

**GAO**

Report to the Chairman and Ranking  
Member, Subcommittee on Energy and  
Water Development, Committee on  
Appropriations, House of  
Representatives

December 2010

**NUCLEAR  
NONPROLIFERATION**

**Comprehensive U.S.  
Planning and Better  
Foreign Cooperation  
Needed to Secure  
Vulnerable Nuclear  
Materials Worldwide**



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Highlights of [GAO-11-227](#), a report to the Chairman and Ranking Member, Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives

## Why GAO Did This Study

In April 2009, President Obama announced an international initiative to secure all vulnerable nuclear materials worldwide within 4 years. Nonproliferation programs administered by the National Nuclear Security Administration (NNSA) are working to secure nuclear materials in Russia and other countries. GAO assessed (1) U.S. governmentwide efforts to implement the President's 4-year nuclear material security initiative; (2) the status and challenges, if any, of NNSA's nuclear security programs in Russia; and (3) NNSA efforts to secure nuclear materials in countries other than Russia. To address these issues, GAO analyzed U.S. nuclear security strategies and plans and interviewed U.S. and Russian government officials. This report summarizes the findings of GAO's classified report on securing nuclear materials worldwide.

## What GAO Recommends

GAO suggests that Congress consider extending the deadline for NNSA to complete Material Protection, Control, and Accounting (MPC&A) program activities in Russia. GAO recommends that the Department of Energy (DOE) and NNSA take several actions regarding three nonproliferation program efforts in Russia, such as clarifying the remaining scope and costs of MPC&A work in Russia. GAO also recommends that the National Security Council (NSC) lead interagency development of a more detailed implementation plan for the President's 4-year initiative. DOE and NNSA agreed with the recommendations. NSC did not comment on GAO's recommendations.

View [GAO-11-227](#) or key components. For more information, contact Gene Aloise at (202) 512-3841 or [aloisee@gao.gov](mailto:aloisee@gao.gov).

# NUCLEAR NONPROLIFERATION

## Comprehensive U.S. Planning and Better Foreign Cooperation Needed to Secure Vulnerable Nuclear Materials Worldwide

### What GAO Found

NSC officials have approved a governmentwide strategy for the President's 4-year global nuclear material security initiative that describes the scope and objectives of the interagency effort and identifies the main efforts by U.S. agencies and programs to support the initiative. However, this interagency strategy lacks specific details concerning how the initiative will be implemented, including the identity of vulnerable foreign nuclear material sites and facilities to be addressed, agencies and programs responsible for addressing each site, planned activities at each location, potential challenges and strategies for overcoming those obstacles, anticipated timelines, and cost estimates. As a result, key details associated with the initiative are unclear, including its overall estimated cost, time frame, and scope of planned work.

Three NNSA nuclear nonproliferation programs GAO reviewed—the MPC&A program, the Materials Consolidation and Conversion (MCC) program, and the Global Threat Reduction Initiative (GTRI)—have made varying degrees of progress in securing Russian nuclear warheads and materials. While the MPC&A program has made considerable progress securing Russia's nuclear warhead and material facilities, the MCC and GTRI programs have had more limited success achieving their objectives in Russia. Moreover, the future of these efforts in Russia is unclear because of questionable high-level Russian political commitment to nuclear security cooperation with the United States. Each of these three programs also faces implementation challenges. The MPC&A program, in particular, faces challenges in successfully completing upgrades against insider and outsider threats at some Russian nuclear material facilities and in transitioning responsibility to Russia for sustaining MPC&A systems. Because of the time required to address these challenges, NNSA is unlikely to meet a deadline under current U.S. law requiring Russia to assume sole responsibility for sustaining MPC&A by January 1, 2013, and MPC&A program activities will need to continue in Russia beyond the statutory deadline.

In addition to its efforts in Russia, NNSA is working with other countries on issues related to the security of weapon-usable nuclear materials. In two countries believed to have large nuclear material stockpiles—China and India—political sensitivities have limited NNSA's efforts in both nations to the relatively noncontroversial exchange of nuclear security best practices, training, and demonstration projects instead of implementing MPC&A activities directly at nuclear sites. NNSA is also seeking to accelerate the removal of weapon-usable nuclear materials from other priority countries through the GTRI program, including key countries that made new commitments at the April 2010 Nuclear Security Summit to relinquish or reduce their weapon-usable nuclear material stockpiles. In particular, NNSA officials reported progress in negotiations with several nations—including Ukraine and South Africa—following the summit for the removal of some highly enriched uranium located in those countries.

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## Abbreviations

CAEA	China Atomic Energy Authority
CTR	Cooperative Threat Reduction
DOD	Department of Defense
DOE	Department of Energy
GTRI	Global Threat Reduction Initiative
HEU	highly enriched uranium
IAEA	International Atomic Energy Agency
Kg	kilogram
LEU	low-enriched uranium
MCC	Material Consolidation and Conversion
MNSR	Miniature Neutron Source Reactor
MOD	Ministry of Defense
MOM	MPC&A operations monitoring
MPC&A	Material Protection, Control, and Accounting
NMIP	Nuclear Materials Information Program
NNSA	National Nuclear Security Administration
NRC	Nuclear Regulatory Commission
NSC	National Security Council
ODNI	Office of the Director of National Intelligence
SRF	Strategic Rocket Forces
SSNM	special strategic nuclear material
UN	United Nations
WMD	weapons of mass destruction

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G A O

Accountability \* Integrity \* Reliability

United States Government Accountability Office  
Washington, DC 20548

December 15, 2010

The Honorable Peter J. Visclosky  
Chairman  
The Honorable Rodney P. Frelinghuysen  
Ranking Member  
Subcommittee on Energy and Water Development  
Committee on Appropriations  
House of Representatives

One of the most serious threats facing the United States and other countries is the possibility that other nations or terrorist organizations could steal a nuclear warhead or nuclear weapon-usable materials from poorly secured stockpiles in various locations around the world.<sup>1</sup> Terrorists or countries seeking nuclear weapons could use as little as 25 kilograms (Kg) of weapon-grade highly enriched uranium (HEU) or 8 Kg of plutonium to construct a nuclear weapon. To address this threat and related nuclear proliferation concerns, the Department of Energy's (DOE) National Nuclear Security Administration (NNSA) implements more than 20 nonproliferation programs worldwide.<sup>2</sup> Among other things, these programs include efforts to secure nuclear warheads; protect, consolidate, and dispose of weapon-usable nuclear materials and radiological sources;<sup>3</sup> reduce the risks of nuclear smuggling; research and develop nonproliferation technologies; redirect weapons of mass destruction (WMD) expertise to peaceful research; and enhance international export

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<sup>1</sup>Weapon-usable nuclear materials are highly enriched uranium, uranium-233, and any plutonium containing less than 80 percent of the isotope plutonium-238. Such materials are also often referred to as fissile materials or strategic special nuclear materials.

<sup>2</sup>NNSA was created by the National Defense Authorization Act for Fiscal Year 2000, Pub. L. No. 106-65 (1999). It is a separate semiautonomous agency within DOE, with responsibility for the nation's nuclear weapons, nonproliferation, and naval reactors programs.

<sup>3</sup>Radiological sources include radioactive material, such as cobalt-60, cesium-137, and strontium-90. While these materials cannot be used to create a nuclear weapon, they could be fabricated into a so-called dirty bomb or device to disperse radioactive materials.

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controls and International Atomic Energy Agency (IAEA) nuclear safeguards.<sup>4</sup>

Many of these programs were initiated in the early 1990s, following the dissolution of the Soviet Union, and have focused principally on improving nuclear security in Russia because of the large size of its nuclear complex and its vast nuclear material and weapons stockpiles. In 2005, the U.S. and Russian Presidents issued a joint statement in Bratislava, Slovakia, on nuclear security cooperation between both countries, including accelerating security improvements to Russian nuclear material and warhead storage sites. Some NNSA programs are winding down as work is completed in Russia—such as the program to end Russian production of weapon-grade plutonium—while others are planning to continue indefinitely. A major area of continuing focus is ensuring the long-term sustainability of U.S.-funded security improvements at nuclear facilities in Russia and other countries as U.S. assistance phases out. Congress has required that the NNSA program to improve Russian nuclear material and warhead security—known as the Material Protection, Control, and Accounting (MPC&A) program<sup>5</sup>—conclude efforts in that country by the beginning of 2013, with Russia assuming responsibility for sustaining the program at that time.<sup>6</sup>

In recent years, NNSA nuclear nonproliferation programs have focused increasing attention on the security of weapon-usable nuclear materials in countries beyond Russia and the former Soviet states. For example, the Global Threat Reduction Initiative (GTRI) was created in 2004 to consolidate and accelerate NNSA efforts to secure and recover nuclear and radiological materials overseas and convert HEU-fueled research

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<sup>4</sup>IAEA is an independent international organization based in Vienna, Austria, that is affiliated with the United Nations and has the dual mission of promoting the peaceful uses of nuclear energy and verifying that nuclear technologies and materials intended for peaceful purposes are not diverted to weapons development efforts.

<sup>5</sup>The MPC&A program provides modern nuclear security systems to facilities in Russia and other countries that, among other things, include physical protection systems, such as fencing and video surveillance equipment; material control systems, such as tamper-indicating seals for nuclear material storage containers and other access control equipment; and material accounting systems, such as nuclear measurement equipment and computerized databases, to inventory and track nuclear materials.

<sup>6</sup>Bob Stump National Defense Authorization Act for Fiscal Year 2003, Pub. L. No. 107-314, § 3156, 116 Stat. 2458, 2739-2740 (codified at 50 U.S.C. § 2343(b)(1) (2006)). In March 2010, the Department of Energy sent a request to Congress requesting that the MPC&A program be allowed to work in Russia beyond this deadline.

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reactors in dozens of countries around the world. The NNSA programs have engaged more than 100 countries, and are seeking to increase nuclear security work with several countries where there has been limited prior cooperation. In fiscal year 2009, NNSA spent over \$2 billion on its nuclear nonproliferation programs.

The Obama administration has proposed to further strengthen and expand U.S. efforts to reduce nuclear proliferation risks and improve nuclear security worldwide. As Congress directed, President Obama created a position within the National Security Council (NSC)—Special Assistant to the President and Coordinator for Weapons of Mass Destruction—to serve as the central organizer for U.S. efforts to improve nuclear security and prevent nuclear terrorism worldwide.<sup>7</sup> In April 2009, in a speech in Prague, Czech Republic, President Obama announced a new international effort to secure all vulnerable nuclear material around the world within 4 years. NSC staff have taken the lead in coordinating efforts among different federal agencies that will contribute to this 4-year nuclear material security initiative. In addition, leaders of 47 nations—including Russia, China, India, and Pakistan—endorsed this 4-year nuclear material security goal in a communiqué from a Nuclear Security Summit hosted by the President in April 2010. The summit work plan accompanying the communiqué committed countries to voluntarily take steps to improve nuclear security by bringing international nuclear agreements into force, improving nuclear security standards, and exchanging information on nuclear security best practices. Senior representatives from each government will meet in December 2010 to evaluate progress toward the summit’s goals, and a follow-on summit is planned for 2012 in South Korea.

