Nuclear Threat Reduction CAMPAIGN

A program of Vietnam Veterans of America Foundation and The Justice Project

GLOBAL CLEANOUT OF WEAPONS-USABLE NUCLEAR MATERIALS FROM THE WORLD'S MOST VULNERABLE SITES

I. The Issue

During the 1960's through 1980's, the United States and the Soviet Union dispersed weapons-grade highly enriched uranium (HEU) for use in research reactors in scores of countries around the world.[1] Today, 20 tons of HEU, enough for about 1,500 nuclear weapons, is estimated to remain in civilian research reactors.[2] Most of this dangerous material is inadequately secured; and the programs to remove and replace the HEU with non-weapons-usable low-enriched uranium (LEU) are not well coordinated or adequately funded. U.S. national security requires the establishment of a fast-paced, focused task force with a mandate to ensure that poorly guarded HEU and plutonium, the other material that can be used to build a nuclear weapon, are either retrieved or adequately protected—so as to be placed beyond the reach of al Qaeda or other terrorist or criminal groups. Such a task force must have:

- Sufficient funding.
- The full range of authorities necessary to complete its work.
- A requirement to prioritize the locations at which material removal or security upgrading must be carried out.
- High-level executive-branch (preferably White House) leadership so that its activities receive the broad support of the various programs and agencies that can assist in the effort.

Background

In order to prevent nuclear proliferation, policy makers most often focus on the vast stockpiles of nuclear weapons and materials in Russia. According to many observers, however, the weakest parts of the international non-proliferation regime are civilian research reactors around the world that use (or store) HEU.

There are roughly 130 operating HEU research reactors in 40 countries.[3] Many more have been shut down or converted to less dangerous fuel sources, but still house HEU fuel on site.[4] Used by scientists to study a wide variety of academic and industrial topics, research reactors are smaller than commercial power reactors, producing anywhere from 1 to 100 MW. Their small size, however, does not diminish the danger from their uranium power sources, in either active or spent form.[5]

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Though plutonium has become the predominant fissile material in sophisticated nuclear weapons programs, HEU is easier to handle and lends itself to the simplest weapon designs (*i.e.*, a gun style device), making it the logical choice of terrorists and rogue states pursuing nuclear capability.[6] It was about 36 kg of HEU left over from one Russian and two French supplied research reactors that almost gave Iraq a nuclear weapon capability before the 1991 Gulf War.[7]

Civilian HEU research reactors, especially in Russia and the other states of the former Soviet Union (FSU), are often dangerously insecure. Scarce funding, widespread corruption, and general economic and political uncertainty have severely hampered security measures at many of these facilities. Their accounting of fissile material is often done through archaic methods, such as hand counting, that are prone to manipulation and human error. In addition, the security of weapons-grade material often relies on store-bought padlocks or even wax seals of the type used centuries ago.[8] As a result, multiple cases of theft or attempted theft have been reported since the fall of the Soviet Union.[9]

"Takeback" Programs

Moreover, in addition to active reactor fuel, many facilities also house large amounts of spent HEU. Spent fuel from large, power-producing reactors is extremely radioactive and holds tremendous heat, needing to cool for decades in large pools of water. These characteristics make its theft and weapons use a difficult prospect for any terrorist or proliferant state. Spent fuel from the smaller research reactors, on the other hand, can remain highly enriched, is small enough for easier transport, and often no longer radioactive enough to deter a terrorist from stealing it.[10]

Originally, the United States imported spent fuel from nuclear facilities it helped create abroad, but the Department of Energy's (DOE) Offsite Fuels Policy, or "Takeback" program, expired in 1988. Due to domestic fears about the safety of transporting and reprocessing spent fuel from abroad, Congress elected not to renew it; and it was not reinstated until 1996. With few other places either willing or able to receive spent fuel, many foreign reactors were forced to house it themselves. As a result, some spent fuel has been and is being stored in poorly secured facilities for much longer than intended, creating both environmental and security hazards.[11]

In 1978, the Department of Energy launched the Reduced Enrichment for Research and Test Reactors program (RERTR). Under RERTR, the United States explored ways to convert both domestic and U.S.-origin foreign research reactors to LEU fuel, which cannot be used to manufacture nuclear weapons.[12]

The USSR pursued its own conversion program in the 1970's but eliminated it for lack of funds in the 1980's.[13] After the fall of the Soviet Union caused a significant drop in security for many Russian-origin reactors, the U.S. and Russia signed a joint letter of intent in 1995, pledging cooperation in developing LEU for and converting Soviet-designed research reactors.[14]

