kharkiv, Ukraine, 2005; Ukrainian Foreign Ministry official, interview with CNS staff, New York, May 24, 2005. Washington is not the only target of such criticism. Several Ukrainian government officials expressed similar resentment about the nuclear safety assistance Ukraine has received from European countries following the Chernobyl accident. Members and staff of the Verkhovna Rada and officials of the Ministry of Fuel and Energy, interviews with CNS staff, March 13 and 16, 2005.
31. In this connection, one Ukrainian Foreign Ministry official indicated that a possible precedent for this kind of an arrangement was a deal worked out to overcome Ministry of Defense resistance in 1999–2000 to the return of strategic bombers to Russia. The package included the reduction of a huge debt incurred by Ukraine for purchases of natural gas and oil from Russia and Turkmenistan. Ukrainian Ministry of Foreign Affairs official, interview with the authors, January 10, 2005. See also "Ukraine Profile: Nuclear Weapons," entries for August 1999 and February 2000, <[www.nti.org/e\\_research/profiles/Ukraine/Nuclear/3969\\_4933.html](http://www.nti.org/e_research/profiles/Ukraine/Nuclear/3969_4933.html)>.
32. Illustrative of this sentiment is the article by Vladimir Kravchenko, "An 'Enriched' Partnership," *Zerkalo Nedeli*, March 19–25, 2005.
33. Senior Ukrainian Foreign Ministry official, interview with CNS staff, New York, May 5, 2005. The U.S. Congress has since revoked Jackson-Vanik for Ukraine.
34. Senior Ukrainian Foreign Ministry official interview with CNS staff, New York, May 24, 2005.
35. Ukrainian official, interview with CNS staff, Vienna, October 2005.
36. Ukrainian officials, interviews with CNS staff, January 5, 2005 and January 10, 2005.
37. Ukrainian official, interview with CNS staff, Vienna, October 2005.
38. Ibid.
39. Ukrainian official, interview with CNS staff, Kyiv, October 2007.
40. IAEA and Ukrainian officials, interviews with CNS staff, Vienna, September 2, 2004, and September 27, 2005.
41. Ukrainian officials and U.S. officials, interviews with CNS staff, in Vienna and Washington, DC, October and November 2005, and in Washington and Kyiv in October 2007. The DOE and State Department were optimistic in June 2004 that an agreement for the removal of HEU at Kyiv and Sevastopol would be achieved, but it took several more years to work out an accord, and, as of the spring of 2008, some of the details remain to be settled. Ukrainian officials indicated that there is now a consensus that the spent fuel at the two institutes should be moved but some disagreement about where it should go: some wanted to transfer the fuel to Kharkiv for storage (thus deferring decisions as to its final disposition), while others thought it should be sent directly back to Russia. The disposition of the fresh fuel remains to be agreed; final decisions will clearly require high-level political approval.

42. Ukrainian official, interviews with CNS staff, January 5 and 10, 2005; interviews with CNS staff, in Kyiv and Washington, 2007.
43. NTI, "Government of Kazakhstan and NTI Mark Success of HEU Blend-Down Project; Material Could Have Been Used to Make Up To Two Dozen Nuclear Bombs," press release, October 8, 2005.
44. Interviews in Kyiv, October 2007.
45. See William C. Potter, *The Politics of Nuclear Renunciation: The Cases of Belarus, Kazakhstan, and Ukraine* (Washington, DC: The Stimson Center, 1995); and "Nuclear Move: Pros and Cons," *Zerkalo Nedeli*, November 22–28, 2003.
46. Another approach to reducing stocks of HEU at Kharkiv proposed by one senior KIPT scientist was to sell the HEU as "calibration samples" to the United States and the IAEA. CNS experts are unable to assess the technical merits of this proposal. KIPT scientist, interviews with CNS staff, Kharkiv, March 11, 2005.
47. The 170 kg figure refers to the weight of the U-235. Some sources cite 370 kg of HEU, but this amount appears to refer to the total weight of the uranium. See A. Mikhaelivich et al., "Ensuring Physical Protection of Nuclear Materials in Belarus."
