Opportunities to Aid Russian Dismantlement

6

The breakup of the Soviet Union and the end of the Cold War present a unique opportunity for the United States and the republics of the former Soviet Union to begin dismantling their nuclear arsenals. Unilateral and bilateral agreements and announcements have formed a basis for both sides to retire weapons systems, destroy delivery vehicles such as missiles, and perhaps make progress in dismantling the nuclear warheads themselves.

The challenge of true mutual and significant reduction of the nuclear stockpile, however, still faces both nations. The United States has begun its own activities to dismantle nuclear warheads, as described in chapters 2 and 3. The extent of corresponding activities in Russia is not clear, but some work is under way.[1] Both nations have made a variety of proposals, and certain agreements are being discussed, but no specific actions have been taken to dispose of nuclear materials from retired warheads. Russia is currently struggling with economic and political problems that may relegate warhead dismantlement and materials disposition to a low priority.

Nonetheless, the United States has expressed its intention to encourage nuclear weapons dismantlement and materials disposal activities in Russia and other former Soviet republics to the maximum extent feasible and has developed its own programs of assistance as a means of helping stockpile reduction become a reality. Congress has provided for a number of recent initiatives aimed at assisting the former Soviet Union to proceed with warhead dismantlement in a safe, secure, and timely manner.

"Among all the huge renewal projects facing Russia today, the main goal is the revival of its industries, including its atomic industry. There are about a million people working for the Ministry of Atomic Energy. We are capable of dismantling up to 5,000 warheads per year. But in order to do this, it is first imperative to undertake and ensure the necessary organization, financing, and provisions for the disposal of nuclear waste."

1992 speech by Viktor Mikhailov, Minister of Atomic Energy of the Russian Federation

[1] Although no U.S. officials have verified warhead dismantlement rates in Russia, some U.S. experts believe that recent statements and evidence indicate a current rate of 1,500 warheads per year (7,1 1).

This chapter summarizes the information available from unclassified sources about activities, programs, and plans in Russia. It also discusses current U.S. efforts to assist Russian dismantlement and evaluates how well such programs work to reduce future risks from nuclear weapons and materials. Recent progress made in these areas, and prospects for moving forward, are also evaluated.

WARHEAD DISMANTLEMENT IN RUSSIA

The information available on matters related to nuclear weapons activities in the former Soviet Union is very limited, and sometimes conflicting or ambiguous. Publicly available sources indicate that since 1949, the former Soviet Union has produced an estimated 55,000 nuclear warheads (12). Recent statements by the Russian Atomic Energy Minister, Victor Mikhailov, indicate that the Soviet stockpile peaked in 1986 at 45,000 and declined by about 20 percent by mid-1992 (an average of 1,500 per year) (37). Over time, some experts have estimated that Russia has dismantled up to 25,000 warheads, but it is uncertain how much of the material has been recycled into new warheads (12). In various statements over the past year, Russia has indicated that it will retire and "destroy" about 20,000 nuclear weapons,[2] but the exact numbers and types of weapons (and warheads) are subject to speculation.

This chapter focuses on Russia since it is by far the largest republic of the former Soviet Union, and the only one with both the announced intent and the capability to dismantle its own warheads and dispose of the special nuclear materials from those warheads.[3] Russia also has the largest portion of the nuclear arsenal within its borders, compared with weapons now located in other former Soviet republics. Some limited information is available about the situation in these other republics.

The Russian agencies in control of weapons and dismantlement activities are quite similar in function to those in the United States. The Ministry of Atomic Energy (comparable to DOE) has traditionally produced nuclear materials and weapons components, and assembled and tested warheads, while the Ministry of Defense (comparable to DOD) is responsible for weapons staging and stockpile management.

The Russian Ministry of Atomic Energy (MINATOM)—which was created out of the Soviet Ministry of Atomic Power and Industry in January 1992 by decree of President Boris Yeltsin-is responsible for the entire nuclear fuel cycle in Russia, from uranium mining and enrichment to nuclear electricity production and nuclear weapons design, testing, and manufacturing. MINATOM operates nuclear weapons assembly facilities, as well as a number of institutes and laboratories similar in nature to the U.S. system of national laboratories. There are 29 departments within MINATOM, and more than 100 institutes, laboratories, and associations (6,35,40).

The design, testing, and production of fissile materials and nuclear warheads, as well as warhead dismantlement and recycling, have been carried out at about 12 sites. The location of 10 of these sites is so sensitive that they were not marked on any Soviet map and are code named

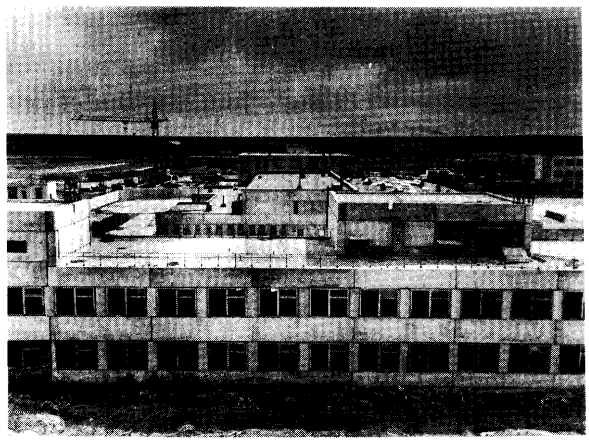
[2] According to certain experts, official documents describing the types of warheads to be eliminated partially or completely include (46): 1) all strategic and tactical warheads withdrawn from Ukraine, Belarus, and Kazakhstan; 2) all nuclear warheads for ground-based tactical missiles, artillery shells, and land mines; 3) half of the tactical bomb inventory of the Air Force, with the remainder removed from frontline units and deployed on bases for centralized stockpiling; 4) one-half of the nuclear warheads for anti-aircraft missiles and one-third of sea-based tactical warheads; and 5) strategic warheads located in Russia, which are to be reduced according to the Strategic Arms Reduction Treaty (START II). The quoted number of warheads to be "destroyed" is 27,000-30,000 (6,54).

[3] The major Soviet Union facilities for assembly and disassembly of nuclear weapons today are in Russia. Three other newly independent states also have nuclear weapons, including Belarus, Kazakhstan and Ukraine. Officials from Ukraine have stated that they may want to dismantle nuclear weapons located in their country themselves, although it is not clear if they have the resources, knowledge, or facilities to carry this out. There is some question whether Ukraine would violate the Non-proliferation Treaty if it dismantled nuclear weapons.

after cities 50 to 100 kilometers away. Until recently, the exact locations of these sites were kept secret. Since 1989, most of them have been opened for a limited number of foreign visitors, but others have remained inaccessible. Recently, certain sites have been visited by foreign government and nongovernmental groups, and more information is becoming openly available. Figure 6-1 is a map locating some of the key Russian nuclear weapons sites that have recently been discussed in the open literature.

Information is limited concerning the organization, personnel, and management practices of the Russian Ministry of Defense with regard to nuclear weapons. The Main Administration of Nuclear Weapons (the 12th Main Directorate) of the Ministry is known to be responsible for nuclear weapons staging, storage, and management, once the weapons are obtained from MINATOM. The 12th Main Directorate is apparently responsible for transporting nuclear weapons from MINATOM plants and for staging the weapons at Defense Ministry sites. The Ministry of Defense is also responsible for the transportation of nuclear weapons and warheads from their deployed sites back to MINATOM plants for dismantlement. Apparently, nuclear weapons deployed outside Russia are shipped from their staging sites to central storage facilities in Russia under the control of the Ministry of Defense.[4]

Russian officials have indicated that they are dismantling warheads at the rate of 1,500 to 2,500 per year, but U.S. officials have not verified these dismantlement rates (15). Although definite information about Russian dismantlement progress would be invaluable, it maybe difficult to obtain such data without implementing some sort of monitoring to reliably verify the number of warheads going into-and the amount of fissionable materials in storage containers coming out of—a dismantlement site.



