GLOBAL FISSILE MATERIAL REPORT 2015

NUCLEAR WEAPON AND FISSILE MATERIAL STOCKPILES AND PRODUCTION

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NPT Review Conference
United Nations, New York, May 8, 2015

Revision 3

ABOUT THE IPFM

MISSION

To provide the technical basis for policy initiatives to reduce global stocks of military and civilian fissile materials

Established in 2006, IPFM has 29 members from 18 states

Publications: *Global Fissile Material Reports,* research reports, and country studies

www.fissilematerials.org and www.fissilematerials.org/blog

GLOBAL FISSILE MATERIAL REPORTS

2008: Scope and Verification of a Fissile Material (Cutoff) Treaty

2009: A Path to Nuclear Disarmament

2010: Balancing the Books: [Weapon State] Production and Stocks

2011: Nuclear Weapon and Fissile Material Stockpiles and Production

2013: Increasing Transparency

NUCLEAR WEAPONS AND FISSILE MATERIALS

70 YEARS OF THE NUCLEAR AGE

HEU AND PLUTONIUM FIRST PRODUCED BY U.S. MANHATTAN PROJECT

Oak Ridge K-25 enrichment plant, 1945–2014
Source: U.S. Department of Energy

Hanford B plutonium production reactor, 1944–1968
Source: hanford.gov

70 YEARS OF THE NUCLEAR AGE

SMALLER, LIGHTER, MORE DESTRUCTIVE

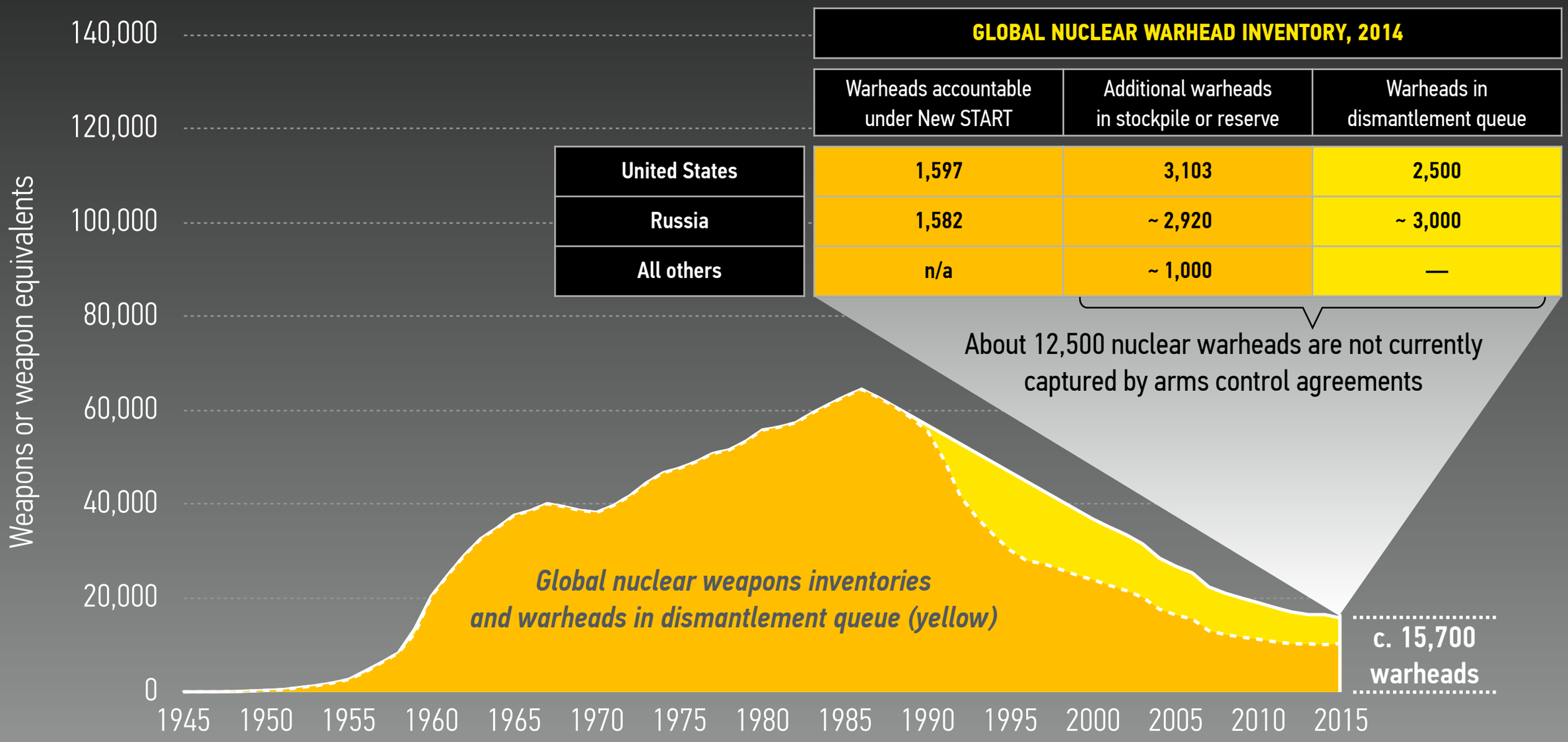
First atomic bomb, July 1945
Source: Los Alamos National Laboratory and atomland-on-mars.com

