

How Much More Bomb Uranium Will Russia Blend Down?

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Under a landmark 1993 nuclear “Megatons to Megawatts” pact, Russia is blending down 500 metric tons of weapons-usable high enriched uranium (HEU) to low enriched uranium (LEU) for U.S. civil nuclear utilities to purchase over a 20-year period.¹ A bilateral agreement restricts all other Russian LEU imports into the United States.² The U.S. Department of Energy describes imports of this Russian downblended LEU as now accounting for “almost half” of the nuclear fuel consumed by America’s nuclear power reactors.³ After this pact expires at the end of 2013, however, it is uncertain (a) whether Russia will keep blending down bomb-grade uranium to nuclear reactor fuel, and (b) how much U.S. nuclear utilities will still have to rely on LEU imports from Russia and other foreign suppliers. The answers will depend on how the U.S. and Russia navigate three key issues:

(1) Will new incentives persuade Russia to blend down more bomb-grade uranium? When the current pact expires at the end of 2013, Russia will still have large stocks of HEU: by one estimate, it will have 770 metric tons of bomb-grade uranium (*see* Figure 1 below),⁴ enough for some 64,000 nuclear weapons.⁵ A recent law sponsored by Senator Pete Domenici (R-NM), however, creates new commercial incentives for Russia to keep blending down HEU.⁶ Known as the “Domenici Amendment,” this law reaffirms existing bilateral commitments to let Russia access 20 percent of the post-2013 U.S. commercial uranium market, but also promises to increase access up to 25 percent if Russia agrees to blend down 300 more metric tons of HEU.

Prior to the Domenici Amendment’s passage, Russia had expressed disinterest in blending down HEU after 2013. As Russian officials privately explain, their government views its bomb-grade uranium to be a “strategic resource” with other important potential civil uses besides

¹ “Russian-U.S. HEU Agreement,” February 18, 1993, at <http://www.nti.org/db/nisprofs/russia/fulltext/heudeal/heufull.htm>. The program to implement the HEU Agreement is often referred to as “Megatons to Megawatts.”

² “Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation,” *Federal Register*, Vol. 57, No. 211 (October 30, 1992), pp. 49235-49242. Hereinafter the “1992 Russian Suspension Agreement.”

³ *See* “NNSA Announces Nearly 13,000 Nuclear Weapons-Worth of Russian Uranium Converted to Peaceful Use,” National Nuclear Security Agency, U.S. Department of Energy, February 20, 2008, at <http://nnsa.energy.gov/news/1789.htm>.

⁴ This estimate—which has a range of uncertainty of ± 300 metric tons of HEU—comes from “Figure 1.3: National Stocks of Highly Enriched Uranium as of Mid-2008,” *Global Fissile Material Report 2008*, third annual report of the International Panel on Fissile Materials (IPFM), October 2008, p. 11, at http://www.fissilematerials.org/ipfm/site_down/gfmr08.pdf. (“Figure 1.3” is reproduced on page two of this paper as “Figure 1.”) IPFM estimates that Russia has 590 metric tons of HEU available for use in nuclear weapons; 100 metric tons of fresh HEU for military naval use; 50 metric tons of irradiated HEU for military naval use; and 30 metric tons of HEU for civil use.

⁵ This figure assumes 12 kilograms of HEU per nuclear weapon. Both the U.S. Department of Energy (DoE) and the International Atomic Energy Agency (IAEA) assume 25 kilograms of HEU per nuclear weapon, but some non-governmental analysts criticize this assumption as too conservative. For one critique, *see* Thomas B. Cochran and Christopher E. Paine, “The Amount of Plutonium and Highly-Enriched Uranium Needed for Pure Fission Nuclear Weapons,” Natural Resources Defense Council, revised April 13, 1995, esp. Table 1 on page. 9, at http://docs.nrdc.org/nuclear/nuc_04139501a_144.pdf.

⁶ Public Law No. 110-329, Sec. 8118, at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h2638enr.txt.pdf. Hereinafter “Domenici Amendment.”

downblending (e.g., HEU could fuel future Russian fast reactors).⁷ The question now is what Russia will decide to do with its HEU in five years' time.