We have performed several reviews of NNSA nuclear nonproliferation programs, as well as those implemented by the Department of State (State) and Department of Defense (DOD), and found a number of limitations, management weaknesses, and other challenges facing these efforts. For instance, in 2005, we assessed the DOD and DOE strategies guiding their nuclear nonproliferation programs and efforts to coordinate DOE, DOD, and State nonproliferation activities.<sup>8</sup> We found that there was no overall strategy integrating the threat reduction and nuclear

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<sup>7</sup>50 U.S.C. § 2931 (2006).

<sup>8</sup>GAO, *Weapons of Mass Destruction: Nonproliferation Programs Need Better Integration*, [GAO-05-157](#) (Washington, D.C.: Jan. 28, 2005).

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nonproliferation programs of these agencies. We also found that coordination of DOD, DOE, and State border security programs could be improved. To that end, we recommended that NSC issue clear guidance for the coordination of border security programs, as it has done with programs to employ biological weapons scientists. We also recommended that the Secretaries of Defense and Energy develop an integrated plan for improved coordination of all U.S. threat reduction and nonproliferation programs. DOE concurred with the report and our recommendations. DOD concurred with the need for better integration of nonproliferation and threat reduction programs but did not specify whether it agreed about the need for an integrated plan, while neither State nor NSC commented on the report.

This report responds to your request that we conduct a review of U.S. nuclear nonproliferation strategies.<sup>9</sup> Specifically, our objectives were to assess (1) U.S. governmentwide efforts to implement the President's initiative to secure all vulnerable nuclear materials worldwide within 4 years; (2) the status and challenges, if any, of NNSA's nuclear security programs in Russia; and (3) NNSA efforts to secure nuclear materials in countries other than Russia. In September 2010, we reported to you on the results of our work in a classified report. This report summarizes certain aspects of our classified report.

To address these objectives, we obtained and analyzed official documentation, including an interagency document describing the strategy for improving security of nuclear materials worldwide, an international nuclear security status report, NNSA's plan for advancing the President's initiative to secure vulnerable nuclear materials around the world within 4 years, materials on MPC&A program efforts in Russia, and other information on NNSA's efforts to secure nuclear materials in countries other than Russia. We also interviewed senior U.S. officials at NSC, NNSA, DOD, State, and the Office of the Director of National Intelligence (ODNI) and representatives of the intelligence community. We also interviewed senior Russian officials who have worked with the NNSA nuclear nonproliferation programs, including officials from the Russian Ministry of Foreign Affairs; the Russian State Corporation for Atomic Energy (Rosatom); the Russian Ministry of Defense (MOD); Russian Federal

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<sup>9</sup>In a separate report to be issued early next year, we plan to assess NNSA's financial support for its nonproliferation programs and evaluate the extent to which nonproliferation programs are being coordinated across the U.S. government.



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Customs Service; and Russian Federal Service of Environmental, Technological, and Nuclear Supervision (Rostekhnadzor), which provides oversight of Russia’s civilian nuclear facilities. Additional details on our scope and methodology can be found in appendix I.

We conducted this performance audit from April 2009 to December 2010 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

In 1991, Congress authorized DOD to establish the Cooperative Threat Reduction (CTR) program—the initial program of nuclear security assistance to Russia and the former Soviet states and the origin of some of the NNSA programs—to help Russia, Ukraine, Belarus, and Kazakhstan secure and protect former Soviet nuclear weapons.<sup>10</sup> In 1992, the United States and Russia signed a CTR “umbrella agreement” that established an overall legal framework for U.S. nuclear security assistance to Russia.<sup>11</sup> The United States and Russia completed 7-year extension protocols for the umbrella agreement in 1999 and 2006, and similar CTR umbrella agreements have been concluded with other former Soviet states.

In 1993, DOE began implementing some CTR program activities funded by DOD, principally the MPC&A effort to help secure weapon-usable nuclear materials in the former Soviet Union. In 1995, DOE established its own MPC&A program with its own funding, and in 1996, funding for the

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<sup>10</sup>In 1991, Congress passed the Soviet Nuclear Threat Reduction Act of 1991, popularly referred to as the Nunn-Lugar Act, authorizing U.S. threat reduction assistance to the former Soviet Union, because of concerns about the safety and security of Soviet nuclear weapons. Pub. L. No. 102-228, 105 Stat. 1691 (1991) (see 22 U.S.C. § 2551 note). The legislation authorized funding to assist the former Soviet Union with its efforts to (1) destroy nuclear, chemical, and other weapons; (2) transport, store, disable, and safeguard weapons in connection with their destruction; and (3) establish verifiable safeguards against the proliferation of such weapons.

<sup>11</sup>The official title of the umbrella agreement is the Agreement Between the United States of America and the Russian Federation Concerning the Safe and Secure Transportation, Storage and Destruction of Weapons and the Prevention of Weapons Proliferation.

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MPC&A program shifted directly from DOD to DOE.<sup>12</sup> The scope of DOE nonproliferation programs further expanded with DOE assuming responsibility for the CTR effort to shut down Russia's three remaining plutonium production reactors,<sup>13</sup> initiating efforts to detect nuclear smuggling in Russia and other countries,<sup>14</sup> and undertaking programs to redirect WMD scientific expertise through cooperative peaceful research projects.<sup>15</sup> In October 1999, DOE's nonproliferation programs were realigned in the Office of Defense Nuclear Nonproliferation with the creation of NNSA. This office consists of six line offices under which various nuclear nonproliferation programs are implemented (see fig. 1).

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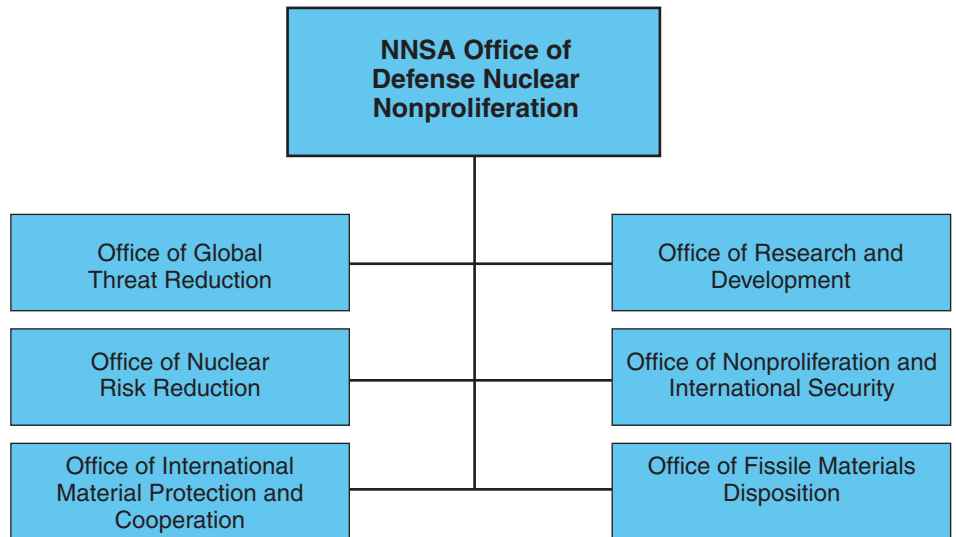
<sup>12</sup>For information on the MPC&A program, see GAO, *Nuclear Nonproliferation: Progress Made in Improving Security at Russian Nuclear Sites, but the Long-term Sustainability of U.S.-Funded Security Upgrades Is Uncertain*, [GAO-07-404](#) (Washington, D.C.: Feb. 28, 2007).

<sup>13</sup>Further information about this program can be found in GAO, *Nuclear Nonproliferation: DOE's Effort to Close Russia's Plutonium Production Reactors Faces Challenges, and Final Shutdown Is Uncertain*, [GAO-04-662](#) (Washington, D.C.: June 4, 2004).

<sup>14</sup>For previous GAO reports on these efforts, see GAO, *Combating Nuclear Smuggling: Corruption, Maintenance, and Coordination Problems Challenge U.S. Efforts to Provide Radiation Detection Equipment to Other Countries*, [GAO-06-311](#) (Washington, D.C.: Mar. 14, 2006), and *Preventing Nuclear Smuggling: DOE Has Made Limited Progress in Installing Radiation Detection Equipment at Highest Priority Foreign Seaports*, [GAO-05-375](#) (Washington, D.C.: Mar. 31, 2005).

<sup>15</sup>For information on NNSA's WMD scientist redirection programs, see GAO, *Nuclear Nonproliferation: DOE's Program to Assist Weapons Scientists in Russia and Other Countries Needs to Be Reassessed*, [GAO-08-189](#) (Washington, D.C.: Dec. 12, 2007); *Nuclear Nonproliferation: DOE's Efforts to Assist Weapons Scientists in Russia's Nuclear Cities Face Challenges*, [GAO-01-429](#) (Washington, D.C.: May 3, 2001); and *Nuclear Nonproliferation: Concerns with DOE's Efforts to Reduce the Risks Posed by Russia's Unemployed Weapons Scientists*, [GAO/RCED-99-54](#) (Washington, D.C.: Feb. 19, 1999).

**Figure 1: NNSA Office of Defense Nuclear Nonproliferation**



Source: NNSA.

The principal NNSA nuclear nonproliferation offices involved in securing and eliminating nuclear warheads and materials in foreign locations include the following:

- The Office of International Material Protection and Cooperation. This office administers the MPC&A program through four suboffices: (1) the Office of Nuclear Warhead Protection, which, in cooperation with DOD, works with the Russian MOD, including the 12th Main Directorate, the Russian organization responsible for nuclear munitions; Navy; and Strategic Rocket Forces (SRF) to improve security of Russian warheads; (2) the Office of Weapons Material Protection, which enhances MPC&A systems at nuclear weapons material facilities controlled by Rosatom; (3) the Office of Material Consolidation and Civilian Sites, which conducts MPC&A upgrades at civilian nuclear facilities in Russia, supports conversion of Russian HEU to low-enriched uranium (LEU), consolidates nonweapons Russian HEU and plutonium to fewer locations, and cooperates with other key countries on nuclear security; and (4) the Office of National Infrastructure and Sustainability, which is working with Russia and other countries where MPC&A security improvements have been made to develop and strengthen national-level infrastructures that can sustain MPC&A systems over the long term.

