Global Stocks of Nuclear Explosive Materials: Summary Tables and Charts

July 12, 2005*, Revised September 7, 2005*

Table 1 Global Plutonium and Highly Enriched Uranium (HEU), Assigned to Civil or Military Stocks, end 2003, in tonnes[a]

Category	Plutonium	HEU	Total
Civil Stocks	**1,675[b]**	**175**	**1850**
Power and Research Reactor Programs[c]	1570	50	
Russian and U.S. Military Excess[d]	102.5	125 (US only)	
Military Stocks	**155**	**1725**	**1880**
Primary	155	1250	
Naval and Other	--	175	
Russian HEU Declared Excess	--	300[e]	
Total	**1830**	**1900**	**3730**

[a] These aggregate numbers are based on an attempt to realistically assign plutonium and HEU to civil or military stocks based on a combination of factors, principally current use and future intended use. The bulk of the plutonium and HEU in military stocks is material in nuclear weapons, reserves, naval and production reactor programs, and in storage from dismantled weapons.

[b] Rounded.

[c] British excess plutonium is included with civil power reactor values because Britain includes this plutonium in the category of civil, unirradiated plutonium in its INFCIRC/549 declarations to the International Atomic Energy Agency.

[d] Britain and the United States declared that their excess plutonium would be used only for peaceful purposes. The United States made a similar commitment for its excess HEU; Britain did not declare any excess HEU. Russia has made a similar commitment for its excess plutonium, but not for its excess HEU (see below).

[e] Russia has committed to blend down 500 tonnes of HEU to LEU. By the end of 2003, it had blended down 200 tonnes. The remaining 300 tonnes remain in its military stock, probably in nuclear weapons, and not isolated from its primary military stock and committed to peaceful uses. As a result, this stock is assigned to the military stock. As HEU from this category is blended down to LEU, it is removed from this total.

Table 2 Plutonium and HEU Holdings by Country, end 2003, in tonnes[a]

Country	PLUTONIUM					HEU[b]			Total[c]
	Civil				Military	Subtotal	Civil	Military	Subtotal	
	Power Reactor Programs		Military Excess	Subtotal						
	Irradiated	Separated								
Argentina	11			11		11	0.020		0.020	11.02
Armenia	1.4			1.4		1.4	0		0	1.4
Australia	0			0		0	0.35		0.35	0.35
Austria	0			0		0	0.005-0.02		0.005-0.02	0.005-0.02
Belarus	0			0		0	0.25-0.37		0.25-0.37	0.25-0.37
Belgium	23.1	0.4-1.4		23.5-24.5		23.5-24.5	0.70-0.75		0.70-0.75	24.2-25.3
Brazil	2.1			2.1		2.1	0-0.001		0-0.001	2.1
Bulgaria	8.5			8.5		8.5	0.006		0.006	8.5
Canada	135			135		135	1.35		1.35	136
Chile	0			0		0	0.005		0.005	0.005
China	5.1			5.1	4	9.1	1	21	22	31.1
Colombia	0			0		0	0		0	0
Denmark	0			0		0	0		0	0
Czech Republic	6.2			6.2		6.2	0.08-0.14		0.08-0.14	6.28-6.34
Finland	11			11		11	0		0	11
France	183	48.1		231.1	5	236.1	4.0-5.3	29	33-34.3	269-270
Georgia	0			0		0	0-0.001		0-0.001	0-0.001
Germany	67-70	26		93-96		93-96	1.4-2.7		1.4-2.7	94.4-98.7
Ghana	0			0		0	0.001		0.001	0.001
Greece	0			0		0	0.003-0.016		0.003-0.016	0.003-0.016
Hungary	7.5			7.5		7.5	0.15-0.25		0.15-0.25	7.65-7.75
India	12.5-13	1-1.5		13.5-14.5	0.43	13.9-14.9	0.005-0.01		0.005-0.01	13.9-14.9
Iran	0			0		0	0.007		0.007	0.007
Israel	0			0	0.56	0.56	0.034		0.034	0.594
Italy	4.0	2.5		6.5		6.5	0.10-0.20		0.10-0.20	6.6-6.7
Jamaica	0			0		0	0.001		0.001	0.001
Japan	111-113	40.6		151.6-153.6		151.6-153.6	2.0		2.0	154-156
Kazakhstan	3.0			3.0		3.0	10.59-10.94[d]		10.59-10.94	13.6-13.9
Latvia	0			0		0	0.020-0.025		0.020-0.025	0.02-0.025
Libya	0			0		0	0.025		0.025	0.025
Lithuania	10			10		10	0		0	10

