Military Fissile Material Stockpile

Last update: July 2015

Country	Plutonium	HEU
Belarus[1]	0	0.1
China[2]	1.8 ± 0.5*	16 ± 4*
France[3]	6* ± 1	26 ± 6*
India[4]	0.59 ± 0.18*	3.2 ± 0.9*
Israel[5]	0.84 ± 0.15*	0.3 ± 0.12*
Kazakhstan[6]	0	0
North Korea[7]	0.03*	?
Pakistan[8]	0.17 ± 0.05	3.1 ± 1.5
Russia[9] [10]	128 ± 8* total, 88 weapons grade, 34 surplus to defense needs	616 ± 120
South Africa[11]	0	0
Ukraine[12]	0	0
UK[13]	3.2 available for weapons 4.4 declared excess	21.2
USA[14]	87 total: 38 weapons grade, 49.3 surplus to defense needs	260

* Figures provided are the best available open source estimates, implying some level of uncertainty.

Sources:

[1] As a non-nuclear weapon state, Belarus does not produce HEU or plutonium for military purposes. The nuclear weapons stationed on its territory during the Soviet period have been transferred to the Russian Federation. Belarus agreed to return all of its stock of HEU, around 230 kg, to Russia before the 2012 Nuclear Security Summit. However, Belarus suspended its participation with the U.S. for HEU removal in 2011. 100kg of HEU remain while negotiations continue. "Belarus Nuclear Overview," Nuclear Threat Initiative, www.nti.org; William Potter, "Belarus Agrees to Remove all HEU," CNS Feature Story, December 1, 2010, www.nonproliferation.org; Fissile Materials Working Group, "NuclearSecurity's Top Priority," *Bulletin of the Atomic Scientists* (web edition), June 12, 2012,

Related content is available on the website for the Nuclear Threat Initiative, www.nti.org.

www.thebulletin.org; Pavel Podvig, “Belarus suspends HEU removal talks with the United States,” IPFM Blog, August 19, 2011, http://fissilematerials.org.

[2] Definitive information about China’s stockpile of fissile material does not exist in the open-source literature. China is believed to have discontinued production of fissile material for military purposes. China has not declared officially that it has stopped HEU and plutonium production, but it is believed to have done so between 1987 and 1990. International Panel on Fissile Materials, “Increasing Transparency of Nuclear-warhead and Fissile-material Stocks as a Step toward Disarmament,” April 2013, www.fissilematerial.org; International Panel on Fissile Materials, Global Fissile Material Report 2014, January 2015, www.fissilematerials.org; International Panel on Fissile Materials, “China,” January 2011, www.fissilematerials.org.

[3] France ceased plutonium production in 1992 and HEU production in 1996. The French government has dismantled two military facilities used for fissile material production. However, France has been reluctant to provide any definitive information on its existing stocks of plutonium and HEU. In contrast to the United States, the Russian Federation and the United Kingdom, France has not declared any of its fissile material to be excess to military use. Estimates of the French stockpile come from an evaluation of the production capacities of known historical facilities. International Panel on Fissile Materials, Global Fissile Material Report 20141, January 2015, www.fissilematerials.org; International Panel on Fissile Materials, “Increasing Transparency of Nuclear-warhead and Fissile-material Stocks as a Step toward Disarmament,” February 2014, www.fissilematerial.org; Nuclear Disarmament: Statement by the Head of the French Delegation, Third Session of the Preparatory Committee for the 2015 NPT Review Conference, May 2, 2014, www.reachingcriticalwill.org; Wade Boese, "France Upgrades, Trims Nuclear Arsenal," Arms Control Association, April 2008, www.armscontrol.org; Zia Mian, Alexander Glaser, "Global Fissile Material Report 2015. Nuclear weapons and fissile material stockpiles and production," Presentation at NPT Review Conference, May 8, 2015, United Nations, New York, http://fissilematerials.org.

[4]India produces both HEU and weapons-grade plutonium. Open-source quantitative assessments of India’s stockpile of fissile material have to be understood as highly speculative. India’s stockpile of HEU is only enriched between 30% and 45% U235 and therefore not weapons-useable. The amount of HEU enriched to the 90% level is estimated at 0.8 ± 0.3 tons The HEU may be used for nuclear submarine propulsion. There is some speculation that India uses reactor-grade plutonium in its weapons, increasing the plutonium stockpile to 4.3-5.1 tons. International Panel on Fissile Materials, Global Fissile Material Report 2014, January 20152, www.fissilematerials.org; Zia Mian, Alexander Glaser, "Global Fissile Material Report 2015. Nuclear weapons and fissile material stockpiles and production," Presentation at NPT Review Conference, May 8, 2015, United Nations, New York, http://fissilematerials.org.

M.V Ramana, “India,” in the publication Assuring Destruction Forever by Reaching Critical Will, March 2012, www.reachingcriticalwill.org; M.V Ramana, “India,” in the publication Still Assuring Destruction Forever: An Update to the 2012 Report, March 2013, *www.reachingcriticalwill.org*.