U.S. W80-4 cruise missile warhead
Source: NNSA/Sandia National Laboratory

GLOBAL NUCLEAR WEAPON INVENTORY

1945–2015

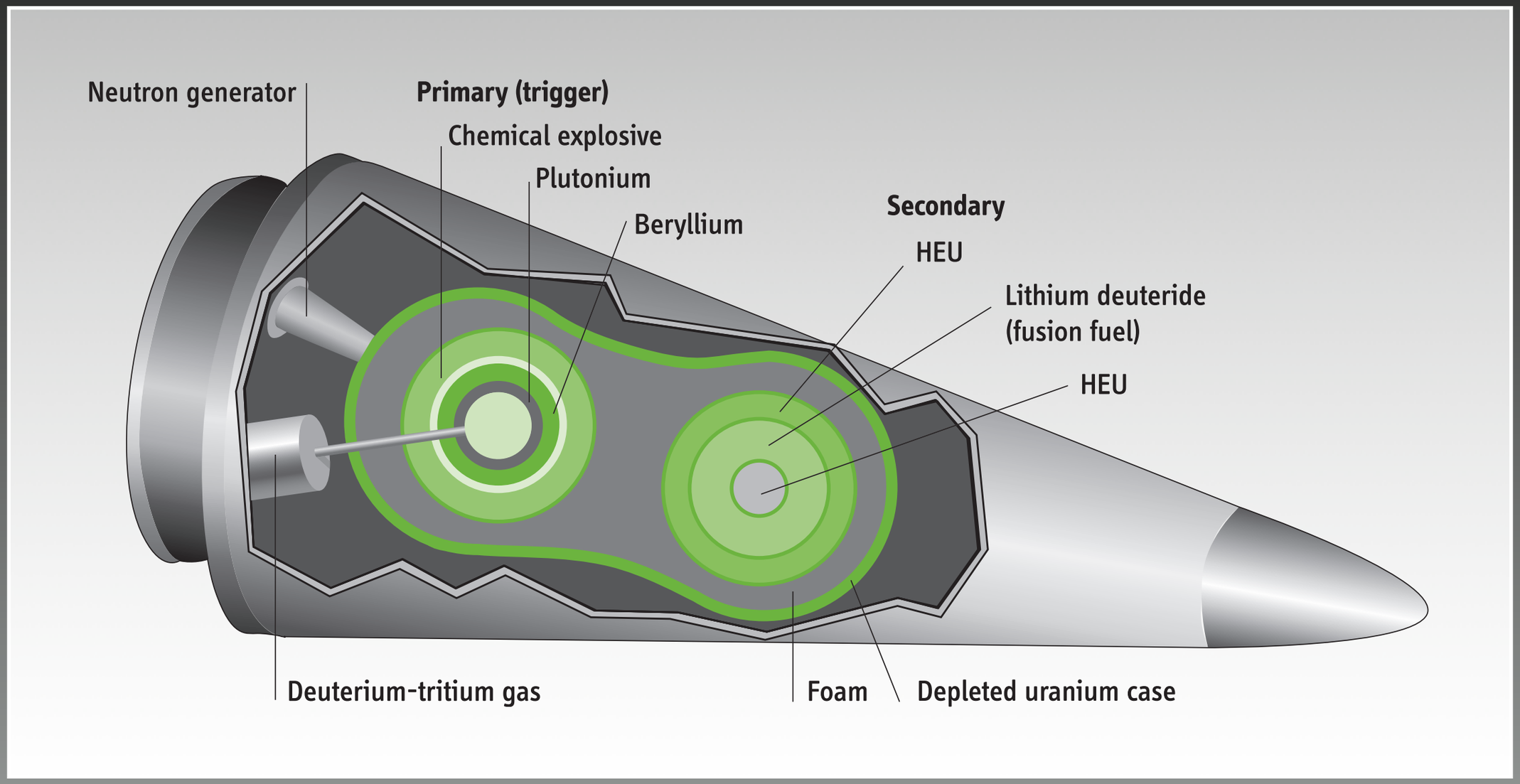
GLOBAL NUCLEAR WARHEAD INVENTORY, 2014			
	Warheads accountable under New START	Additional warheads in stockpile or reserve	Warheads in dismantlement queue
United States	1,597	3,103	2,500
Russia	1,582	~ 2,920	~ 3,000
All others	n/a	~ 1,000	—