Country	PLUTONIUM						HEU[b]			Total[c]
	Civil				Military	Subtotal	Civil	Military	Subtotal	
	Power Reactor Programs		Military	Subtotal						
	Irradiated	Separated	Excess							
Mexico	2.4			2.4		2.4	0.012		0.012	2.41
Netherlands	1-1.4	2-2.5		3-3.9		3-3.9	0.73-0.81		0.73-0.81	3.73-4.71
Nigeria	0			0		0	0.001		0.001	0.001
North Korea	0			0	0.04[e]	0.04	0.042[f]		0.042	0.082
Norway	0			0		0	0.004		0.004	0.004
Pakistan	0.8			0.8	0.04	0.84	0.017		0.017	0.857
Philippines	0			0		0	0		0	0
Poland	0			0		0	0.49		0.49	0.49
Portugal	0			0		0	0.007-0.008		0.007-0.008	0.007-0.008
Romania	2.4			2.4		2.4	0.033-0.044		0.033-0.044	2.43-2.44
Russia	88	38.2	50	176.2	95	271.2	15-30	1073[g]	1088-1103	1360-1375
Serbia	0			0		0	0.013		0.013	0.013
Slovakia	8.4			8.4		8.4	0		0	8.4
Slovenia	2.7			2.7		2.7	0-0.005		0-0.005	2.7-2.71
South Africa	5.8			5.8		5.8	0.61-0.76		0.61-0.76	6.41-6.56
South Korea	44			44		44	0.002		0.002	44
Spain	26.6	0.3		26.9		26.9	0		0	26.9
Sweden	41	0.83		41.8		41.8	0.002		0.002	41.8
Switzerland	16-17	1.5-3.0		17.5-20		17.5-20	0.005-0.010		0.005-0.010	17.5-20
Syria	0			0		0	0.001		0.001	0.001
Taiwan	22			22		22	0.003-0.010		0.003-0.010	22
Thailand	0			0		0	0		0	0
Turkey	0			0		0	0.008		0.008	0.008
Ukraine	41			41		41	0.16-0.25		0.16-0.25	41.2-41.3
United Kingdom	18.5-24.6	74.6[h]		93.1-99.2	3.2	96.3-102.4	1.5	21.9	23.4	120-126
United States	403		52.5	455.5	47	502.5	125[i]	580	705	1208
Uzbekistan	0			0		0	0.12		0.12	0.12
Vietnam	0			0		0	0.0056		0.0056	0.0056
15 Others	0			0		0	0-0.001		0-0.001	0-0.001
Total[c]	**1325-1340**	**238**	**102.5**	**1665-1680**	**155**	**1820-1835**	**165-185**	**1725**	**1890-1910**	**3710-3745**

[a] Holdings represent the stocks owned by a country or its utilities. Some of this material may be located overseas.

[b] Includes both irradiated and separated HEU. The vast bulk of HEU is separated (unirradiated). However, the estimates presented in this table do not make a distinction between irradiated and separated HEU because of sensitivities about security at many sites at which the HEU is located.

[c] Rounded.
[d] The value for Kazakhstan includes 10.5-10.8 tonnes of Russian-origin HEU used in the BN-350 breeder reactor and 0.09-0.14 tonnes Russian-origin HEU for research and development activities.
[e] The estimated value for North Korea's military stock is 0.035-0.045 tonnes of plutonium. At the end of 2003, most of North Korea's plutonium was unirradiated.
[f] Russian-origin HEU provided for IRT reactor at Yongbyon.
[g] Russia has committed to blend down 500 tonnes of HEU to LEU. By the end of 2003, it had blended down 200 tonnes. The remaining 300 tonnes remain in its military stock, probably in nuclear weapons. As a result, this stock is assigned to the military stock. The United States has also declared a large amount of military HEU excess to military needs but has identified and committed it to peaceful uses. For this reason, remaining US excess HEU is included in the civil HEU category (see footnote (h)).
[h] Contains 4.4 tonnes of British excess plutonium.
[i] The civil HEU value for the United States includes the remaining 123 tonnes of HEU declared excess to military purposes as of the end of 2003 and scheduled for disposition, as well as HEU in or at domestic civil research reactors and about 1 tonne of HEU that has been returned from civil foreign research reactors since 1996. A small fraction of the declared excess is HEU that was irradiated in foreign research reactors prior to 1996 or in domestic research reactors and sent to DOE sites for storage or processing, at which time the DOE took ownership of the material.