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- The Office of Global Threat Reduction. This office implements the GTRI program, which protects, removes, and eliminates the use of nuclear and radiological materials located at civilian sites worldwide.<sup>16</sup> GTRI subprograms work in the United States and internationally to convert research reactors from use of HEU to LEU, remove and dispose of excess nuclear and radiological materials, and protect high-priority nuclear and radiological sources from theft. The GTRI program has removed all significant amounts of HEU from 17 countries and Taiwan, including removals from Chile, Libya, Romania, Taiwan, and Turkey, since the President's April 2009 Prague speech; removed or assisted in the disposal of more than 2,800 Kg of HEU and plutonium from 39 countries; and assisted in the conversion from the use of HEU to LEU or verified the shutdown of 72 HEU research reactors around the world, including reactors in the Czech Republic, Ukraine, South Africa, Uzbekistan, and Vietnam.
  - The Office of Nuclear Risk Reduction. This office has led work with Russia under the Elimination of Weapons Grade Plutonium Production program to facilitate the permanent shutdown of the three remaining Russian weapon-grade plutonium production reactors—which collectively produced approximately 1.2 metric tons of weapon-grade plutonium each year—by refurbishing existing and constructing new replacement fossil-fuel-based sources of power. The last reactor was shut down in April 2010, and the program is to come to an end in fiscal year 2011.
  - The Office of Fissile Materials Disposition. This office has two major missions: the disposition of surplus U.S. weapon-grade HEU, and the elimination of U.S. and Russian plutonium no longer needed for defense programs. Under this latter mission, the fissile material disposition program will assist Russia in modifying reactors that will dispose of 34 metric tons of Russian weapon-grade plutonium. In April 2010, the United States and Russia concluded a revised agreement laying the groundwork for both countries to begin this process by 2018.

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<sup>16</sup>There is a geographic division of labor between MPC&A and GTRI efforts to secure foreign nuclear material. The MPC&A program addresses sites in foreign countries including Russia, Belarus, Kazakhstan, Ukraine, Uzbekistan, China, and India. GTRI addresses security at civilian research reactors and related facilities utilizing nuclear weapon-usable materials in all other countries that are not considered high-income. For an assessment of the GTRI effort, see GAO, *Nuclear Nonproliferation: National Nuclear Security Administration Has Improved the Security of Reactors in Its Global Research Reactor Program, but Action Is Needed to Address Remaining Concerns*, [GAO-09-949](#) (Washington, D.C.: Sept. 17, 2009).

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The two other U.S. agencies that conduct major nuclear nonproliferation programs and activities overseas are DOD and State. DOD administers the CTR program, which has facilitated the removal of nuclear weapons from Ukraine, Belarus, and Kazakhstan and has helped Russia and Ukraine meet their arms control commitments by assisting in the elimination of strategic delivery systems. CTR has also provided assistance to secure Russian nuclear warheads, destroy the Russian chemical weapons stockpile, reduce biological proliferation risks across the former Soviet Union, and combat WMD smuggling in the region. The CTR program has expanded its geographic scope in recent years, notably helping Albania eliminate its chemical weapons.

State manages its own nonproliferation programs, provides support to NNSA and other U.S. agency nuclear nonproliferation programs working overseas, and conducts bilateral and multilateral diplomacy to address proliferation threats around the world under the Bureau of International Security and Nonproliferation.<sup>17</sup> Among other things, State's nuclear nonproliferation programs include efforts to enhance international export controls and border security; counter nuclear smuggling; redirect WMD expertise in Iraq, Libya, and other countries to peaceful research; and sustain a Nonproliferation and Disarmament Fund that provides supplemental funding to address nonproliferation contingencies and other urgent threat reduction efforts.

NSC staff have the principal role in coordinating the implementation of NNSA, DOD, State, and other agency nonproliferation programs. While NSC oversees development of general policy and establishes guidelines for U.S. nonproliferation programs, it does not implement programs or control their budgets.

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<sup>17</sup>The Bureau of International Security and Nonproliferation was formed as a result of a 2005 State reorganization that combined nonproliferation and arms control issues under one bureau. For more information on this reorganization, see GAO, *State Department: Key Transformation Practices Could Have Helped in Restructuring Arms Control and Nonproliferation Bureaus*, [GAO-09-738](#) (Washington, D.C.: July 15, 2009).

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## A Governmentwide Strategy for the President's 4-Year Global Nuclear Material Security Initiative Has Been Developed, but Details Concerning the Initiative's Overall Cost, Time Frame, and Scope of Work Are Unclear

NSC officials approved a governmentwide strategy for the President's 4-year initiative to secure all vulnerable nuclear materials worldwide. In addition, U.S. agencies—including NNSA, DOD, and State—have identified individual plans in varying levels of development and specificity describing how they intend to contribute to the 4-year initiative. However, this interagency strategy lacks specific details concerning how the initiative will be implemented, including the identity of and details regarding vulnerable foreign nuclear material sites and facilities to be addressed, agencies and programs responsible for addressing each site, planned activities at each location, potential challenges and strategies for overcoming those obstacles, anticipated timelines, and cost estimates. As a result, key details and objectives for the 4-year initiative remain unclear, including the overall estimated costs, time frames, and scope of work associated with the initiative.

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## NSC Has Approved an Interagency Strategy for the President's 4-Year Global Nuclear Material Security Initiative, and Individual Agencies Have Identified Plans for Contributing to This Goal

NSC has approved an interagency document describing NNSA, DOD, and State contributions to the President's initiative to secure all vulnerable nuclear materials worldwide within 4 years.<sup>18</sup> According to NSC officials, this document serves as a governmentwide strategy for the 4-year initiative. We reviewed a copy of this seven-page document, "Interagency Efforts to Improve the Security of Nuclear Weapons and Fissile Materials," which, among other things, describes the scope and objectives of the interagency effort and identifies the main activities by agencies and programs in support of the President's 4-year initiative.

Individual agencies have plans in varying levels of development and specificity regarding their contributions to the 4-year nuclear security goal. Specifically,

- NNSA was the only agency to have developed a formal written plan with specific details regarding how it intends to contribute to the 4-year nuclear material security goal. NNSA officials told us that they had anticipated a

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<sup>18</sup>This document also identifies potential contributions from the U.S. Nuclear Regulatory Commission (NRC), including assistance and other forms of cooperation from NRC to help countries develop regulatory programs for physical protection of nuclear materials and facilities. We did not interview NRC officials concerning NRC plans for its contributions to the President's 4-year initiative.

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presidential initiative to secure vulnerable nuclear materials worldwide prior to the President's April 2009 announcement and began developing a plan in 2008 based on statements made during the 2008 presidential campaign. The classified NNSA plan details a prioritized five-part effort, including (1) continuing nuclear security cooperation, especially MPC&A upgrades and efforts to transition responsibility for sustaining MPC&A systems; (2) expanding nuclear security cooperation with other countries; (3) accelerating nuclear material removal efforts with other countries; (4) strengthening nuclear security standards, practices, and next-generation international nuclear safeguards; and (5) building international capabilities to prevent illicit nuclear trafficking and smuggling. Among other things, the NNSA plan identifies specific sites and facilities in various countries for engagement and includes additional technical information that will support the development of next steps for cooperation.

- DOD is planning to contribute to the President's 4-year initiative through the CTR program. In February 2010, the CTR program announced a Global Nuclear Lockdown initiative as its contribution, with funding of \$74.5 million for fiscal year 2011. While DOD has not developed a detailed written plan similar to NNSA's, according to DOD officials, the CTR program is planning to undertake several activities, including the following:
  - Working with NNSA to establish Centers of Excellence for Nuclear Security in China and India to foster nuclear material security training, facilitate exchange of nuclear material security best practices, and explore possible cooperative activities to improve nuclear material security infrastructure.
  - Continuing to provide assistance to the Russian MOD for secure transportation of nuclear warheads and working in collaboration with NNSA to evaluate and provide possible future nuclear warhead security assistance to the Russian MOD, including various forms of assistance to sustain security improvements at Russian nuclear warhead storage sites.
  - Cooperating with NNSA and other countries to identify HEU in spent nuclear fuel in locations where NNSA's GTRI program and other international efforts are not active.
- State has also not developed a written plan similar to NNSA's for contributing to the President's 4-year initiative, but according to State officials, State intends to provide general diplomatic support for the other

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agency programs in implementing their nuclear material security activities abroad. State also intends to support several international mechanisms and regimes relevant to the initiative, including the G-8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction,<sup>19</sup> the Global Initiative to Combat Nuclear Terrorism,<sup>20</sup> the United Nations Security Council Resolution 1540 Committee,<sup>21</sup> and the Amendment to the Convention on the Physical Protection of Nuclear Material.<sup>22</sup>

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### Interagency Strategy for the 4-Year Global Nuclear Material Security Initiative Lacks Key Implementation Details, and the Initiative's Overall Costs, Time Frames, and Scope Are Uncertain

We found that the interagency strategy for the 4-year global nuclear material security initiative lacks specific details concerning how the initiative will be implemented, including the identity of and details regarding vulnerable foreign nuclear material sites and facilities to be addressed, agencies and programs responsible for addressing each site, planned activities at each location, potential challenges and strategies for overcoming those obstacles, anticipated timelines, and cost estimates. NSC officials told us that they believed developing such a single, integrated cross-agency plan could take years. However, we found that absent such an implementation plan, essential details associated with the 4-year initiative remain unclear, including the initiative's overall estimated costs, time frames, and scope of work.

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<sup>19</sup>Under the G-8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, which was announced by the G-8 nations (Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the United States) at their 2002 summit, the G-8 members agreed to raise \$20 billion over 10 years for nonproliferation-related assistance, initially to Russia, of which the United States agreed to provide \$10 billion.

<sup>20</sup>At the July 2006 G-8 summit, the United States and Russia announced the creation of this nonbinding initiative under which partner nations agreed to a set of principles to enhance national, regional, and collective capabilities against nuclear terrorism. The initiative currently includes 82 partner nations and four official observer organizations.

<sup>21</sup>United Nations (UN) Security Council Resolution 1540, adopted in April 2004, requires all states to adopt and enforce laws prohibiting proliferation, enact strict export controls, and secure all sensitive materials within their borders. The UN 1540 Committee focuses on identifying assistance projects for states in need and matching donors to improve their WMD controls.

<sup>22</sup>This convention establishes security requirements for the protection of nuclear materials in international transit against terrorism. In 2005, the convention was amended to extend its scope to include nuclear material in domestic use, storage, and transport, as well as protection of nuclear material and facilities from sabotage. Entry into force of the amendment requires two-thirds ratification, acceptance, or approval of the 138 parties; only 41 have so far ratified, accepted, or approved the amendment.



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**Costs to Implement Initiative  
Are Unknown**

The overall costs associated with fulfilling the President's 4-year initiative have not been estimated and are unknown. For its part, NNSA estimated that approximately \$700 million would need to be shifted to its fiscal year 2010 and 2011 nuclear nonproliferation program budgets from projected out-year budgets in NNSA's Future Years Nuclear Security Plan in order to accelerate MPC&A and GTRI activities under the 4-year work scope. NSC officials told us, however, that they did not believe this was a valid estimate of costs associated directly with the 4-year nuclear material security goal, in part because the NNSA work scope encompasses activities that NSC believes fall outside of the initiative's scope. In addition, these officials told us that estimating the costs associated with the President's goal is impossible because the initiative is predicated on other countries providing assistance and cost sharing, and it is impossible to forecast cooperation that may be possible with other countries in the future, including resuming denuclearization efforts in North Korea.

