STEMMING RUSSIA'S PLUTONIUM TIDE: COOPERATIVE EFFORTS TO CONVERT MILITARY REACTORS

by Todd Perry

Todd Perry is a 1996-97 Peace Scholar at the U.S. Institute of Peace, a Ph.D. candidate in the University of Maryland's Department of Government and Politics, and a Washington Representative for Arms Control and International Security with the Union of Concerned Scientists.[1] He obtained much of the information in this report from research interviews with U.S. officials, Congressional staff, private contractors, and members of the U.S. nongovernmental arms control and nonproliferation communities. Descriptions of events and governmental positions for which sources are not provided come from internal, unclassified governmental documents that he obtained while monitoring U.S. nonproliferation assistance programs on behalf of the Union of Concerned Scientists.

Since 1992, U.S. and Russian officials have attempted to conclude an agreement on ending Russian plutonium production for weapons. But, three Russian military reactors are still in operation because they provide heat and electricity to Russia's "plutonium cities" and nearby municipalities.[2] One problem is that the reactors, two in Seversk (formerly known as Tomsk-7) and one in Zheleznogorsk (formerly known as Krasnoyarsk-26) use fuel that corrodes if not either properly stored, chemically separated, or "reprocessed" after it is removed from the reactors.[3] Moreover, the reprocessing of spent fuel from these reactors produces an estimated 1.5 tons of unsafeguarded, weapons-grade plutonium per year.

In June 1994, U.S. Vice President Al Gore and Russian Prime Minister Viktor Chernomyrdin signed an agreement committing the Russian government to end plutonium production at the reactors "no later than the year 2000."[4] In the agreement, the United States promised to help Russia "identify funding" to replace the reactors, "on the same schedule" as the agreed time frame for ending plutonium production.[5] But, for the next two years, U.S.-Russian differences over the relationship between U.S. funding commitments and the timing of reactor shutdown prevented the entry into force of the 1994 agreement.

The two sides officially broke this impasse in January 1996, when U.S. Department of Energy (DOE) Secretary Hazel O'Leary and Russian Ministry of Atomic Energy (Minatom) Secretary Viktor Mikhailov signed an agreement to convert, rather than replace the reactors. Converting the reactor fuel cores would allow the use of a fuel that produces at least 10 to 100 times less plutonium than is currently produced.[6] As importantly, the spent fuel produced in the converted reactors would not require reprocessing. And plutonium in this spent fuel would not be well-suited to weapons use.[7] Also, converting the reactors is considerably cheaper than replacing them with nuclear or fossil fuel power plants. At the same time, this "core conversion" option improves safety at the reactors over the short-term by, among other things, reducing the likelihood that a loss-of-coolant accident would lead to a reactor fire.[8]

Progress towards core conversion was delayed after

the January 1996 agreement because of internal U.S. governmental arguments over how to manage and fund the U.S. contribution to the core conversion project. This delay was in part responsible for slowing renegotiation of the June 1994 agreement on ending Russian plutonium production to reflect the core conversion decision. By December 1996, after considerable pressure from nongovernmental and Congressional proponents of the program, a short-term management plan was completed, and the administration appeared prepared to request sufficient funding from Congress.

Negotiations held in Moscow in late January 1997 resolved a range of disagreements surrounding core conversion and related issues. Unless problems arise during either side's internal, inter-agency reviews of these negotiations, the U.S. and Russian governments will sign a set of accords that provide for conversion of the reactors to a non-plutonium production mode, verify the nonmilitary use of the reactors after conversion, allow U.S. monitoring of most, if not all, of the nonmilitary plutonium produced in the reactors before conversion, and assure that highly enriched uranium (HEU) used to manufacture the fuel for the converted reactors comes only from dismantled Russian nuclear warheads. Under the agreement, the United States would fund roughly half of the $160 million project by providing technical assistance for converting the reactors, upgrading reactor safety, and improving spent fuel storage facilities.

This report explains why the United States officially dismissed the core conversion option between 1992 and mid-1996 and has still not fully resolved domestic funding and management issues surrounding the core conversion project. It first describes U.S.-Russian disagreements over how to end Russian plutonium production. After this, it traces the emergence of the U.S.-Russian consensus to pursue the core conversion option. The report then details U.S. inter-agency and Congressional disputes over how to fund and manage the U.S. contribution. The conclusion describes the issues that were resolved in January 1997 negotiations and discusses the broader significance of a successful conversion effort.

EFFORTS TO REPLACE THE PLUTONIUM PRODUCTION REACTORS

Although there were several bilateral and multilateral proposals to end fissile material production during the Cold War, there were no official discussions on the subject during most of the 1980s.[9] However, official interest in ending production was revived in 1989 when President Gorbachev embraced the idea of a production ban and announced that the Soviet Union had ended the production of HEU for weapons.[10]

Over the next several years, formal deliberations on a cut-off were pushed aside by both nuclear superpowers as they devoted their attention to reducing deployed nuclear and conventional arsenals and settling broader strategic issues. But in January 1992, in response to domestic concerns about reactor safety and international concerns about plutonium production, President Yeltsin formally committed Russia to ending plutonium production by the year 2000. In July 1992, President Bush announced that the United States would no longer reprocess plutonium.[11]

Subsequent to these declarations, leaders of the nuclear weapons states (NWS) issued a number of statements on ending fissile material production. In September 1993, President Clinton proposed at the United Nations a negotiated global ban on the production of new fissile materials for weapons. The proposal was endorsed unanimously by the U.N. General Assembly. Conflicts in the U.N. Conference on Disarmament on how to proceed with cut-off negotiations and U.S.-Russian disagreements on how to verify a cut-off stalled further progress.[12] However, a consensus did emerge on the need to end Russian plutonium production as a necessary first step towards achieving either a bilateral or multilateral ban on fissile material production for weapons.