ROBERT DEL TREDICI

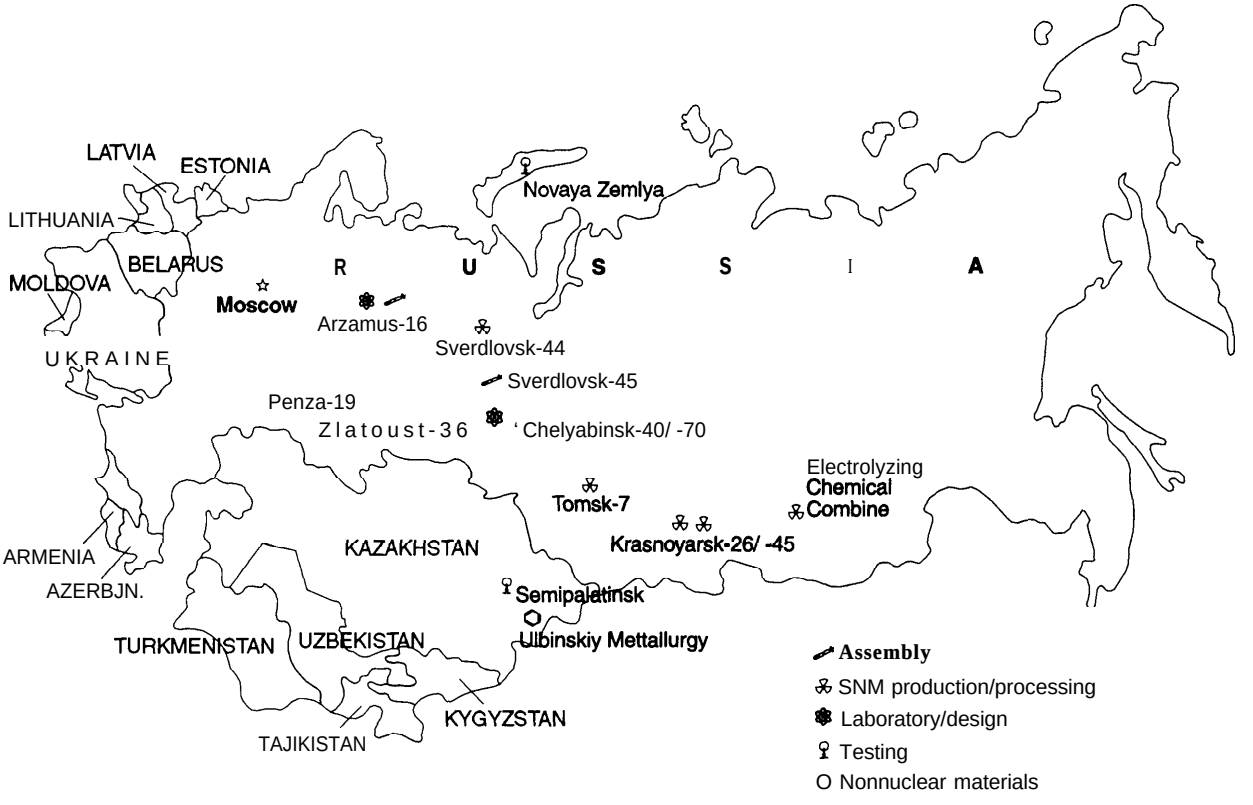
Partially constructed offices for a breeder reactor complex in the Chelyabinsk region near a Russian plutonium production facility. Construction was stopped in 1991 after a nonbinding public referendum that opposed the building of new reactors.

The lack of knowledge about the former Soviet nuclear arsenal and materials stockpile is recognized as an impediment to international confidence in weapons dismantlement and arms control agreements. During Senate consideration of the first Strategic Arms Reduction Treaty (START) (ratified by the United States on Oct. 1, 1992), a condition to the ratification resolution was added that called for the President to make a good faith effort at negotiating agreements that will allow for the exchange and declaration of information about nuclear weapons and materials stockpiles. Specifically, the condition called for:

> . . . appropriate arrangement(s), including the use of reciprocal inspections, data exchanges, and other cooperative measures, to monitor:
>
> (A) the numbers of nuclear stockpile weapons on the territory of the parties to this Treaty; and
>
> (B) the location an inventory of facilities on the territory of the parties to this treaty capable of producing or processing significant quantities of fissile materials (52).

[4]Transportation of most nuclear weapons is by train. At least some nuclear weapons have been transported by train from the staging sites to weapons storage depots in Russia (35).

Figure 6-l—Nuclear Weapons Complex in the Former Soviet Union[a]



a Locations are approximate. Facilities are commonly named for the nearest town of significant size.

SOURCE: Defense Intelligence Agency, briefing to the Office of Technology Assessment, Apr. 15, 1993. Graham Allison et al. (eds.), *Cooperative Denuclearization: From Pledges to Deeds* (Cambridge, MA: Harvard University, January 1993). R. Stanley Norris, "The Soviet Nuclear Archipelago," *Arms Control Today,* vol. 21, No. 1, January/February 1992. Thomas Cochran, Senior Scientist, Natural Resources Defense Council, comments, June 1993.

The amendment to the Senate ratification resolution is nonbinding, and does not affect the ratification process for the START II treaty. However, the condition serves to bring warhead dismantlement under the same type of scrutiny that traditionally accompanies arms control verification regimes. Achieving such data exchanges and monitoring arrangements would greatly enhance international confidence in the nuclear nations' dismantlement programs.

Russian warheads most likely are dismantled in the MINATOM plants where they were produced and assembled. Although the Russians clearly possess the facilities for nuclear warhead dismantlement, it is not clear that their economy will be able to maintain the personnel, infrastructure, and financial resources required to operate these facilities.

There are three principal warhead assembly plants in Russia that appear to be similar in function to the U.S. Pantex Plant. They are Sverdlovsk-45, located at Nizhnyaya-Tura (the main facility in the Urals); Penza-19, located at Kuznetsk (115 kilometers east of Penza); and Zlatovst-36, located at Yuryuzan (a smaller facility 85 kilometers southeast of Zlatovst in the Urals). Most sources indicate that these facilities are currently involved in dismantlement activities (6). In addition, the Russian design laboratory known as Arzamas-16 has a small-scale warhead assembly/disassembly capacity and is reported to be involved in warhead dismantlement (see table

Table 6-l-Nuclear Weapons Complex in the Former Soviet Union

Facility name	Activities	Location	U.S. equivalent
Penza-19	Component assembly	Kuznetsk	Pantex/Kansas City
Arzamus-l 6	Design/assembly	Sarova	LANL/LLNL
Sverdlovsk-45	Assembly	Nizhnyaya Tura	Pantex
Zlatoust-36	Assembly	Yuryuzan	Pantex
Chelyabinsk-70	Design	Kasli	LAN/LLNL
Chelyabinsk-40[a]	Pu/T production	Kyshtym	Hanford
Tomsk-7	Pu/T production/U enrichment	Tomsk	Rocky Flats/Hanford/Oak Ridge
Krasnoyarsk-26	Pu/T production	Dodonova	Hanford
Krasnoyarsk-45	U enrichment	Zernogorsk	Oak Ridge
Sverdlovsk-44[b]	U enrichment	Verkniy Neyvinsk	Oak Ridge
Electrolyzing Chem. Combine	U enrichment	Angarsk	Oak Ridge
Semipalatinsk	Test site[c]	Kazakhstan	Nevada Test Site
Novaya Zemlya	Test site	N. Russia	Nevada Test Site
Ulbinsky Metallurgy	Be/Zr production	Kazakhstan	-

NOTE: Be- beryllium; LANL = Los Alamos National Laboratory; LLNL = Lawrence Livermore National Laboratory; Pu = plutonium; T = tritium; U = uranium; Zr = zirconium.
a May also be called Chelyabinsk-65.
b Alos called Urals Electrochemistry Combine.
c Closed 1991.

SOURCE: Office of Tecnology Assessment, 1993.

6-1 and figure 6-l). In the past, the fissile materials recovered from dismantled warheads were probably recycled into new warheads.