Table 3 Fissile Materials of Special Concern: In-Country Stocks of Separated Plutonium and Total Stocks of HEU (end 2003, in tonnes)[a,b]

Country	Separated Plutonium			HEU			Total[d]
	Military	Civil[c]	Subtotal[d]	Military	Civil	Subtotal[d]	
Russia	95	88[e]	183	1073[f]	15-30	1088-1103	**1280**
Pakistan	0.04	0	0.04	1.1	0.017[g]	1.120	**1.16**
North Korea	0.015-0.04	0	0.015-0.04	?	0.042[h]	0.042	**0.06-0.08**
India	0.4	~1-1.5	1.4-1.9	~0.5	0.005-0.01	0.505-0.51	**1.9-2.4**
China	4	0	4	21	1	22	**26**
Countries with Russian-supplied HEU[j]	0	?[i]	?	0	1.32-1.70	1.3-1.7	**1.3-1.7**
Kazakhstan	0	0	0	0	10.59-10.94[k]	10.6-10.9	**11**
South Africa	0	0	0	0	0.61-0.76[l]	0.61-0.76	**0.61-0.76**
Belgium	0	3.5	3.5	0	0.3	0.3	**3.8**
Canada	0	0	0	0	1.35	1.35	**1.35**
France	5	78.6	84	29	6.4	35.4	**119**
Germany	0	12.5	12.5	0	1	1	**13.5**
Israel	0.6	0	0.6	?	0.034	0.034	**0.6**
Japan	0	5.4	5.4	0	2.0	2	**7.4**
Netherlands	0	0	0	0	0.73-0.81	0.73-0.81	**0.73-0.81**
Switzerland	0	0.5-1.0	0.5-1.0	0	0.005-0.01	0.005-0.01	**0.5-1.0**
United Kingdom	3.2	96.2	99	21.9	1.5	23	**123**
United States	47	45[m]	92	580	125[n]	705	**797**
Smaller Stocks of HEU in Many Countries	0	0	0	0	0.38-0.54[o]	0.4-0.5	**0.4-0.5**
Smaller Stocks of Plutonium in Several Countries	0	<1	<1	0	0	0	**<1**
Total[d]	**155**	**332**	**490**	**1725**	**175**	**1900**	**2400**

[a] In-country stocks represent the amount of fissile material held in a country, rather than the amount owned by that country. France, for example, has an active reprocessing program which requires it to hold a significant amount of foreign-owned plutonium at its reprocessing and MOX fabrication facilities. This plutonium is not owned by France, but is included in the estimate of its in-country stocks.

[b] This table estimates stocks of separated plutonium and both separated and irradiated HEU in countries that are of special concern because of the risk of diversion for use by terrorists. Separated plutonium and HEU are directly usable in nuclear weapons. Most of the HEU is unirradiated. In addition, much of the irradiated HEU

stock is not very radioactive and is relatively easy to transport. Plutonium unseparated from power reactor spent fuel, while still posing a proliferation risk, is more difficult for terrorists to handle and convert into a nuclear weapon, and is not included in the estimates. The order of the countries in the table is meant to suggest which stocks are most important to understand and secure, but this judgment is subjective.

[c] Includes plutonium separated in civil power reactor programs and separated plutonium declared excess to military needs and committed to peaceful uses.

[d] Rounded.

[e] This value includes about 50 tonnes of plutonium that Russia has declared excess to military needs and committed to peaceful uses.

[f] Russia has committed to blend down 500 tonnes of HEU to LEU. By the end of 2003, it had blended down 200 tonnes. The remaining 300 tonnes remain in its military stock, probably in nuclear weapons. As a result, this stock is assigned to the military stock. The United States has also declared a large amount of military HEU excess to military needs but has identified and committed it to peaceful uses. For this reason, remaining US excess HEU is included in the civil HEU category (see also footnote (l)).

[g] The civil HEU value for Pakistan includes 16 kg of US-origin HEU and 1 kg of Chinese-origin HEU.

[h] Russian-origin HEU provided for IRT reactor at Yongbyon.

[i] Believed to be small, but not estimated.

[j] Includes the former Soviet States and other countries with Russian-supplied research reactors, excluding Kazakhstan, China, Germany, and North Korea, which also have in-country stocks of Russian-supplied HEU but are listed separately in this table. An estimated 0-5 kg of 36% enriched Russian-origin spent fuel may also have remained in Romania. The countries in this category with civil HEU stocks larger than or equal to 5 kg are Belarus; Bulgaria; Czech Republic; Hungary; Latvia; Libya; Poland; Serbia; Ukraine; Uzbekistan; and Vietnam.

[k] The value for Kazakhstan includes 10.5-10.8 tonnes of Russian-origin HEU used in the BN-350 breeder reactor and 0.09-0.14 tonnes Russian-origin HEU for research and development activities.