**Time Frames Are Uncertain**

NSC does not consider the 4-year time frame for securing nuclear materials worldwide a hard and fast deadline. NSC officials told us that the President did not state that nuclear material security would or should be completed within 4 years when he announced the proposal in 2009, and they did not believe the purpose of the initiative is to achieve a specific level of nuclear material security around the world within a specific period of time. Instead, these officials described the value of the President's proposal in broader terms, specifically as a "forcing function" to (1) accelerate ongoing U.S. nuclear nonproliferation programs, (2) drive closer integration of nuclear nonproliferation programs across the federal government, and (3) mobilize greater international responsibility for and commitment to nuclear material security. NSC officials stressed that the 4-year initiative is international, and that responsibility rests with all nations—not just the United States—to achieve this goal.

**Scope of Foreign Sites to Be  
Covered by Initiative, Levels of  
Access to Some Foreign Sites,  
and When Materials Will Be  
Considered Secure Are Unclear**

Details relating to the overall scope of the 4-year initiative—including the identity of and details regarding vulnerable foreign nuclear material sites and facilities to be addressed, how limitations on access to nuclear facilities that some countries may impose will be overcome, and the criteria used to judge when foreign nuclear sites can ultimately be considered secure—remain vague.

Regarding the initiative's scope of foreign nuclear material sites, NSC has led an interagency process to identify, classify, and prioritize sites internationally based on information about the amounts and types of material at those locations and security vulnerabilities. This effort draws heavily on information from the Nuclear Materials Information Program

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(NMIP), an interagency program whose details are classified that organizes, consolidates, and assesses information from a range of U.S. government agencies and sources on worldwide nuclear material inventories, locations, and security status in an integrated and continuously updated information management system. On the basis of information from NMIP, nuclear material sites around the world were placed in one of seven different categories:

- sites in high-income countries with a relatively high degree of security;
- sites now considered relatively secure based on prior assistance from the MPC&A program and other U.S. nonproliferation assistance programs;
- sites where MPC&A security upgrades have been made, but where residual security concerns still remain;
- sites to be addressed by the GTRI program for protection and/or removal of nuclear materials, or conversion of facilities so they no longer require HEU;
- sites in countries that have been reluctant to relinquish their HEU for shipment to more secure facilities in the United States or Russia;
- a separate category for several specific countries where there are political sensitivities and access limitations to working with the United States on nuclear material security issues; and
- sites in high-income countries with large nuclear industries where there may be security vulnerabilities.

According to the interagency strategy document for the 4-year nuclear material security initiative, several hundred sites around the world were determined to have significant amounts of nuclear material. While the majority of these sites were determined to meet IAEA baseline security guidelines, a large number of sites were determined to be most vulnerable. NSC officials told us that a list of the most vulnerable sites, derived from NMIP, is being used in planning for the 4-year nuclear material security initiative. We received and reviewed information describing the NMIP methodologies and criteria used to assess the security of nuclear material storage sites. However, the interagency strategy document did not identify the total universe of sites evaluated or the subset of sites determined to be most vulnerable, and we did not obtain additional information specifying

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or providing further details about these sites within the time frame of this engagement.

In a 2008 U.S. government report inventorying known facilities and sites worldwide with nuclear weapons or formula quantities of strategic special nuclear materials,<sup>23</sup> which draws on information from NMIP, we found a list of foreign nuclear material sites that could be within the scope of the 4-year effort. An NSC official told us that this list would be comparable to the overall scope of sites evaluated for inclusion under the 4-year nuclear material security initiative. However, the inventory of facilities in this document does not include detailed information for these sites—such as warhead or material inventories, vulnerability assessments, or risk ratings—that would allow us to understand and assess the potential scope of the 4-year nuclear material security initiative.

NSC officials told us that even with the information available through NMIP, there is a large universe of nuclear material sites around the world and there are many unknowns and uncertainties concerning some foreign nuclear material sites. For this reason, the scope of international facilities with nuclear materials that are considered vulnerable is constantly evolving. Furthermore, NSC officials also told us that they are taking a broad view of what constitutes vulnerable nuclear material. Specifically, they told us that any material that could be used in a nuclear explosive device is inherently dangerous and that some weapon-usable materials located in high-income countries could still be considered vulnerable and within the scope of the President's initiative.

In addition, it is unclear how the initiative intends to address foreign sites with potentially vulnerable nuclear materials in cases where the host countries have imposed access limitations that could complicate or preclude security assessments and assistance. Some countries with weapon-usable nuclear materials may resist nuclear security cooperation with the United States, and U.S. programs may never be given access to some foreign nuclear sites and facilities. For example, the Russian government has refused to include in the scope of cooperation with NNSA three major facilities in the closed nuclear cities of Lesnoy, Trekhgorny,

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<sup>23</sup>A formula quantity of strategic special nuclear material (SSNM) means 2 Kg or more of plutonium, 5 Kg or more of uranium-235 contained in HEU, 2 Kg or more of uranium-233, or 5 Kg or more in any combination of material computed by the equation: grams = (grams of uranium-235 contained in HEU) + (2.5 X [grams uranium-233 + grams of plutonium]). A formula quantity of SSNM is also often referred to as Category I SSNM.

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and Zarechny that are responsible for serial production of nuclear weapons material.<sup>24</sup> NNSA has not been provided access to and is not anticipating conducting future MPC&A work at those locations.

Finally, the criteria for determining when foreign nuclear material sites can be considered secure remain vague. The interagency strategy document for the initiative states that the goal of the effort is to ensure that all nuclear material sites are secured at least to IAEA guidelines on the “Physical Protection of Nuclear Material and Nuclear Facilities” (INFCIRC/225/Rev.4) and to integrate when and where possible the most recent versions of these guidelines.<sup>25</sup> However, NSC and NNSA officials told us that nuclear material security is a long-term and evolving endeavor that extends beyond making near-term improvements to nuclear material sites, such as installing modern MPC&A systems. While near-term security upgrades to nuclear material are important, NSC and NNSA officials both told us—and as we have previously reported<sup>26</sup>—that effective and lasting nuclear material security requires working with other countries to adopt effective security practices so they can sustain MPC&A systems on their own; removing and consolidating nuclear materials to fewer, more secure locations; converting facilities such as research reactors so they no longer require weapon-usable materials; and ultimately eliminating nuclear materials wherever possible.

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<sup>24</sup>These 3 cities are part of a complex of 10 closed nuclear cities where access is restricted and which formed the core of the former Soviet Union’s nuclear weapons complex. Many of these cities are in geographically remote locations and were so secret that they did not appear on any publicly available maps until 1992.

<sup>25</sup>Since 1972, IAEA has provided its member states with guidelines for the physical protection of nuclear material, most recently in 1999.

<sup>26</sup>GAO, *National Nuclear Security Administration Has Improved the Security of Reactors in Its Global Research Reactor Program, but Action Is Needed to Address Remaining Concerns*, [GAO-09-949](#) (Washington, D.C.: Sept. 17, 2009).

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## NNSA's Nuclear Security Programs Have Made Varying Levels of Progress in Russia and Face Challenges That Are Delaying Program Implementation and Could Increase Future Program Costs

Three NNSA nuclear nonproliferation programs we reviewed—the MPC&A program, the nuclear Material Consolidation and Conversion (MCC) program, and the GTRI program—have made varying degrees of progress in securing Russian nuclear warheads and materials. The future of these efforts in Russia could be jeopardized by an uncertain high-level Russian political commitment to further nuclear security cooperation with the United States. In addition, each of these programs faces implementation challenges that could delay or prevent achievement of its objectives in Russia. In particular, because of the challenges facing the MPC&A program, NNSA is unlikely to meet the deadline under current U.S. law requiring Russia to assume sole responsibility for sustaining MPC&A by January 1, 2013, and MPC&A program activities will likely need to continue in Russia beyond 2012.

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## NNSA Program Securing Russian Nuclear Warhead and Material Facilities Has Made Progress, while NNSA Programs to Consolidate Russian HEU and Convert Russian Research Reactors Have Produced More Limited Results

While the MPC&A program has made considerable progress in improving the security of Russia's nuclear warheads and material facilities, the other two programs—MCC and GTRI—have had more limited success in achieving their objectives in Russia.

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MPC&A Program Has Implemented Security Upgrades at 110 Russian Nuclear Warhead and Material Sites

Through the MPC&A program, NNSA has improved security at 110 Russian nuclear warhead and material sites. NNSA has completed a combination of rapid and comprehensive MPC&A upgrades<sup>27</sup> to 73 Russian MOD nuclear warhead sites.<sup>28</sup> However, there is currently no agreement to conduct security upgrades at additional Russian warhead facilities. NNSA has also implemented MPC&A upgrades at 37 Russian nuclear material sites. A total of 214 Russian nuclear material buildings at these 37 sites are included in NNSA's current scope of work, of which 195 have been upgraded.

However, the MPC&A program's scope of upgrade work for Russian nuclear warhead and material sites continues to evolve. For instance, the MPC&A program is conducting additional work at some of the 73 Russian MOD sites where MPC&A upgrades have already been made, such as installing checkpoints to improve screening of vehicles and personnel on the perimeter of four Russian Navy closed cities where nuclear warhead sites are located. NNSA is also retrofitting and improving previous upgrades to 15 Russian Navy warhead sites to address vulnerabilities that were unknown at the time initial upgrades were made. A similar replacement of outdated and obsolete MPC&A equipment installed at 11 SRF sites has also been proposed by MOD. In addition, at Russian nuclear material sites, NNSA is planning to replace obsolete or nonfunctioning equipment and retrofit previously upgraded systems that have reached the end of their expected lifetimes. NNSA has also identified additional buildings at several Russian nuclear material sites that it would like to add to the U.S.-Russian action plan for future MPC&A upgrade work.

NNSA has also been working to transition to Russian ownership and responsibility for sustaining the upgraded MPC&A systems that it has provided to Russia. NNSA officials told us that this transition is critical to effective long-term nuclear security in the country and to ensuring that the

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<sup>27</sup>NNSA conducts MPC&A security upgrades in two phases: Rapid upgrades include improvements such as bricking up windows where material is stored; installing strengthened doors, locks, and nuclear container seals; and establishing controlled access areas. Comprehensive upgrades include electronic systems to detect intruders, central alarm stations, and computerized nuclear material accounting systems.

<sup>28</sup>In reference to the MPC&A program work at Russian nuclear warhead and material locations, the term "site" typically refers to a complex of more than one building with nuclear warheads or materials, though some Russian sites of MPC&A cooperation do constitute a single building or individual handling facility. MPC&A upgrades may be made to the overall site perimeter in addition to individual buildings located within the site boundaries.