The securing and removal of HEU at civilian facilities is the first imperative of the RERTR program. To this end, the United States reinstated the "Takeback" program for U.S.-origin HEU in 1996, agreeing to accept 22,700 irradiated fuel elements, HEU fuel that has been put into a reactor, from research facilities using U.S.-origin fuel.[15]

In order to encourage the conversion of research reactors to the use of LEU, the "Takeback" privilege is conditional: Only facilities that agree to convert to LEU by May 13, 2006, or whenever it becomes technically possible after that date, can participate.[16] After removal, the spent fuel is "downblended" -- mixing it with very low-enriched or un-enriched uranium -- to produce LEU that can be used to fuel commercial and research reactors, but not to make nuclear weapons.

The dire economic situation in Russia in the 1990's prevented a similar Russian comprehensive fuel reclamation effort; and the security at Russian origin reactors began to falter, creating a substantial proliferation risk. At first, the U.S. and Russia responded to identifiable proliferation threats through *ad hoc* efforts. For example, 1994's Operation Sapphire, a joint U.S.-Russian operation, removed 600 kg of HEU from a nuclear fuel fabrication facility in Kazakhstan.[17] Building from this initial success, the United States, working with Russia and the International Atomic Energy Agency (IAEA), launched the Russian Research Reactor Fuel Return (RRRFR) program in 1999 to facilitate the safe transport and disposal of Russian-origin fuels.[18] Only reactors that agree to either convert to LEU or shut down completely qualify for U.S. assistance.[19]

The first operation removed 48 kg of fresh HEU from a research facility in Vinca, Yugoslavia, in August 2002. The United States provided $2 to $3 million for the project. However, to make up for a gap in the U.S. government's legal authorities to conduct such an operation, a private nonprofit group, the Nuclear Threat Initiative, donated $5 million for an environmental cleanup project that was necessary in order to complete the arrangement.[20] The Vinca mission was followed by missions in Romania (September 2003) and Bulgaria (December 2003).[21]

Though Vinca and subsequent operations were hailed as successes, experts have criticized the delays from the large amount of bureaucratic process and inter-agency negotiation involved, as well as the need to seek funding from a non-governmental organization for a portion of the bill for the removal of the Yugoslav material. As leading nonproliferation experts Matthew Bunn, Anthony Wier, and John Holdren noted in a 2003 report,

> *"After September 11th, the world can no longer afford such [bureaucratic] delays or such reliance on private generosity. Instead, a single, flexible program should be established that collects the needed expertise, authority, and resources to negotiate removals of nuclear materials from facilities around the world in a single set of hands."*[22]

The RRRFR program also encountered problems due to the Russian reluctance to receive substantial amounts of spent fuel from foreign reactors, instead focusing on active HEU stockpiles only. A U.S.-Russian agreement regarding spent fuel appears to be finalized, however, and the spent fuel repatriation should move forward as intended.[23]

LEU Fuel Development

In addition to the removal of HEU, the research and development of LEU fuel rods for use in research reactors is an integral part of the RERTR program. Such development

is ongoing at various sites in both the United States and abroad at institutions such as the Argonne National Laboratory at the University of Chicago and Moscow's Bochvar Institute. As a result, improved LEU fuel rods should be certified for use in most reactors of U.S. origin in the next few years.[24] The Russians are also working on a fuel that, if it proves out, could make it possible to convert all Soviet-supplied research reactors to LEU.[25]

Many facilities, however, hesitate to convert to the new fuel right away due to fears of reduced reactor performance and a lack of incentives for immediate action. There is no benefit for those who convert their reactors sooner rather than later, hence many plan on using HEU right up to the 2006 deadline.[26] In addition, the current LEU fuel for conversion cannot be reprocessed, entailing additional storage and shipping costs after the U.S. takeback policy expires. Newer fuels that can be reprocessed as well as those that are compatible with all HEU reactors are still in development and are not expected to be ready until late 2006 to 2008, after the deadline for reclaiming spent fuel has passed.[27] In response to these problems, DOE is considering an extension of the deadline.[28] Reactions to the possible extension are mixed, however. Some claim that the extension is needed to prevent spent fuel storage problems due to unexpected delays in the LEU fuel development. Others argue that extending the deadline will remove the conversion incentive and reduce pressure on Russia to expedite its own takeback initiatives.[29]