[l] About 500 kg of South Africa's HEU stock is separated (unirradiated) HEU.

[m] Plutonium declared excess to military needs and committed to peaceful uses. This value does not include about 7.5 tonnes of declared excess plutonium contained in irradiated material.

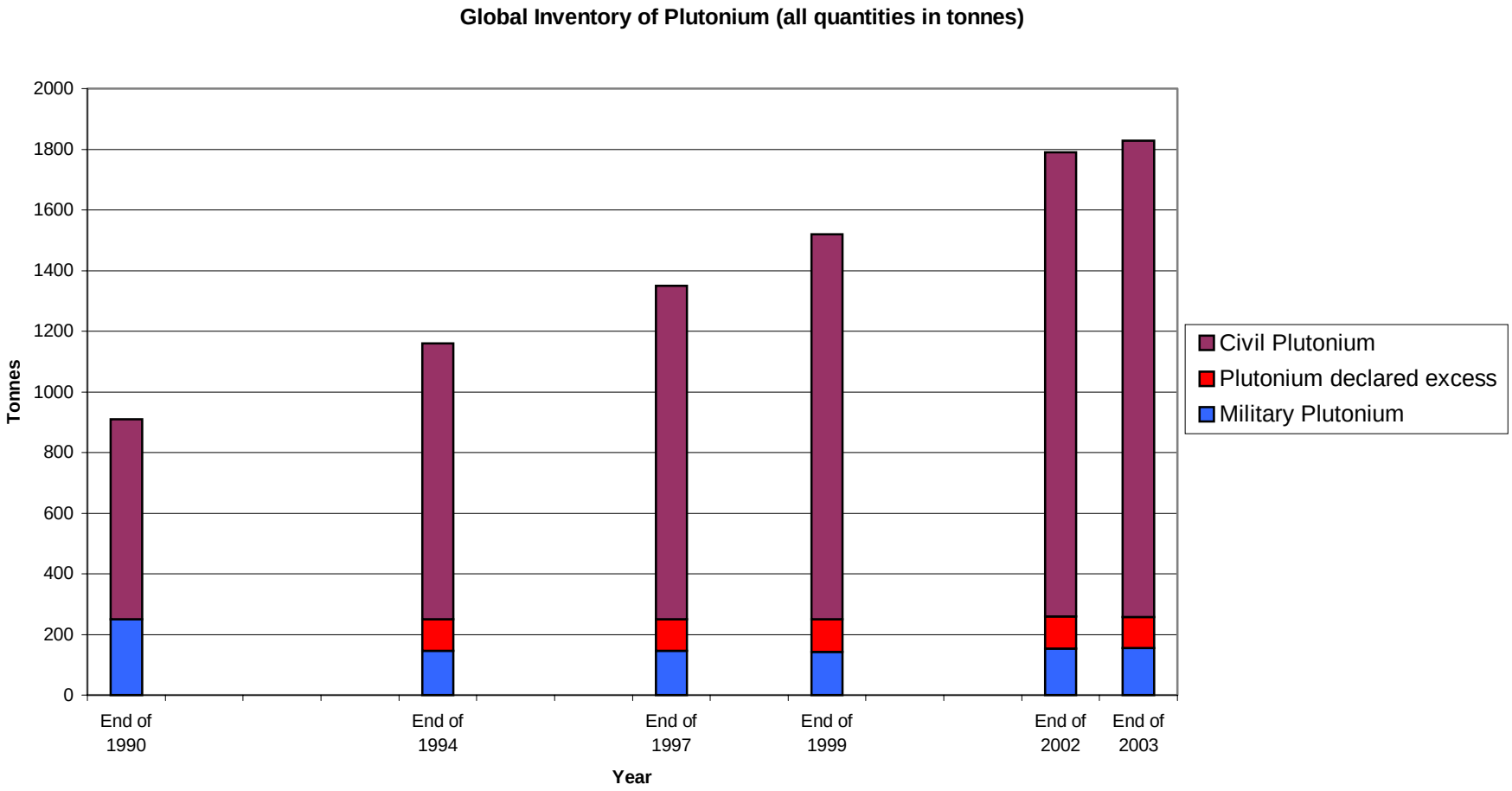
[n] The civil HEU value for the United States includes the remaining 123 tonnes of HEU declared excess to military purposes as of the end of 2003 and scheduled for disposition, as well as HEU in or at domestic civil research reactors and about 1 tonne of HEU that has been returned from civil foreign research reactors since 1996. A small fraction of the declared excess is HEU that was irradiated in foreign research reactors prior to 1996 or in domestic research reactors and sent to DOE sites for storage or processing, at which time the DOE took ownership of the material.