"Status of World Nuclear Forces," *Federation of American Scientists,* fas.org, April 2015

MODERN THERMONUCLEAR WARHEAD

Typically contains an average 3–4 kg of plutonium and 15–25 kg highly enriched uranium



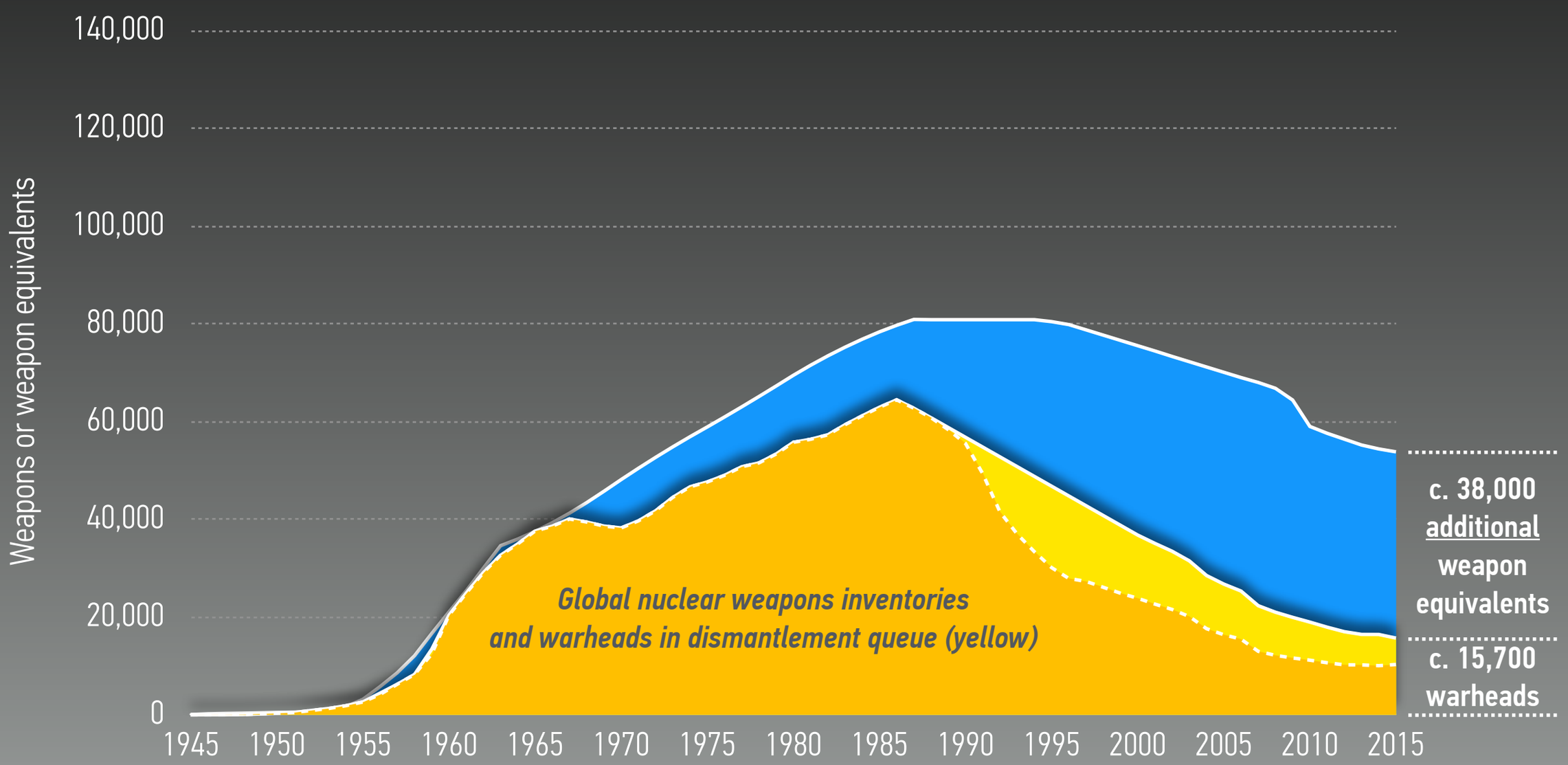
Adapted from Final Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the Peoples Republic of China ("Cox Report"), U.S. House of Representatives, 3 January 1999