Funding for RERTR and RRRFR Programs

Funding for RERTR and RRRFR is through the DOE Nonproliferation and International Security (NIS) program. RERTR also has received financial support for equipment purchases in the form of a one-time grant from the Nonproliferation and Disarmament Fund (NDF) administered by the Department of State, though this assistance was expended by FY 2003. Critics assert that RERTR and its components, particularly the LEU fuel development, have not been as effective as possible due to historically inadequate funding.[30] Recent years, however, have seen some improvement. For FY 2004, for example, Congress appropriated $3 million over the DOE budget request for RERTR, providing RERTR $8.86 million; the budget request for RRRFR was fully funded at $9.691 million.[31] For FY 2005, the Department of Energy has requested a funding increase of 12% for RERTR and 1% for RRRFR for overall requests of $9.965 million and $9.866 million respectively. These are significant increases but they pale in comparison to the size and urgency of the task of preventing the HEU from getting into the hands of terrorist or criminal organizations.

Need for Accelerated Program to Secure and Remove HEU at Vulnerable Sites: A "Global Cleanout" Program

Despite the achievements of these programs, the current estimate for securing the bulk of HEU is 2008.[32] In addition, DOE Deputy Administrator for Nuclear Nonproliferation Paul Longsworth announced a schedule to recover and repatriate all Soviet origin HEU fuel by the end of FY 2005.[33] In order for this goal to be met, however, an extraordinary acceleration is necessary: the program targets 22 sites for cleanout within the next two years when a total of only three cleanouts have been accomplished since the program was established in 1999.[34] In addition, DOE's FY 2005 budget documents fail to provide any evidence of the funding or programmatic focus that would be necessary for such an expedited program. Moreover, conditions within the target states and institutions can

present substantial barriers to achieving the goal. Unforeseeable political and pragmatic contingencies can cause substantial delays in removal operations.

Furthermore, some facilities using HEU are archaic, anachronistic, and ultimately unnecessary. Instead of the conversion of these reactors to LEU, some experts call for efforts to close those that are not absolutely necessary for the industrial or academic community, with any remaining institutions being expected to provide access to their reactors to enable scientists at closed facilities to continue their research.[35]

Providing the flexibility to provide adequate incentives for institutions to participate is key to overcoming many of the systemic problems described above. These incentives can be as simple as assisting in the cleanup process and helping displaced scientists and personnel to find employment.[36] The incentives involved in previous removal operations varied widely. For example, the United States agreed to give Kazakhstan $20 to $30 million additional funds for other projects in return for relinquishing the material in Operation Sapphire. Only $4 million for the purchase of new LEU fuel, however, sufficed to convince Romanian authorities to cooperate with HEU removal in September 2003.[37]

Russian reactors other than its research reactors also give rise to concerns; Russia continues to use HEU fuel in nuclear icebreakers and has announced a proposal to manufacture new floating reactors to be based on the icebreaker design. Production reactors for medical isotopes that use HEU are also proliferation risks.[38] Without clarifying the ultimate aim of the elimination of the unnecessary use of weapons-usable materials, proliferation risks from icebreakers, floating reactors, and medical production facilities will remain despite any success the RERTR and RRRFR programs may have.

Furthermore, RRRFR is ultimately limited to Russian origin material and has primarily focused on Eastern Europe and the FSU. Proliferation threats exist worldwide, however, and are not limited to Russian-origin materials. In the case of about 18 tons of U.S.-origin HEU remaining in foreign possession, the current DOE "Takeback" program does not even address the bulk of the material—despite the DOE Inspector General's observation that "all of the HEU … represents a security concern to the United States."[39]

This situation recently let IAEA Director Dr. Mohammed ElBaradei to warn, "Irrespective of whether it's Russian … [or] American, we need to clean up the mess, … clean up the potential threat. My suggestion to [President Bush] is that we need a good plan to clean up all this nuclear weapons-usable material that is all over the place,"

The nonproliferation community has called for and Congress is considering a "Global Cleanout" program that targets all vulnerable weapons-usable materials for removal and protection around the world.[40] In the Energy and Water Development Appropriations bill last year, the Senate proposed a $20 million add-on "to reinvigorate initiatives focused on removing nuclear weapons –usable materials from vulnerable sites around the word."[41] Ultimately, however, the additional funding was cut to $5 million in conference.[42]

Others in Congress are, nevertheless, pressing ahead. They realize that a focused effort provided with adequate funding, the necessary authorities, and high-level support are essential needs for the success of a global cleanout program. Experts have estimated that about $40 million per year is required for a satisfactory cleanup of the most vulnerable

HEU stockpiles.[43] That is the amount authorized to be appropriated in bills introduced by Senator Diane Feinstein (S. 2310) on April 8, 2004, and Rep. Adam Schiff (H.R. 4212) on April 22, 2004, and a legislative proposal announced by Rep. Curt Weldon,—all of which include the elements identified as necessary for a successful effort.