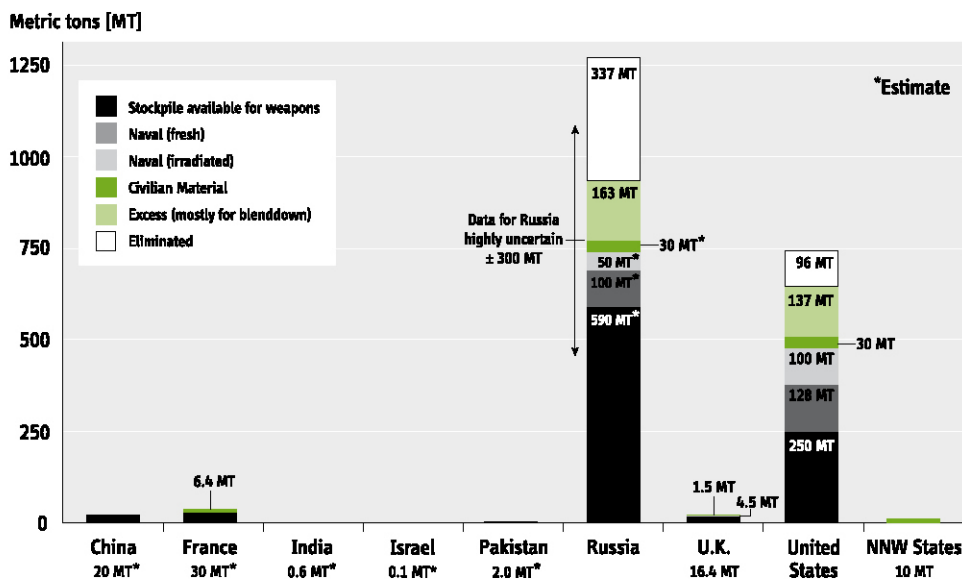


Figure 1. National stocks of highly enriched uranium as of mid-2008. The numbers for the United Kingdom and United States are based on official information. Numbers with asterisks are non-governmental estimates, often with large uncertainties. Numbers for Russian and U.S. excess HEU are for June 2008. HEU in non-nuclear-weapon (NNW) states is under IAEA safeguards.

Source: Modified version of “Figure 1.3” in *Global Fissile Material Report 2008*, third annual report of the International Panel on Fissile Materials, October 2008, p. 11, at http://www.fissilematerials.org/ipfm/site_down/gfmr08.pdf.

(2) Will a recent law to limit Russian uranium sales to the U.S. be challenged legally? A U.S. federal appellate court has ruled that low enriched uranium, when obtained by “separative work unit” (SWU) contracts to enrich natural uranium up to LEU,⁸ constitutes a *service* and not a *good*, and cannot be limited by U.S. trade laws forbidding the dumping of goods.⁹ The U.S. Supreme Court is reviewing the appellate court’s rulings. But a recent law sponsored by Senator Domenici has created a new legal basis—independent of whatever the Supreme Court decides—for upholding antidumping limits on Russian LEU imports, including imports via SWU contracts.

⁷ Author interview with a Russian individual with close ties to the Russian government. See also Rosatom Director Sergei V. Kiriyyenko, Letter to U.S. Secretary of Energy Samuel Bodman on the Domenici Amendment, June 5, 2008. In this letter, Kiriyyenko calls Russia’s HEU inventory a “valuable energy resource.”

⁸ Nuclear utilities use two types of commercial contracts to buy low enriched uranium from enrichers. (1) In a *separative work unit (SWU) contract*, the utility pays the enricher only for the cost of the effort (measured in SWUs) to enrich a specified amount of natural uranium feedstock up to LEU. The utility, after receiving an equivalent amount of already-enriched LEU from the enricher, transfers to the enricher ownership of that specified amount of natural uranium feedstock. (2) In an *enriched uranium product (EUP) contract*, the price includes all elements of the LEU’s value—e.g., value of natural uranium feedstock, and cost of effort in SWUs required to enrich the feedstock to LEU.

⁹ See *Eurodif, S.A. v. United States*, 411 F.3d 1355 (Fed. Cir. 2005), *aff’d on reh’g*, 423 F.3d 1275 (Fed. Cir. 2005), *final judgment*, 506 F.3d 1051 (Fed. Cir. 2007), *passim*.

Fledgling U.S. uranium enrichers, who claim to worry about Russia’s 40 percent share of global enrichment capacity,¹⁰ praise the Domenici Amendment; U.S. nuclear utilities, which want to purchase LEU through low-cost SWU contracts, criticize the new law. Although Russian officials opposed early versions of the Domenici Amendment,¹¹ they have said little publicly about the final version that passed into law. If the Supreme Court upholds appellate court rulings that U.S. antidumping laws generally cannot limit SWU contracts, it is possible that U.S. nuclear utilities, Russia, or others might try to legally challenge the Domenici Amendment’s specific limits on Russian SWU contracts. What’s unclear is whether any challenges would be successful.

(3) Will U.S. enrichment capacity grow enough to decrease U.S. dependence on Russian uranium? Today, America’s only enrichment facility—a plant using gaseous diffusion technology in Paducah, Kentucky—meets 10 percent of America’s LEU demand through SWU contracts to enrich natural uranium.¹² (See Figure 2 below.) But with global LEU demand projected to rise in the coming years, some analysts are forecasting future LEU shortages.¹³

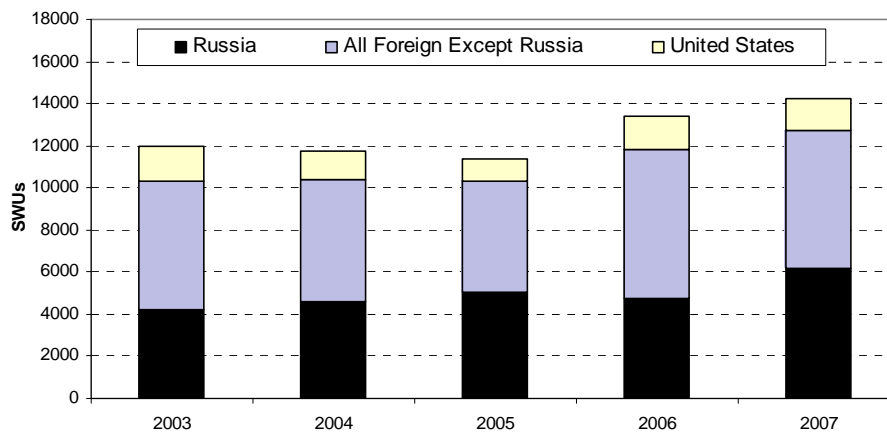


Figure 2. Origin of Low Enriched Uranium via SWU Contracts Purchased by U.S. Civil Nuclear Utilities (2003-2007)