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significant U.S. investment in Russian MPC&A is not wasted. As MPC&A upgrades at Russian nuclear warhead and material sites have been completed, NNSA has typically funded a period of sustainability assistance to the sites, including support for maintenance, repair, and logistical services and spare equipment for the improved security systems. In addition, NNSA has worked with Russian government agencies and organizations to establish an effective national MPC&A infrastructure through regulatory development, training, inspections, and other forms of assistance, such as equipping guard and protective forces for the sites. Joint concepts and plans to transition responsibility for sustaining MPC&A have been developed by NNSA with Rosatom and the Russian MOD under which U.S. funding for sustainability is to gradually decrease while Russian support gradually increases. In fiscal year 2009, NNSA spent approximately \$100 million on MPC&A sustainability efforts in Russia for nuclear warheads and materials.

**MCC Program Has Made Limited Progress in Facilitating Consolidation of Russian HEU**

The MCC program supports (1) converting non-weapons-origin Russian HEU to LEU and (2) reducing the number of buildings and sites in Russia that contain HEU by consolidating materials in fewer, more secure locations. While NNSA has made progress in the HEU-LEU conversion component of the program, having facilitated the conversion of over 12 metric tons of Russian HEU, less progress has been made in the consolidation component of the program. When it was created, in 1999, the MCC program estimated that it would assist Russia in removing material from 50 buildings and 5 sites completely by 2010. However, to date, it has achieved removal of all HEU from only 1 site and 25 buildings.

**GTRI Program Has Made Little Progress in Converting Research Reactors in Russia from Use of HEU**

While NNSA officials told us that there is uncertainty about the total number of Russian reactors using HEU, the GTRI program plans to complete the conversion or verified shutdown of 71 HEU-fueled research reactors and related facilities in Russia by 2020.<sup>29</sup> Although Russia has not yet agreed to convert any of these facilities, Russia verified to the GTRI program in February 2010 that it had shut down 3 of its research reactors, and GTRI officials told us that the program has a commitment from Russia to close 5 additional HEU research reactors. NNSA officials also told us that GTRI has achieved an agreement in principle with Russia to conduct conversion feasibility studies on 6 Russian research reactors, which could

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<sup>29</sup>The scope of Russian facilities does not include 19 HEU-fueled research reactors that have been declared to have a solely military purpose, 2 reactors with a unique design such that conversion has already been determined to be technically unfeasible, and an unspecified number of Russian naval propulsion reactors fueled with HEU.

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facilitate completion of feasibility studies for other Russian facilities once Russia agrees to them.

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## Future NNSA Nuclear Security Efforts in Russia Jeopardized by Uncertain Political Commitment from the Russian Government

NNSA's nuclear nonproliferation programs in Russia face an uncertain future because of questionable high-level Russian political commitment to continue cooperation with the United States on nuclear security. For example, senior Russian officials at the Ministry of Foreign Affairs and Rosatom told us that nuclear materials in their country are now fully secure and that they saw little value to continuing to work with the United States on improving the security of its nuclear facilities. This view was reiterated in the Russian government's statement to the April 2010 Nuclear Security Summit, in which it declared:

"Russia maintains its nuclear security at an appropriate level. The Russian Federation confirms that all nuclear materials in its territory and respective facilities are safely protected, so there are no vulnerable nuclear materials or facilities in its territory, which would raise concerns due to their security level."

As a consequence, some Russian officials have raised questions about the need for continuing U.S. assistance to improve Russian nuclear warhead and material security. For example, a Russian Ministry of Foreign Affairs official told us that it was the ministry's position that the CTR umbrella agreement should not be extended for a third time when the current extension protocol expires in 2013. However, without the privileges and immunities provided by the umbrella agreement, NNSA officials told us that with the exception of the MPC&A program's work with Rostekhnadzor, which occurs under a separate government-to-government agreement, it would be impossible to continue MPC&A program work in Russia.

Russian officials told us that it was important for Russia to be considered an "equal partner" with the United States on nuclear material security instead of being viewed as a recipient of U.S. nuclear security assistance. Moreover, these officials said that the emphasis of U.S.-Russian cooperation should be on nuclear proliferation risks in countries other than Russia. However, these officials did not provide us with specific examples of new initiatives or proposals where the United States and Russia could work together in the future to address nuclear security risks in other nations.

We also found that the Russian government's financial commitment to provide and sustain effective nuclear security systems independent of U.S.



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support is uncertain. Russian officials told us that the Russian government considers its nuclear security budgets secret and refuses to provide such information to the United States. This lack of transparency makes it difficult to assess Russia's willingness and ability to support an effective nuclear security program independent of U.S. assistance.

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### Some NNSA Nuclear Security Programs Working in Russia Face Implementation Challenges

The MPC&A, MCC, and GTRI programs also face challenges to the effective and timely implementation and completion of their efforts in Russia. The MPC&A program in particular faces two principal challenges to completing its efforts in Russia by the end of 2012, as required under U.S. law, including (1) successfully completing upgrades against insider and outsider threats at some Russian nuclear material facilities and (2) developing both Russian national-level infrastructure and practices and procedures at Russian sites to ensure effective long-term sustainability of MPC&A systems for nuclear materials. To overcome these challenges, MPC&A program activities in Russia will need to continue beyond 2012. NNSA also faces continuing obstacles to completing a government-to-government agreement needed to advance the consolidation component of the MCC program in Russia, while Russian technical concerns over the conversion of its research reactors from HEU and the absence of a formal conversion agreement also pose obstacles to the achievement of GTRI program objectives.

### Challenges to Mitigating Insider and Outsider Threats at Russian Nuclear Material Facilities

We found that NNSA faces challenges in implementing MPC&A upgrades against insider and outsider threats at some Russian nuclear material facilities to reduce the risk of material theft. NNSA has sought to work more actively with some Russian nuclear facilities to jointly identify where additional or augmented MPC&A upgrades would be desirable. While NNSA has proposed MPC&A upgrades at certain Russian sites to address these concerns, we found that progress in implementing upgrades at some locations and in some MPC&A technical areas has been limited. Implementing certain types of upgrades—especially those that Russian facilities believe could slow site operations—can take considerable time, and require several rounds of discussions and project demonstrations for NNSA and Russian counterparts to reach agreement.

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Challenges to Developing  
Russian National Infrastructure  
and Site-Level Practices and  
Procedures for Long-Term  
MPC&A Sustainability

NNSA is working to enhance Russia's national-level infrastructure to sustain MPC&A systems for nuclear materials in 10 ongoing project areas, including enhancement of Russian nuclear security culture, developing Russian regulations for MPC&A operations, and strengthening Russian inspection and oversight capabilities.<sup>30</sup> Appendix II identifies and describes the goals of the MPC&A program's national-level sustainability project areas in Russia. In our interviews with U.S. and Russian officials, we found that more work needs to be done in several of these areas, including development of Russian MPC&A regulations, nuclear security culture enhancement, MPC&A oversight and inspection, and MPC&A operations monitoring.

The United States and Russia have also fostered development of MPC&A sustainability practices and procedures at the Russian nuclear material site level based on seven sustainability elements,<sup>31</sup> such as the presence of an effective MPC&A management structure at the site that plans, implements, tests, and evaluates the site's MPC&A systems. For each of the seven sustainability elements, a series of indicators has been established to monitor and rate progress at each site toward these objectives. Appendix III identifies each of the seven sustainability elements and selected indicators for each.

At certain Russian sites and in certain MPC&A sustainability areas, we found that the MPC&A program has made limited progress and faces challenges in developing effective practices and procedures consistent with the seven elements of MPC&A sustainability. For instance, we found that sustainability-related activities had not started or were only in the early stages of implementation at some of the Russian nuclear material sites where MPC&A activities are ongoing.

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<sup>30</sup>One national-level MPC&A sustainability project area with Russia has been completed—working with Russia to upgrade a federal information system to systematically collect, process, and analyze reports from Russian nuclear material sites on their nuclear material inventories.

<sup>31</sup>According to NNSA's guidelines for sustaining and transitioning MPC&A systems in Russia, the seven elements that are key to an effective and sustainable MPC&A program are site MPC&A organization; site operating procedures; human resource management and site training; operational cost analysis; equipment maintenance, repair, and calibration; performance testing and operational monitoring; and MPC&A system configuration management.

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A Potentially Large Scope of MPC&A Work in Russia May Be Needed beyond 2012

Because of the ongoing challenges confronting MPC&A program work in Russia, an effective MPC&A system sustained solely by Russia is unlikely to be achieved by the congressionally mandated January 1, 2013, deadline, and a potentially significant program of continued U.S. assistance to Russia may be necessary beyond this date. Specifically, a combination of continued MPC&A upgrades and sustainability activities at some Russian nuclear material sites and support for further development of Russian national-level MPC&A sustainability infrastructure could continue through 2018.

Regarding Russian nuclear warhead sites, both NNSA and the Russian MOD have exchanged proposals for upgrade work at certain warhead facilities that could continue beyond 2012, including NNSA support for replacing obsolete MPC&A equipment at 11 SRF sites as proposed by MOD. NNSA officials also indicated that MPC&A sustainability activities for Russian warhead MPC&A could continue past 2012, including assisting MOD and the services with the implementation of MPC&A regulations.

NNSA has not developed firm out-year budget estimates for continuing MPC&A efforts overall in Russia. However, NNSA officials told us that they had roughly estimated that approximately \$150 million per year would be needed to support MPC&A efforts in Russia beyond fiscal year 2012, including approximately \$40 million per year for national-level sustainability activities and approximately \$110 million per year to support future site-level upgrades and sustainability programs.

MCC Program Faces Continuing Challenges in Consolidating Russian Nuclear Materials to Fewer, More Secure Locations

NNSA has made little progress in and faces continuing challenges to advancing the consolidation component of the MCC program in Russia. NNSA believes consolidating Russian HEU is important because it would (1) reduce the burden on the MPC&A program by allowing it to focus on securing a smaller number of Russian material sites, (2) allow Russia to focus its MPC&A resources on fewer potential theft targets, and (3) enhance nuclear security at a lower, more sustainable cost. NNSA officials acknowledged that there has been limited nuclear material consolidation progress in Russia and described two reasons for the slow pace. First, NNSA is not aware of any Rosatom plan for reducing the size of its nuclear complex, and therefore cannot make specific proposals regarding potential MCC program support for such an effort. Second, the MCC program has been implemented only on a pilot basis in Russia. Efforts have been under way since 2007 to conclude a formal government-to-government MCC agreement that, according to NNSA, would give the program an agreed-upon legal framework for the continuation and expansion of program activities. NNSA officials said that they expected

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GTRI Program Faces  
Challenges in Converting  
Russian Research Reactors  
from HEU to LEU

this agreement to be concluded during the July 2009 summit meeting between President Obama and Russian President Medvedev in Moscow. However, the agreement was reportedly rejected during Russian government interagency review. As a consequence, NNSA officials told us that plans to work with Russia on nuclear material consolidation remain on “cold standby.”