Initial Efforts to End Russian Plutonium Production

In late 1992, representatives of the Kurchatov Institute, an organization that is under Minatom, privately raised the plutonium production issue with Pacific Northwest National Laboratory (PNNL) officials in Moscow. PNNL is a DOE contractor with substantial responsibility for U.S. military reactors. The Kurchatov representatives expressed concern about safety at the three reactors, and suggested that core conversion could alleviate short-term safety concerns while ending Russian plutonium production. PNNL staff and other DOE contractors had twice successfully converted the fuel of the Hanford "N" reactor, and both parties agreed that PNNL expertise could be applied in converting the Russian reactors.

Some of the first discussions among mid-level U.S.

officials about the need for the United States to act on the problem of Russian plutonium production were prompted by PNNL reports on the Kurchatov proposal. These discussions took on added urgency when Representative Edward Markey (D-MA) sponsored an amendment to the fiscal year (FY) 1994 Defense Authorization Bill withholding the $75 million U.S. contribution to a military plutonium storage facility near Mayak, Russia. The amendment required that the U.S. secretary of state certify to Congress that Russia had "committed to halting the chemical separation of weapons-grade plutonium," and that it "was taking all practical steps to halt such separation at the earliest possible date" before the funds could be disbursed.[13]

The Markey amendment created incentives on the part of both governments to end Russian plutonium production so as to not place the Mayak facility and other projects funded under the Department of Defense's (DOD's) "Nunn-Lugar" Cooperative Threat Reduction (CTR) Program at risk.[14] Private communiqués between Presidents Clinton and Yeltsin ensued, in which Yeltsin reiterated his commitment to shut down the reactors by the year 2000.[15]

In December 1993, Gore and Chernomyrdin agreed to form a working group within the Gore-Chernomyrdin Commission (GCC) to examine options for closing the production reactors. Gore stated that the U.S. would support studies to identify replacement sources of power for the reactors. These commitments were reiterated at the January 1994 Clinton-Yeltsin summit at which Yeltsin endorsed Clinton's September 1993 fissile material cutoff proposal.[16]

In a February 14, 1994, letter to Gore, Chernomyrdin outlined a series of options for replacing the reactors with fossil fuel power plants. Chernomyrdin also mentioned the core conversion option and emphasized that any option needed to address the "social needs" of the two regions. While U.S. officials might have interpreted this as a repetition of statements about the heating and electricity demands in and around Seversk and Zheleznogorsk, it would later become obvious that he was referring to the need for any option to take account of the thousands of jobs associated with the three reactors.

On March 16, 1994, O'Leary and Mikhailov signed a protocol summarizing their governments' views on a range of issues surrounding plutonium production. In the protocol, the two governments declared their intent to:

> Enter into a mutual agreement to cease the military use of plutonium after the date of the agreement. This agreement would include provisions for compliance. Further, the Russian side proposed that Russia, within one year after creation of an alternative source of energy, would cease production and chemical separation of weapons-grade plutonium.[17]

The protocol adds that such a shutdown agreement would "require that each side permit inspection of its relevant plutonium production facilities as well as the storage sites for the plutonium produced by the reactors at Tomsk and Krasnoyarsk."[18] The next day, Secretary of State Warren Christopher certified that Russia had met the conditions spelled out in the Markey amendment.

The protocol reflects a U.S. bias towards replacing the reactors with fossil fuel plants, and states that the United States is prepared to assist in "securing financing for the completion of a feasibility study that would examine fully" a gas turbine option at Tomsk, and attracting international financing for a partially-completed coal-fired plant at Krasnoyarsk.[19]

Although the protocol reflects the Russian view that it is "possible to perform...conversion work on the Tomsk-7 and Krasnoyarsk-26 reactors," it adds that "the U.S. will only consider participating in this work if Russia obtains financing." The O'Leary-Mikhailov protocol was codified into a formal governmental agreement at a June 23, 1994, GCC meeting.

But statements made about the reactors at secretarial- and ministerial-level meetings reflected irresolvable differences between the two sides: U.S. expectations regarding reactor shutdown and verification were clearly spelled out in the agreement, while Russia's desire for firm assurances as to U.S. or U.S.-supported multilateral funding mechanisms was not. Since no consensus could be reached on the extent to which reactor shutdown should be linked to the availability of outside funding, the relationship between these two issues was not clearly described.[20] As a consequence, Russian officials insisted that diplomatic notes finalizing the June agreement be exchanged before it could come into force. These notes were never exchanged.

Other difference over replacement power sources and fissile material safeguards emerged during the talks.

Minatom wanted the reactors to be replaced by new nuclear plants, and repeatedly requested that joint feasibility studies be conducted for the nuclear as well as fossil plant replacement options. In addition, Minatom officials continually expressed their skepticism about the need for fissile material safeguards in Russia, arguing that since Russia possessed the largest stocks of weapons-usable materials in the world, there was little sense in expending resources to keep fissile material out of Russian weapons.[21]

U.S. Policy Objectives

The option of replacing the reactors with new nuclear reactors was opposed by the U.S. government on the grounds that the nuclear option would be more costly than the fossil fuel option and would take too long to implement.[22] A fossil fuel replacement plant feasibility study would later show that replacing the reactors with coal and/or natural gas technologies would cost between $700 million and $1 billion.[23] A nuclear power replacement plant study estimated that building new nuclear plants would cost between $1 and $3 billion.[24]