II. Recent Legislation

- Section 3611 of the H.R. 1588, the National Defense Authorization Act for Fiscal Year 2004, as passed by the House of Representatives on May 22, 2003, would have authorized the establishment in the Department of State of a "global cleanout" program outside the former Soviet Union. Under section 2305 of that same measure, funding would have come from a discretionary transfer by the Secretary of Defense of "prior year Cooperative Threat Reduction funds to the State Department's Nonproliferation and Disarmament fund. This provision was dropped in conference.
- S.2031, introduced by Senator Feinstein (D-CA) on April 8, 2004, with Senators Nelson (D-FL) and Reed (D-RI), and H.R. 4212, introduced by Rep. Schiff (D-CA) on April 22, 2004, with Rep. Turner (D-TX), establish in the Department of Energy a "global cleanout" task force (Task Force on Nuclear Material Removal), headed by a presidential appointee and having broad authorities, and authorize the appropriation of $40 million.

III. Obstacles

- Some countries may not have sufficient financial resources to convert research reactors to LEU fuels without assistance or incentives towards that end.
- At some facilities, records regarding nuclear material can be lacking, inaccurate, or even non-existent.
- Citizens in the United States and other countries with reprocessing facilities have resisted importing nuclear material for down blending because of environmental concerns.
- Larger foreign policy issues have at times hamstrung cooperation between the United States and Russia. For example, the Russian role in the Iranian nuclear program slowed progress in the late 1990's.
- Many reactor operators in both the United States and Russia have resisted conversion to LEU because of technical concerns about the viability of new fuels to maintain the same level of performance. However, new LEU fuels promise to perform fully adequately.
- Authority for the administration of funds and programs related to the removal of nuclear materials from vulnerable locations around the world are scattered among a variety of government agencies; and in some cases, the statutory authority to address the concerns of the facility involved in order induce it to relinquish its HEU may be lacking.

IV. Q&A

Q: Why should the United States bear a significant burden in this kind of effort when much of the problem is a legacy of the Soviet Union and other nations are also at risk of a terrorist attack?
A: Multilateral cooperation is highly desirable in any situation that cuts across political and cultural boundaries and should certainly be pursued. Nevertheless, we cannot afford to delay a global cleanout—at the risk of a catastrophic terrorist attack against us at the cost of hundreds of thousands of lives—while the attempt to get more of the international community on board proceeds.

Q: Why has United States not already made a major effort to address the problems of fissile materials at civilian research institutions?
A: The RERTR program began in earnest in 1996 and has made significant strides since its inception. Prior to the events of September 11th, however, anti-proliferation policies mainly focused on securing the large arsenal of the Soviet Union. With a newfound focus on the non-state actors, however, experts realize how dangerous smaller stockpiles of nuclear material outside of military control can be. In any event, it is imperative that we secure these materials now.

Q: What are High Enriched Uranium (HEU) and Low Enriched Uranium (LEU)?
A: The International Atomic Energy Agency defines HEU as uranium with a concentration of the isotope U^{235} of 20% or more. Ninety percent U^{235} is considered weapons grade, but all HEU is usable in nuclear weapons. LEU is Uranium with a U^{235} concentration below 20% and cannot sustain the chain reaction necessary for a nuclear explosion.

V. Talking Points

- As shown by the events of September 11th, terrorists attack where we are most vulnerable. If we allow nuclear material to remain vulnerable to theft, it is only a matter of time until terrorists obtain such material and use it against the United States, its allies, or a U.S. presence overseas.
- Terrorists and hostile states are already trying to acquire material for nuclear devices and have significant financial resources to use for this purpose. Osama Bin Laden has called the acquisition of WMD a "religious duty," and credible intelligence points to a significant effort to this end. Vulnerable HEU stockpiles should be secured as soon as possible.
- Unsecured fissile material is not only a danger to the United States and its allies but to the world at large. U.S. national security requires the establishment of a fast-paced, focused task force to ensure that poorly guarded HEU and plutonium retrieved or adequately protected—so as to be placed beyond the reach of al Qaeda or other terrorist or criminal groups. Such a task force must have:
    - Sufficient funding.
    - The full range of authorities necessary to complete its work.
    - A requirement to prioritize the locations at which material removal or security upgrading must be carried out.