Source: Data used to generate this chart were drawn from U.S. Energy Information Administration, “Purchases of Enrichment Services by Owners and Operators of U.S. Civilian Nuclear Power Reactors by Origin Country and Delivery Year,” updated May 19, 2008, at <http://www.eia.doe.gov/cneaf/nuclear/umar/table16.html>.

To help meet the anticipated growth in America’s LEU demand, USEC, Areva, and URENCO’s Louisiana Energy Services are each planning to build, on U.S. soil, new enrichment facilities

¹⁰ World Nuclear Association (WNA), “Uranium Enrichment,” updated September 2008, at <http://www.world-nuclear.org/info/inf28.html>. In 2006, Russia’s enrichment capacity was estimated to be 25 million SWU per year, and global enrichment capacity, 58.5 million SWU per year.

¹¹ See Kiriyenko, Letter to U.S. Secretary of Energy Samuel Bodman on the Domenici Amendment, *op. cit.* Sen. Domenici responded with letters to Rosatom Director Kiriyenko and Energy Secretary Bodman, respectively. See Domenici, Letter to U.S. Secretary of Energy Samuel Bodman, June 10, 2008; and Letter to Rosatom Director Sergei Kiriyenko, June 11, 2008.

¹² Percentage is calculated using data from U.S. Energy Information Agency, “Table 16: Purchases of Enrichment Services by Owners and Operators of U.S. Civilian Nuclear Power Reactors by Origin Country and Delivery Year,” May 18, 2008, at <http://www.eia.doe.gov/cneaf/nuclear/umar/table16.html>. Although USEC’s Paducah plant has a capacity of as much as 8 million SWUs, USEC sells some 6 million SWUs per year to Japan and Taiwan, leaving at most 2 million SWUs for U.S. consumption.

¹³ For news coverage, see “Lack of Fuel May Limit U.S. Nuclear Power Expansion,” News Office, Massachusetts Institute of Technology, March 21, 2007, at <http://web.mit.edu/newsoffice/2007/fuel-supply.html>.

using more cost-effective centrifuge technology.¹⁴ Will new U.S. enrichment capacity, along with post-2013 levels of limited Russian uranium imports and non-Russian foreign LEU supply, collectively be able to meet America’s future uranium demand? Or will the U.S. Commerce Department have to ease planned post-2013 limits on Russian uranium imports to fill the gap?

U.S.-Russian relations have strained recently over the August 2008 Russo-Georgian conflict, over whether and how to sanction Iran’s ongoing nuclear noncompliance with U.N. Security Council resolutions, and over Euro-American efforts to build ballistic missile defense systems in Eastern Europe. Cooperation on LEU imports and HEU downblending therefore may be one of the few immediate areas to improve Russo-American relations.

Towards that end, this paper examines the connections between U.S.-Russian efforts to promote trade in civil uranium, and to blend down bomb-grade uranium for use in civil nuclear commerce. The first section provides background on the history leading up to the passage of the Domenici legislation. The second concludes with some tentative thoughts on how the U.S. and Russia might go about navigating the future of HEU downblending and bilateral LEU commerce.

I. Background: How Did We Get Here?

The recent law sponsored by Senator Domenici (the “Domenici Amendment”) represents the first time that the Congress has explicitly spoken on what the future of Russian downblending of bomb-grade uranium, and of Russian civil uranium sales to the U.S., ought to be. Prior to this law, Russo-American collaborative efforts in civil and military uranium were managed mainly by America’s Executive and Judicial Branches and by the Russian government. To understand why the Congress chose to act, and what issues are likely to arise in the next decade, it is essential to understand four key developments that preceded Senator Domenici’s legislation.

1992 Russian Suspension Agreement

The U.S. Department of Commerce in late 1991 began investigating the Soviet Union for allegedly dumping—that is, selling at below fair-market value—low enriched uranium (LEU) and other civil uranium goods in the United States. The worry was (and still is) that if foreign enrichers sell LEU to U.S. nuclear utilities at dumping prices, then this could seriously harm America’s nascent uranium enrichment sector. After the U.S.S.R. dissolved in December 1991, Commerce refocused its antidumping investigation on the uranium sales of Russia (which would end up inheriting 80 percent of the Soviet Union’s large government-built nuclear complex) and other former Soviet republics.