As discussed in chapter 2, the relevant arms reduction treaties mandate only the destruction of the delivery system (e.g., a missile), if that, and say nothing about the fate of the nuclear warhead or the plutonium and other materials contained in the nuclear explosive package. There is speculation that any missiles that have already been removed as part of arms control treaties, along with those missiles returned to Russia from other former Soviet republics, have been stored intact at existing Ministry of Defense storage sites inside Russia, or that they have been only partially disassembled and the warheads are being stored at Ministry of Defense facilities (6,35,40). Up to the present, the United States has not been able to verify the extent of Russian dismantlement of warheads or the subsequent storage of fissile materials.

At the "Third International Workshop on Verified Storage and Destruction of Nuclear Warheads," held in Kiev and Moscow in 1991, a senior arms control adviser to President Yeltsin indicated that nuclear warhead dismantlement is being carried out at two sites at a rate of about 1,500 warheads per year. Although this implies that Russian dismantlement is actually proceeding at this rate, the United States has not confirmed the number of warheads dismantled. Some Russian statements on dismantlement do not make clear whether warheads dismantled in the past are being discussed or whether the materials recovered from these dismantled warheads have been used in new warheads.[5]

According to both the Ministry of Defense and MINATOM, available facilities for the storage of fissile materials recovered from existing warheads are inadequate to store the amounts of plutonium anticipated from current dismantlement plans (8). There are existing facilities for

5 The available literature does not provide the answer as to what amounts, if any, of fissile materials from warheads have been recycled into new warheads versus the amounts in storage facilities. According to statements by Ministry of Defense and MINATOM officials, however, the most likely scenario is that very little of the fissile material has been stored in the past. Most of it is likely to have been recycled into new warheads.

Box 6-A--Nunn-Lugar Legislation

In 1991 and 1992, Congress authorized $400 million (for a total of $800 million) in the so called Nunn-Lugar legislation to assist the former Soviet Union in dismantling weapons of mass destruction, including nuclear warheads. Spending required presidential certification that states of the former Soviet Union were adhering to relevant arms control agreements. The actual funds have already been approptriated to the Department of Defense (DOD). Originally, $400 million was set aside in Public Law 102-228, the Conventional Forces in Europe Treaty Implementation Act of 1991, by an amendment introduced by Senators Sam Nunn and Richard Lugar. The specific legislation now in place authorizing this program includes the following:

- The Soviet Nuclear Threat Reduction Act of 1991 (Title II of Public Law 102-228, Dec. 12, 1991) authorized spending $400 million of DOD'S FY 1992 budget to "establish a program to assist Soviet weapons destruction." The full name of PL 102-228 is the "Conventional Forces in Europe Treaty Implementation Act of 1991." It is a law dealing with North Atlantic Treaty Organization fundding and equipment transfers. Amendment SP 1439, introduced by Senators Nunn and Lugar, became the "Soviet Nuclear Threat Reduction Act of 1991."
- The Soviet Nuclear Threat Reduction Act of 1992 (Title of Public Law 102-229, Dec. 12, 1991) is a portion of the Dire Emergency Supplemental Appropriations Act of 1992, which makes technical corrections and changes in the budget. It "[a]llows for the transfer of funds to assist the former Soviet Union and/or emerging political structures . . . in dismantling nuclear weapons."
- The Former Soviet Union Demilitarization Act of 1992 (Title XIV of Public Law 102-484,Oct 23, 1992) sets various conditions for the money authorized under the two bills described above. For example, "defense conversion" money cannot exceed $40 million. It is part of the Defense Authorization Act for FY 1993.
- The Freedom Support Act (Public Law 102-511, Title V, Oct. 24, 1992) provides for economic and nuclear nonproliferation assistance to the states of the former Soviet Union, and authorizes the use of funds made available under specified acts to carry out demilitarization, and economic conversion regarding nuclear weapons. This focuses mostly on repealing Cold War restrictions on trade, etc., with Soviet bloc nations.

SOURCE: Office of Technology Assessment, 1993.

processing recovered plutonium into new warheads. The three plants at which plutonium has been produced--Chelyabinsk-65, Tomsk-7, and Krasnoyarsk-26--are believed to have storage facilities for plutonium, but it is not known whether enough space for additional fissile materials from warheads exists at these sites, or whether there is capacity at any of the sites for the storage of plutonium pits, tritium, or highly enriched uranium.[6]

Views about nuclear warhead dismantlement and plutonium disposition among various Russian organizations are diverse. The positions taken by military, academic, and certain government agencies may be divergent. Dismantlement policy is also a controversial political issue in Russia. MINATOM Minister Victor Mikhailov has become the target of more conservative Russians for his part in promoting Russian warhead dismantlement. Some members of the Supreme Soviet have criticized other activities involving the United States. The possible effect of internal Russian critics on U.S.-Russian cooperation is unknown at this time.

6 Only the Mayak complex at Chelyabinsk processes spent fuel from power and naval reactors. "Reactor-grade" plutonium is stored there as plutonium dioxide, and between 25 and 30 metric tons maybe stored there currently (such material is less than ideal for weapons use but still could be used to make a nuclear bomb). The Tomsk and Krasnoyarsk facilities continue to produce plutonium for weapons. Apparently, those facilities have a related plutonium handling and storage infrastructure (6,12).

US. Assistance in Russian Warhead Dismantlement

Since 1991, Congress has enacted several measures providing U.S. assistance for Russian nuclear warhead dismantlement activities (see box 6-A). The Soviet Nuclear Threat Reduction Act of 1991 (Nunn-Lugar; Public Law 102-228, Title II, Dec. 12, 1991) directed the Administration to provide assistance to facilitate nuclear weapons dismantlement and destruction in the former Soviet Union, and authorized $400 million for that purpose. As of March 31, 1993, the Department of Defense had proposed to obligate about $460 million for various purchases and activities related to this initiative that have been agreed to by the United States and Russia or by the United States and other former Soviet republics. Of the total, only $31 million has actually been obligated. The agreements were reached via a series of meetings and exchanges through March 31, 1993, between the relevant agency representatives of these countries (principally Russia) and U.S. agencies.

In the 1992 Dire Emergency Supplemental Appropriations Act (Public Law 102-229), Congress authorized an additional $400 million to be applied for this purpose. The latter provides for the transfer of up to $400 million from DOD operations and maintenance appropriations or working capital account balances to facilitate the transportation, storage, safeguarding, and destruction of nuclear (and other) weapons in the former Soviet Union (13).

DOD is the executive agent for the program and is working closely with the National Security Council, the Department of State, the Arms Control and Disarmament Agency, DOE, and other governmental organizations (13). The Safe and Secure Dismantlement Interagency Steering Group (SSD) coordinates the various activities. The impetus for forming the SSD was concern about the security and control of Soviet nuclear weapons raised after the August 1991 abortive coup d'etat in the Soviet Union (8).

In initial bilateral discussions in Moscow during January 1992, the Russians stated that the greatest impediment to dismantlement was their lack of suitable long-term storage facilities and containers, and inadequate transportation (8). Secretary of State James Baker responded to Russian Foreign Minister Andrei Kozyrev in February 1992 with suggestions covering possible U.S. assistance in transportation and storage, accident response, an accounting and control system, and ultimate disposition of the highly enriched uranium (HEU) and plutonium from warheads (8). In a November 1992 Moscow meeting, the United States reaffirmed an earlier offer to provide aid to expedite the elimination of strategic arms slated for reduction under START II (8). Relevant legislative provisions pertaining to U.S. assistance require the Administration to certify that the former Soviet republics are committed to:

- making substantial investments toward dismantling and destroying weapons; [7]
- forgoing military modernization;
- forgoing the reuse of fissionable materials in new weapons;
- facilitating U.S. verification of weapons destruction;
- complying with all relevant arms control agreements; and
- observing human rights.[8]

The Bush-Yeltsin summit in June 1992 included the signing of four SSD agreements, and discussions in August 1992 led to further U.S.-Russian agreements (8,16). These included:

. an umbrella agreement for providing Nunn-Lugar assistance, naming DOD and MINATOM as executive agents (see appendix C);

[7] It is not clear how the Adrninistration is clef@ "substantial investments" or ascertaining the extent of these investments.

[8] Title II of Public Law 102-228, the Soviet Nuclear Threat Reduction Act of 1991, Dec. 12, 1991.