NNSA also faces challenges in working with Russia to convert its research reactors and related facilities currently utilizing HEU. NNSA officials told us that Russian research reactor operators have traditionally been wary of such conversion because of concerns about the performance of replacement LEU-based fuels. In the 2005 joint U.S.-Russian presidential statement in Bratislava, Slovakia, the United States and Russia agreed to focus the reactor conversion program on “third countries,” thus excluding Russian reactors from U.S.-Russian cooperation.

The GTRI program has achieved an agreement in principle with Russia to conduct conversion feasibility studies on 6 Russian research reactors. However, NNSA officials told us that completion of this agreement, which was expected in early fiscal year 2010, has been delayed. Moreover, NNSA officials told us that any agreement to conduct these studies would not constitute an official Russian decision to convert or undertake activities toward conversion. According to NNSA officials, a formal government-to-government agreement would need to be completed to facilitate the conversion of any Russian HEU research reactors or related facilities, while Russian officials have indicated that pursuing conversion activities beyond the feasibility study phase may require implementation of a U.S.-Russian agreement for peaceful nuclear cooperation.<sup>32</sup>

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<sup>32</sup>The United States has 26 agreements in force for peaceful nuclear cooperation with foreign countries, the European Atomic Energy Community, IAEA, and Taiwan. For more information on this subject, see GAO, *U.S.-Russia Nuclear Agreement: Interagency Process Used to Develop the Classified Nuclear Proliferation Assessment Needs to Be Strengthened*, [GAO-09-743R](#) (Washington, D.C.: June 30, 2009); *2010 Resubmission of the U.S.-Russia Nuclear Cooperation Agreement: Further Actions Needed by State and Other Agencies to Improve the Review of the Classified Nuclear Proliferation Assessment*, [GAO-10-1039R](#) (Washington, D.C.: Sept. 21, 2010); and *Nuclear Commerce: Governmentwide Strategy Could Help Increase Commercial Benefits from U.S. Nuclear Cooperation Agreements with Other Countries*, [GAO-11-36](#) (Washington, D.C.: Nov. 4, 2010).

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## NNSA's Efforts to Improve Nuclear Material Security in Other Countries Are Under Way, but Progress Is Mixed

In addition to its efforts in Russia, NNSA is working with other countries on issues related to the security of weapon-usable nuclear materials. In two countries that are believed to have large nuclear material stockpiles—China and India—NNSA's efforts have been primarily limited to the relatively noncontroversial exchange of nuclear security best practices, training, and demonstration projects, rather than working to develop a program of security improvements at nuclear material facilities in those countries. NNSA is also seeking to accelerate the removal of weapon-usable nuclear materials from other priority countries through the GTRI program, including key countries that made new commitments at the April 2010 Nuclear Security Summit to relinquish or reduce their weapon-usable nuclear material stockpiles.

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## Limited Scope of NNSA Nuclear Security Cooperation with China and India

Beyond Russia, NNSA is also engaging China and India in discussions on issues related to the security of weapon-usable nuclear materials. The MPC&A program is the lead NNSA program involved in this effort. However, because this cooperation is considered politically sensitive, NNSA's approach in both nations has been limited to the relatively noncontroversial exchange of nuclear security best practices, training, and demonstration projects.

## Nuclear Security Efforts in China

Since 2003, NNSA has held technical discussions primarily with Chinese civilian nuclear officials—including officials of the China Atomic Energy Authority (CAEA) and China National Nuclear Corporation—and other Chinese nuclear experts principally through workshops and training sessions on nuclear material security best practices, export controls, and safeguards. NNSA also sponsored a 2005 joint technology demonstration with CAEA in Beijing to promote modern MPC&A and safeguards technologies. In total, NNSA officials estimated that approximately \$8.2 million has been spent on MPC&A cooperation with China through March 2010.

To further the nuclear security dialogue with the Chinese civilian nuclear sector, NNSA is working with China, in cooperation with DOD, to establish a center of nuclear security excellence in the country, where nuclear material security best practices could be exchanged and related technologies demonstrated. At the April 2010 Nuclear Security Summit, China announced its intent to cooperate on the development of such a center. There is no official agreement among NNSA, DOD, and the Chinese government to establish such a center, though a memorandum of understanding is under discussion and may be signed in early 2011. However, notwithstanding these plans, NNSA officials told us that they do

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not anticipate conducting a program of site-specific upgrade work in China in either the civilian or the defense sector.

Moreover, NNSA officials said that while CAEA supports continued MPC&A cooperation with NNSA, a Chinese government reorganization has replaced CAEA as the lead implementing agency under the existing agreement that serves as the vehicle for the implementation of NNSA nuclear nonproliferation activities in China. NNSA officials told us that they believe CAEA is interested in pursuing a new bilateral agreement with NNSA under which this cooperation could continue and expand. The MPC&A program's interactions in China, however, are likely to be limited to CAEA and China's civilian nuclear organizations. While there has been some participation by Chinese defense personnel in workshops, according to NNSA, Chinese military organizations—which control the bulk of China's nuclear weapon-usable material inventory—have shown little interest in discussing nuclear security collaboration with the United States.

Separately, the GTRI program has worked with China through an IAEA Coordinated Research Project to address conversion of Chinese-supplied Miniature Neutron Source Reactors (MNSR) located in China, and which China exported to Ghana, Iran, Nigeria, Pakistan, and Syria.<sup>33</sup> Existing replacement LEU fuels GTRI is developing for conversion of other foreign research reactors may not be feasible for the Chinese MNSRs. However, China has shut down one MNSR and converted another, and according to State officials, replacement LEU fuel being developed by China will likely be feasible for conversion of other Chinese MNSRs. In addition, China has committed to the disposition of HEU from Ghana, Nigeria, and Syria through an agreement with IAEA.

## Nuclear Security Efforts in India

NNSA is also seeking to work with India on a range of nuclear material security subjects, including implementing a Design Basis Threat, vulnerability assessments, physical protection systems, material control and accounting, transportation security, and nuclear security culture development. However, according to NNSA officials, there is no active, bilateral cooperation with India on these issues. In total, NNSA has spent less than \$500,000 on activities designed to stimulate a nuclear security

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<sup>33</sup>A Coordinated Research Project is an IAEA-supported collaborative research effort involving researchers from developing and industrialized countries to solve a problem of common interest relevant to nuclear technology.

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dialogue with India through workshops sponsored under the auspices of IAEA and other organizations.

NNSA officials told us that discussions of Indian nuclear facility security with Indian officials has been very sensitive, though NNSA officials anticipate that a planned center of nuclear excellence in India, to be established in cooperation with DOD, could promote a broader nuclear security dialogue. However, NNSA officials told us that there is no official agreement with India to develop such a center.

At the April 2010 Nuclear Security Summit, the Indian government announced that it would work with IAEA and other international partners to establish a regional Global Center for Nuclear Energy Partnership in India that would have a nuclear security component, along with other components related to nuclear power, radiation safety, and civilian applications of nuclear energy. NNSA officials told us that this announcement did not constitute a direct endorsement of the center planned by NNSA and DOD, but that further negotiations with the Indian government were expected to determine what role NNSA and DOD could play in the center proposed by India.

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### Prospects for NNSA Removal of HEU from Other Countries Are Improving after Nuclear Security Summit

NNSA has also focused on efforts to remove weapon-usable material from nearly two dozen countries through the GTRI program. NNSA officials told us that some progress has been made in negotiations with several countries for the removal of their HEU to either the United States or Russia following the April 2010 Nuclear Security Summit.

For example, NNSA officials told us that negotiations had been under way with the Ukrainian government for many years concerning the repatriation of its HEU inventory to Russia. During the Nuclear Security Summit, the Ukrainian President pledged to “get rid of” all Russian-origin HEU from the country by 2012, from all three sites where the material is currently located. In May 2010, GTRI facilitated the removal of a significant portion of Ukraine’s HEU inventory—specifically, the return of 56 Kg of HEU in spent fuel from the Kiev Institute of Nuclear Research to Russia. This effort represented the removal of more than a third of Ukraine’s HEU inventory. Consistent with the joint statement made by the U.S. and Ukrainian Presidents during the Nuclear Security Summit, under which the United States agreed to provide technical and financial assistance to help Ukraine eliminate its HEU stocks, negotiations have been under way with the Ukrainian government and nuclear institutes to complete an

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agreement on an assistance package that would help facilitate the removal of Ukraine's remaining HEU stocks.

In addition, NNSA officials told us that discussions occurred with the South African Nuclear Energy Corporation on nuclear material security issues following the Nuclear Security Summit. For instance, NNSA completed a contract for the future return of U.S.-origin spent HEU fuel located in South Africa to the United States. NNSA and the South African Nuclear Energy Corporation also agreed to establish a joint U.S.-South African technical working group to develop cost estimates and address technical issues for the possible future disposition of South African HEU in spent fuel form. The first meeting of the joint working group occurred in August 2010, during which both sides agreed to produce a joint feasibility study by the fall of 2010. Finally, South Africa has decided to pursue production of the molybdenum-99 medical isotope using a research reactor—converted previously from use of HEU to LEU fuel, with the help of the GTRI program—that will now use LEU targets instead of HEU targets.<sup>34</sup> According to GTRI officials, South Africa would become the world's first major molybdenum-99 producer to convert to an all-LEU process.

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## Conclusions

The President's 4-year nuclear material security initiative has a worthwhile objective and can provide an impetus to accelerate NNSA and other U.S. government nuclear material security efforts with foreign countries. The initiative's goal, however, seems unrealistic in light of the formidable challenges to improving the security of nuclear stockpiles worldwide, especially the reluctance of key countries such as Russia to acknowledge weaknesses in their nuclear security systems. The uncertainty surrounding the likelihood of securing all vulnerable nuclear materials worldwide within 4 years is compounded by the absence of a robust U.S. interagency implementation plan for the initiative that clearly identifies vulnerable foreign nuclear material facilities to be addressed, assigns clear agency and program responsibilities for those locations, identifies activities to be conducted at each location, reviews potential challenges and how those obstacles could be overcome, estimates time frames for completing activities at each site, and presents estimated funding needed to achieve

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<sup>34</sup>Molybdenum-99 generates another isotope, technetium-99m, through the radioactive decay process that is used widely for diagnostic imaging procedures in nuclear medicine. The United States consumes roughly half of the world's supply of molybdenum-99.



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this goal. In addition to clarifying key objectives and details concerning how the 4-year initiative would be implemented, such a plan would provide Congress with a useful baseline on the status of global nuclear material security and provide a framework to systematically track progress.

Important challenges continue to confront NNSA efforts to work cooperatively with Russia on nuclear material security. It is clear that U.S.-Russian collaboration on MPC&A will take more time—certainly beyond the January 1, 2013, deadline under current U.S. law—to have confidence that Russia will be in a position to assume full responsibility for sustaining U.S.-provided nuclear security systems over the long term. Even if this deadline were amended, we believe it is important for the program to provide Congress with realistic estimated time frames, strategy, work scope, and costs for future work in that country. In our view, the continuation of MPC&A assistance to Russia beyond the current deadline should not be open-ended but for a specified period of additional time, at the end of which Congress can reassess the progress that has been made and evaluate the need to authorize any additional extension.