Two major developments in the antidumping investigation followed. First, the Commerce Department determined in June 1992 that Russia had dumped uranium in the U.S., and imposed a duty of 115.82 percent on imported Russian uranium goods.¹⁵ Second, Commerce signed an accord with

¹⁴ For background, see WNA, “Nuclear Power in the U.S.A.,” updated October 2008, at <http://www.world-nuclear.org/info/inf41.html#enrichment>.

¹⁵ “Preliminary Determinations of Sales at Less than Fair Value: Uranium from Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Ukraine and Uzbekistan...,” *Federal Register*, Vol. 57, No. 107 (June 3, 1992), pp. 23380-23384.

Russia's Ministry of Atomic Energy (Minatom)¹⁶ in October 1992 to suspend the antidumping investigation. In return, however, this so-called "Russian Suspension Agreement" (RSA) required Russia to limit sales of LEU and other uranium goods to the U.S.¹⁷

1993 HEU Agreement

Although the Russian Suspension Agreement generally restricted Russian uranium exports to the U.S., it permitted bilateral negotiations for a pact to have the Russians sell civil uranium—derived from the bomb-grade high enriched uranium (HEU) of dismantled Soviet nuclear warheads—to U.S. nuclear utilities.

Such a pact was signed in February 1993. Known as the "HEU Agreement," this pact laid the foundation for what would come to be known as "Megatons to Megawatts," a bilateral program to promote nuclear arms control and nonproliferation through civil trade in demilitarized bomb uranium. In specific, the HEU Agreement obligated Russia to blend 500 metric tons of excess Soviet-era weapons-usable HEU down to LEU. In return, the United States promised to arrange for this downblended LEU to be sold on the U.S. uranium market.¹⁸

To implement the HEU Agreement, a commercial contract was signed in January 1994 by the United States Enrichment Corporation (USEC), the company serving as the Department of Energy's executive agent, and Techsnabexport (Tenex), Minatom's government-owned commercial arm. Under this contract, USEC—which, at the time, was still a wholly government-owned corporation—agreed, over a 20-year period ending in 2014, to buy Russia's downblended LEU from Tenex, with the aim of reselling this LEU to U.S. nuclear utilities.

Although the HEU Agreement's implementation over the years has run into some (occasionally serious) obstacles on both sides, none of these obstacles has proven to be insurmountable.¹⁹

¹⁶ Minatom was succeeded by the Russian Federal Atomic Energy (Rosatom) in March 2004. In November 2007, the Russian government passed a law that converted Rosatom into a state-owned corporation.

¹⁷ "Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation," *op. cit.*

In 2004, Joseph Spetrini, who at the time was a Commerce Department official, commented: "The Agreement was negotiated under section 734(l) of the Tariff Act of 1930, as amended, which is the provision under which suspension agreements with nonmarket economy countries are negotiated. In 2002, Commerce evaluated the Russian economy and determined that the Russian Federation had become a market economy country. However, the Russian Federation has never proposed that this Agreement be converted to a market economy suspension agreement, under section 734(b) or (c) of the statute. If such a proposal were to be made, Commerce would need to consider on a policy basis whether or when to negotiate a market economy agreement." See Spetrini, "Fact Sheet on Russian Uranium Suspension Agreement," World Nuclear Association Annual Symposium, September 8-10, 2004.

¹⁸ See 1993 HEU Agreement, *op. cit.* William Burns, head of the U.S. Safe and Secure Dismantlement Delegation, signed on behalf of the United States; and Viktor Mikhailov, Minister of Atomic Energy, signed on behalf of the Russian Federation.

¹⁹ For background on the HEU Agreement's implementation obstacles, see U.S. General Accounting Office, *Nuclear Nonproliferation: Status of Transparency Measures for U.S. Purchase of Russian Highly Enriched Uranium*, report to Senator Richard G. Lugar, GAO/RCED-99-194, September 1999, at <http://www.gao.gov/archive/1999/rc99194.pdf>; and *Nuclear Nonproliferation: Implications of the U.S. Purchase of Russian Highly Enriched Uranium*, Report to the Chairman of the House Committee on Commerce, GAO-01-148, December 2000, at <http://www.gao.gov/new.items/d01148.pdf>. A July 2004 law changed GAO's official name to the U.S. Government Accountability Office.

***Eurodif* Decisions: Implications on the Russian Suspension Agreement**

In legal disputes indirectly related to the 1992 Russian Suspension Agreement, a U.S. federal appellate court ruled, in decisions known collectively as the *Eurodif* decisions, that when low enriched uranium is obtained by “separative work unit” (SWU) contracts to enrich natural uranium, this transaction constitutes the provision of a *service* and not a *good*. The legal implication was that, under U.S. statutes that preclude the dumping of goods, the Department of Commerce could not restrict any LEU obtained by SWU transactions. As a result, a U.S. trade court subsequently decided that the Commerce Department should not apply the RSA’s limits on imported Russian LEU obtained via SWU contracts.