HIGHLY ENRICHED URANIUM

NUCLEAR WEAPONS AND FISSILE MATERIALS

GLOBAL INVENTORIES, 1945–2015

THE CASE OF HIGHLY ENRICHED URANIUM



"Status of World Nuclear Forces," *Federation of American Scientists,* fas.org, April 2015

Fissile material estimates and weapon-equivalents are authors' estimates; assuming an average of 25 kg of highly enriched uranium per weapon

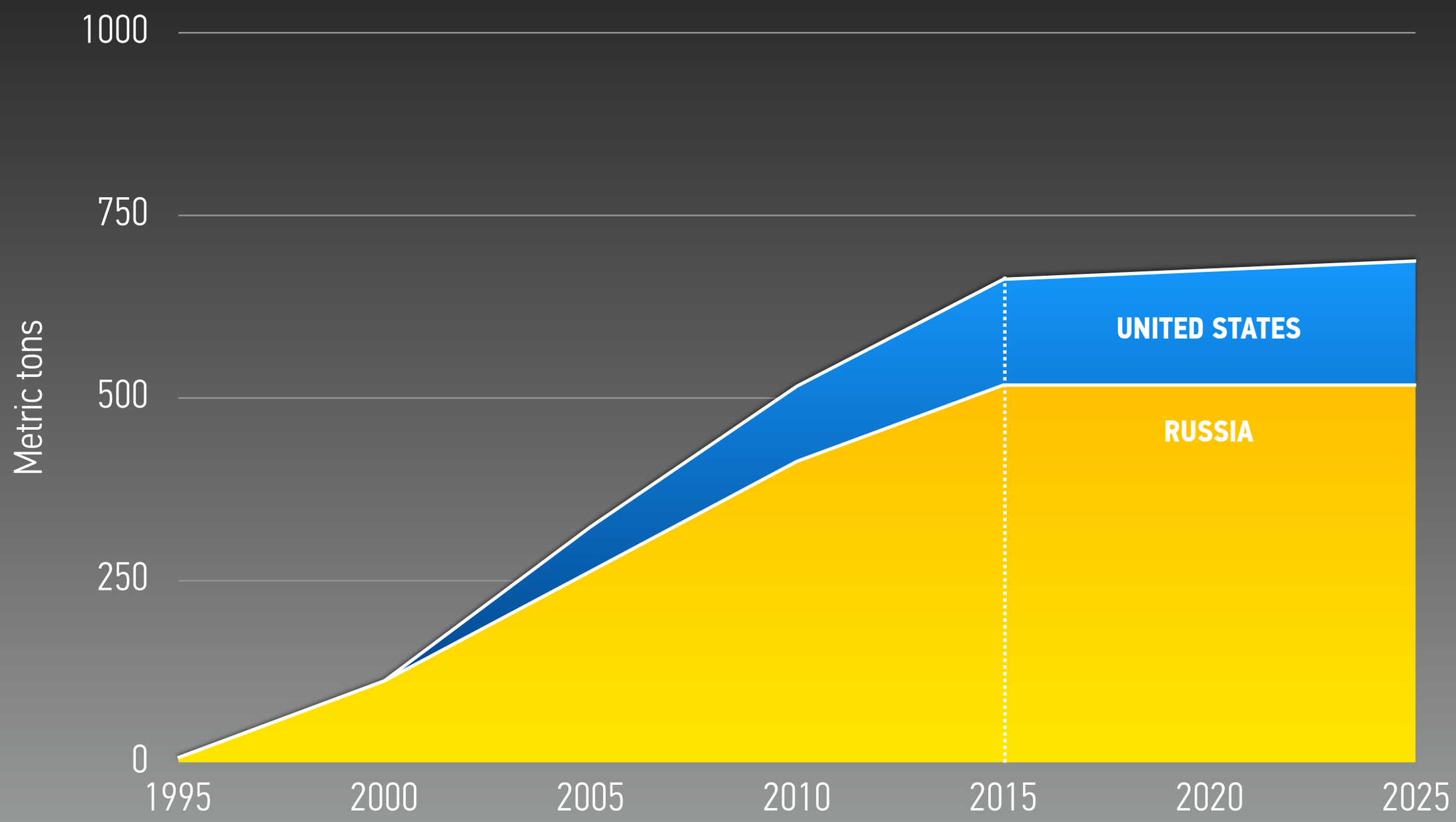
HEU PRODUCTION FOR WEAPONS HAS LARGELY ENDED

PRODUCTION PERIODS IN NPT WEAPON STATES

Country	Military HEU production
China	stopped 1987 *(unofficial)*
France	stopped 1996
Russia	stopped 1989
United Kingdom	stopped 1962 *(but imports from United States)*
United States	stopped 1992 *(since 1964 for naval fuel only)*