There were other reasons why some in the U.S. government favored the fossil fuel option. Planning for construction for fossil fuel plants had already begun in both regions by the end of the Cold War.[25] Even though Minatom opposed all non-nuclear replacement options, local officials continued to voice their support for the fossil fuel projects.[26] For the United States, supporting regional governments that shared U.S. views on reactor replacement was especially important because at many levels, Minatom seemed unable to place technical, economic, or security criteria ahead of its parochial interests.[27] Faced with this reality, many U.S. officials believed that direct funding of Russian nuclear facilities through reactor replacement or core conversion would provide additional incentives for Minatom to engage in activities that the United States was trying to discourage, like reprocessing and further development of breeder reactor technologies.[28]

Concerns about Russia's nuclear safety record only added to the U.S. government's opposition to reactor core conversion. In the early 1990s, U.S. officials still had hopes that Russia could be persuaded to shut down its least safe reactors. They feared that conversion might signal U.S. approval of Minatom plans to upgrade other unsafe reactors, and they also were concerned about the moral and legal liabilities inherent in assisting Minatom in upgrading reactors that did not and could not meet Western safety standards. Beyond this, there was a general concern that "conversion might have the perverse effect of actually delaying implementation of a replacement energy plan by lifting the sense of urgency from the task."[29]

At the time, U.S. support of conversion might have also undermined the U.S. goal of supporting the emergence of an independent nuclear safety agency in Russia. In November 1993, U.S. Nuclear Regulatory Commission (NRC) Chairman Ivan Selin had met with Yuri Vishnevsky, Chairman of the Russian Federal Radiation Protection and Nuclear Safety Authority (GAN). Vishnevsky urged the United States to support the permanent shutdown of the reactors for safety reasons. For U.S. officials, undermining Vishnevsky was especially unattractive because the U.S.-funded Materials Protection, Control, and Accountancy (MPC&A) program was getting underway, and one of the U.S. conditions for the collaborative MPC&A program was the inclusion of an independent Russian regulator.[30]

Negotiations On A Compliance Regime

Yeltsin and Clinton agreed upon the urgency of resolving the plutonium production issue at their September 1994 summit. But, in August, the Russian government had stated that satisfactory progress would have to be made on a funding mechanism for reactor replacement and on the conclusion of an "Intergovernmental Agreement for Cooperation on the Exchange of Classified Data" (Intergovernmental Agreement) before allowing implementation of compliance measures.[31] The two sides nevertheless proceeded to begin negotiations on a compliance agreement to monitor reactor shutdown, reprocessing of spent fuel, and interim storage of the plutonium produced through reprocessing until the shutdown was achieved.

In December 1994, just as a compliance agreement covering the reactors and the storage of the plutonium was reaching conclusion, the Russians decided to halt compliance regime negotiations, citing the need for completing the Intergovernmental Agreement.[32] The United States attempted to bring Russia back to the table by acceding to Minatom's demands for nuclear replacement plant feasibility studies.[33] But the overall argument about the relationship between reactor shutdown and replacement plant funding had finally caught up with, and politicized, the compliance agreement talks. Further

negotiations would be put on hold until the broader financial and political issues could be resolved.

TOWARDS CORE CONVERSION

Despite the impasse on ending plutonium production, O'Leary's relationship with Mikhailov started improving in late 1994. For O'Leary, it was becoming increasingly clear that the primary issue plaguing negotiations was funding. The relatively low cost of the core conversion option offered a way to end plutonium production without finding billions of dollars to replace the reactors. Mikhailov was increasingly amenable to this alternative. In October 1994, the Russian government had announced its intention to no longer convert separated plutonium oxide into plutonium metal for weapons. The fact that the Russian Ministry of Defense (MOD) concurrently stopped paying Minatom for the plutonium prompted Mikhailov to place less emphasis on long-term, grandiose reactor replacement schemes in favor of the short-term financial benefits of core conversion.

On-going Kurchatov-PNNL discussions about core conversion gave both secretaries greater confidence in the technical and political feasibility of this alternative. PNNL provided data on the operations of the Hanford plutonium reactors at a joint workshop in Hanford in late 1994. Kurchatov subsequently provided information about its three operating reactors at a joint workshop in Moscow in early 1995. This success mimicked the pattern of laboratory-to-laboratory contacts in the budding MPC&A program, and would create a successful pattern of circumventing cumbersome governmental structures on both sides, at least for the short term.

The secretaries' attention to the core conversion option also reflected their respective governments' growing concerns about effects of economic dislocation on reactor safety and materials accountancy.[34] According to one estimate, by April 1995, the organizations responsible for operating the reactors were being paid 20 percent less than the actual cost of reactor operation.[35] Meanwhile, living standards in the nuclear cities had dropped to levels considerably lower than those in surrounding areas.[36] Conversion held out some hope that the thousands of jobs associated with reactor operation could be sustained and that the marginal improvement in living standards might prevent material diversion.

O'Leary Re-Initiates Government-To-Government Efforts

In November 1994, O'Leary had authorized her staff to propose a set of reciprocal, government-to-government visits to relevant nuclear facilities. DOE suggested that Russians could visit shutdown U.S. plutonium reactors in exchange for access to the three Russian production reactors. The Russian government refused access to the operating reactors, but offered to allow U.S. officials to visit similar, already shutdown Russian facilities. Despite this initial rejection, O'Leary's initiative had the effect of demonstrating the U.S. government's seriousness about resolving the issue in a way that accommodated Russian concerns.

In a joint statement at a May 1995 summit meeting, Clinton and Yeltsin pledged to never again build weapons from civil fissile material from dismantled weapons, excess fissile material, or newly produced fissile material.[37] The next month, O'Leary and Mikhailov signed a statement of intent to proceed with joint feasibility studies on the nuclear replacement and conversion options. The studies would be conducted by Kurchatov and PNNL. The statement established the mandate for a set of reciprocal, technical visits, including U.S. visits to the operating reactors and Russian visits to DOE's Savannah River Plant (SRP). By allowing access to each others' facilities, the statement cleared the way for negotiations on the modalities of a "Phase I" design and feasibility study for core conversion.