[5] Israel’s policy of nuclear opacity prevents the release of any definitive information about its presumed nuclear weapons program. Therefore, estimates of its fissile material stocks have a high degree of uncertainty. Former Dimona technician Mordechai Vanunu provided the most detailed account of Israel’s nuclear weapons program to date. His testimony and books by Avner Cohen and Pierre Péan guide much of the open source analysis on Israel’s probable plutonium

production. Less can be surmised about Israel's stock of HEU. Vanunu stated that uranium enrichment via gas centrifuges at the Dimona nuclear facility took place during his tenure. Publications by Israeli scientists on centrifuge theory, and their participation in related conferences provide supporting evidence to his testimony. In addition to alleged indigenous production, there is speculation of a secret transfer of 100 kg of HEU from a U.S. nuclear fuel facility to Israel during the 1960s. After several classified investigations it is still unclear whether Israel received diverted HEU from a U.S naval nuclear fuel facility.

International Panel on Fissile Materials, Global Fissile Material Report 2014, January 2015, www.fissilematerials.org; Victor Gilinsky and Roger J. Mattson, "Revisiting the NUMEC Affair," *Bulletin of the Atomic Scientists,* Vol. 66(2), March 2010, pp.61-75, www.thebulletin.org; Alexander Glaser and Zia Mian, "Fissile Materials and Stocks, 2008," *Bulletin of the Atomic Scientists,* Vol. 65, No. 1, pp. 35-47, January 2009. www.thebulletin.org.

[6] Kazakhstan inherited a large stockpile of HEU (~10,750 kg) and plutonium (3,000 kg) from the Soviet Union's BN-350 breeder reactor. Kazakhstan also operates two research reactors powered by HEU. However, Kazakhstan is a party to the NPT, the CTBT and has an IAEA Additional Protocol in force. Additionally, Kazakhstan is an active member of the Global Initiative to Combat Nuclear Terrorism. "Kazakhstan Nuclear Overview," Nuclear Threat Initiative, www.nti.org; International Panel on Fissile Materials, "The Non-Weapon States," in Global Fissile Material Report 2010, Balancing the Books: Production and Stocks (2010), pp. 134-143, www.fissilematerials.org.

[7] Estimates of North Korea's plutonium stockpile are based on its claim to have completed reprocessing of 8,000 spent fuel rods from its 5 MW(e) reactor at Yongbyon. The DPRK unveiled a uranium enrichment plant with 2,000 centrifuges in 2010 that it claims will be used for LEU production, but it could produce up to 40kg HEU per year if the DPRK chose to do so—enough for one to two warheads annually. A report in August 2013 revealed that North Korea doubled the size of its centrifuge building, doubling the amount of possible centrifuges. It remains uncertain if the DPRK has produced any highly enriched uranium.

Shannon N. Kile, Vitaly Fedechenko, Bharath Gopalaswamy, and Hans M. Kristensen, "Chapter 7: World Nuclear Forces" in *SIPRI Yearbook 2011,* SIPRI, n.d., pp. 351-352; Seigfried S. Hecker and Robert Carlin, "North Korea in 2011: Countdown to Kim il-Sung's Centenary," *Bulletin of the Atomic Scientists,* Vol. 68 (1), January/February 2012, pp. 50-60, www.thebulletin.org; Kelsey Davenport, "N. Korea Continues to Evade Sanctions" in *Arms Control Today* from the Arms Control Association, September 2013, www.armscontrol.org; International Panel on Fissile Materials, *Global Fissile Material Report 2014,* January 2015, www.fissilematerials.org; Zia Mian, Alexander Glaser, "Global Fissile Material Report 2015. Nuclear weapons and fissile material stockpiles and production," Presentation at NPT Review Conference, May 8, 2015, United Nations, New York, http://fissilematerials.org.

[8]Pakistan has not published any information on its production of fissile-materials. However, it is generally understood that Pakistan has been producing HEU for weapons since the 1980s. Moreover, Pakistan operates three heavy-water reactors with a capacity of 40-50 megawatts-thermal, with four nuclear power reactors under construction and planned—two of which may be operational by late 2017. Pakistan's efforts to expand its fissile material production capacity seem limited only by its supply of uranium. International Panel on Fissile Material, *Global Fissile Material Report 2014,* January 2015, www.fissilematerials.org; Hans M. Kristensen and Robert S. Norris, "Pakistan's Nuclear Forces, 2011," *Bulletin of the Atomic Scientists,* Vol. 67(4), pp. 91-99, July/August 2011, www.thebulletin.org;

"Countries: Pakistan," International Panel on Fissile Materials, 3 February 2013, http://fissilematerials.org; "Nuclear Power in Pakistan," *World Nuclear Association,* updated April 2015, www.world-nuclear.org; Zia Mian, Alexander Glaser," *Global Fissile Material Report 2015*. Nuclear weapons and fissile material stockpiles and production," Presentation at NPT Review Conference, May 8, 2015, United Nations, New York, http://fissilematerials.org.