- an armored blanket agreement;[9]
- an accident response equipment and training agreement; [10]
- a fissile materials container agreement; [11]
- a rail car conversion agreement;
- a storage facilities agreement; and
- an agreement on HEU disposition by conversion to low-enriched uranium (LEU).

In March 1993, Ambassador James Goodby replaced General William Burns as the head of the U.S. Delegation on Safe and Secure Dismantlement of Former Soviet Nuclear Weapons (22). Ambassador Goodby has indicated that the Clinton administration intends to put high priority on agreements under the Nunn-Lugar appropriations to provide incentives for reducing the stockpile and eliminating warheads in the former Soviet Union. The United States is also discussing a possible multilateral approach with other nations such as Japan, the United Kingdom, Germany, Canada, and France. One suggestion is for an international fund with a U.S. contribution through Nunn-Lugar and subsequent appropriations. Each country would lend assistance in its areas of expertise.

Another meeting of the U.S. delegation with its Russian counterparts in Moscow took place at the end of March 1993. During that meeting, the texts of three *new* agreements (22) were agreed upon and await Russian signature under the general umbrella agreement to:

- provide $130 million for equipment to assist with the dismantlement of missile delivery vehicles, [12]
- provide an additional $75 million for special equipment for the planned plutonium storage facility, [13] and
- provide $10 million for improving materials control and accountability systems.

Table 6-2 lists the status of funding for all of these projects as of April 1993.[14]

Different degrees of progress have been made with the other three nuclear states-Ukraine, Belarus, and Kazakhstan-but agreements similar to those with Russia are under discussion for the transportation of nuclear weapons and the dismantlement of delivery systems (8). Efforts to conclude agreements with these states continue--the greatest progress having been made with Belarus, which has already signed agreements (22). Kazakhstan appears to be willing to move forward, but Ukraine has presented some problems (22). The Ukraine Government is now divided over whether it should become, or remain, a nuclear power. The government has stated that it will require $2.8 billion to dismantle its nuclear weapons, whereas the U.S. offer of assistance is in the range of $175 million (22). Little information is available about the breakdown of the $2.8 billion requirement, but U.S. officials generally consider it to be unrealistically high (29).

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9 The armored blankets are for the protection of nuclear warheads during transportation. DOD has delivered 250 armored blankets and is sending out for bid procurement of additional blankets (13).

10 This agreement is to provide emergency response equipment and training to deal with potential nuclear weapons transportation accidents. The United States, through work conducted largely at Sandia National Laboratory, is considered to have the lead in this area. DOD will provide MINATOM with a variety of emergency equipment used for dealing with weapons transportation accidents, as well as initial operator training.

11 Under this agreement, DOD will provide MINATOM with Up to 1(.)$OOO containers for exclusive use in transporting fissile materials from dismantled weapons. Design and development were begun by DOE, the containers will be built in the United States, and delivery is anticipated by December 1995 (8).

12 For the United States, the Defense Nuclear Agency will administer procurement of the equipment, and for Russia, the Committee on Defense Industries will be the executing agency.

13 MINATOM will be the executing agency for the Russians and the Department of Defense for the United States.

14 However, in negotiating the sale of Russian HEU, the United States is insisting that Ukraine receive a fair portion of the income from the sale, which may yield $1 billion for Ukraine (22,23).

Table 6-2-Soviet Nuclear Threat Reduction Projects

Recipient nation	Project	Obligations (proposed) as of March 31, 1993 ($ millions)	Obligations (actual) as of March 31, 1993 ($ million)
Russia	Armored blankets[a]	5.0	3.1
	Rail car security[a]	20.0	3.1
	Emergency response[a]	15.0	9.9
	Materials controls	10.0	0
	Storage containers	50.0	2.0
	Facility design[a]	15.0	6.0
	Facility equipment	75.0	0
	Export controls	2.3	0
	Science center[a]	25.0	0.2
	Chemical weapons[a]	25.0	1.9
	SNDV dismantlement[b]	130.0	0
	Military contacts	15.0	0
	Arctic nuclear waste	10.0	0
Subtotal		397.3	26.4
Ukraine	Emergency response	5.0	0
	Communications	2.4	0
	Export controls	2.3	0
	Materials controls	7.5	0
	Science center	10.0	0
Subtotal		27.2	0
Belarus	Emergency response[a]	5.0	3.3
	Communications[a]	2.3	0
	Export controls[a]	2.3	0
Subtotal		9.6	3.3
Kazahkstan	Emergency response	5.0	0
	Communications	2.3	0
	Export controls	2.3	0
	Materials controls	5.0	0
Subtotal		14.4	0
General	Support/assessment	**10.0**	1.6
TOTAL		458.7	31.3

a Denotes signed agreement%
b SNDV = Strategic nuclear delivery vehicles.

SOURCE: U.S. Department of State, 1993.

ROBERT DEL TREDICI

The people of Muslyumovo from the Chelyabinsk region. Muslyumovo is less than 50 miles downriver from a plutonium processing plant that dumped high-level radioactive waste into the Techa river from 1948 to 1951.

Almost all of the assistance to Russia for weapons dismantlement is in either of two forms: 1) supplies or equipment purchased in the United States, or from U.S. stockpiles, to be shipped to appropriate Russian agencies; or 2) U.S. technical or advisory teams to supply technical services or data to appropriate agencies. Russia has not yet sought any assistance for actual weapons dismantlement, and it opposes U.S. involvement in such activities.[15] It appears that Russia is concerned the United States would gain too much access to secret facilities or information, and Russia is confident of its own dismantlement capabilities. To date, all U.S. assistance has been based on funds spent in the United States for goods or services to be delivered later to Russian agencies.

In each case, U.S. negotiators have tried to determine the need for assistance and assess its importance before reaching an agreement with the Russians. Russia has expressed a number of needs and pressed for the direct commitment of funds for building facilities. However, the U.S. policy is to retain essentially complete control over spending of funds under Nunn-Lugar and to purchase services or materials in the United States, consistent with the intent of the Nunn-Lugar legislation to maximize the use of U.S. technologies and technicians (14). The program is administered by DOD, and most of the purchases of services or equipment are managed by the Defense Nuclear Agency. The Army Corps of Engineers is, at present, executing only the

15 According to the Weapons *Complex Monitor* (55): "General Sergei Zelenstov, chief nuclear engineer of the Russian Ministry of Defense, said all tactical nuclear weapons informer Soviet republics except the Ukrain and Byelorussia have beenremoved. A top Russian official said 'We don't need any technology or technical aid for dismantling warheads. We don't need a United States contractor. We can do it ourselves.' Russia has however asked for aid to develop storage facilities,'

storage facility design (14). This policy could be reexamined if U.S. goals for Russian dismantlement are not achieved.

Although Russian President Yeltsin supports the SSD program and work now under way, the Supreme Soviet has criticized it on the grounds that it diminishes Russia's status as a nuclear superpower to have the United States dictate specific aspects of its nuclear enterprise. This, in turn, has led President Yeltsin to keep a low profile on the SSD program for the time being and also to postpone submitting the START II treaty for ratification (22). In addition to some dissatisfaction with what are viewed as U.S. efforts to unilaterally dictate the nuclear policy of former Soviet Union nations, officials from both Russia and Ukraine have expressed frustration with the slow pace at which U.S. dismantlement aid is being made available (42).

Even in Russia, the political climate for acceptance of U.S. assistance is problematic. The current program is a compromise between the two countries. Agreements have been reached slowly and in small steps. Some critics believe that expenditures have not been well targeted and have not led to significantly safer or quicker dismantlement (11). It does not appear that this program is being used to address the broader issues of mutual goals and interests in the overall weapons dismantlement programs of both countries. The timing of U.S. efforts to address these issues may become more critical if political and economic instability in Russia continue (9).