HEU BLENDDOWN

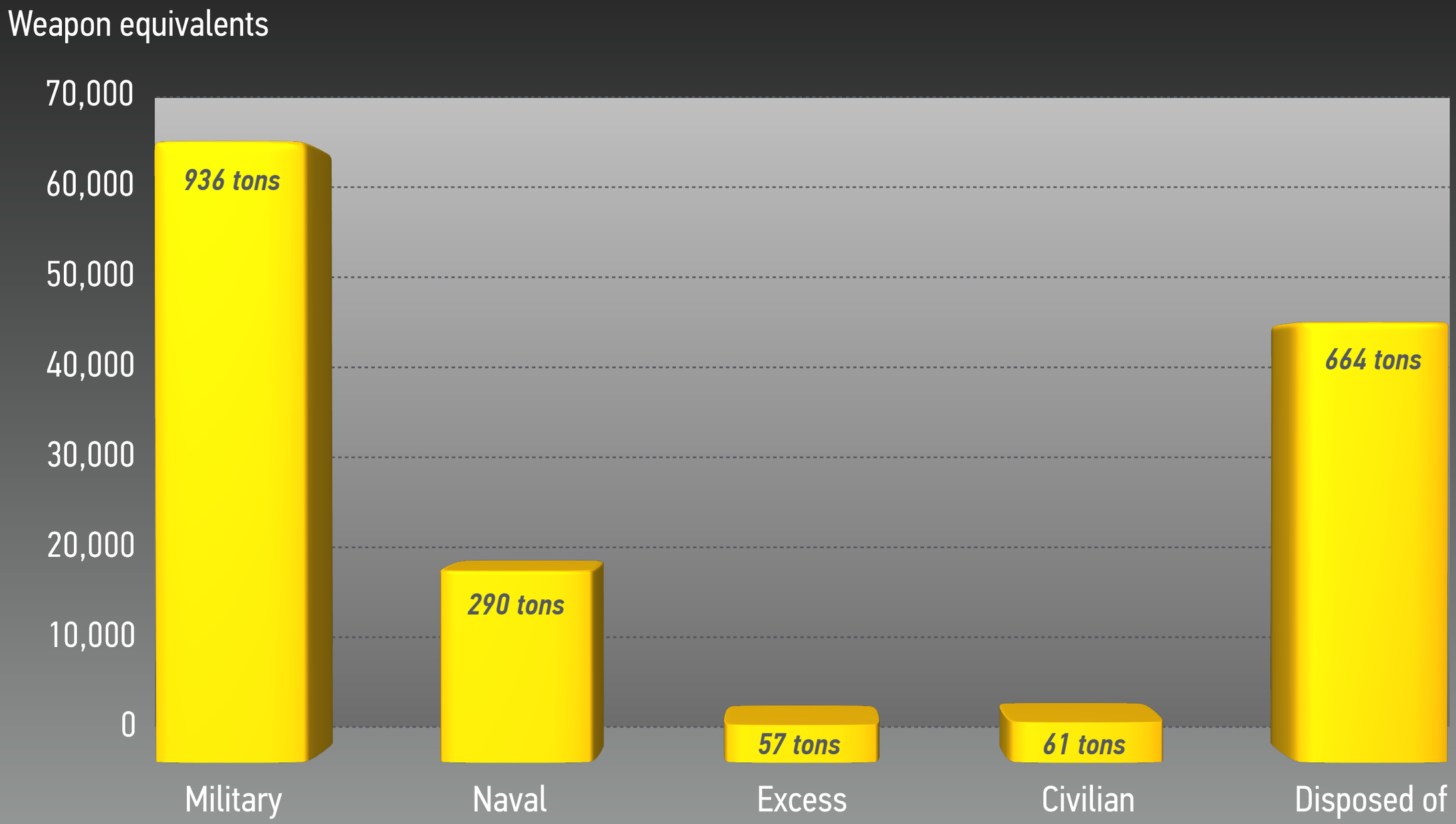
RUSSIA IN 2013 COMPLETED 20-YEAR 500 TONS EXCESS HEU BLENDDOWN PROGRAM
UNITED STATES HAS 36 TONS EXCESS HEU REMAINING TO DOWN-BLEND BY 2030



Global Fissile Material Report 2015, International Panel of Fissile Materials, Princeton, NJ, forthcoming