The origins of the *Eurodif* decisions trace back to January 2001, when the Commerce Department began investigating whether companies from France, Germany, the Netherlands and Britain had dumped LEU in the United States. USEC and other petitioners had asked for this investigation.²⁰

During the comment process of the Commerce Department’s investigation, a group of U.S. nuclear utilities known as the “Ad Hoc Utilities Group” (AHUG) argued that, while LEU sales via “enriched uranium product” (EUP) contracts constitute goods, LEU sales via SWU contracts should instead “constitute the provision of services, not the production or sale of goods subject to the antidumping law.”²¹ Commerce, however, responded in December 2001 with a final determination that LEU via SWU contracts are goods, and are therefore subject to laws on the dumping of goods.²²

The Ad Hoc Utilities Group subsequently sought redress from the U.S. Court of International Trade (CIT), leading to complex litigation involving AHUG, Areva, Tenex and the Commerce Department. In a ruling known as “USEC I,” the CIT decided in 2005 that LEU via SWU contracts constitutes a service.²³ But when the Commerce responded to the CIT by continuing to view SWU contracts for LEU as providing goods and not services, AHUG and others appealed again to the court. The CIT, in a decision known as “USEC II,” ruled again that a SWU contract is a service.²⁴

The Court of International Trade then permitted an interlocutory appeal to the Court of Appeals for the Federal Circuit (CAFC). This U.S. appellate court granted the appeal and, in a March 2005

²⁰ “Notice of Initiation of Countervailing Duty Investigations: Low Enriched Uranium from France, Germany, the Netherlands, and the United Kingdom,” *Federal Register*, Vol. 66, No. 4 (January 5, 2001), pp. 1085-1088, at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2001_register&docid=01-385-filed.pdf.

²¹ “Notice of Preliminary Determination of Sales at Less than Fair Value and Postponement of Final Determination: Low Enriched Uranium from France,” *Federal Register*, Vol. 66, No. 135 (July 13, 2001), p. 36744, at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2001_register&docid=01-17622-filed.pdf.

For a simple description of the differences between *separative work unit (SWU) contracts* and *enriched uranium product (EUP) contracts* to purchase low enriched uranium, see above footnote 7.

²² “Notice of Final Determination of Sales at Less than Fair Value: Low Enriched Uranium from France,” *Federal Register*, Vol. 66, No. 246 (December 21, 2001), p. 65878, at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2001_register&docid=01-31509-filed.pdf. Although the Commerce Department found that France’s Eurodif, S.A., had dumped LEU in the U.S., it found that companies from Germany, the Netherlands and Britain had not. See “Notice of Final Determinations of Sales at Not Less Than Fair Value: Low Enriched Uranium From the United Kingdom, Germany and the Netherlands,” *ibid*, pp. 65886-65889, at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2001_register&docid=01-31513-filed.pdf.

²³ See *USEC, Inc. v. United States*, 259 F. Supp.2d 1310 (2003).

²⁴ See *USEC, Inc. v. United States*, 281 F. Supp.2d 1334, (2003).

ruling known as “Eurodif I,” affirmed the CIT’s decisions.²⁵ The U.S. government and USEC then asked the appellate court to rehear the case. The CAFC, in a ruling known as “Eurodif II,” reaffirmed the decision that SWU contracts for LEU constituted services, not goods.²⁶ Litigation continued both in trade and federal appellate courts.²⁷

With respect to the 1992 Russian Suspension Agreement, the Court of International Trade in September 2007 remanded the Commerce Department’s decision to limit Russian SWU as a good under U.S. antidumping laws. The CIT wrote that, after the *Eurodif* decisions, it is now “settled law that LEU processed pursuant to a uranium enrichment services transaction is not a ‘good’ ... [and therefore not] subject to the antidumping duty statute.”²⁸

In February 2008, both the U.S. government and USEC filed petitions for a writ of *certiorari* to have the U.S. Supreme Court review the Court of Appeals of the Federal Circuit’s *Eurodif* decisions. The Supreme Court in April 2008 agreed to review those decisions. A ruling is expected by early 2009. In the absence of the Domenici Amendment, the Supreme Court’s expected ruling on the *Eurodif* decisions would have had the effect either of upholding—or overturning—the Commerce Department’s limits on Russia LEU obtained via SWU contracts.

2008 Amendment to the Russian Suspension Agreement

A recent bilateral amendment to the 1992 Russian Suspension Agreement eases the RSA’s limits on Russian uranium imports into the United States. Since the 1990s, generally all Russian LEU imports have gone through USEC in accordance with the HEU Agreement’s implementation. But the so-called “2008 RSA Amendment” allows Russia to begin selling uranium *directly* to U.S. nuclear utilities, though in small amounts, between 2011 and 2013; and then permits Russia to have direct access to 20 percent of the U.S. uranium market between 2014 and 2020. The RSA Amendment also envisions lifting all limits on Russia’s access to the U.S. uranium market after 2020.

In addition, the 2008 RSA Amendment states that the Suspension Agreement’s limits on Russian uranium imports will be applied in a manner “consistent with any applicable decision of the U.S. Courts, including the *Eurodif* decisions.”²⁹ Here, it is important to note that when the U.S. and Russia agreed to

²⁵ See *Eurodif, S.A. and Ad Hoc Utilities Group v. United States and USEC, Inc. and United States Enrichment Corporation*, 411 F. 3d 1355 (2005).

²⁶ See *Eurodif, S.A. v. United States*, 423 F.3d 1275 (Fed. Cir. 2005).