MANAGEMENT OF RUSSIAN PLUTONIUM

Little information is available on how the former Soviet Union managed plutonium from dismantled nuclear warheads in the past, including how long and where it may have been stored as intact pits, and where and how it was reprocessed or recycled into new warheads. Some experts believe that plutonium was fabricated rapidly into new warheads so that large storage facilities were not required.[16]

There are conflicting reports on whether Russia currently has sufficient storage capacity to carry out dismantlement activities.[17] Reports from some meetings in Russia indicate that lack of a dedicated storage facility will not delay dismantlement because temporary storage facilities are available. The name or location of these facilities is unclear (12). On the other hand, Russian officials assert that lack of containers and storage space for highly enriched uranium and plutonium is the limiting factor in Russia's dismantlement effort[18] (8). This contradiction indicates that more specific information about Russian capabilities and facilities may be needed if the assistance program is to be effective.

US. Assistance to Russia for a Plutonium Storage Facility

As is the case with U.S. weapons, the nuclear materials from dismantled warheads of the former Soviet Union will have to be stored until a decision is reached on final disposition. The United States is providing assistance in the design of a storage facility for nuclear materials recovered from dismantled Russian warheads (via the origi-

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IS In the United States, plutonium pits are commonly reprocessed to remove impurities (americium-241 in particular) prior to being remade into new pits. According to one source, both the Soviet Union and the United States recycled plutonium recovered from dismantled warheads into new warheads, and therefore did not generate large plutonium stocks until the late 1980s (53).

17 The three plants, described above, in the former Soviet Union at which plutonium was produced have stored at least small amounts. At the end of 1991, 25 metric tons of separated plutonium in oxide form from civilian reactors was stored at the Chelyabinsk-65 plutonium production facility (12).

18 A Russian news report dated August 6, 1992, stated that "the nuclear workers themselves attest that Krasnoyarsk-26 [another plutonium production site] is joining the process of dismantling nuclear warheads. The tons of plutonium produced here will most likely also return here-for storage' (25). Another former plutonium production facility—Tomsk-7—is the site currently being considered for construction of the large storage facility for fissile materials from retired warheads.

nal Nunn-Lugar Soviet Nuclear Threat Reduction Act, Public Law 102-228, and subsequent laws) .19

An agreement between the U.S. DOD and Russian MINATOM to assist Russia in the safe, secure storage of fissile materials from dismantled weapons was announced in August 1992. It committed DOD to assist a Russian-led effort in designing a storage facility. Initial Russian design requirements were received in August, and several joint technical meetings have been held. The United States has had ongoing discussions with Russia about construction of a storage facility there for nuclear materials from dismantled warheads.

DOD is committed to provide, at no cost to MINATOM, technical assistance in this design effort, including the development of design requirements and criteria for the storage facility. Under this agreement, MINATOM retains full responsibility for facility design, and the total DOD cost may not exceed $15 million (l). This amount is considered to be only for design assistance and is not expected to cover any fraction of actual construction. The total construction cost and the source of funding have not been established. Although the United States would clearly like Russia to cover the major portion of these expenses, Russia maybe unable to provide the amounts needed.

The Army Corps of Engineers is responsible for storage facility design assistance under the agreement.[20] DOE is providing design expertise from the Albuquerque Operations Office for project oversight; the Los Alamos National Laboratory (LANL) for control, accounting, and safeguards; and the Sandia National Laboratory for physical security and materials handling (48,49). The design is intended as a joint U.S.-Russian project, and by March 1993, several U.S.-Russian technical workshops had been held. For example, in December 1992, the Russian delegation, the Corps, and LANL staff drafted general safety criteria (20). The U.S. team is also assisting the Russians in a preliminary safety analysis, although the United States ultimately considers any analysis of environmental impact to be Russia's responsibility (48,49). The scheduled date for completion of the design remains December 1993, although there is uncertainty whether the Russians will be able to complete all their design tasks by that date (14).

Although the Russian fissile materials storage facility design is proceeding with U.S. assistance, the completion date for construction has been delayed 1 year, to 1997 (22). The Russians plan to locate the storage facility at Tomsk-7, near the plutonium production facility. When the new facility was announced, however, the population in the adjacent community registered some opposition (8). In light of the accident at Tomsk-7 in early 1993, when one tank at a weapons material reprocessing plant exploded and released radioactive material, such opposition may reappear (22). The city council of Tomsk voted against locating the plutonium storage facility in that region, and President Yeltsin has stated that these desires would be respected (53). Like the United States, Russia plans to store the plutonium initially as weapons pits, but these may be removed from storage later for further use or converted to a more stable form for longer-term storage. Many Russian officials consider storage to be mainly an interim measure that is required while final disposition plans and technologies are being developed. There is general agreement among government officials that excess plutonium should be used eventually in power-producing reactors, but that these technologies will require considerable investment to be operational.

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19 The Department of Defense plans to obligate up to $90 million to support the storage facility's design, construction, and outfitting (27); $15 million of the $90 million can be used for facility design (8). Up to $75 million is proposed to provide the specialized equipment necessary to make the storage facility operational (13).

20 The Transatlantic Division of the Corps in Winchester, Virginia manages the program.

Russian officials have agreed in principle that the United States will be able to monitor the fissile materials storage facility. One condition of U.S. assistance under the Nunn-Lugar legislation is that fissionable materials from dismantled Russian warheads will not be reused in weapons. The details of certification are not clear. One of the U.S.-Russian agreements covers the development of a materials and accounting security system (probably with assistance from LANL) for use throughout Russian nuclear operations. By helping to design these systems, the United States hopes to minimize proliferation concerns (8).

U.S. AGREEMENT FOR PURCHASE OF RUSSIAN WEAPONS HEU

The United States and Russia signed an agreement on February 18, 1993, to convert 500 tons of HEU from Russian warheads to LEU and sell it to the United States (see appendix C). This agreement calls for the safe and prompt disposition of HEU from dismantled Russian weapons by conversion ''as soon as practical" to LEU [21] for use in commercial nuclear power reactors. Executive agents for the agreement are DOE (or the successor U.S. Enrichment Corporation) and the Ministry of the Russian Federation of Atomic Energy. HEU is a comparatively greater security concern than plutonium because it is technically much easier to construct a bomb from HEU. On the other hand, HEU is easier to "de-weaponize" by dilution with unenriched uranium to 2 to 5 percent uranium-235 used in civilian power reactors (34). Uranium with less than 20 percent enrichment is not considered to be weapons grade.

The HEU agreement specifies that it will take place 'in accordance with existing agreements in arms control and disarmament' and to further the objectives of the Non-Proliferation Treaty (NPT), and will ''comply with all applicable nonproliferation, physical protection, nuclear material accounting and control, and environmental requirements. ' The agreement provides that both Russia and the United States are to maintain physical protection of the HEU and LEU, and to implement the relevant International Atomic Energy Agency (IAEA) recommendations and NPT safeguards. Each country would also establish transparency measures, including provisions for nuclear materials accounting, control, and access, from the time HEU is made available until it has been converted to LEU (2).

To carry out the agreement, the United States has established an interagency task force that includes the National Security Council (which has the lead), the State Department, the Arms Control and Disarmament Agency, the Office of Management and Budget, DOE (Nuclear Energy Office), DOD, and the Nuclear Regulatory Commission (18,43). The agreement covers the amounts of LEU to be purchased, the security necessary, and the location at which conversion will occur. It also provides for participation of the private sector in the U.S.-Russian enterprises.

The State Department is continuing to negotiate the U.S.-Russian HEU purchase agreement. It considers the basic terms to have been established, but two issues remain to be negotiated: transparency and how profits will be divided between the four nuclear states of the former Soviet Union (47). The allocation of profits from the sale is a major difficulty that is yet to be resolved.

Quantities, Location, and Transportation of Russian HEU

The HEU agreement specifies that approximately 500 tons of Russian HEU from dismantled warheads is to be converted to LEU in Russia.[22] Most experts believe that this represents a substantial proportion of the HEU to be recovered from dismantled Russian warheads, although the

21 Defined as uranium enriched to less than 20 percent concentration of the isotope uranium-235.

22 In all cases, tons as used in this chapter refers to metric tons.

Box 6-B-US. Facilities for Handling Russian Weapons Uranium

If and when LEU is shipped to the United States from Russia, certain private fuel fabricators such as General Electric, Westinghouse, Siemens, or ABB (see figure 6-2), could be engaged to convert it to a usable product for commercial reactors. They do not have licenses to store or handle uranium above 5 percent enrichment but could process LEU to exact customer specifications if Russian HEU were blended down to less than 5 percent uranium-235 before shipment.

