Global Inventory of Highly Enriched Uranium

(Detailed Descriptions by Country)

(Data: End of 2022)

Russia US France China UK Israel
Pakistan India North Korea Non-nuclear Weapon Countries

Country	Military Use (ton)	Non-military Use (ton)
Russia	**672.0**	**8.0**
	In Russia, uranium enrichment has been carried out at four uranium enrichment facilities (Sverdlovsk-44, Tomsk-7, Krasnoyarsk-45, and Angarsk). All of them are in operation and supplying LEU for nuclear power plant fuel. The centrifuge plant in Krasnoyarsk produces HEU for research reactors and fast breeder reactors. Russia is reprocessing both the spent fuel for naval use and spent fuel from research reactors.	There is no HEU clearly declared for civilian use, but it is estimated that the equivalent of 6 tons of 90% enriched uranium (8-9 tons) is used for research reactors and is not diverted to military use. In addition, in December 2022, 7.6 tons of HEU (21%, 26%) was provided for fast reactors in China (equivalent of 2 tons of 90% HEU). Under an agreement with the US, Russia has disposed of 500 tons of HEU (diluted into low-enriched uranium (LEU)). The LEU was sold to the US and used as fuel for nuclear reactors. The program ended in 2013. Under the Material Consolidation and Conversion program (MCC) 16.8 tons of HEU had been diluted by 2014.
US	**450.4**	**32.6**
	The US finished production of HEU for nuclear weapons in 1964 and the production of fuel for nuclear-powered ships in 1992. The total amount produced is about 850 tons (excluding that recycled on nuclear-powered ships). So far, more than 150 tons have been diluted. As of the end of September 2013 the total US inventory was 585.6 tons (Of this inventory, 121.1 tons were a stockpile for naval use and 17.3 tons for research reactors. Of the remaining 86.2 tons, 41.6 tons are for dilution. As of the end of 2022, 465.1 tons of HEU were available, of which 89.5 tons were a stockpile for naval use, 14.6 tons for research reactors, and 18 tons for future dilution.	
France	**25.0**	**3.8**
	Production was halted in 1996. The total amount produced thus far has not been made public. 5 tons to 7 tons have been used for tritium production in reactors, 2 tons to 4 tons in nuclear tests, and the current stockpile is between 19 tons and 31 tons.	The stockpile figure is as published on September 7, 2023(INFCIRC/549/Add.5/27). France has one uranium enrichment plant. 3,761 tons are unirradiated HEU.

China	**14.0**	**0.0****
	China has two uranium enrichment plants, one is in Lanzhou (gaseous diffusion, Plant 504) and the other in Hanzhong (gaseous diffusion, Plant 405). The latter is currently in operation and also provides HEU for research reactors and for naval use. The latest estimate of cumulative production is 13-19 tons. Of this, 0.5 tons are in research reactors, and 0.84 tons were used in nuclear testing. The current stockpile is 11-17 tons.	At least 240kg of uranium enriched to 66.4% has been provided by Russia for fast reactor fuel. TVEL, a subsidiary of a Russian state corporation Rosatom, announced that it delivered the first batch of fuel to China's CFR-600 fast reactor. In 2019, TVEL and CNLY (a subsidiary of China National Nuclear Corporation) signed a contract for the supply of nuclear fuel, under which TVEL supplies HEU fuel for the first of two fast reactors under construction until 2030. To fulfill the contract, TVEL increased the production capacity of its Zelenogorsk Electrochemical Plant and completed a dedicated fuel production line for China in 2021. It is believed that the fuel was delivered in September, November, and December 2022, but the enrichment of the fuel is unknown. If the fuel is similar to BN600, it is estimated to be around 17%, 21%, or 26%. If the enrichment is 21% or 26% enrichment, the amount of HEU is 7.6 tons (equivalent of 2 tons of 90% HEU). China has one domestic production plant, and two centrifugal separation plants imported from Russia. These have been used in making HEU for research reactors and LEU for ship or submarine reactors. One unit is still operational.
UK	**21.9**	**0.7**
	The UK produced HEU for military use at the Capenhurst gaseous diffusion plant (1952-1962). Later, LEU for power generation was also produced. The UK also received 13 tons of U235 from the US. According to figures released in 2006, it had 21.86 tons of HEU as of March 31, 2002 (average enrichment not disclosed).	The stockpile figure is published on November 16,2023(INFCIRC/549/Add.8/26,). 0.691 tons are unirradiated and the material is mainly used in research reactors. The UK has one large-scale uranium enrichment plant.
Israel	**0.3**	**0.02**
	There is information that Israel secretly obtained several hundred kilograms of HEU from a US factory producing fuel for nuclear-powered ships.	The US has provided 34kg, of which 12kg has been returned.
Pakistan	**5.1**	**0.02**
	Pakistan started production of HEU in 1974. It appears that they stole technology from the URENCO factory in the Netherlands. There is also information that they obtained 50 kg of HEU from China. There is considerable uncertainty about Pakistan's amount of uranium resources, and the enrichment capabilities and state of operation of the enrichment facility in Kahuta. It is possible that there is a second plant in Gadwal. The current estimated inventory is 3.6-6.6 tons.	Provided by the US.

India	**5.3**	**0.0****
	HEU is still being manufactured, it appears to be produced mainly to fuel submarines. India possesses a pilot plant at the Bhabha Atomic Research Centre (BARC), in operation since 1985. A large-scale centrifugal enrichment facility has been in operation since 1990 (Rare Materials Project). The enrichment rate of the HEU is between 30% and 45%, and the stockpile is 3.3 tons to 7.3 tons at an enrichment rate of 30%.	Provided by former Soviet Union. A civilian facility is planned for construction in Chitradurga.
North Korea	**0.7**	
	According to the estimates of Kang et al. (2021), the estimates are 230kg to 1,180kg; the IPFM estimates are 0.4 tons to 1.0 ton.	
Non-nuclear Weapon Countries*		**15.0**
Total	**1,195**	**60**

*Based on the total inventory of U235 under IAEA safeguards (159 significant quantities [25kg U235]), the estimated amount is about 3.9 tons if all are assumed to be 100% enriched, and about 19.5 tons if all are 20% enriched. The IPFM (2023) adopted the former. Since the individual enrichment levels are unknown, the correct figure would be "3.9 to 19.5 tons." RECNA has decided to return to the figure shown by the IPFM in 2019 (15 tons). However, the details have not been disclosed, so the figure is uncertain. This makes the total amount of HEU appear to have increased from last year, but this is due to differences in the way estimates are treated. The non-nuclear weapon states are believed to be Japan, Germany, Canada, Kazakhstan, the Netherlands, Belgium, South Africa, Italy, Belarus, Norway, Iran, Australia, and Syria (13 states in total), but details are unknown.

** Inventory is less than 100 kg but the detail is unknown.

The stockpile of fissile materials includes estimated ones with different isotopic composition and with large uncertainties, and thus total quantities are expressed in rounded numbers.

The material that can be used in nuclear weapons is highly enriched uranium (HEU) with an enrichment level of 20% or more. Most of HEU for military use is estimated to be over 90% enriched, and there is a significant amount of HEU for civilian use that is less enriched. However, details are not disclosed.

Therefore the values for converting to the Hiroshima atomic bomb are a rule of thumb.