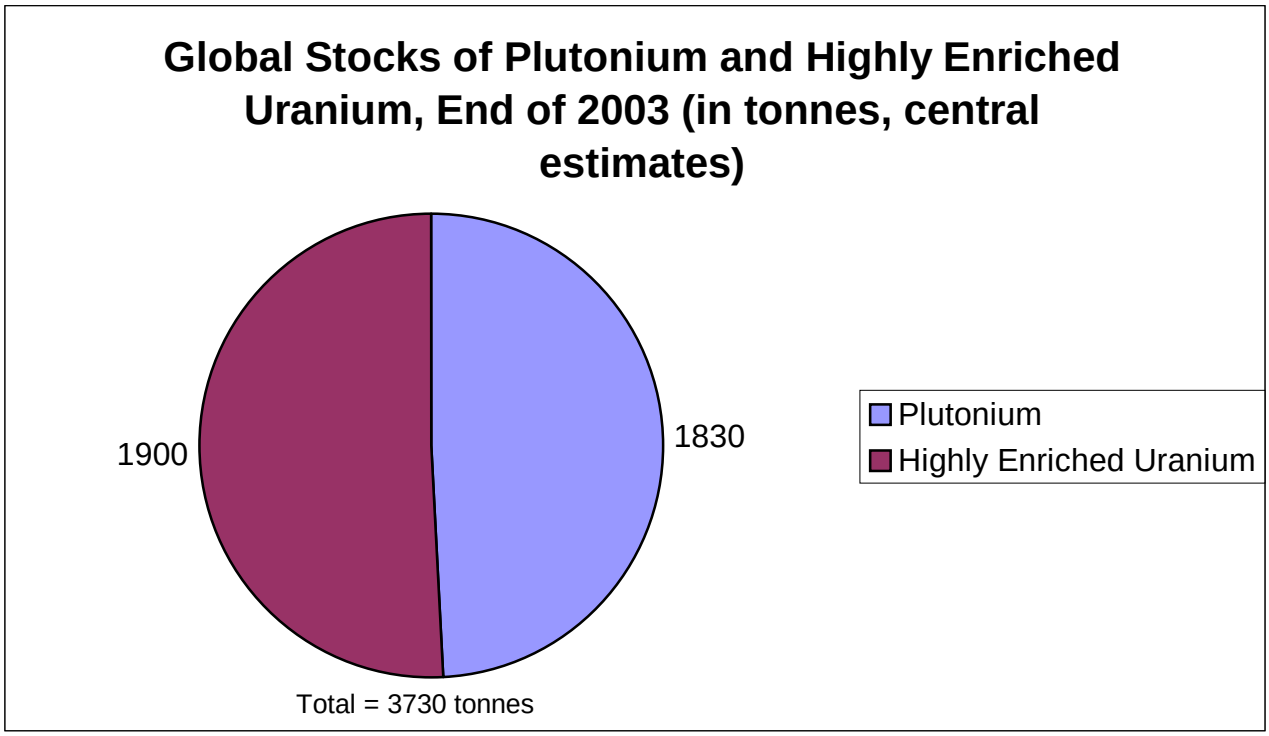
[o] This value includes holdings in non-nuclear weapon states that received US-origin HEU that are not listed separately in this table and countries with Chinese-supplied research reactors (Ghana, Syria, Iran, Nigeria). Pakistan also received Chinese-origin HEU, but is listed separately in this table (see footnote (f). Within this category, the countries with civil HEU stocks larger than or equal to 5 kg are Argentina; Australia; Austria; Chile; Greece; Iran; Italy; Mexico; Pakistan; Portugal; Romania; Slovenia; Taiwan; and Turkey.