²⁷ Over the next few years, the Commerce Department issued nuanced determinations that attempted to continue limiting LEU obtained by SWU as goods. The Court of International Trade issued a series of remand decisions, known as the “Eurodif III,” “Eurodif IV” and “Eurodif V” rulings, for Commerce to modify its treatment of SWU transactions. See *Eurodif, S.A. v. United States*, 414 F. Supp.2d 1263 (Ct. Int’l Trade 2006); “Final Results of Redetermination Pursuant to Court Remand, *Eurodif S.A. v. United States*,” March 3, 2006, at <http://ia.ita.doc.gov/remands/06-2.pdf>; *Eurodif, S.A. v. United States*, 431 F. Supp.2d 1351, 1354 (Ct. Int’l Trade 2006); and *Eurodif S.A. v. United States*, 442 F. Supp.2d 1367 (Ct. Int’l Trade 2006).

²⁸ *Techsnabexport v. United States*, 515 F. Supp.2d 1363 (Ct. Int’l Trade 2007).

²⁹ “Amendment to the Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation,” *Federal Register*, Vol. 73, No. 28 (February 11, 2008), pp. 7705-7708, at <http://edocket.access.gpo.gov/2008/pdf/08-608.pdf>. Hereinafter “2008 RSA Amendment.” Quote at p. 7707. See also “United States and Russian Uranium Agreement Reached,” Press Release, Office of Public Affairs, U.S. Department of Commerce, February 1, 2008, at http://www.commerce.gov/NewsRoom/PressReleases/FactSheets/PROD01_005136.

The RSA has been amended previously. See “Amendment to Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation,” *Federal Register*, Vol. 59, No. 63 (April 1, 1994), pp. 15373-15377; “Amendments

this amendment, neither party knew whether the U.S. Supreme Court would agree to review the *Eurodif* decisions, or whether the Congress would be able to pass any legislation pertaining to the Commerce Department's limits on Russian SWU contracts for LEU.

That said, the Commerce Department—and more generally the Bush Administration—had already been calling on the Congress to close what they saw as the “legal loophole” opened by the *Eurodif* decisions that would have allowed unlimited Russian LEU sales to the U.S. For instance, a Commerce Department official told the Senate Committee on Energy and Natural Resources in March 2008 that, if the Supreme Court's decision has the effect of overturning the Russian Suspension Agreement's import limits on Russian SWU contracts for LEU, then Russia's very large commercial uranium enrichment capacity could run U.S. uranium enrichers “out of business.”³⁰ Soon after the U.S. and Russia signed the 2008 RSA Amendment, USEC issued a statement urging the Executive and Legislative Branches to find a way to uphold all planned limits on Russian uranium, including LEU obtained via SWU transactions.³¹

2008 Domenici Amendment

In the wake of the *Eurodif* decisions, lawmakers in the Congress proposed bills to uphold the legality of Commerce Department limits on Russian low enriched uranium imports via “separative work unit” contracts. One approach sought to amend U.S. law to treat *all* SWU transactions for LEU—whether from Russia or another foreign supplier—as goods under U.S. antidumping statutes.³²

In early 2008, Senator Pete Domenici (R-NM) began circulating language, in the form of a legislative amendment, that took a different approach by focusing *specifically* on upholding limits on all Russian sales of LEU, including those via SWU contracts. This approach was received with a mixture of support and opposition. U.S.-based uranium enrichers, such as USEC, supported early versions of the Domenici Amendment. In contrast, U.S. nuclear utilities generally opposed the legislative language. In addition, Rosatom Director Sergei Kiriyyenko in June 2008 sent a letter to Secretary of Energy Samuel Bodman that protested Senator Domenici's legislation.³³

For much of 2008, it was not clear whether the Congress would even consider the Domenici Amendment. However, a revised version of the legislation was included on the so-called “continuing resolution” of September 2008 to sustain temporarily certain government appropriations at the previous year's levels. The House passed this resolution on September 24, 2008, and the Senate followed three

to the Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation,” *Federal Register*, Vol. 61, No. 214 (November 4, 1996), pp. 56665-56667; and “Amendment to Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation,” *Federal Register*, Vol. 62, No. 135 (July 15, 1997), pp. 37879-37880. In addition, the Energy Department issued a notice of changes in the administration of the RSA in July 1998. See “Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation,” *Federal Register*, Vol. 63, No. 147 (July 31, 1998), pp. 40879-40880.

³⁰ See Assistant Secretary of Commerce for Import Administration David M. Spooner, Testimony before the Senate Committee on Energy and Natural Resources, March 5, 2008, at http://www.trade.gov/press/speeches/spooner_030508.pdf.

³¹ See “USEC Inc. Statement on Signing of Russian Suspension Agreement Amendment,” USEC News Release, February 1, 2008, at http://www.usec.com/v2001_02/Content/News/NewsTemplate.asp?page=/v2001_02/Content/News/NewsFiles/02-01-08.htm.

³² To that end, Congressman Ed Whitfield (R-KY) had introduced H.R. 4929, and Senators Mitch McConnell (R-KY) and Jim Bunning (R-KY) co-sponsored companion legislation, S. 2531, in late December 2007.