Another option would be for Russia to blend HEU to less than 20 percent enrichment. At this level, two private companies, Nuclear Fuel Services (NFS) in Erwin, Tennessee and B&W Corporation in Lynchburg, Virginia, as well as Department of Energy facilities at Y-1 2 and Portsmouth, could handle the more highly enriched material.

If HEU were shipped directly from Russia (as provided for, in principle, in the agreement), the basic technology for blending HEU into LEU is available here (32). Examples of small-scale U.S. blending facilities include the NFS facility that has processed and delivered HEU naval reactor fuel under a Nuclear Regulatory Commission license (4,43). B&W Corp. also has a naval fuel fabrication facility in Lynchburg that is similar, but smaller (18). Allied Signal has processed uranium concentrates into uranium hexafluoride at its Illinois plant(4). At NFS and B&W, however, the capacity to convert uranium to uranium hexafluoride would have to be added. Although these technologies have been used on a small scale, they have not yet been employed on the scale required if the United States were to import Russian HEU.

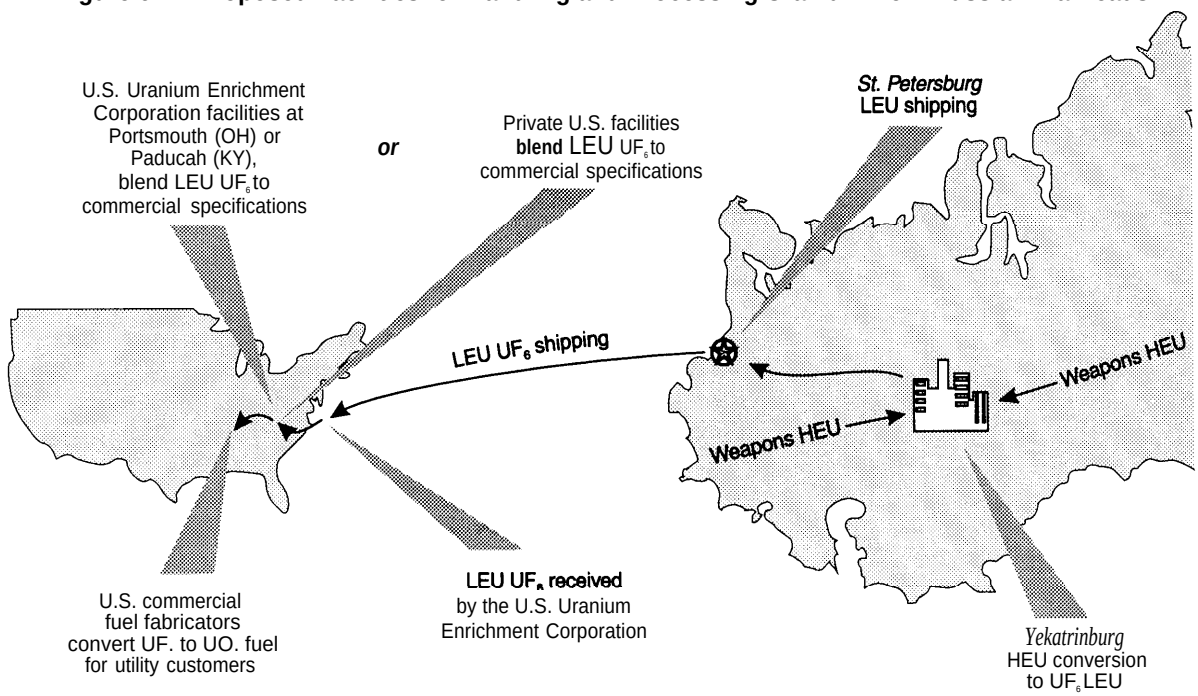
SOURCE: Office of Technology Assessment, 1993.

precise proportion is subject to speculation. By August 1993, an implementing contract is to provide for the conversion of no less than 10 tons of HEU per year for five years-followed by 30 tons per year-requiring a total of 20 years for the conversion of 500 tons. When converted to LEU, 500 hundred tons of HEU would provide enough fuel to supply all U.S. requirements for about 10 years (19).

Russian officials have stated that they have the necessary capacity to blend the Russian HEU to LEU (U.S. facilities are described in box 6-B and figure 6-2). A technical team from the U.S. uranium companies Allied Signal and Nuclear Fuel Services (NFS) toured a Russian conversion facility, Sverdlovsk-44, at Verkniy Neyuinsk, near Yekatrinburg. They reported that new facilities are being installed at which HEU will be converted and blended with uranium hexafluoride (UF_6) to produce LEU in the form of UF_6. In addition, the Russians are installing loading facilities for UF_6 shipping containers (44). The UF_6 fluorination facility is expected to have a test run in October 1993. DOE's Office of Nuclear Energy also believes that the Russian facilities at Sverdlovsk-44 will be adequate for converting and blending Russian HEU to LEU hexafluoride (45). Although the Office of Nuclear Energy thinks that the results of the Allied Signal-NFS review support this viewpoint, it is conducting its own investigation and tour. Some modifIcations and additions to this facility may be required to achieve the maximurn capacity of 30 tons per year stated in the agreement. There is also some question about the quality of Russian HEU relative to U.S. standards for fuel fabrication (see box 6-C), and the blending operations may have to accommodate processes to ensure quality.

Under the purchase agreement, LEU, after conversion, would be shipped in the form of UF_6 in commercial shipping cylinders. DOE expects to receive these shipments at its existing enrichment facilities (Portsmouth and Paducah) for the purpose of final blending to meet private customer specifications. Alternatively, blending could be done by private firms under arrangements with both DOE and Russian parties. After blending, the LEU would be shipped to a fuel fabricator for conversion to an oxide form and the manufacture of fuel rods (see figure 6-2).

Figure 6-2—Proposed Facilities for Handling and Processing Uranium from Russian Warheads



SOURCE: Office of Technology Assessment, 1993.

" The agreement of February 18,1993, states that " . . . an equivalent amount of HEU can substitute for the corresponding amount of LEU planned for purchase by the U.S." If HEU were transported from Russia, the cost and difficulty would escalate because of required security measures. Regulatory issues would also have to be considered if HEU blending occurred in the United States. The Nuclear Regulatory Commission oversees HEU and LEU processing in the private sector (although not at DOE Weapons Complex facilities). It issues licenses to store, transport, and process nuclear materials. Regulations governing private U.S. processing facilities are being revised in response to health and safety problems (including near-criticality conditions) (38,39). Commercial nuclear facilities are also subject to regulation under the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA). Portions of DOE and private-sector facilities that process HEU are subject to security measures that could complicate IAEA inspection procedures. Currently DOE facilities are not subject to the same EPA and OSHA requirements that apply to commercial facilities (see chapter 2).

The Russian-U.S. HEU agreement, if implemented as planned, could have consequences for world security, economic matters, and world peace, including the following:

- Dilution to LEU might reduce the threat of nuclear proliferation since LEU can neither be used directly to make nuclear weapons nor be turned back easily into HEU.
- Revenues from the sale of HEU might bolster the economies and social stability of former Soviet Union states; fund dismantlement activities; and support urgently needed environmental restoration and health and safety measures at their weapons facilities and nuclear reactors.

Box 6-C--Problems with Russian HEU Quality

The quality of Russian HEU available **under** the agreement maybe a problem because of its contamination with undesirable uranium isotopes (18). The uranium in LEU fuel is predominantly uranium-238, with lesser amounts (e.g., 3 to 5 percent) of uranium-235. Other uranium isotopes such as uranium-232, uranium-234, and uranium-236 are considered undesirable: uranium-234, an alpha emitter, is regulated because of the occupational risk It poses (18, 36). An American Society for Testing and Materials specification limits the maximum content of uranium-234 **in** fuel to 1 percent (18}.

