

## PLUTONIUM DISPOSITION

### I. The Issue

The United States and Russia possess over 220 metric tons of military plutonium,<sup>1</sup> over 90 percent of the world's supply (see Appendix A). From this plutonium, approximately 55,000 nuclear warheads could be fabricated. Proliferation of even a modest amount of this material could provide a would-be terrorist with a deadly nuclear weapon. For instance, four kilograms, which is approximately the size of a baseball, could produce a weapon as strong as the one that destroyed Hiroshima.<sup>2</sup>

In September 2000, the United States and Russia agreed to transform 34 metric tons each of excess military plutonium (approximately 29 percent of their combined stockpiles) into a proliferation-resistant form over the course of 20 years.<sup>3</sup> Overall, within the past decade, both the United States and Russia have declared 50 metric tons of plutonium to be surplus to their security needs.<sup>4</sup>

Russia intends to irradiate all 34 metric tons of the plutonium that it has agreed to dispose of by burning it in commercial nuclear power reactors, using the mixed-oxide (MOX) fuel option. Under the 2000 agreement, the United States also planned to dispose of 25.5 of its 34 metric tonnes of surplus plutonium using the MOX option, while the rest was to be immobilized by combining it with highly radioactive waste and burying it deep underground. In early 2002, due to steep increases in the cost of underground disposal, the U.S. announced that it would cancel the immobilization program and concentrate solely on the MOX option.

In both countries, plutonium disposition programs are only beginning. Start-up costs of plutonium disposition are extremely high, as neither Russia nor the United States has industrial-scale MOX fuel production facilities to convert plutonium. The Russian program is currently estimated at \$2 billion, and the U.S. program at \$3.8 billion. To date, international funding for the Russian program has not yet been secured, but Russian officials are hopeful to receive funding as part of the G-8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction.<sup>5</sup> Also, following on the Joint Declaration on the New Strategic Relationship Between the United States of America and the Russian Federation, signed by Presidents Bush and Putin at the May 2002 Moscow Summit,<sup>6</sup> a joint experts group has been working out proposals on near- and long-term, bilateral and multilateral means to reduce inventories of plutonium, as well as highly enriched uranium.<sup>7</sup>

In addition to remaining financial uncertainties about the Russian program, other implementation issues, including verification, monitoring and licensing, must be resolved

before the program in both countries can move forward. Given these challenges it is unlikely that plutonium disposal will begin by the target date of 2007.<sup>8</sup> Also, there remains considerable debate over whether it is safer and more economical to dispose of the excess military plutonium using the MOX option or immobilizing it. In the words of the Nuclear Control Institute, which opposes the MOX option, “immobilization is far less costly than the MOX approach, could be started and completed more rapidly, and poses far fewer security, health and environmental risks.”<sup>9</sup> In addition to the MOX and immobilization options, there are other disposition technologies under consideration, including the thorium cycle.<sup>10</sup>

## APPENDIX A<sup>11</sup>

### Estimated Military Stocks of Plutonium, 2000

Country	Plutonium (tonnes)	Percentage of world total
Russia	130	53%
United States	99.5	40%
United Kingdom	7.6	3%
France	5	2%
China	4	2%
Israel	0.5	0.2%
India	0.3	0.1%
North Korea	0.03	0.012%
Pakistan	0.005	0.002%

## II. Recent Legislation

- The “Bob Stump National Defense Authorization Act for Fiscal Year 2003” (H.R. 4546, which became Public Law 107-314):
  - Section 3151 transfers from the Department of Defense to the Department of Energy the program to eliminate production of weapon-grade plutonium in Russia and prohibits the expenditure of certain funds under the program until the U.S. and Russia reach an agreement on the shutdown of Russia’s three plutonium producing reactors, including specific timelines and milestones for completion of the shutdown.
  - Section 3162 expresses the sense of Congress that the Secretary of Energy should, in consultation with the Secretary of State and Secretary of Defense, develop a comprehensive program of activities to encourage all countries with nuclear materials to adhere to, or to adopt standards equivalent to the International Atomic Energy standard on The Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Rev.4), relating to the security of stockpiles of highly enriched uranium (HEU) and plutonium (Pu).
  - The Act also authorizes \$93 million for the “U.S. MOX Fuel Fabrication Facility” in the Department of Energy Nonproliferation Programs. This program will build the facility to convert military plutonium into MOX fuel.

### III. Obstacles

- The United States and Russia are still working on developing the means to safely and efficiently dispose of the large amount of excess plutonium (Pu) they possess.
- Hundreds of tonnes of “civilian plutonium,” both separated and un-separated, are part of the global nuclear power industry.<sup>12</sup>

### IV. Q & A

**Q: Is it technically possible to dispose of excess military plutonium? If so, how much will it cost?**

**A:** Considerable work still needs to be done to develop the means to dispose of the huge plutonium stockpiles in the U.S. and Russia. This effort will cost billions of dollars, but this is a small investment compared to the damage that only a small amount of loose plutonium converted into a nuclear weapon could do.

**Q: Is there really a risk of this material proliferating out of Russia?**

**A:** Yes. Ten years after the United States and Russia began working to reduce the threat posed by potentially loose Russian nuclear weapons and materials only 40% of Russian fissile material is in sites that have received modern security upgrades, and Russia continues to invest about 3.3 percent the resources per annum compared to the United States to ensuring that its nuclear materials are secure. A February 2002 CIA report on the Russian nuclear weapons complex stated that “undetected smuggling has occurred.”<sup>13</sup>

**Q: Wouldn't it be difficult to convert plutonium into a bomb?**

**A:** While it would be more difficult to use plutonium to create a nuclear bomb than highly enriched uranium, the technical expertise for turning plutonium into a nuclear weapon is widely available, in particular now-unemployed scientists who worked in the Soviet nuclear weapons program.