The efforts of the MPC&A and other NNSA programs working in Russia require cooperation from the Russian government, and we believe greater Russian commitment and openness are essential for the NNSA programs to succeed. As U.S. and Russian officials told us, it is important that cooperation between the two countries on joint nuclear security efforts be viewed as one of partnership and not U.S. assistance. We believe an important measure of partnership is the financial contributions from the foreign governments to the NNSA programs being implemented in their countries. In that regard, if the Russian government were to provide the United States with a clearer and more thorough sense of its current and future spending plans on nuclear security programs and activities, NNSA and other U.S. agency officials could have more informed discussions with Russian counterparts on where resources and cooperation are most urgently needed.

While NNSA has made considerable progress securing Russian nuclear warheads and materials at numerous sites where they are located, we believe more progress is needed in consolidating and reducing the number of locations in Russia with nuclear materials, and phasing out the use of HEU at Russian research reactors and related facilities. In our view, these steps would provide a higher level of security at lower potential cost. Unfortunately, Russia has been reluctant to work more actively with

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NNSA to consolidate its nuclear weapon-usable materials and convert its HEU-fueled research reactors.

Beyond Russia, it is apparent that some countries and facilities that are high priorities for the NNSA programs may be addressed by NNSA or other U.S. nuclear security programs only in very limited or restricted ways. While the President's April 2010 Nuclear Security Summit helped draw high-level international political attention to the threat of nuclear terrorism and proliferation risks, the process of building relationships with certain countries will likely take many years. Recognizing that progress on nuclear material security with foreign countries requires mutual cooperation, we believe the centers of nuclear security excellence that NNSA and DOD are planning to jointly develop in China and India are good first steps toward cultivating international nuclear security best practices and a shared perception of nuclear security risks. These centers may represent a model for engaging other countries in nuclear security dialogues and possibly more extensive future cooperation.

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## Matter for Congressional Consideration

Because of the likely need for the MPC&A program to work with Russia past December 31, 2012, Congress may wish to consider amending the current law—as initially laid out in the Bob Stump National Defense Authorization Act for Fiscal Year 2003—to give the MPC&A program additional time to work toward achievement of an MPC&A system that Russia is prepared for and capable of sustaining on its own. Considering input from the Secretary of Energy and the Administrator of NNSA as recommended below, Congress may wish to consider such an extension for a fixed period of time.

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## Recommendations for Executive Action

We recommend that the Secretary of Energy and the Administrator of NNSA take the following three actions:

- to assist Congress in its decision whether and for how long to extend the current deadline, clarify in a written plan the scope of remaining MPC&A work in Russia beyond the current program deadline, including information on remaining MPC&A activities by site or facility, timelines, and estimated costs of completing MPC&A program work in that country;
- to enhance NNSA nuclear nonproliferation program planning, and provide a clearer picture of Russia's willingness and ability to support and sustain MPC&A and other nuclear security investments the United States has made in Russia, strengthen cooperation with the Russian government

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regarding the transparency of its current and future spending plans on nuclear security programs and activities; and

- reevaluate NNSA strategies—with an eye toward new incentives, inducements, or other sources of leverage—to persuade Russia to expand its cooperation with the MCC and GTRI programs with the goal of expediting the consolidation of Russian HEU to fewer locations and the conversion of Russian HEU-fueled research reactors and related facilities.

We are making the following recommendation to the Assistant to the President for National Security Affairs:

To provide a clear sense of the overall scope of work anticipated under the President's initiative to secure all vulnerable nuclear materials worldwide within 4 years, we recommend that NSC lead and coordinate through NNSA, DOD, State, and other relevant agencies, including members of the intelligence community, the development of a comprehensive plan for implementing the initiative. Such a plan should clearly identify the specific foreign countries, sites, and facilities where materials have been determined to be poorly secured, and include information specifying the agencies and programs responsible for addressing each location; planned activities, potential implementation challenges, and steps needed to overcome those challenges at each location; and estimated time frames and costs associated with achievement of the 4-year goal.

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## Agency Comments and Our Evaluation

We provided a draft of our classified report to NNSA, DOE, NSC, State, DOD, and ODNI for formal comment. DOE and NNSA provided written comments on the classified draft report, the unclassified portions of which are presented in appendix IV. NSC, State, DOD, and ODNI had no written comments on our classified report. NNSA, DOE, NSC, State, and DOD provided technical comments that we incorporated as appropriate.

DOE and NNSA agreed with our three recommendations that they (1) clarify in a written plan for Congress the scope of remaining MPC&A work in Russia beyond the 2013 program deadline, (2) strengthen cooperation with the Russian government regarding the transparency of its current and future spending plans on nuclear security programs and activities, and (3) reevaluate strategies to persuade Russia to expand its cooperation with the MCC and GTRI programs with the goal of expediting the consolidation of Russian HEU to fewer locations and the conversion of Russian HEU-fueled research reactors and related facilities. DOE and NNSA responded

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that progress has already been made in implementing the third recommendation.

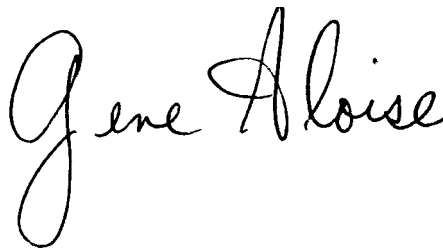
DOE and NNSA took issue with our characterization that the GTRI program has made little progress in converting Russian research reactors using HEU to LEU. We noted in the report that Russia verified to the GTRI program in February 2010 that it had shut down 3 HEU research reactors and that the GTRI program has an agreement in principle with Russia to conduct conversion feasibility studies on 6 Russian research reactors. We have modified the report to include language noting that the GTRI program has obtained a commitment from Russia to close 5 additional research reactors. However, we believe the statement and the findings supporting it are factually correct, for the following reasons. First, as we reported, the GTRI program plans to complete the conversion or verified shutdown of 71 Russian HEU-fueled research reactors and related facilities. To date, the program acknowledges having verified the shutdown of only 3 of these reactors. In our view, this constitutes little progress toward the specific GTRI program objective relating to Russian research reactor shutdown or conversion. DOE's and NNSA's comment that the GTRI program's primary focus is on threat reduction efforts outside of Russia is not relevant to our finding that limited progress has been made toward this specific GTRI program goal in Russia. Moreover, the prospects and timelines for future shutdowns or actual conversions of Russian HEU research reactors are unclear and contingent on Russian government support, which we also believe is uncertain. As we noted in our report, NNSA officials told us that completion of the implementing agreement with Russia to allow for conversion feasibility studies on 6 Russian research reactors that was expected in early 2010 has been delayed, the agreement would not constitute a Russian agreement to actually convert any of its facilities, and any future conversion activities beyond feasibility studies may require implementation of a U.S.-Russian agreement for peaceful nuclear cooperation.

In addition, DOE and NNSA commented that some recent GTRI program accomplishments were not addressed in our report. We have modified language in our report to reflect those accomplishments.

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We are sending copies of this report to the appropriate congressional committees; the Secretaries of Energy, State, and Defense; the Administrator of NNSA; the Assistant to the President for National Security Affairs; the Director of National Intelligence; and other interested parties. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or [aloisee@gao.gov](mailto:aloisee@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix V.

A handwritten signature in black ink that reads "Gene Aloise". The signature is written in a cursive style with a large, looped initial "G".

Gene Aloise  
Director, Natural Resources and Environment

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# Appendix I: Objectives, Scope, and Methodology

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The objectives of our review were to assess (1) U.S. governmentwide efforts to implement the President’s initiative to secure all vulnerable nuclear materials worldwide within 4 years; (2) the status and challenges, if any, of the National Nuclear Security Administration’s (NNSA) nuclear security programs in Russia; and (3) NNSA efforts to secure nuclear materials in countries other than Russia.

To assess overall U.S. strategies and plans for implementing the 4-year global nuclear material security initiative proposed by the President, we obtained and reviewed relevant documentation on the strategies for achieving this goal, including the interagency strategy document for this effort; an overview of the Nuclear Materials Information Program (NMIP) used to identify vulnerable nuclear material sites overseas; the most recent annual report to Congress on the security of nuclear weapons, strategic special nuclear materials, and related equipment located outside the United States as of 2008; and NNSA’s “work scope” plan for securing nuclear materials worldwide within 4 years. The Department of Defense (DOD) and Department of State (State) did not develop comparable written plans detailing how their programs would contribute to the 4-year initiative. We interviewed National Security Council (NSC) officials on the initiative, the April 2010 Nuclear Security Summit, and issues related to broader national-level nuclear nonproliferation strategies and planning. We also interviewed officials at NNSA, DOD, and State concerning their contributions to the 4-year nuclear material security initiative. We also interviewed officials from the Office of the Director of National Intelligence (ODNI) and representatives of the intelligence community, and reviewed documentation provided to us by ODNI, on issues and threats related to worldwide nuclear material security.

We focused our evaluation of the status of and challenges facing NNSA nuclear security programs in Russia on three NNSA nuclear nonproliferation programs working in that country—the nuclear Material Protection, Control, and Accounting (MPC&A) program; the nuclear Material Consolidation and Conversion (MCC) program; and the Global Threat Reduction Initiative (GTRI). We selected these three programs because they work directly on securing Russian nuclear warheads and materials in place (MPC&A program), converting Russian highly enriched uranium (HEU) to non-weapon-usable low-enriched uranium and consolidating the number of Russian sites with HEU to fewer, more secure locations (MCC program), or eliminating Russian use of HEU (GTRI program). We did not address other NNSA nuclear nonproliferation programs in Russia that are nearing completion (such as the Elimination of Weapons Grade Plutonium Production program), have not yet initiated

significant programs of assistance to Russia (such as the program that will assist Russia in the disposition of its excess weapon-grade plutonium), or are indirectly related to nuclear warhead or material security (such as nuclear smuggling detection or weapons of mass destruction scientist reemployment programs).

To evaluate the status of and challenges facing the efforts of these NNSA nuclear security programs in Russia, we examined these issues in interviews with the NNSA Administrator, senior officials in the NNSA Office of Defense Nuclear Nonproliferation, and the principal nonproliferation program offices involved in nuclear material security activities in Russia, including the Office of International Material Protection and Cooperation, which implements the MPC&A and MCC programs in Russia; the Office of Global Threat Reduction, which administers the GTRI program to, among other things, facilitate conversion of Russian research reactors and related facilities from use of HEU to use of low-enriched uranium; the Office of Nuclear Risk Reduction, which has facilitated the shutdown of Russia's last remaining weapon-grade plutonium production reactors; and the Office of Fissile Materials Disposition, which is working with Russia to eliminate plutonium it has declared excess to defense needs.