Concentrations of these undesirable uranium isotopes relative to uranium-235 can be increased either during normal uranium enrichment processes or during the reprocessing and recovery of uranium in spent nuclear fuel (18]. Uranium-234 is a naturally occurring isotope that becomes enriched along with uranium-235 during the normal **enrichment prows.** In addition, uranium-234 fissions more slowly than uranium-235 during irradiation in a nuclear reactor (i.e., uranium-235 is used up more quickly), Thus, reprocessed uranium recovered from irradiated spent fuel is even more enriched in uranium-234. The Russians have mixed and recycled their civilian power reaotor and military uranium, and their HEU may now be contaminated with these isotopes at levels that are **unacceptable by U.S.** standards (18).

Minimally contaminated uranium might be cut with depleted or enriched uranium to produce an acceptable product. However, if Russian HEU cannot be blended to below this level of undesirable isotopes, U.S. fuel fabricators may be reluctant to accept it (18).

SOURCES: U.S. **Department** of **Energy** and Office of **Technology** Assessment, 1993.

Security Enhancement from the U.S.-Russian HEU Agreement

A major incentive for U.S. purchase of Russian weapons HEU is to limit the security and proliferation threat represented by this material as long as it remains in Russia. Some consider that the most effective method for preventing proliferation is to limit, as much as possible, access to special nuclear materials (26). Although the relative value of HEU and plutonium (to a reasonably technically advanced nation or group) probably depends on how readily obtainable each is, rather than how it would be used in a weapon, HEU may be more attractive in some ways. HEU, but not plutonium, can be used in a "gun-type" weapon, which would be easier to design and would have a greater chance of working than a bomb based on ''implosion' (33). This advantage would be especially appealing to a state with limited technical capability or to a subnational terrorist group. On the other hand, the gun design requires substantially more nuclear material. Therefore, HEU may be more attractive than plutonium to those interested in certain potential weapons if enough material could be obtained.

The stated rationale for the HEU agreement is that it will enhance security and reduce proliferation potential. President Bush announced that the agreement was intended to ensure that Russian HEU from dismantled nuclear weapons would be used exclusively for nonmilitary purposes via conversion to civilian reactor fuel, and that it established nonproliferation, physical security, materials accounting and control, and environmental requirements (56). Intuitively, the HEU agreement appears beneficial for both U.S. and world security, but little analysis is available because of a lack of relevant information.

For example, without knowing the current and potential Russian HEU inventory, it is difficult to fully assess the security value of the agreement. Very little information is available about Russian uranium inventories, production capabilities, and practices (51). MINATOM supervises the entire chain of production and use of nuclear materials in Russia, including mining of uranium ore,

enrichment, construction of reactors, and waste management (4). In the late 1940s the Soviet Union began enriching uranium for weapons, and by the 1980s it had gained a reputation as a dependable supplier of enrichment services in Europe (51). DOE projects that Russia will have a significantly larger share of the U.S. market for enriched uranium, the largest uranium market in the world, by the mid-to late 1990s and that, by the end of 1992, Russia will obtain 65 percent of all new contracts (51)$_0$ In 1991, the Soviet Union operated four gas centrifuge enrichment plants (the U.S. uranium enrichment industry is based on gaseous diffusion enrichment), which according to a Ministry of Atomic Power and Industry official in 1990 were all located in Russia (51). An industry report estimated that Russia's total capacity is at least 10 million SWUs (separative work units) per year, which is more than the total U.S. annual consumption of uranium fuel for commercial reactors (51). Russian uranium enrichment capacity is presumably the same today as it was before the breakup of the Soviet Union. With Russian interest in exporting its enrichment services to earn needed hard currency, it may be motivated to continue enrichment operations.

The timetable of the HEU agreement requires 20 years for 500 tons of Russian HEU to become de-weaponized by conversion to LEU, but it is not clear what proportion of the total Russian HEU stockpile this represents. The 500 metric tons was a figure volunteered by Russia about how much material would be made available after dismantlement (45). Although the U.S. State Department estimated that scheduled nuclear warhead dismantlement in Russia would generate about 500 tons of HEU, it recognized the possibility of other HEU stockpiles not contained in warheads (34). Furthermore, HEU may remain in warheads not scheduled to be dismantled, so it is not known whether all Russian HEU would be converted to LEU.

However, DOE considers that converting any amount of HEU from Russian stockpiles is a positive step for U.S. security and world peace (45). Yet, without knowing the Russian plans for conversion to LEU, it is difficult to assess the impact of the agreement on the amount of HEU transported in Russia and the corresponding risk of diversion or theft. Russian HEU may now be located atone or more storage facilities. During or after the 20-year period when, under the agreement, Russian HEU stocks are to be drawn down, it is not clear to what extent the risk of theft will be reduced.

Russia retains the capability to produce more HEU. Although Russia, like the United States, has not produced any HEU for some years (8), the agreement does not address the issue of possible future HEU production in Russia. Instead, the agreement is based on the premise that the uranium purchased by the United States would come from dismantled weapons.

Critics have suggested that the agreement to purchase 500 tons of HEU may be more of a symbolic than a practical measure, which will have little impact on reducing the threat of nuclear weapons at least in the near term. According to this perspective, the agreement may be primarily a way to aid the Russian economy, with only a marginal contribution toward reducing the threat of nuclear weapons (21). On the other hand, bolstering the economy and social structure of the republics of the former Soviet Union through this means may have its own security rewards.

Also to be considered are the practical realities of implementing the provisions regarding compliance with IAEA safeguards and materials protection standards, although actual IAEA enforcement of these standards is *not* contemplated in the agreement. Even if the parties agree in the future to an IAEA role, it may be difficult to implement. Although the IAEA has the legal authority to take and store excess fissionable materials (relative to the amount required for civilian use) including uranium, it may not have the necessary resources (34). The IAEA may continue to have funding problems that will preclude any increased role in security and verification (10), unless funded by the United States and other nations.

Economic Benefits from the U.S.-Russian HEU Agreement

By most criteria, the incentive to achieve enhanced security outweighs most considerations of economics or profit. Yet, many within DOE and U.S. private industry have looked at the U.S.-Russian HEU agreement primarily as a potentially profitable business deal, although it is to be budget neutral for the U.S. Government on a year-to-year basis.[23] Russia also has positive financial expectations since the agreement specifies that it is to use some proceeds for the "conversion of defense enterprises, enhancing the safety of nuclear power plants, environmental clean up of polluted areas and the construction and operation of facilities in Russia" (2).

Processing and diluting HEU to LEU in Russia could maintain Russian jobs at defense-related facilities that might otherwise be downsized or closed. Stabilizing the Russian economy may be crucial in maintaining sufficient political stability for the Russian nuclear warhead dismantlement program to proceed as hoped. The Russian Ministry of Atomic Energy has more than a million employees. However, the United States will have to be convinced that maintaining employment at Russian defense facilities would not in effect invigorate the Russian nuclear weapons complex. The Nunn-Lugar provisions partially address this point by requiring that nuclear materials recovered from dismantled Russian warheads and stored in facilities built with U.S. assistance must be certified not to be reused in new weapons.

Victor Mikhailov, the Russian Minister of Atomic Energy, has stated that Russia would invest "hundreds of millions of dollars" in profits from the sale of HEU into cleaning up its environment and building safer nuclear power plants and facilities (31). DOE and the U.S. State Department consider that the Russians are motivated primarily by the opportunity to earn hard, Western currency from their sales of LEU to DOE (18,34).

DOE perceives the agreement as an opportunity for Russian uranium enrichment operations to prosper in the competitive worldwide nuclear fuel business. Although in 1969 the United States had a monopoly over the Western World's uranium enrichment market, foreign investors had taken over most of the struggling U.S. uranium mining industry by 1988, and imports supplied 51 percent of U.S. power utility requirements (50). In 1992, DOE's share of the world enrichment services market was reduced to 40 percent (24,28). Sales of the 500 tons of Russian HEU after conversion to LEU would be equivalent to about 7 years of DOE's enrichment services (43) or, spread over 20 years, to an average of 35-40 percent of DOE's enrichment sales annually (32). The key economic benefit for DOE may be to reduce operating costs and thus remain a competitive source of uranium fuel in the next century (32).