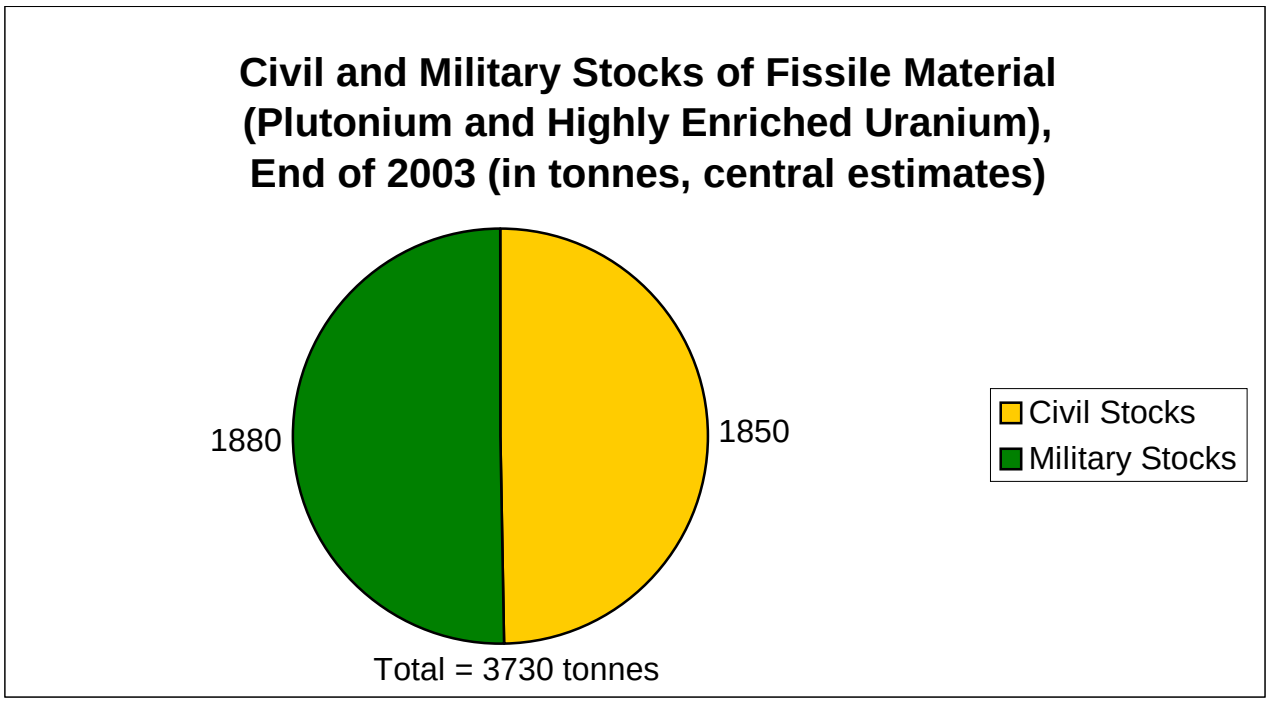
Table 4 Key Nuclear Explosive Material Holdings by Country, end 2003, in tonnes

Country	Plutonium	HEU	Np 237	Am	Total (rounded)
Argentina	11	0.020	0.066	0.198	11.3
Armenia	1.4	0	0.097	0.209	1.7
Australia	0	0.35	0	0	0.35
Austria	0	0.005-0.02	0	0	0.005-0.02
Belarus	0	0.25-0.37	0	0	0.25-0.37
Belgium	23.5-24.5	0.70-0.75	1.28	1.742	27.2-28.3
Brazil	2.1	0-0.001	0.060	0.058	2.22
Bulgaria	8.5	0.006	0.595	0.852	9.95
Canada	135	1.35	0.807	2.330	139
Chile	0	0.005	0	0	0.005
China	9.1	22	0.156	0.119	31.5
Colombia	0	0	0	0	0
Denmark	0	0	0	0	0
Czech Republic	6.2	0.08-0.14	0.291	0.362	6.93-6.99
Finland	11	0	0.517	0.839	12.4
France	236.1	33-34.3	9.80	12.9	292-293
Georgia	0	0-0.001	0	0	0-0.001
Germany	93-96	1.4-2.7	4.87	7.67	107-111
Ghana	0	0.001	0	0	0.001
Greece	0	0.003-0.016	0	0	0.003-0.016
Hungary	7.5	0.15-0.25	0.289	0.429	8.37-8.47
India	13.9-14.9	0.005-0.01	0.142	0.290	14.3-15.3
Iran	0	0.007	0	0	0.007
Israel	0.56	0.034	0	0	0.594
Italy	6.5	0.10-0.20	0.096	0.355	7.1-7.2
Jamaica	0	0.001	0	0	0.001
Japan	151.6-153.6	2.0	5.12	8.87	168-170
Kazakhstan	3.0	10.59-10.94	0	0	13.6-13.9
Latvia	0	0.020-0.025	0	0	0.02-0.025
Libya	0	0.025	0	0	0.025
Lithuania	10	0	0.220	0.342	10.6
Mexico	2.4	0.012	0.076	0.095	2.58
Netherlands	3-3.9	0.73-0.81	0.147	0.249	4.13-5.11
Nigeria	0	0.001	0	0	0.001
North Korea	0.04	0.042	0	0	0.077-0.087
Norway	0	0.004	0	0	0.004
Pakistan	0.84	0.017	0.008	0.019	0.884
Philippines	0	0	0	0	0
Poland	0	0.49	0	0	0.49
Portugal	0	0.007-0.008	0	0	0.007-0.008
Romania	2.4	0.033-0.044	0.012	0.019	2.46-2.48
Russia	271.2	1088-1103	3.47	5.313	1370-1380
Serbia	0	0.013	0	0	0.013