GLOBAL HEU STOCKPILE BY CATEGORY, 2014

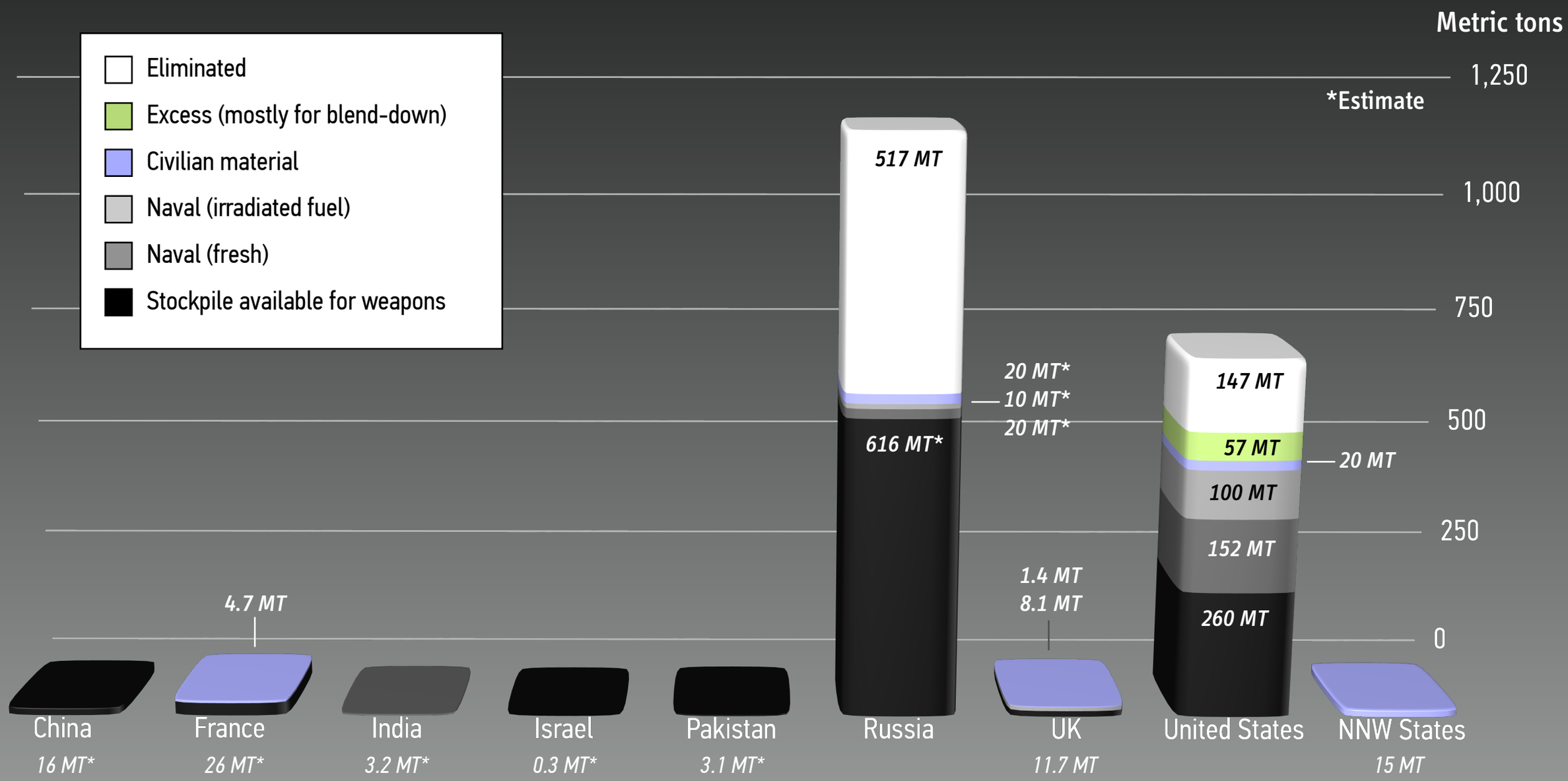
REDUCING CIVILIAN USE HEU STOCKPILE FOCUS OF THREE NUCLEAR SECURITY SUMMITS
NAVAL HEU FUEL STOCKPILE IS FIVE TIMES LARGER THAN CIVILIAN STOCKPILE



Assumes 15 kg of highly enriched uranium per weapon equivalent

HIGHLY ENRICHED URANIUM, 2014

GLOBAL STOCKPILE IS ABOUT 1345 TONS, ALMOST 99% IS IN WEAPON STATES



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HEU CHALLENGES

GLOBAL PRODUCTION RATE LESS THAN RATE OF DOWN-BLENDING FOR NOW

CONTINUING PRODUCTION OF HEU

For military use: Pakistan, India, and possibly North Korea

For civilian use: Russia, reportedly restarted in 2012 (for export)