The Core Conversion Feasibility Study

By late August, Kurchatov and PNNL signed an agreement of confidentiality, providing a context in which proprietary, unclassified data could be exchanged at the technical level with the promise that neither organization would share this information with anyone but project participants. In September 1995, DOE and Minatom signed an agreement that funded a range of core conversion nuclear replacement options. Largely as a result of on-going PNNL and DOE Office of Energy, Science and Technology, the $4.9 million dollar effort was completed by December 1995, in record time.[38]

The feasibility studies estimated that conversion would cost roughly $160 million and would thus require an $80 million U.S. contribution, assuming that the costs were shared equally by both sides.[39] Furthermore, the studies demonstrated that if conversion were to be achieved by

the year 2000, much of the funding would have to be allocated quickly. This urgency resulted from the anticipated overlap between the "Phase II" engineering design study and the "Phase III" implementation stage of the project, requiring procurement of Phase III equipment during Phase II.

The core conversion feasibility studies were reviewed by GAN, and the studies stated that GAN would participate in safety aspects of the conversion process. The relationship between core conversion and the U.S. policy objective of empowering GAN had been reversed by President Yeltsin's 1994 decree limiting GAN's access to Russian military nuclear facilities.[40] While earlier U.S. support for the conversion project would have contradicted GAN's opposition to conversion, U.S. support for GAN involvement was now seen as a way of assuring at least some GAN access to these facilities.

Core Conversion Receives Government-Level Approval

An agreement to proceed with Phase II of core conversion was signed by O'Leary and Mikhailov at the January 1996 GCC meeting. In a subsequent letter to Mikhailov, O'Leary noted that the United States would agree to provide the $10 million portion of its contribution to the Phase II engineering design only if it could gain access to the plutonium produced in the reactors prior to conversion.

The January 1996 talks added an additional wrinkle to the project. HEU fuel cores have been routinely used in some Russian reactors, and the Russian side proposed that HEU from Russian warheads should be used to fuel the converted reactors.[41] GAN and Minatom are in favor of HEU fuel use because this will allow the converted reactors to be certified for operation more expeditiously. They are joined by some in the U.S. government who argue that the low-enriched uranium (LEU) option could delay conversion due to the need to construct a new HEU-LEU blending capacity.[42]

Others in the U.S. government advocate the LEU option, and point to the fact that HEU use is at odds with U.S. attempts to strengthen the global nonproliferation regime by seeking to "minimize the civil use of highly enriched uranium."[43] Opponents of the HEU option also argue that since spent HEU fuel will contain large quantities of unused HEU, this option will encourage Russian reprocessing to recover the HEU, despite the fact that the plutonium in the spent fuel does not warrant reprocessing.[44]

U.S. DOMESTIC DEBATES OVER FUNDING AND PROGRAM MANAGEMENT

The January 1996 agreement to proceed with core conversion created near bureaucratic chaos in the U.S. government because it required turf-conscious bureaucrats to cooperate on a potentially divisive issue. One of the initial problems was the timing of the January agreement. Agency budgets had already been submitted for Congress' deliberations on the FY 1997 budget. Absent a reprogramming request to use current year non-disbursed funds, additional funding would not be available until the end of the year. Discussions were held at a January 1996 inter-agency meeting on how to identify current-year and future funding for the U.S. contribution to the project. At issue was the $10 million required to conduct the Phase II engineering design and the $70 million required for the Phase III implementation portion of the project.

Two options for short- and long-term funding had been generated internally in 1995 and were discussed at the January meeting.[45] First, given DOE's history of involvement in the reactor replacement and conversion studies, DOE accounts were the obvious source of revenue. However, in spite of O'Leary's efforts, Congress had already refused to fund some of DOE's activities associated with ending plutonium production. In 1995, an FY 1996 appropriation for various site-related activities had been rejected.

To add to this, staff members with Representative John Myers (R-IN), Chairman of the House Energy and Water Subcommittee of the House Appropriations Committee, had recently indicated the chairman's belief that DOE had gone beyond its discretionary mandate by spending $3.7 million to help fund the 1995 reactor replacement and core conversion studies. He had been the driving force behind the rejection of the FY 1996 request. This placed DOE's $3.5 million FY 1997 request for conversion work in jeopardy.[46] Myers's general hostility to DOE's nonproliferation activities dimmed prospects for obtaining additional reprogrammed (current year) funding for the new agreement, or for obtaining larger amounts of funding for program implementation.[47] The second potential funding source was the Nunn-Lugar CTR funds controlled by DOD. Given the size of CTR accounts, the DOD budget was viewed as the most likely source of

long-term funding.

DOD representatives in the meeting reluctantly agreed to consider long-term funding under three conditions. First, other accounts would have to be identified to contribute the $10 million required for short-term funding. Second, specific milestones that could be used to demonstrate progress towards conversion would have to be identified. And third, the program would have to be managed by DOD and thus preclude PNNL involvement.

DOE representatives objected to the third condition, claiming that the technical expertise for the program resided in PNNL and hence in DOE, and that the DOE's Office of Nuclear Energy, Science, and Technology had unique managerial competencies suited to the program. This claim was based on two lessons learned from prior years' experience. First, PNNL and DOE staff had established a relationship of trust with Russian partners who were naturally suspicious of U.S. involvement in converting these sensitive facilities. According to DOE and PNNL officials, throughout the evolution of the PNNL-Kurchatov relationship and especially in the context of the reactor shutdown agreement negotiations, conservative Russian political forces inside and outside of Minatom had remained suspicious that U.S. defense and intelligence agencies intended to use U.S.-Russian cooperative structures to collect intelligence information. In this view, adding DOD to the process would heighten these suspicions.