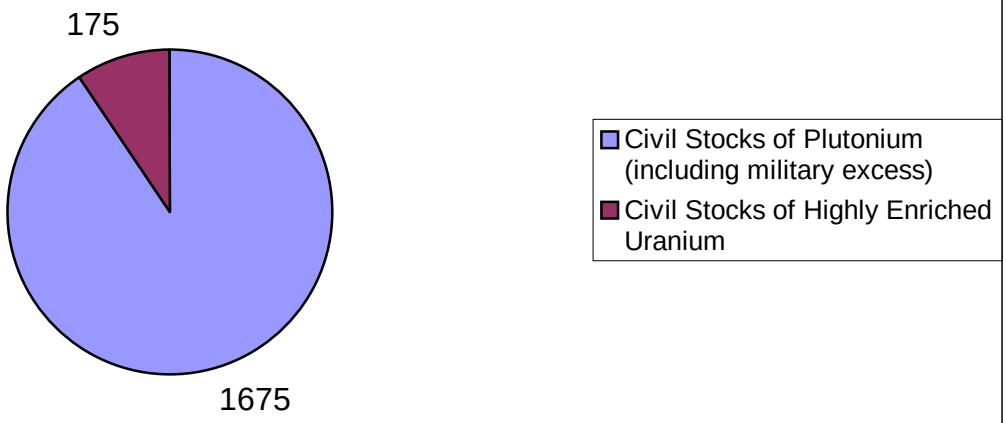
Country	**Plutonium**	**HEU**	**Np 237**	**Am**	**Total (rounded)**
Slovakia	8.4	0	0.390	0.561	9.35
Slovenia	2.7	0-0.005	0.132	0.157	2.99
South Africa	5.8	0.61-0.76	0.274	0.308	6.99-7.14
South Korea	44	0.002	1.54	1.851	47.4
Spain	26.9	0	1.13	1.843	29.9
Sweden	41.8	0.002	1.17	3.086	46.1
Switzerland	17.5-20	0.005-0.010	0.859	1.256	19.6-22.1
Syria	0	0.001	0	0	0.001
Taiwan	22	0.003-0.010	0.648	1.511	24.2
Thailand	0	0	0	0	0
Turkey	0	0.008	0	0	0.008
Ukraine	41	0.16-0.25	2.34	2.608	46.1-46.2
United Kingdom	96.3-102.4	23.4	1.01	3.81	125-131
United States	502.5	705	16.3	26.85	1250
Uzbekistan	0	0.12	0	0	0.12
Vietnam	0	0.0056	0	0	0.0056
15 Others	0	0-0.001	0	0	0
Total (rounded)	**1830**	**1900**	**54**	**87**	**3870**


Global Inventory of Plutonium (all quantities in tonnes)
Tonnes
2000
1800
1600
1400
1200
1000
800
600
400
200
0
End of 1990
End of 1994
End of 1997
End of 1999
End of 2002
End of 2003
Year
Civil Plutonium
Plutonium declared excess
Military Plutonium


Global Stocks of Plutonium and Highly Enriched Uranium, End of 2003 (in tonnes, central estimates)
1900
1830
Total = 3730 tonnes
Plutonium
Highly Enriched Uranium

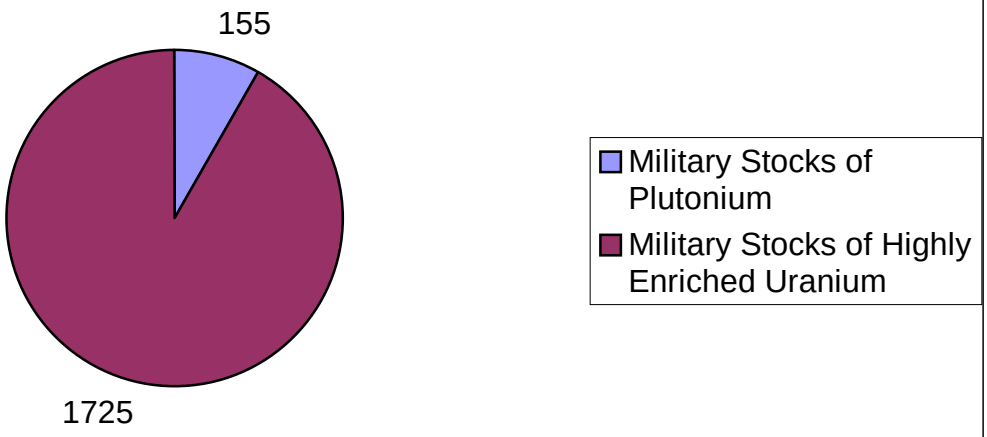

Civil and Military Stocks of Fissile Material (Plutonium and Highly Enriched Uranium), End of 2003 (in tonnes, central estimates)
1880
1850
Total = 3730 tonnes
Civil Stocks
Military Stocks