[9]Russia has not published any account of its plutonium production for military purposes. Estimates therefore rely on "assumptions about the power history of the production reactors." These assessments have improved over time with the release of historical documents and memoirs into the public domain. The IPFM estimates Russia's total stock of plutonium at 128 ± 8 metric tons. International Panel on Fissile Material, *Global Fissile Material Report 2011,* January 2012, www.fissilematerials.org; Zia Mian, Alexander Glaser, "Global Fissile Material Report 2015. Nuclear weapons and fissile material stockpiles and production," Presentation at NPT Review Conference, May 8, 2015, United Nations, New York, http://fissilematerials.org.

[10] Calculating Russia's stockpile of HEU with a high degree of certainty is not possible. Best guess estimates-of Russia's total SWU production; based on the history of the Soviet enrichment program, have a degree of uncertainty of ± 5%. The IPFM estimates that approximately 616 metric tons of HEU are currently in weapons or are available for weapons use. In 2013, Russia completed a 20-year 500-ton excess HEU blend down program. International Panel on Fissile Materials, Global Fissile Material Report 2014, January 2015, www.fissilematerials.org; "Increasing Transparency of Nuclear-warhead and Fissile-material Stocks as a Step toward Disarmament," International Panel on Fissile Materials, April 24, 2013, www.fissilematerials.org.

[11] South Africa dismantled its nuclear weapons program in the early 1990s and halted the production-of weapons grade HEU. Remaining HEU was subsequently converted to civilian use. South Africa has approximately 400 to 450 kg weapons grade HEU under IAEA safeguards. International Panel on Fissile Materials, "Nuclear Weapon and Fissile Material Stockpiles and Production," in Global Fissile Material Report 2009: A Path to Nuclear Disarmament (2009), www.fissilematerials.org, pp. 8-23.

[12] Ukraine does not produce any HEU or plutonium for weapons purposes. The massive stockpile of nuclear weapons Ukraine inherited from the Soviet Union was returned to Russia by 1996 for dismantlement. Ukraine committed to remove all HEU from its territory by the beginning of the 2012 Nuclear Security Summit. The Ministry of Foreign Affairs confirmed in March 2012 that all HEU had been transferred to Russia. "Ukraine Nuclear Overview," Nuclear Threat Initiative, www.nti.org; Martin Matishak, "Ukraine Agrees to Eliminate Highly Enriched Uranium Stock by 2012," Global Security Newswire, April 13, 2010, www.nti.org; Pavel Podvig, "Ukraine removed all HEU from its territory," International Panel on Fissile Materials, March 22, 2012, www. fissilematerials.org.

[13] The United Kingdom has provided partial accounts of its stockpile of-fissile material on a number of occasions. Current estimates of its holdings-of HEU and plutonium are largely based on the Strategic Defence and-Security Review from 1998 and a follow-up report released in 2000. While the U.K. has provided what are believed-to be accurate declarations of its production and use of fissile material, there remains much to be learned about its holdings. The IPFM estimates-the total stock of separated plutonium in the U.K. at 7.6 metric tons, with 4.4 declared excess and 3.5 available for weapons. In 1995 the United Kingdom ceased fissile material production and has decommissioned or converted fissile material production facilities. International Panel on Fissile Materials, Global Fissile Material

Report 2014, January 2015, www.fissilematerials.org; International Panel on Fissile Materials, "Increasing Transparency of Nuclear-warhead and Fissile-material Stocks as a Step toward Disarmament," May 7, April 2013, www.fissilematerial.org; Main Committee I Statement," Report by Mr. Guy Pollard, Deputy Permanent Representative of the United Kingdom to the Conference on Disarmament, 2015 Review Conference of the Treaty on Non-Proliferation of Nuclear Weapons, April 27-May 22, 2015.

[14] In 2006, the Department of Energy released a previously classified report on its HEU production through 1996 called Highly Enriched Uranium: Striking a Balance. Undertaken in the interests of transparency, the report provides what is likely the most accurate assessment of the U.S. HEU stockpile. In 2012, the U.S. Department of Energy released a report titled "The United States Plutonium Balance, 1994-2009" which served as an update to its 1996 report "Plutonium: The First 50 Years." The United States currently has 36 tons of excess HEU remaining to be blended down by 2030. The IPFM largely bases it assessments on these reports and other information provided by the U.S. government. The total stock of separated plutonium in the United States is reported to be 87 metric tons, of which 38 metric tons is weapons grade. The United States also declared 49.4 metric tons as plutonium surplus to defense needs.

[15] International Panel on Fissile Materials, Global Fissile Material Report 2014, January 2015, www.fissilematerials.org; "The United States Plutonium Balance, 1944-2009: An Update of 'Plutonium: The First 50 Years,'" National Nuclear Security Administration and the U.S. Department of Energy, June 2012, www.nnsa.energy.gov; International Panel on Fissile Materials, "Increasing Transparency of Nuclear-warhead and Fissile-material Stocks as a Step toward Disarmament," April 2013, www.fissilematerial.org; "Countries: United States," International Panel on Fissile Materials, July 31, 2013, http://fissilematerials.org; Zia Mian, Alexander Glaser, "Global Fissile Material Report 2015. Nuclear weapons and fissile material stockpiles and production," Presentation at NPT Review Conference, May 8, 2015, United Nations, New York, http://fissilematerials.org.