Second, DOE and PNNL officials pointed to the fact that the multiple, overlapping phases of core conversion required an holistic understanding of the program so that long lead-time contracts could be entered into early enough to complete conversion by the year 2000. They added that DOD contracting procedures would only further complicate this process because they were more cumbersome than the contracting procedures that had already proven successful in the MPC&A program.[48]

Despite an effort by National Security Council (NSC) staff to resolve management and funding issues prior to the April G-7 "nuclear summit" in Moscow, DOE and DOD officials remained deadlocked over these issues well into the spring of 1996.

Congress Acts on Core Conversion

In March 1996, the House National Security Committee marked up its bill and denied DOE's $3.5 million request. But in April, prospects for short-term funding improved. An amendment to the House Defense Authorization Bill restoring the DOE request passed.[49] The amendment was sponsored at the request of nongovernmental (NGO) arms control organizations by Representative Richard Hastings (R-WA), who represents much of the Hanford facility in Washington state where the PNNL work force is located.

During the House deliberations, committee and personal staff to Senators Sam Nunn (D-GA), Richard Lugar (R-IN), and Pete Domenici (R-AZ) had been crafting an amendment to the Senate Defense Authorization Bill designed to greatly expand the scope of the Nunn-Lugar CTR and lab-to-lab MPC&A efforts. The draft amendment fully funded the core conversion project.

Upon learning of this provision in the draft amendment, senior DOD officials demanded that Senate staff delete core conversion funding. These officials had reluctantly supported core conversion in January, but had since grown hostile to the program when DOE staff balked at handing over managerial responsibility to DOD.[50]

In an attempt to forge a compromise between DOD and DOE, Senate staff asked DOE and White House Office of Science and Technology staff to determine what level of funding would be necessary to sustain the program for the coming year only. Funding levels for conversion in the amendment were subsequently reduced to $16 million, with $6 million coming from the DOE Russian Plutonium Production Reactor Shutdown Program, and $10 million from DOD CTR accounts to be transferred to DOE.

Despite this change, the DOD officials once again demanded that Senate staff either remove all core conversion funding from the amendment, or designate DOD as the lead agency to manage core conversion. Senate staff were at a loss as to how to proceed. In their view, sustaining momentum towards core conversion required authorizing program funding *and* maintaining DOE's lead role in the project. Yet, from a political standpoint, these objectives had become mutually exclusive. The issue was discussed at the inter-agency level until early May, at which point the NSC Standing Committee on Nonproliferation called a high-level meeting to resolve the dispute.[51]

At the meeting, high-level DOE and DOD officials and Vice President Gore's representative agreed that DOD should manage the program. High-level DOE officials were convinced that once funding was secured,

the managerial problems could be worked out. The final Senate amendment placed DOD in charge of the program.[52] On June 26, 1996, the amendment, containing core conversion funds as well as nearly $100 million in additional CTR and DOE MPC&A funding, passed unanimously.[53]

The House-Senate Conference Places DOE In Charge

The arms control community was alarmed by the potentially deleterious effect that DOD management would have on core conversion.[54] They believed that if PNNL were replaced by a new contractor, the Russian government would question the sincerity of U.S. efforts to help Russia end plutonium production.[55] This view was substantiated by independent reports that, upon hearing of possible management changes to the core conversion project management structure, Mikhailov forcefully voiced his support for continued DOE-PNNL leadership.[56]

NGO representatives pressed their case with Representative John Spratt (D-SC).[57] Spratt, a senior member of the House National Security Committee, was the cosponsor with Representative Bill McCollum (R-FL) of a House bill similar to the Senate amendment, designed to generate support for Nunn-Lugar-Domenici amendment provisions in the House-Senate Defense Authorization Conference. As a veteran of U.S. legislative efforts to address problems in U.S. and Russian nuclear weapons facilities, Spratt had extensive knowledge of the issues surrounding core conversion and understood the danger of derailing the program by changing the management structure. In the House-Senate Conference on the Defense Authorization Bill the following month, Spratt successfully prevailed upon his colleagues to designate DOE as the lead agency on core conversion, and to require DOD to transfer the $16 million in funding to DOE for the project.

The NSC Staff Ignores Congress' Charge

In September, the NSC staff announced that in spite of this Congressional directive, DOD would manage the core conversion program. No one could determine why NSC staff would attempt to thwart the will of Congress. These same staff were not hostile, *per se*, to the core conversion program. In fact, they also instructed DOD to request full funding for the project in its FY 1998 budget request.

In early October, Spratt sent a letter to NSC head Anthony Lake asking for an explanation. After six weeks of inter-agency wrangling, Lake sent Spratt a response containing language intended to satisfy the spirit of the authorizing language on program management while allowing DOD a token role in overseeing the program.

In November, the NSC staffer and the DOD official most closely associated with funding and management disputes left the government. This gave DOE officials a new opportunity to make their case for maintaining a consistent management structure throughout all phases of the core conversion project. In December, with the assistance of new NSC staff, DOE and DOD agreed that DOE should serve as the technical advisor to DOD for one year in all aspects of the project, with DOD responsible for requesting the needed funds from Congress.

While convinced that this division of responsibility can work, project proponents within DOE worry that if DOD should decide not to renew this arrangement in 1998, the continuity in management needed to integrate Phases II and III may once again be lost. This said, the administration is now prepared, for the first time, to pursue a cohesive approach to ending Russian weapons-grade plutonium production after nearly a year of leaderless confusion.