Civil Stocks of Plutonium and Highly Enriched Uranium, End of 2003 (in tonnes, central estimates)

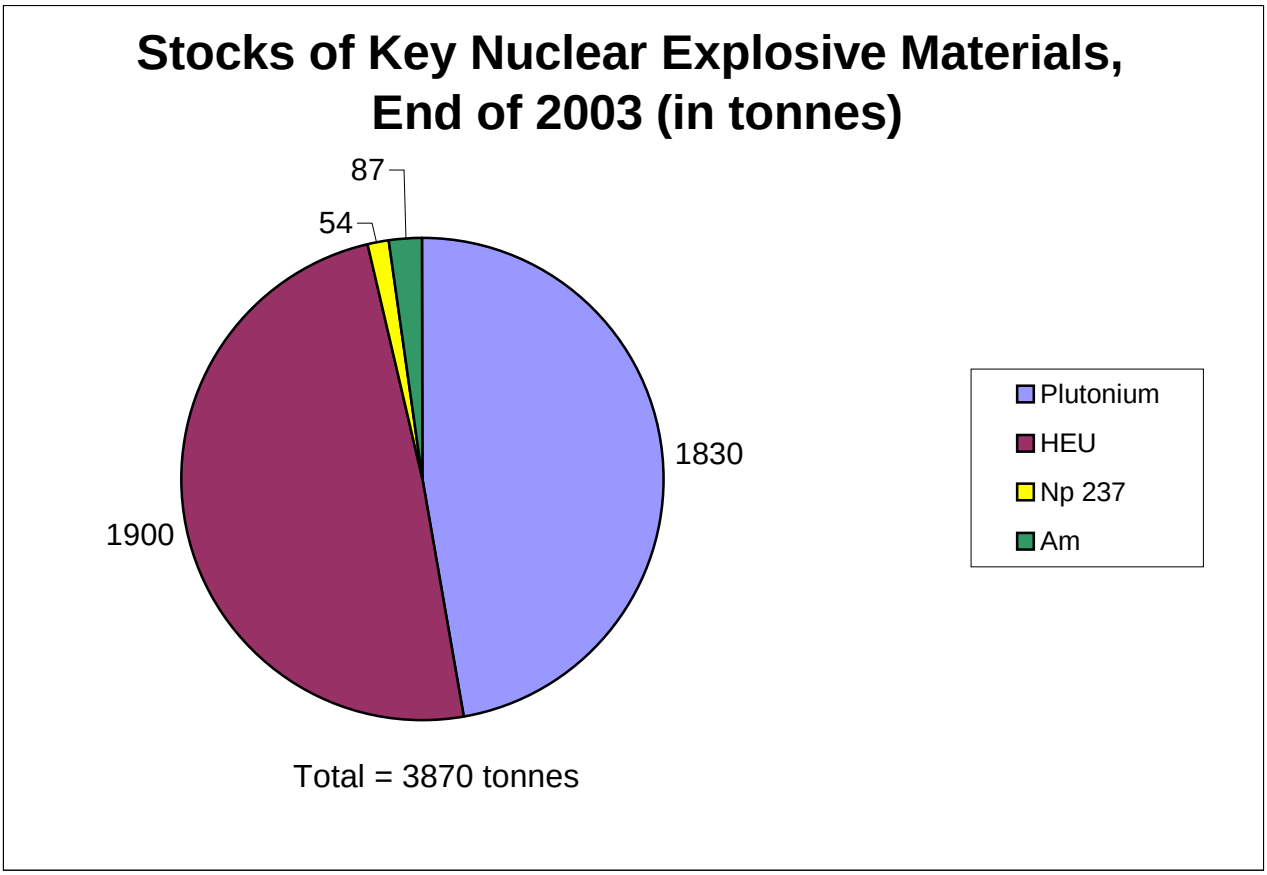


Total = 1850 tonnes

Military Stocks of Plutonium and Highly Enriched Uranium, End of 2003 (in tonnes, central estimates)



Total = 1880 tonnes


Stocks of Key Nuclear Explosive Materials, End of 2003 (in tonnes)
87
54
1830
1900
Plutonium
HEU
Np 237
Am
Total = 3870 tonnes