- High-level (preferably White House) leadership so that its activities receive the broad support of the various programs and agencies that can assist in the effort.

VI. Factoids

- An estimated 20 tons of HEU, enough to build more than 1,500 nuclear weapons is housed in civilian research reactors and institutions worldwide.
- There are at least 130 operating research reactors fueled with HEU in more than 40 countries.
- HEU from a research reactor almost gave Iraq nuclear capability before the First Gulf War.
- A 10-kiloton bomb, if detonated in downtown Manhattan, could kill half a million people and force evacuation of the island. The bomb dropped on Hiroshima on August 6, 1945, was about 15 kilotons.

VII. Applicable Treaties, Legislation, and Other International Agreements

- Not Applicable.

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[1] 18 tons of U.S. origin HEU was in foreign possession in 1993, as of October 2003, only 1,100 kg. were recovered – See: Office of Inspector General, *Audit Report: Recovery of Highly Enriched Uranium Provide to Foreign Countries*, Department of Energy, DOE/IG-0638, February 2004, p. 2; the amount exported by the Soviet Union is not known.

[2] The estimate includes spent and fresh HEU fuel as well as any material currently within reactor cores. Matthew Bunn, "Securing Nuclear Warheads and Materials: Converting Research Reactors," from the Nuclear Threat Initiative (NTI) website, accessed at: http://nti.org/e_research/cnwm/securing/convert.asp.

[3] Matthew Bunn and Anthony Wier, "Faster Pace Needed on Uranium Removal," *Boston Globe*, September 23, 2003, accessed at www.nexis.com.

[4] Matthew Bunn, *op. cit.*, note 2. .

[5] Active fuel is HEU that has not been placed in the reactor. Spent fuel is HEU that has gone through the reactor and been removed.

[6] Oleg Bukharin, Christopher Ficek, and Michael Roston, "U.S.-Russian Reduced Enrichment for Research and Test Reactors (RERTR) Cooperation," *RANSAC Policy Update*, Summer 2002, p. 1, accessed at: http://www.ransac.org/PDFFrameset.asp?PDF=policy_update2002.pdf; and testimony of Matthew Bunn before the Subcommittee on National Security, Committee on Government Reform, House of Representatives, September 24, 2002, accessed at: http://bcsia.ksg.harvard.edu/BCSIA_content/documents/Preventing_Nuclear_Terrorism.pdf.

[7] Oleg Bukharin *et al., op. cit.*, note 6, p. 2.

[8] Matthew Bunn, "The Next Wave: Urgently Needed New Steps to Control Warheads and Fissile Material," Harvard University Project on Managing the Atom and the Non-Proliferation Project at the Carnegie Endowment for Peace, April 2000, p. 16.

[9] *Ibid.*, p. 12.

[10] Matthew Bunn, *op. cit.*, note 2.

[11] Iain G. Ritchie, "Growing Dimensions: Spent Fuel Management at Research Reactors," IAEA Issue Paper, 1997, accessed at: http://www.iaea.org/Publications/Magazines/Bulletin/Bull401/article7.html#author.

[12] HEU is defined by the IAEA as Uranium composed of greater than 20% U^{235}; LEU is composed of less than 20% U^{235}. LEU still presents serious dangers and can produce a chain reaction for a nuclear explosion, but nuclear devices using LEU produce significantly less yield and require much more material than those using HEU. An LEU weapon would be substantially larger than an HEU weapon and produce a weaker explosion, making it less than ideal for use by terrorists or rogues states. Dangers from LEU are still an issue that must be addressed, but this is outside the scope of this study. Overall, relative risk is lower with LEU than HEU.

[13] Oleg Bukharin *et. al., op. cit.*, note 6, p. 5.