We reviewed documentation and analyzed information provided to us by NNSA describing nuclear warhead and material security program efforts and the challenges they face in Russia, including documentation on the status of MPC&A upgrades at Russian nuclear warhead and material sites and efforts to transition responsibility to Russia for sustaining MPC&A over the long term.

In addition, we obtained documentation from and interviewed senior Russian officials who have worked with the NNSA nuclear nonproliferation programs, including those from the Russian Ministry of Foreign Affairs; Russian State Corporation for Atomic Energy (Rosatom); Russian Ministry of Defense (MOD); Russian Federal Customs Service; and Russian Federal Service of Environmental, Technological, and Nuclear Supervision (Rostekhnadzor), which provides oversight of Russia's civilian nuclear facilities.

We obtained and reviewed documentation from and interviewed U.S. officials to assess NNSA's efforts to secure nuclear materials in countries other than Russia. Specifically, we reviewed documentation provided by NNSA and interviewed MPC&A program officials concerning nuclear security program activities in China and India. We also interviewed DOD

officials on DOD's plans to work jointly with NNSA in developing nuclear security centers of excellence in China and India. We analyzed relevant information from and interviewed GTRI program officials concerning program plans for foreign HEU removal and reactor conversion.

We conducted this performance audit from April 2009 to December 2010 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.



# Appendix II: NNSA National-Level Project Areas for MPC&A Sustainability of Russian Nuclear Materials

Project area	Goal
Regulatory development	Provide a civilian regulatory structure in Russia for an integrated MPC&A program
Inspections	Enhance Russian MPC&A inspections by establishing an infrastructure with sufficient resources to enforce MPC&A regulations through federal and industry oversight
Material control and accountability measurements	Assist Russia in improving the security of weapon-usable material at high risk of theft or diversion, through development and support of a sustainable and effective measurement-based MC&A program
Rosatom training and technical support infrastructure project	Develop cost-effective, self-sustaining, and accessible training and technical support for upgraded MPC&A systems in Russia
MPC&A Education	Educate the next generation of Russian safeguards and security specialists to secure special nuclear material
MPC&A operations monitoring (MOM)	Install MOM systems at non-Rosatom nuclear sites in Russia with completed MPC&A upgrades to provide increased confidence that the upgrades continue to operate effectively
Transportation security	Work with Rosatom to improve the security of Russian nuclear materials in transit
Protective force	Ensure that a sufficient number of organized, equipped, and trained protective force personnel are present to provide balanced protection against all design basis threats to Russian special nuclear material
Federal information systems	Operate and upgrade a Russian system designed to systematically collect, process, and analyze site reports on quantities of nuclear materials and inventory changes (project completed)
Certification and taxation	Improve Russia's ability to certify MPC&A system-related equipment and software effectively and in a timely manner
Nuclear security culture	Develop Russian regulatory requirements, evaluation criteria and methodologies, and training programs to enhance nuclear security culture at the site level, including creating a nuclear security culture enhancement program at each site

Source: GAO analysis of NNSA data.

# Appendix III: Seven Elements of MPC&A Sustainability and Selected Indicators

Element	Description	Selected indicators
Site MPC&A organization	MPC&A organizations at the site level plan, coordinate, implement, test, and evaluate MPC&A operations and have sufficient authority to carry out all aspects of their duties.	<ul style="list-style-type: none"> <li>• Site has an established and documented MPC&amp;A organization with clear roles and responsibilities.</li> <li>• Site has developed MPC&amp;A plans of its own.</li> <li>• Site has developed a budget for MPC&amp;A organization, activities, and personnel.</li> </ul>
Site operating procedures	MPC&A personnel follow existing regulatory requirements for using systems, equipment, and technologies to ensure security of nuclear materials at the sites and during transportation. The development of regulatory requirements takes into account data from vulnerability assessments and is customized to technical processes for handling nuclear materials.	<ul style="list-style-type: none"> <li>• Site has written procedures for all key MPC&amp;A operations.</li> <li>• Site procedures conform to Russian regulations.</li> <li>• Site has a process for field evaluation of procedures.</li> </ul>
Human resource management and site training	The human resource management and personnel training programs at the site ensure that employees have the requisite knowledge, skills, and abilities to perform necessary MPC&A operations.	<ul style="list-style-type: none"> <li>• Performance by site personnel complies with operating procedures.</li> <li>• Site has established and resourced an on-site training organization.</li> <li>• MPC&amp;A training is required for each staff member every year.</li> </ul>
Operational cost analysis	Operation of MPC&A systems requires adequate funding to ensure reduction of risk of theft and unauthorized use of nuclear materials. An operational cost analysis should examine all categories of costs associated with the upgrade and subsequent operation of MPC&A programs.	<ul style="list-style-type: none"> <li>• Site has identified life cycle costs, capital replacement costs, and other costs for MPC&amp;A equipment.</li> <li>• Site's operating budget covers the site's MPC&amp;A requirements.</li> <li>• Site demonstrates ability to technically and financially sustain MPC&amp;A.</li> </ul>
Equipment maintenance, repair, and calibration	Timely preventive maintenance, repair, and calibration of equipment provide for the efficient operation of all system components.	<ul style="list-style-type: none"> <li>• Site has evaluated MPC&amp;A system maintenance requirements.</li> <li>• Site has developed a master list of MPC&amp;A equipment installed and maintenance and/or replacement priorities.</li> <li>• Site has spare parts supply and extended equipment warranties or replacement service contracts.</li> </ul>
Performance testing and operational monitoring	To evaluate MPC&A program effectiveness, it is necessary to have a performance testing and operational monitoring program.	<ul style="list-style-type: none"> <li>• Site has internal review program to evaluate MPC&amp;A performance.</li> <li>• Site is identifying and correcting MPC&amp;A deficiencies.</li> <li>• Site tracks number and type of MPC&amp;A incidents.</li> </ul>
MPC&A system configuration management	To sustain the efficient operation of MPC&A systems, it is necessary to track, log, and evaluate any changes that are introduced into these systems' configuration.	<ul style="list-style-type: none"> <li>• Changes to MPC&amp;A system configuration are reviewed by appropriate staff to verify system effectiveness is not degraded.</li> <li>• Changes in configuration are communicated to and understood by site staff.</li> </ul>

Source: GAO analysis of NNSA data.

# Appendix IV: Comments from the Department of Energy and National Nuclear Security Administration



Department of Energy  
National Nuclear Security Administration  
Washington, DC 20585



December 8, 2010

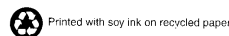
Mr. Gene Aloise  
Director  
Natural Resources and Environment  
Government Accountability Office  
Washington, D.C. 20548

Dear Mr. Aloise:

The National Nuclear Security Administration (NNSA) appreciated the opportunity to review the Government Accountability Office (GAO) draft report, GAO-11-227, *Nuclear Nonproliferation: Comprehensive U.S. Planning and Better Foreign Cooperation Needed to Secure Vulnerable Nuclear Materials Worldwide*. We understand that this work was done at the request of the Chairman, Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives, to assess (1) U.S. government-wide efforts to implement the President's 4-year nuclear material security initiative; (2) the status and challenges, if any, of NNSA's nuclear security programs in Russia; and (3) NNSA efforts to secure nuclear materials in countries other than Russia.

NNSA appreciates GAO taking note of our accelerated efforts to meet the President's four-year goal in his April 2009 Prague speech, and in particular, that NNSA "anticipated a presidential initiative to secure vulnerable nuclear materials worldwide prior to the President's April 2009 announcement and began developing a plan based on statements made during the 2008 Presidential campaign." Experienced observers of the nonproliferation and arms control arena have long recognized the need to address the proliferation threat outside of Russia, and it is one of the most important reasons the Global Threat Reduction Initiative (GTRI) was created in the first place. The 2008 Presidential election provided an opportunity to make accelerated progress on a set of goals recognized by both candidates to be of the highest national security concern.

We do not agree with GAO's assertion that GTRI has made little progress in converting Russian research reactors from the use of highly enriched uranium (HEU) to low enriched uranium (LEU) fuel. First, GTRI's primary focus has been on threat reduction efforts outside of Russia, and second, as part of NNSA's comprehensive and integrated approach to manage all our nonproliferation programs, security upgrades were completed at all of the Russian civilian HEU research reactor sites under our Material Protection, Control and Accounting (MPC&A) program. NNSA's ultimate goal is permanent threat reduction, by converting Russian research reactors from the use of HEU to LEU fuel. To this end, we have verified the closure of three Russian HEU research reactors, obtained a commitment for the closure of five additional Russian HEU research reactors, and are awaiting Russian approval to begin feasibility studies for the conversion of six more Russian HEU research reactors. Of note, GTRI has converted or verified the shutdown of 69 HEU research reactors around the world and it was only within the past year that we significantly expanded GTRI's reactor conversion work scope to include the additional 50 Russian research reactors.



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**Appendix IV: Comments from the Department  
of Energy and National Nuclear Security  
Administration**

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Your third objective was to assess NNSA efforts to secure nuclear materials in countries other than Russia. We appreciate the fact that you highlighted the extensive efforts already undertaken by NNSA to remove all significant quantities of HEU from 18 countries outside Russia. However, some of our recent accomplishments that fall within the timeframe were not addressed. In particular, we have made major progress on a number of threat reduction efforts in South Africa. The contract for removal of all the U.S.-origin spent HEU fuel was signed in August 2010, enabling this HEU to be returned to the United States by June 2011. We also assisted South Africa with the successful conversion of South Africa's Safari research reactor from the use of HEU to LEU fuel in 2008, and assisted the South African Nuclear Energy Corporation (Necsa) with the conversion of its Molybdenum-99 medical isotope production process from the use of HEU to LEU targets.

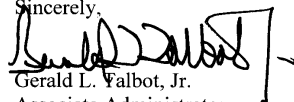
In regard to the first recommendation, we agree that effective communication with Congress on the anticipated scope of work beyond 2013 is very important, and we will continue to provide clear descriptions of that work as the legislation is developed. We also agree with the second recommendation and will work to find new incentives/inducements to address the issue highlighted in the classified report.

With regard to the third recommendation, we agree that NNSA should develop new ideas to persuade Russia to expedite conversion of their HEU-fueled research reactors and related facilities, and to sign a Material Consolidation and Conversion agreement. We are pleased to report that we have already begun implementation of this recommendation.

Under separate cover, we will send technical comments to help clarify and improve the report in areas that may be confusing or misleading.

Should you have any questions related to this response, please contact JoAnne Parker, Director, Office of Internal Controls at 202-586-1913.

Sincerely,



Gerald L. Falbot, Jr.  
Associate Administrator  
for Management and Administration

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# Appendix V: GAO Contact and Staff Acknowledgments

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## GAO Contact

Gene Aloise, (202) 512-3841 or [aloisee@gao.gov](mailto:aloisee@gao.gov)

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## Staff Acknowledgments

In addition to the contact named above, Glen Levis (Assistant Director), William Hoehn, William King, and Kevin Remondini made key contributions to this report. Other technical assistance was provided by Antoinette Capaccio and Alison O'Neill.

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