³³ Rosatom Director Sergei V. Kiriyyenko, Letter to U.S. Secretary of Energy Samuel Bodman on Domenici Amendment, *op. cit.*

days later. President Bush signed into law the continuing resolution with the Domenici Amendment on September 30, 2008.

Among other things, the final version of the Domenici Amendment:

- (a) closes what the Senator, the Commerce Department, and the Bush Administration, had described as the legal “loophole” opened by the *Eurodif* decisions that would have allowed Russia to sell to U.S. nuclear utilities, without limit, low enriched uranium obtained under SWU contracts to enrich natural uranium up to LEU;
- (b) reaffirms existing plans to give Russia access to 20 percent of the post-2013 U.S. uranium market, but now conditions that market access on Russia’s blending down of the entire 500 metric tons of bomb-grade uranium that it had agreed to blend down before 2014 under the HEU Agreement;³⁴ and
- (c) promises to increase Russia’s post-2013 uranium market access to 25 percent if Russia signs a new pact to blend down an additional 300 metric tons of HEU to LEU.³⁵

In contrast to the current HEU Agreement, the Domenici Amendment would not prevent Russia from selling LEU from a post-2013 HEU downblending pact to nuclear utilities outside of the United States. Nor does it call for Russia to continue blending down bomb-grade uranium in a manner conforming to the stringent isotopic standards of ASTM International (formerly the American Society of Testing Materials). Russian officials have privately suggested that these aspects of the Domenici Amendment are not viewed negatively by Moscow.³⁶

II. Where Are We Going? Some Tentative Thoughts . . .

Will Russia Keep Blending Down Bomb-Grade Uranium After 2013?

Russia has already blended down 345 metric tons of the promised 500 metric tons weapons-usable high enriched uranium under the 1993 HEU Agreement.³⁷ Moreover, when the current pact ends by 2013, Russia will have earned as much \$12 billion from downblended low enriched uranium sales to the United States.³⁸

³⁴ In a background interview with the author, a U.S. nuclear utilities executive claimed to worry that Russia—in the wake of lingering tensions over the August 2008 Russo-Georgian conflict and the September 2008 passage of the Domenici Amendment—might decide not to blend down the remaining 155 metric tons of bomb-grade uranium that it is obliged to blend down under the 1993 HEU Agreement. However, American individuals working in the U.S. Executive and Legislative Branches, as well as a Russian individual with close ties to the Russian government, have all opined to the author that they think it is unlikely that Russia would not fulfill its obligations under the HEU Agreement.

³⁵ See Domenici Amendment, *op. cit.* Initial iterations of the Domenici Amendment would have not only created commercial incentives for Russia to sign as sequel to the HEU Agreement, but also lowered Russian access to the post-2013 uranium market to 17 percent if Russia refused to sign a new downblending agreement. Early versions of the draft legislation were received with a mixture of support and opposition. For news coverage on reactions to early versions of the Domenici Amendment, see Jeff Beattie, “Domenici Moves Plan Tying Russian Uranium Imports to HEU Cuts,” *The Energy Daily*, Vol. 36, No. 95, May 19, 2008, pp. 1 & 3.

³⁶ Author interview with a Russian individual with close ties to the Russian government.

³⁷ Russia has already blended down 345 metric tons of bomb-grade uranium. USEC, “Megatons to Megawatts,” updated September 30, 2008, at <http://www.usec.com/megatonstomegawatts.htm>.

³⁸ USEC, “Megatons to Megawatts,” updated September 30, 2008, at <http://www.usec.com/megatonstomegawatts.htm>.

That said, both Russia and the United States will still possess vast stocks of weapons-usable high enriched uranium. One assessment estimates that Russia will have some 770 metric tons of bomb-grade uranium that could yet be blended down, and the U.S., some 675 metric tons.³⁹ But by passing the recent law sponsored by Senator Domenici (the “Domenici Amendment”) to offer new commercial incentives for Russia to agree to keep blending down HEU after 2013, the U.S. government has demonstrated that it views Russia’s continued downblending of bomb-grade uranium to be an important policy goal. Still, it remains unclear whether efforts to arrive at a sequel to the current HEU Agreement with Russia will succeed.

How Dependent Will U.S. Nuclear Utilities Be on LEU Imports from Russia and Other Foreign Suppliers?

Only time will tell what role Russian low enriched uranium—whether it comes from downblended stocks of bomb-grade uranium, or SWU contracts to enrich natural uranium feedstock—will end up playing in America’s post-2013 commercial uranium market.

As the World Nuclear Association reported, Russia assesses that it could undercut American and other foreign LEU competitors with cheap SWU contracts “by some 30 percent.”⁴⁰ In the absence of a legal basis for the Commerce Department to keep limiting imports of Russian LEU via SWU transactions, Commerce officials therefore worried that unfettered Russian LEU sales to the United States could have run America’s still-fledgling uranium enrichment sector. The Domenici Amendment, however, provides a new and independent legal basis for such limits.