### V. Talking Points

- Both the United States and Russia have agreed to get rid of 34 tons of plutonium each; this is a good start, but with concerted effort much more can be accomplished and the threat posed by loose plutonium can be greatly reduced.
- Russia's approximately 130 tons of Pu is enough to build over 30,000 warheads.
- Russia has already deemed 50 tons of its plutonium excess to its defense needs. With cooperative steps, this amount could be increased.

### VI. Factoids

- Four kilograms of plutonium, which is about the size of a baseball, could be turned into a bomb about as powerful as the one that destroyed Hiroshima.
- Russia devotes about 3.3 percent the resources per annum compared to the United States to ensuring that its nuclear materials are secure.

- Russia possesses almost 90 percent of the world’s military plutonium, outside of the United States.

## VII. Applicable Treaties, Legislation, and Other International Agreements

- Joint Statement Concerning Management and Disposition of Weapon-Grade Plutonium Designated as No Longer Required For Defense Purposes and Related Cooperation, June 4, 2000, accessed at: <http://clinton3.nara.gov/WH/New/Europe-0005/factsheets/js--weapon-grade-plutonium.html>
- Joint Declaration on the New Strategic Relationship Between the United States of America and the Russian Federation, May 24, 2002, accessed at: [www.whitehouse.gov/news/releases/2002/05/20020524-2.html](http://www.whitehouse.gov/news/releases/2002/05/20020524-2.html)

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<sup>1</sup> The term “military plutonium” is used to differentiate plutonium devoted to military purposes from that used in nuclear power production, known as “civilian plutonium.” The primary focus of this paper is “military plutonium,” though there is some discussion of “civilian plutonium.”

<sup>2</sup> David Albright, Frans Berkhout and William Walker, “Plutonium and Highly -Enriched Uranium 1996: World Inventories, Capabilities and Policies,” *SIPRI Yearbook* (Oxford Press: 1997), p. 8, cited in Secretary of Energy Advisory Board, “A Report Card on the Department of Energy’s Non-proliferation Programs with Russia,” Howard Baker and Lloyd Cutler, co-chairs, Russia Task Force, January 10, 2001, p. iv, accessed at: <http://www.seab.energy.gov/publications/rusrpt.pdf>.

<sup>3</sup> See The White House, “Fact Sheet: United States-Russian Federation Plutonium Disposition Agreement,” June 4, 2000, accessed at: <http://clinton3.nara.gov/WH/New/Europe-0005/factsheets/fs--plutonium-disposition-agreement.html> and The White House, “Joint Statement Concerning Management and Disposition of Weapon-Grade Plutonium Designated as No Longer Required For Defense Purposes and Related Cooperation,” June 4, 2000, accessed at: <http://clinton3.nara.gov/WH/New/Europe-0005/factsheets/js--weapon-grade-plutonium.html>.

<sup>4</sup> For information on plutonium disposition, see Nuclear Threat Initiative, Research Library, “Russia: Plutonium Disposition Overview,” accessed at: <http://www.nti.org/db/nisprofs/russia/fissmat/plutdisp/puovervw.htm>.

<sup>5</sup> For more on the G-8 effort, see Statement by the Group of Eight Leaders, “The G-8 Global Partnership Against the Spread of Weapons of Mass Destruction,” Kananaskis, Canada, June 27, 2002, accessed at: [http://www.g8.gc.ca/kananaskis/gp\\_stat-en.pdf](http://www.g8.gc.ca/kananaskis/gp_stat-en.pdf).

<sup>6</sup> The White House, “Joint Declaration by President George W. Bush and President Vladimir V. Putin on the New Strategic Relationship Between the United States of America and the Russian Federation,” accessed at: <http://www.whitehouse.gov/news/releases/2002/05/20020524-2.html>.

<sup>7</sup> “Joint Statement Secretary Abraham and Minister Rummyantsev,” September 16, 2002, accessed at: [http://www.energy.gov/HQPress/releases02/seppr/jointstatement\\_v.htm](http://www.energy.gov/HQPress/releases02/seppr/jointstatement_v.htm).

<sup>8</sup> Much of the preceding paragraphs is drawn from Elena Sokova, “Plutonium Disposition,” *CNS NIS Nonproliferation Program*, July 2002, accessed at: [www.nti.org/e\\_research/e3\\_11a.html](http://www.nti.org/e_research/e3_11a.html).

<sup>9</sup> For arguments in favor of immobilization, see Nuclear Control Institute, “Plutonium Disposal,” accessed at: <http://www.nci.org/nci-wpu.htm>

<sup>10</sup> For more information on the thorium cycle option, see Thorium Power’s website: <http://www.thoriumpower.com>.

<sup>11</sup> Adapted from Steve Fetter, “Stockpile Declarations,” in Nicholas Zarimpas, ed., *Building a Nuclear Stockpile and Warhead Dismantlement Transparency Regime: Issues and Options* (Oxford: Oxford University Press, 2002), p. 10, and Joseph Cirincione with Jon B. Wolfsthal and Miriam Rajkumar, *Deadly Arsenals: Tracking Weapons of Mass Destruction* (Washington, DC: Carnegie Endowment for International Peace, 2002), p. 241.

<sup>12</sup> See Nuclear Control Institute, “The Plutonium Threat,” accessed at: [www.nci.org/new/nci-plu.htm](http://www.nci.org/new/nci-plu.htm).

<sup>13</sup> Central Intelligence Agency, *Annual Report to Congress on the Safety and Security of Russian Nuclear Facilities and Military Forces*, February 2002, accessed at: [http://www.cia.gov/nic/pubs/other\\_products/icarusiansecurity.htm](http://www.cia.gov/nic/pubs/other_products/icarusiansecurity.htm).