CONCLUSION

At a July 1996 GCC meeting, Gore and Chernomyrdin endorsed the January O'Leary-Mikhailov accord. Since then, Phase II work has moved forward in the absence of a formal agreement. Throughout the remainder of 1996, a central difference emerged between the two sides over the amount of plutonium to be placed under a joint monitoring regime. The United States argued that it should have access to all plutonium produced after the October 1994 Russian declaration of non-weapons use. However, Russian negotiators argued that these rights should only apply to that plutonium produced after the signing of a formal set of agreements covering the full range of issues associated with core conversion.

The plutonium monitoring issue and all other outstanding issues now appear to have been resolved in a series of intensive negotiations that took place in Moscow in late January 1997. In these negotiations, a set of agreements was concluded that now requires only internal, inter-agency review before being signed by Gore and Chernomyrdin (or other high-level officials) and entering

into force. The agreement that covers plutonium monitoring will allow the United States access to an "estimated nine tons" of plutonium produced in the reactors. This estimate represents the amount of plutonium believed to have been produced between early 1995, soon after Russia's October 1994 declaration of non-weapons use, and the year 2000, when the last reactor is scheduled for conversion.

In Moscow, negotiators also concluded agreements on how to verify that the reactors are operating in the agreed to, non-plutonium production mode, and on how to verify whether the HEU used for reactor fuel has come from Russian warheads. Thus, for the first time since Gore and Chernomyrdin endorsed the June 1994 agreement to end Russian plutonium production, both governments appear poised to sign *and* implement agreements needed to manage and fund a range of cooperative projects related to ending plutonium production at the three reactors. Assuming these agreements enter into force, the only remaining matter requiring resolution is the HEU versus LEU fueling issue. This issue need not be resolved before the entry into force of the agreements, but a fuel choice will need to be made before the Phase III implementation phase is scheduled to begin in 1998.[58]

Given Russian and, in some instances, U.S. reluctance across the range of nuclear issues to improve transparency, it is noteworthy that government-to-government negotiations to end plutonium production have advanced as far as they have. Much of the credit for this progress can be attributed to patterns of interaction established by the MPC&A program, in which lab-to-lab, secretarial-level, and GCC talks have paved the way towards resolving narrow issues incrementally, using reciprocal information sharing practices as a point of departure.

This said, the divided nature of the U.S. policymaking process poses significant and enduring obstacles to the success of various cooperative efforts. Even if the January 1997 agreements negotiated in Moscow enter into force, remaining tension between the DOD and the DOE, and/or failure by Congress to fund the U.S. contribution to the project could still jeopardize timely implementation of the agreements. As this case study shows, the U.S. policymaking processes become especially cumbersome when Russian nuclear issues involve conflicting U.S. policy priorities. In its relations with Russia in the nuclear area, the U.S. government has often been hard pressed to balance its nonproliferation, arms control, reactor safety, and energy policy goals. The dynamic nature of Russian political institutions and preferences has only complicated this balancing act.

A more centralized U.S. decisionmaking process might have aided in the extremely difficult task of ranking U.S. negotiating priorities and thus resulted in more U.S. leverage over reactor shutdown and over other goals, such as a fissile material production cut-off for weapons.[59] But, if signed, the agreements negotiated in January 1997 would still remove the issue of Russian plutonium production from the broad array of obstacles that confront proponents of a bilateral or multilateral ban on fissile material for weapons. Meanwhile, like other cooperative projects in the former Soviet Union, a reactor shutdown agreement would help sustain a productive U.S.-Russian nuclear relationship during a period that is likely to witness new challenges to U.S.-Russian cooperative security efforts.

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[2] For a description of these secret cities, see Oleg Bukharin, *The Future of Russia's Plutonium Cities* (Princeton: Center for Energy and Environmental Studies, Report #296, March 1996).

[3] In theory, the aluminum-clad uranium metal fuel could be stored rather than reprocessed. But, the lack of storage space combined with limited abilities to control storage pond water chemistry has required Minatom to reprocess the spent reactor fuel generally within several months to a year after its removal from the reactors.

[4] "Agreement Between The Government Of The United States and the Government Of The Russian Federation Concerning The Shutdown Of Plutonium Production Reactors And The Cessation Of Use Of Newly Produced Plutonium For Nuclear Weapons," June 23, 1994, p. 2.

[5] *Ibid.*

[6] The amount of plutonium in spent fuel taken from the converted reactors will depend upon the uranium content of the new fuel rods, as well as the level and duration of fuel exposure in the reactors.

[7] The plutonium in the fuel will contain heavy concentrations of plutonium-240, an element that complicates the construction of nuclear explosives due to high neutron emissions.

[8] Core conversion would change the reactors' physics, and make them less likely to catch fire in the event of a loss of reactor coolant. Core conversion would also allow the reactors to be run at reduced power levels, increasing the time for reactor operators to take corrective actions in an emergency situation. These and other safety upgrades have short-term benefits because when the reactors reach the end of their scheduled life spans by about the year 2010, other safety issues will arise.

[9] For a complete discussion of the various fissile material cut-off proposals

discussed during the Cold War, see Frans Berkhout, "Components of an International Plutonium Management Regime," paper delivered to NATO Workshop on Global Stability Through Disarmament, Erice, Sicily, August 19-23, 1993.

[10] The United States had ceased HEU production in 1964. Bukharin, *The Future of Russia's Plutonium Cities,* p. 6.

[11] The United States had shut-down its aging plutonium reactors in 1988. Berkhout, "Components of an International Plutonium Management Regime," p. 10. That same year, Russian officials had announced at the United Nations their intention to eventually end plutonium production. Bukharin, *The Future of Russia's Plutonium Cities,* p. 6.