Now, with USEC, Areva, and URENCO’s Louisiana Energy Services all planning to build on U.S. soil new enrichment plants, U.S.-based enrichers hope soon to begin providing a greater proportion of the nuclear fuel consumed by U.S. nuclear power plants. Moreover, General Electric-Hitachi Nuclear Energy and Australia-based SILEX Systems, Ltd., are trying to develop and commercialize a technology known as SILEX (which stands for “Separation of Isotopes by Laser EXcitation”), a potentially “game-changing” approach to uranium enrichment using lasers that could make available an extremely cost-effective, U.S.-based enrichment capacity.⁴¹

Questions

For Washington and Moscow to successfully navigate the issues surrounding the future of Russian civil uranium sales to the U.S., and of Russian downblending of bomb-grade uranium, at least six equities may need to be balanced:

- (1) Both Washington and Moscow want to ensure that neither of their stockpiles of high enriched uranium ever fall into the wrong hands;
- (2) The U.S. Executive and Legislative Branches appear to see the continued Russian downblending of bomb-grade uranium as an important way of promoting the aims of arms control;

³⁹ See *Global Fissile Material Report 2008*, *op. cit.* See also pp. 1-2, as well as fn. 3, of the present essay.

⁴⁰ “Nuclear Power in Russia,” World Nuclear Association, September 2008, available at <http://www.world-nuclear.org/info/inf45.html>.

⁴¹ For recent news coverage on SILEX, see Mark Clayton, “Will Lasers Brighten Nuclear’s Future? New Process Could Replace Centrifuges But Renew Threat of Nuclear Proliferation,” *Christian Science Monitor*, August 27, 2008, at <http://features.csmonitor.com/innovation/2008/08/27/will-lasers-brighten-nuclears-future/>.

- (3) Russia wishes to consider other civil uses for its inventory of HEU—for example, to fuel planned fast reactors in the future.
- (4) Russia desires to benefit commercially from its large enrichment capacity by selling more LEU to nuclear utilities in the United States and other countries.
- (5) The United States seeks to avoid having its domestic uranium markets flooded with low enriched uranium such that it undercuts private investment in uranium enrichment plants on U.S. soil.
- (6) Washington does not want—and U.S. nuclear utilities ought not to want—America’s nuclear power reactors to depend too greatly on the uranium supply of Russia or any other single country.

As the U.S. and Russia work to balance these various equities, Washington may need to think longer and harder about a number of relevant questions:

- How much high enriched uranium should Russia and the United States be willing to blend down? How important (if at all) is it for Russia not to blend down so much of its bomb-grade uranium that it ends up having less HEU on-the-ready for civil, military or other purposes than the U.S.? And vice versa?
- From Washington’s point of view, what are the strengths and weaknesses of allowing Russia to build a uranium enrichment plant on U.S. soil, an idea that Russia has floated from time to time?⁴²
- What will the future demand for nuclear power be, since this will be a key factor behind the growth of global LEU demand? Will the U.S. and Russia intervene to elevate nuclear power demand by subsidizing or providing loan guarantees for nuclear power projects both here and abroad? Or will they allow markets directly to determine nuclear power demand?
- Should U.S. desire for a steady supply of uranium fuel be linked—or de-linked—from broader political issues? And to what extent should Washington be prepared to blend down some of America’s HEU for U.S. nuclear utilities to use in an emergency as hedge against an unanticipated interruption of foreign LEU supply?
- What roles can the U.S. Department of Energy (especially its Office of Nuclear Fuel Supply Security⁴³), the U.S. Department of Commerce, the U.S. Department of State, the interagency process within the Executive Branch that is now fulfilling the functions of the Clinton-era Enrichment Oversight Committee,⁴⁴ and the U.S. Congress, play in efforts to answer the above questions? Or equivalent bodies in Russia?

Conclusion

The 1993 HEU Agreement deserves recognition for its continuing contributions to U.S. national security—in particular, to the aims of arms control—and to U.S. energy supply. By 2014, when the current HEU Agreement expires, the Megatons to Megawatts program to implement the Agreement will

⁴² For a news report on this, see Ann MacLachlan and Daniel Horner, “Russia Exploring Building Centrifuge Plant in U.S.,” *NuclearFuel*, March 10, 2008, p. 3.

⁴³ See <http://www.ne.doe.gov/nuclearFuelSecurity/neNFSPProgramActivities.html>.

⁴⁴ “The President: Executive Order 13085—Establishment of the Enrichment Oversight Committee,” *Federal Register*, Vol. 63, No. 102 (May 28, 1998), pp. 29335-29337, at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=1998_register&docid=fr28my98-156.pdf

have resulted in the blending down of 500 metric tons of Russian bomb-grade uranium, enough for as many as sophisticated 41,000 nuclear warheads. What's more, the resulting downblended Russian low enriched uranium is providing for nearly half of the annual nuclear fuel requirements of America's civil nuclear reactors.

But after 2013 what, if anything, shall follow? Russia will still have an estimated 770 metric tons of bomb-grade uranium that could fall into the wrong hands—or be used to make more Russian nuclear warheads; and the United States, 675 metric tons. New efforts will be required if these Russo-American nuclear “swords of Damocles” looming over international security are to be lowered.