No price was indicated in the February agreement. Current price negotiations will be announced when all terms and conditions have been agreed to. A key means of valuing Russian HEU is the health of the uranium market for the remainder of this decade. Some economic forecasts for the nuclear power industry are not optimistic. In an analysis of the installed nuclear-generating capacity worldwide, the resulting uranium demand, and the interaction between demand and supply, the conclusion was that installed capacity is likely to increase very slowly to the year 2000 and that there is little likelihood of substantial real increases in uranium prices (41). Past government and industry forecasts of installed nuclear-generating capacity have been consistently overoptimistic. Most forecasts were compiled by agencies that are strongly committed to nuclear development and did not adequately

23 In addition to the goal that the agreement be budget neutral, it will not be funded under the Soviet Nuclear Threat Reduction (Nunn-Lugar) Acts of 1991 and 1992.

recognize the potential for delays or cancellations arising from engineering, bureaucratic, and political obstacles.

Recent legislation that will convert DOE's Uranium Enrichment Corporation into a semiautonomous government corporation (the Energy Act of 1992, Public Law 102-486) may have some impact on the Russian HEU agreement. Title IX of the Energy Act, which established the U.S. Enrichment Corporation (USEC), also deals explicitly with the purchase of HEU from the former Soviet Union (section 1408). The law authorizes USEC to negotiate the purchase of all HEU made available by any state of the former Soviet Union under a government-to-government agreement, provided that the "quality of material can be made suitable for use in commercial reactors. " Whatever plans are adopted, in the early years of the agreement the USEC is expected to use HEU-derived LEU to satisfy contracts with utilities. The question of budget neutrality over the long run is effectively moot once USEC takes over as executive agent of the agreement since it will no longer be an agency of the U.S. Government and will have to pay its own way. Nevertheless, the long-term financial risk is that the U.S. Treasury will eventually have to cover any losses suffered by USEC or that it will have to guarantee a loan to pay for the uranium on which USEC could default.

Potential Obstacles to the U.S.-Russian HEU Agreement

The Clinton administration has continued negotiating the implementation contracts (originally to be signed within a few months) specified in the U.S.-Russian HEU umbrella agreement (23). Several issues remain to be resolved.

For example, the United States required that the basis for dividing profits from HEU sales among the former Soviet republics involved (Russia, Ukraine, Belarus, and Kazakhstan) be established at the time of the agreement. Russia and Ukraine have not been able to agree on this.

Also to be negotiated are specific provisions for U.S. verification of the weapons source of HEU, as well as other materials control and accountability procedures. In addition, the availability of HEU from dismantled Russian weapons depends on Russia's capabilities to maintain a dismantlement schedule that it states is subject to the availability of a new storage facility.

It is unclear when these difficulties will be resolved, but both parties are working on them. Another obstacle may be the concern about Russian uranium replacing U.S. supplies. Uranium mining and enrichment interests in the United States have objected to the sale of HEU and linked this to complaints about Russia's alleged uranium dumping (see box 6-D). Unions representing workers at uranium enrichment facilities are concerned that importing this Russian uranium will displace U.S. jobs at these plants. An October 1992 uranium antidumping accord exempts Russian HEU from quotas (l), but the antidumping agreement remains contentious.

CONCLUSION

Although the United States has initiated a number of efforts to aid Russian dismantlement that are important first steps, concrete benefits from these efforts may be limited. This limitation may result in part because no adequate strategic analysis has yet been carried out of the most important immediate and long-term objectives of the United States and Russia with respect to warhead dismantlement and materials management, nor is there a plan for attempting to reconcile differing national objectives and requirements.

One issue for consideration is whether the weapons dismantlement assistance that the United States is willing to provide coincides with the priority needs of Russia. Although dismantlement of weapons is a matter that the United States views as important for international security purposes, the economic and political situation in Russia may make it difficult for resources to be

Box 6-D-Uranium Antidumping Suit

How can HEU from nuclear weapons dismantlement be converted and sold on the commercial uranium fuel market without further upsetting the already depressed U.S. uranium mining and enrichment industry? When the previous Administration announced the HEU agreement, it claimed that it would have no adverse impact on U.S. consumers or jobs in t he uranium mining, or processing industries (56). If Russian weapons uranium were blended with newly mined U.S. uranium, the impact on mining jobs might be minimal. However, the current approach to let most blending be done in Russia would, undoubtedly, have the effect of replacing U.S. uranium supplies, unless DOE continues to purchase and stockpile natural uranium.

The uranium miner's union has objected in the past to the likely impact of the importation of Russian uranium (not from weapons) to the United States, and it brought suit to blockRussiancommercial sales. In November 1991 the Ad Hoc Committee of Domestic Uranium Producers, a coalition of 13 U.S. mining and milling companies and the Oil, Chemical and Atomic Workers International Union, whose members are uranium conversion and enrichment plant workers, fried an antidumping petition with the Commerce Department's International Trade Commission and international Trade Administration. The petition requested relief under the Tariff Act of 1930 (19 U.S.C. 1673a) (50). It claimedthat members had been injured by the sale of Soviet uranium at less than fair market value (50). In 1992, as a result of this suit, the U.S. Commerce Department found that Russia had been selling commercial-grade (not from weapons) LEU at unfairly low prices (31).

This case has so far addressed only the dumping of commercial-grade Russian LEU and has excluded Russian weapons uranium from consideration (17). Although the Department of Commerce determined that Russia was indeed dumping uranium, it specifically excluded HEU from its preliminary ruling, which implies that Russian weapons uranium may be freely imported into the United States (30,32). The Uranium Miner's Union may object to this ruling (32).

Agreements ending the U.S. investigation of alleged dumping of uranium by the states of the former Soviet Union were signed on October 16, 1992 (3), The agreement with the Russian Federation states that the Russian Ministry of Atomic Energy will restrict the volume of direct and indirect exports of uranium products from all sources in the Federation. HEU in existence at the signing of the agreement, or any LEU derived from it, is exempted from the quotas imposed on uranium shipments from Russia, provided it is purchased by the Department of Energy or U.S. Enrichment Corporation. Also, the Russian Federation is granted a one-time only opportunity to sell a fixed quantity of uranium through the end of 1994. The exemption of HEU in the antidumping agreement is explicitly linked to the agreement on the purchase of HEU.

It is unclear whether any future challenges to this agreement maybe forthcoming from the U.S. uranium production industry or the unions. The Nation must weigh the security benefits of purchasing Russian HEU against any job impacts that may occur.

SOURCE: Office of Technology Assessment, 1993.

devoted to that purpose, and current U.S. assistance efforts alone may not ensure that Russia's dismantlement process will move forward. If U.S. efforts do not address some critical needs and interests of the former Soviet Union along (and perhaps connected) with dismantlement matters, little may be accomplished in terms of the latter. By continuing to address these issues separately in dealings with Russia, the United States may not be able to achieve optimal results.

Another important issue is whether any storage or processing facilities used in connection with warhead dismantlement and materials management should be subject to international monitoring, inspection, or even control. In that regard, it remains to be seen whether the United States can realistically expect to verify, either directly or through international agencies, that Russia is proceeding with safe storage of special nuclear materials, without some reciprocal interest by

Russia in verifying U.S. progress along the same lines. At present, there does not appear to be a high-level governmental process to consider and address such issues.

The ongoing initiatives and activities to assist Russia are more likely to obtain good results tithe United States develops a more focused and integrated program within the context of broad policy objectives. Whether or not Russia calls for reciprocal actions by the United States, many believe that global nuclear arms reduction will come about only if the United States sets an example through its own warhead dismantlement and materials management policies and programs (5). Thus, the efficacy of any U.S. attempts to influence Russia could be enhanced to the extent that what is expected of Russia has some relationship to the actions of the United States itself. In formulating this overall program, leaders will have to understand what changes in U.S. programs could result in corresponding changes in Russia's program.

The current governmental process to consider and address such issues has not yet resolved them. In addition, U.S. Government efforts with respect to Russian weapons dismantlement and materials disposition have not always been well coordinated. Since various offices and agencies are dealing with different portions of the initiatives, the essential linkages and connections among the initiatives are not always analyzed or considered. This could eventually lead to problems in effectively implementing existing programs or developing additional ones.

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