[12] For a description of this impasse, see Tom Zamora Collina, "Report from Geneva: Test Ban, Fissile Material Talks Stall, NPT Heats Up," Institute for Science and International Security, September 28, 1994, p. 4.

[13] "Modification to the Amendment Offered by Mr. Markey of Massachusetts to H.R. 2401," as reported (Amendment # 7 in House Report 102-236).

[14] For a description of the history, and evolving objectives of this and related nonproliferation assistance programs, see Jason D. Ellis, "Nunn-Lugar's Mid-Life Crisis," *Survival 39* (Spring 1997), pp. 5-29.

[15] U.S. Congress, House of Representatives, Committee on Armed Services, *Cooperative Threat Reduction Hearing Before the Committee on Armed Services*, 103rd Congress, Second Session, April 28, 1994, Statement by Dr. Harold P. Smith, Jr., Assistant to the Secretary of Defense (Atomic Energy).

[16] Graham T. Allison, *et al., Avoiding Nuclear Anarchy: Containing the Threat of Loose Nuclear Weapons and Fissile Material* (Cambridge, MA: The MIT Press, 1996), p. 109, note 80.

[17] This and subsequent references to the protocol are taken from the "Post-Soviet Nuclear Complex Monitor," Vol. 1, Nos. 20 & 21, March 18, 1996, pp. 1-3. In this context, the phrase "military use of plutonium" refers only to that plutonium separated from spent fuel at the three reactors.

[18] The protocol declares both sides' intention to "conclude an agreement on the means of confirming the plutonium and highly enriched uranium inventory from nuclear dismantlement."

[19] The protocol states that the United States commits to making "recommendations" to U.S. and multilateral financial institutions "to attract means of financing as soon as possible" for a Russian feasibility study on finishing a coal-fired facility already under construction at Krasnoyarsk.

[20] Because the Russian economy is in desperate straits, local utilities charge customers only a fraction of the actual cost of their energy consumption. This poses a fundamental obstacle to obtaining loans from the World Bank or other multilateral lending agencies for replacement power plants. Mathew Wald, "Arms Plants Provide Civilians' Power," *The New York Times*, August 18, 1996, p. A10.

[21] Mark Chao, "Prospects for Replacement and Shutdown of Russian Weapons-Plutonium Production Reactors," Master's Thesis, University of California at Berkeley, December 1995, p. 14.

[22] Constructing replacement nuclear power stations would have taken longer than constructing fossil fuel powered facilities that, in theory, could have been completed by the year 2000. "Nuclear Power Replacement Options Study for Seversk (Tomsk-7) and Zheleznogorsk (Krasnoyarsk-26): Technical Evaluation Report," Prepared by Joint U.S./Russian Study Team for the United States Department of Energy (DOE) and the Russian Federation Ministry of Atomic Energy (Minatom), December 1995 (hereafter "Nuclear Power Replacement Options Study").

[23] "Core Conversion Highlights/Issues," Pacific Northwest National Laboratory, October 7, 1996, p. 6.

[24] "Nuclear Power Replacement Options Study," Table 1-1.

[25] Wald, "Arms Plants Provide Civilians' Power," p. A10, and Chao, "Prospects for Replacement and Shutdown of Russian Weapons-Plutonium Production Reactors," p. 23.

[26] Chao, "Prospects for Replacement and Shutdown of Russian Weapons-Plutonium Production Reactors," p. 43.

[27] *Ibid.,* p. 23, 42, and 53-55.

[28] Bukharin, *The Future of Russia's Plutonium Cities,* p. 13.

[29] Chao, "Prospects for Replacement and Shutdown of Russian Weapons-Plutonium Production Reactors," p. 33.

[30] For a description of the relationship between GAN and the MPC&A program, see Jessica E. Stern, "U.S. Assistance Programs for Improving MPC&A in the Former Soviet Union," *The Nonproliferation Review* 3 (Winter 1996), p. 26 and p. 28.

[31] For a discussion of the Intergovernmental Agreement, see *Nuclear Successor States of the Soviet Union: Nuclear Weapon and Sensitive Export Status Report* (Washington, D.C.: Carnegie Endowment for International Peace and the Monterey Institute of International Studies, May 1996), p. 24.

[32] U.S. officials had hoped to use access to reactor fuel reprocessing facilities as a precedent for a future fissile material production ban agreement, but Russia refused in these negotiations to grant such access. Records of reactor operations combined with measurements of the isotopic content of the separated plutonium can instead be used to assure that materials are not diverted during reprocessing.

[33] Chao, "Prospects for Replacement and Shutdown of Russian Weapons-Plutonium Production Reactors," p. 15.

[34] *Ibid.*, p. 21 and p. 43.

[35] Bukharin, *The Future of Russia's Plutonium Cities,* pp. 6-7.

[36] *Ibid.*

[37] Allison, *et al., Avoiding Nuclear Anarchy*, p. 110. After Russia's October 1994 announcement that it would no longer transform extracted plutonium from an oxide to a metal form, there was a certain ambiguity surrounding the exact status of the reactor plutonium. In the Russian view, it was no longer categorized as weapons plutonium. But both sides recognized that the oxide was weapons-usable. The summit language therefore explicitly mentioned "newly produced" fissile material in direct reference to the plutonium being extracted from spent fuel at the three reactors.

[38] This funding was provided by the DOE's Office of Nuclear Energy, Science and Technology ($3.7 million) and by the State Department's Non-Proliferation and Disarmament Fund ($1.2 million).

[39] For a summary of the principle objectives of the core conversion study see "Core Conversion Highlights/Issues."

[40] Stern, "U.S. Assistance Programs for Improving MPC&A in the Former Soviet Union," p. 28.