[14] "Agreement between the U.S. Department of Energy and The Federal Nuclear and Radiation Safety Authority of the Russian Federation for Cooperation on Enhancing the Safety of Russian Nuclear Fuel Cycle Facilities and Research Reactors," accessed at: http://www.nti.org/db/nisprofs/russia/fulltext/gcc/gcc17.htm.
[15] Mike Nartker, "U.S. Considers Extending 'Takeback' Policy of Spent Fuel from Foreign Research Reactors, *Global Security Newswire*, Dec. 16, 2003, accessed at: http://www.nti.org/d_newswire/issues/2003_12_16.html#F1F2893B.
[16] Matthew Bunn, *op. cit.*, note 2.
[17] "PBS Frontline Loose Nukes Timeline: Operation Sapphire," accessed at http://www.pbs.org/wgbh/pages/frontline/shows/nukes/timeline/tl07.html.
[18] Office of Defense Nuclear Nonproliferation, "Russian Research Reactor Fuel Return – Fact Sheet," National Nuclear Security Administration, accessed at http://www.nnsa.doe.gov/na-20/rrRRRFR.shtml
[19] Matthew Bunn and Anthony Weir, "Securing Nuclear Warheads and Materials: Removing Materials from Vulnerable Sites," from the Nuclear Threat Initiative website, January 12, 2004, accessed at http://nti.org/e_research/cnwm/securing/vulnerable.asp.
[20] Office of the Spokesman, "Fact Sheet-Project Vinca," Department of State, August 23, 2002, accessed at: http://www.state.gov/r/pa/prs/ps/2002/12962.htm.
[21] "U.S. Nonproliferation Efforts Continue as Nuclear Material is Removed from Bulgaria," Press Release from the National Nuclear Security Administration, U.S. Department of Energy, Dec. 24, 2003.
[22] Matthew Bunn, Anthony Wier, and John P. Holdren, *Controlling Nuclear Warheads and Materials: A Report Card and Action Plan* (Washington D.C.: Nuclear Threat Initiative and the Project on Managing the Atom, Harvard University, March 2003), p. 142.
[23] Remarks by Under Secretary of Energy for Nuclear Security Linton Brooks during the NNSA Budget Rollout presentation, February 2., 2004.
[24] Armando Travelli, "Status and Progress of the RERTR Program in the Year 2002," presented at the 2002 International Meeting on Reduced Enrichment for Research and Test Reactors, Nov. 3-8, 2002, p. 8.
[25] *Ibid.*
[26] Mike Nartker, *op. cit.*, note 15.
[27]Matthew Bunn, *op. cit.*, note 2.
[28] Mike Nartker, *op. cit.*, note 15.
[29] *Ibid.*
[30] Oleg Bukharin *et. al.*, *op. cit.*, note 6, p. 17.
[31] The DOE FY 2004 budget request for RERTR was $5.86 million – see William Hoehn, "Update on Activity in the 108th Congress Affecting U.S.-Former Soviet Union Cooperative Nonproliferation Programs," November 4, 2003, p. 48. Accessed at: http://www.ransac.org/Documents/110403legupdate.pdf. Congress appropriated $8.86 million – see "Department of Energy Budget Request for FY 2005," February 2, 2004, p. 432.
[32] The 2008 estimate came from Remarks by U.S. Secretary of Energy Spencer Abraham at the announcement of a Joint Statement with Russian Atomic Minister Rumyantsev on Nov. 7, 2003.
[33] Peter Baker, "U.S.-Russia Team Seizes Uranium at Bulgaria Plant; Material Was Potent Enough for Bomb," Washington Post, Dec. 24, 2003, A10.
[34] Matthew Bunn, *op. cit.*, note 19.
[35] Tomihoro Taniguchi, "Opening Address at the International Conference on Research Reactor (Utilization, Safety, Decommissioning, Fuel and Waste Management)," 10 Nov., 2003. Accessed at: www.iaea.org.
[36] Matthew Bunn, "Denying Nuclear Weapons to Terrorists," presentation for the Center for Arms Control and Nonproliferation Congressional Lunch Briefing, January 27, 2004.
[37] "Matthew Bunn" *op. cit.*, note 19.
[38] "Matthew Bunn" *op. cit.*, note 2.
[39] Office of the Inspector General, *op. cit.*, note 1, p. 2.
[40] Matthew Bunn, *op. cit.*, note 19.
[41] Committee on Appropriation report on S. 1424 (S. Rep. No. 108-105), p. 116.
[42] "CNWM Legislative Update: 2004 Energy and Water Appropriations Act," accessed at: Conference Report to accompany F.R. 2754 (H. Rept. No. 108-357, p. 162.