48. See K. Murakami et al., "IAEA Safeguards and Verification of the Initial Inventory Declarations in the NIS," July 1997, p. 3, distributed at a workshop on "A Comparative Analysis of Approaches to the Protection of Fissile Materials," Stanford University, June 28–30, 1997; William C. Potter, *Nuclear Profiles of the Soviet Successor States*, Monograph No. 1 (Monterey, CA: Monterey Institute of International Studies, 1993), pp. 6–7; and NTI, "Country Overviews: Belarus: Nuclear Facilities," <[www.nti.org/e\\_research/profiles/Belarus/5459\\_5434.html](http://www.nti.org/e_research/profiles/Belarus/5459_5434.html)>.
49. IAEA staff, interviews with CNS staff, Vienna, September 21, 2004.
50. See H. Kiyavitskaya et al., "Experimental Investigations at Sub-Critical Facilities of Joint Institute for Power and Nuclear Research—Sosny of the National Academy of Sciences of Belarus," 2005.
51. An interview by a CNS staff member with a Belarusian official from the Ministry of Foreign Affairs' Department of Humanitarian, Ecological, and Scientific-Technical Cooperation indicated that one such project for which funds were sought from the International Science and Technology Center involved "Transmutation of Long-Living Radioactive Materials," Minsk, March 10, 2005. The 2005 paper by Kiyavitskaya et al. reports that Belarusian and U.S. specialists will undertake a multi-year research project to explore the feasibility of converting the HEU core of the subcritical assembly at Sosny to LEU.
52. Ministry of Foreign Affairs officials, personal interviews with one of the authors, New York, May 11, 2005.
53. The Belarusian intelligence service reportedly did not take kindly to this exercise. CNS staff interview with DOE official, November 10, 2005.
54. Belarusian Foreign Ministry official, interview with CNS staff, May 11, 2005.
55. IAEA, interview with CNS staff, February 6, 2004.
56. The Belarus Democracy Reauthorization Act of 2006 bans U.S. government financial assistance to Belarus, except for humanitarian aid, until Minsk investigates the disappearances of Lukashenko opponents, releases political prisoners, and relaxes pressure on independent media and pro-democracy organizations.
57. U.S. expert, interview with CNS staff, Washington, DC, August 22, 2003.
58. IAEA officials, interview with CNS staff, February 6, 2004.
59. U.S. government officials, interviews with CNS staff, March and April 2005.
60. U.S. government officials, interview with CNS staff, Washington, DC, May 20, 2005.
61. DOE officials, interviews with CNS staff, October and December 2007, and January 2008.
62. Belarusian Foreign Ministry official, interview with CNS staff, Minsk, March 10, 2005.
63. Senior Swedish parliamentarian, interview with CNS staff, Bratislava, May 30, 2004.
64. Latypov allegedly was removed as part of a move by Lukashenko to purge senior members of his government who were seen as having particularly close ties with Moscow. See "Belarus Leader Sacks Aide with Close Moscow Ties," Reuters, November 30, 2004.
65. Ural Latypov, personal interviews with CNS staff prior to his assumption of senior posts in the Lukashenko government. Latypov participated for several years in nonproliferation meetings organized in Monterey and Minsk by CNS.

66. Senior Swedish parliamentarian, discussions with CNS staff, December 11 and 20, 2005. The Belarusian scientist appears to have been Academician A. Mikhalevich, formerly the director of IEP.
67. CNS staff repeatedly has encouraged senior officials at State and DOE to take advantage of Sweden's good offices with respect to Belarus, but without noticeable effect to date.
68. DOE reportedly has written at least one classified paper on possible outcomes in the case of Belarus. U.S. government official, interview with CNS staff, Washington, DC, July 11, 2005.
69. U.S. and Swedish officials, interviews with CNS staff, summer 2006 and spring 2007.
70. See Senator Sam Nunn, "Keynote Address," 2002 Non-Proliferation Conference, Carnegie Endowment for International Peace, Washington, DC, November 14, 2002, <[nti.org/c\\_press/speech\\_samnunn\\_1114.pdf](http://nti.org/c_press/speech_samnunn_1114.pdf)>.