[41] An estimated three tons of HEU per year will be used once the reactors are converted.

[42] Chao, "Prospects for Replacement and Shutdown of Russian Weapons-Plutonium Production Reactors," p. 33. At a 19.9 percent concentration, the LEU used in the reactors would be substantially more enriched than standard LEU fuel (three to five percent) and would thus require the construction or modification of a Russian blending facility. It is estimated that such a facility would take eight months to construct and cost roughly $10 million.

[43] "Fact Sheet: Non-Proliferation and Export Control Policy," The White House Office of the Press Secretary, September 27, 1993, p. 2. One of the ways that the United States pursues this goal is by assisting countries to substitute HEU with LEU in their research reactors through the Reduced Enrichment Research and Test Reactor (RETR) Program.

[44] Proponents of HEU fuel use counter that extracting HEU from converted reactor spent fuel would, in any event, make little economic sense because it would require the construction of a new plant especially designed to reprocess this kind of fuel.

[45] A third option for short-term funding, the State Department's Nuclear Nonproliferation and Disarmament Fund, was never fully considered due to the limited dollar amounts in this fund. Thus, although resources from the fund were available to help DOE conduct the core conversion and reactor replacement studies, the fund could not be expected to implement either of these options.

[46] "Department of Energy FY 1997 Congressional Budget Request and other Defense Activities, Nuclear Security/Russian Production Reactor Shutdown Program," p. 628.

[47] At the time, Representative Myers was also raising objections to a re-programming request for DOE's effort to stabilize the spent fuel associated with North Korea's nuclear program. This request would have to be resolved before any re-programming request for core conversion request could be considered, making prospects for obtaining conversion funding seem even dimmer. Ultimately, both the North Korean re-programming request and the FY 1997 core conversion requests were approved.

[48] The "concrete deliverables" contracting process used also in the DOE's

MPC&A program sets a date by which materials or information are to be delivered for a given price. This is substantially less complex than DOD contracting procedures that require extensive auditing of individual projects, and certifications to Congress that funds are being used in accordance with restrictive U.S. contracting laws. For a description of these procedures, see Stern, "U.S. Assistance Programs for Improving MPC&A in the Former Soviet Union," p. 26.

[49] DOE national security-related activities are authorized by House National Security and Senate Armed Services Committees. Funds are then appropriated by the House and Senate Energy Appropriations Sub-Committees, rather than by the respective Defense Appropriations Committees.

[50] For an account of DOD's prior refusal to fund programs that it either did not view as politically feasible or as a legitimate part of the CTR, see Ellis, "Nunn-Lugar's Mid-Life Crisis," pp. 94-95.

[51] Apprised in advance of the meeting, the Union of Concerned Scientists and five other arms control organizations sent a letter to the Vice President Gore on May 13, 1996, urging him to support full funding for the project and "to take whatever action is necessary" to complete the program.

[52] The amendment states that "The Secretary of Defense, in consultation with the Secretary of Energy, shall develop a cooperative program with the Government of Russia to eliminate the production of weapons grade plutonium by modifying or replacing the reactor cores at Tomsk-7 and Krasnoyarsk 26...." Title XIII, The Defense Against Weapons of Mass Destruction Act of 1996, Section 1333.

[53] In a move that unexpectedly created nearly unanimous support for Nunn-Lugar programs in both Houses of Congress, Nunn, Lugar, and Domenici attached a set of measures to their amendment which would help prepare state and local emergency response and disaster management officials for the use of a weapon of mass destruction on U.S. soil.

[54] Throughout 1996, representatives from the following organizations and coalitions expressed their support for the core conversion program through dozens of letters to Congressional and Executive Branch officials: the Coalition to Reduce Nuclear Dangers, Council For A Liveable World, the Federation of American Scientists, the International Center, the Natural Resources Defense Council, Physicians for Social Responsibility, the Plutonium Challenge Coalition, and the Union of Concerned Scientists.

[55] Although Kurchatov Institute project participants were perhaps more understanding of U.S. domestic politics than other Russian officials, they had to contend with the majority view in Minatom that the United States had failed to identify significant funding for replacement or conversion while openly seeking to advance its own agenda with respect to reactor replacement options and verification. Chao, "Prospects for Replacement and Shutdown of Russian Weapons-Plutonium Production Reactors," p. 56.

[56] Princeton University Professor Frank Von Hippel of the Federation of American Scientists and Professor Igor Khripunov of the Center for International Trade and Security at the University of Georgia, telephone interviews with author, July 1996. Khripunov and Von Hippel communicated with Russian officials who had witnessed Mikhailov's unqualified endorsement of the Kurchatov Institute's collaborative work with PNNL and DOE.

[57] For a summary of the positions on core conversion taken by the Union of Concerned Scientist and other non-governmental organizations when meeting with Spratt and his staff, see Todd Perry, "Turf Fights Snarl Nunn-Lugar: Put Nuclear Control Ahead of Agency Squabbles," *Defense News*, July 22-28, 1996, p. 15.

[58] Due to the eight-month period needed to construct a special fuel fabrication infrastructure for the reactors, one reactor is scheduled for conversion in 1999, and the remaining reactors are scheduled to be converted in 2000, once an adequate amount of fuel is fabricated. However, if the LEU option is chosen, this schedule may be delayed by an additional year so that a new or modified blending facility can be constructed.

[59] Chao, "Prospects for Replacement and Shutdown of Russian Weapons-Plutonium Production Reactors," p. 57. On the broader issue of using U.S. assistance to promote U.S. nonproliferation objectives with Minatom, see John C. Baker, "Non-Proliferation Incentives and NIS Dual-Use Technology Exporters," *Adelphi Paper* (draft)(International Institute for Strategic Studies, November 1996).