HEU REACTOR FUEL

United States, United Kingdom, Russia, and India use HEU naval fuel

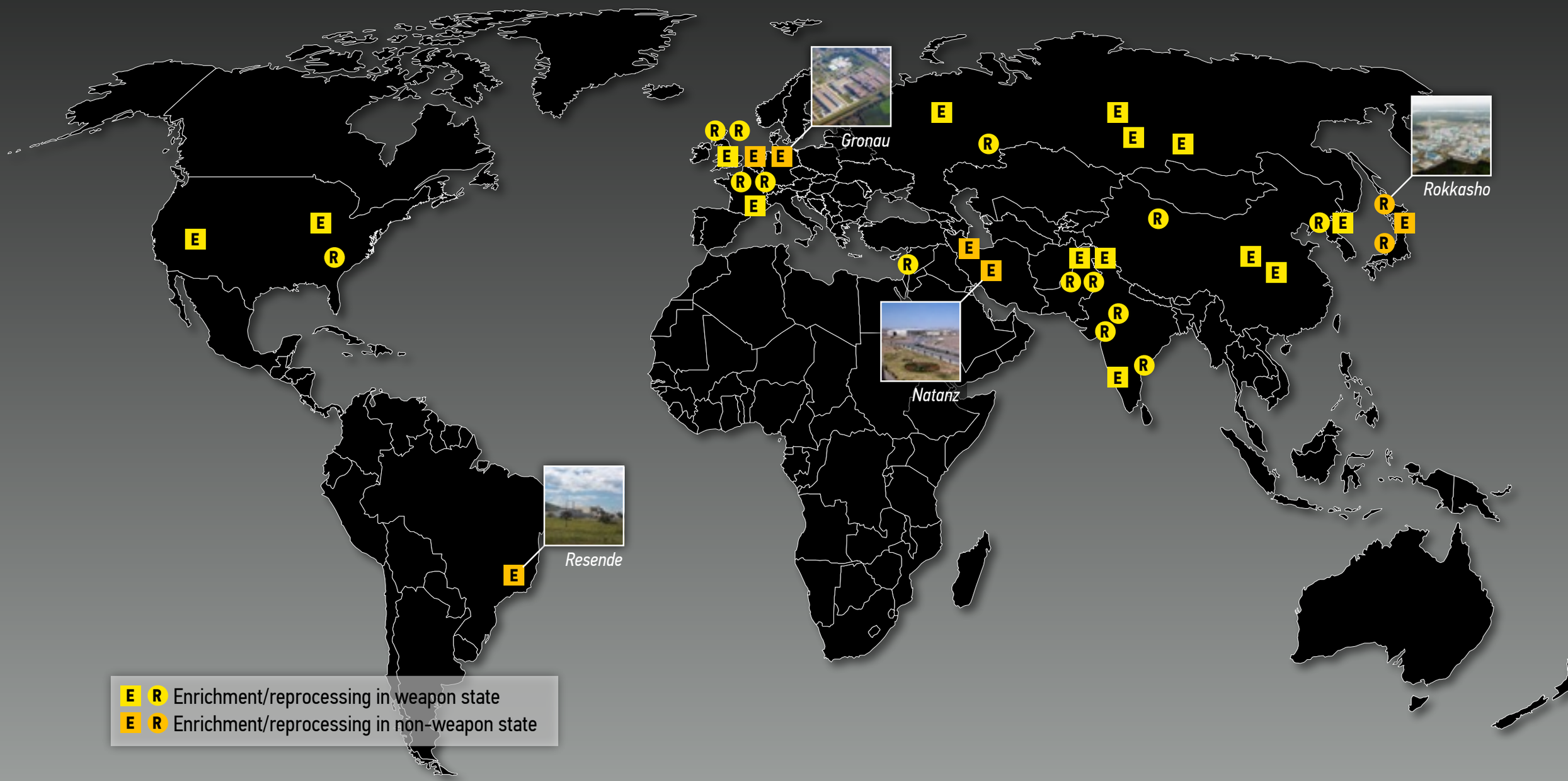
United States has over half of all HEU naval reactors

Russia has over half of all HEU research reactors

Sources: U.S. DOE and U.S. Navy

WHO CAN MAKE FISSILE MATERIAL TODAY

ENRICHMENT AND REPROCESSING FACILITIES WORLDWIDE

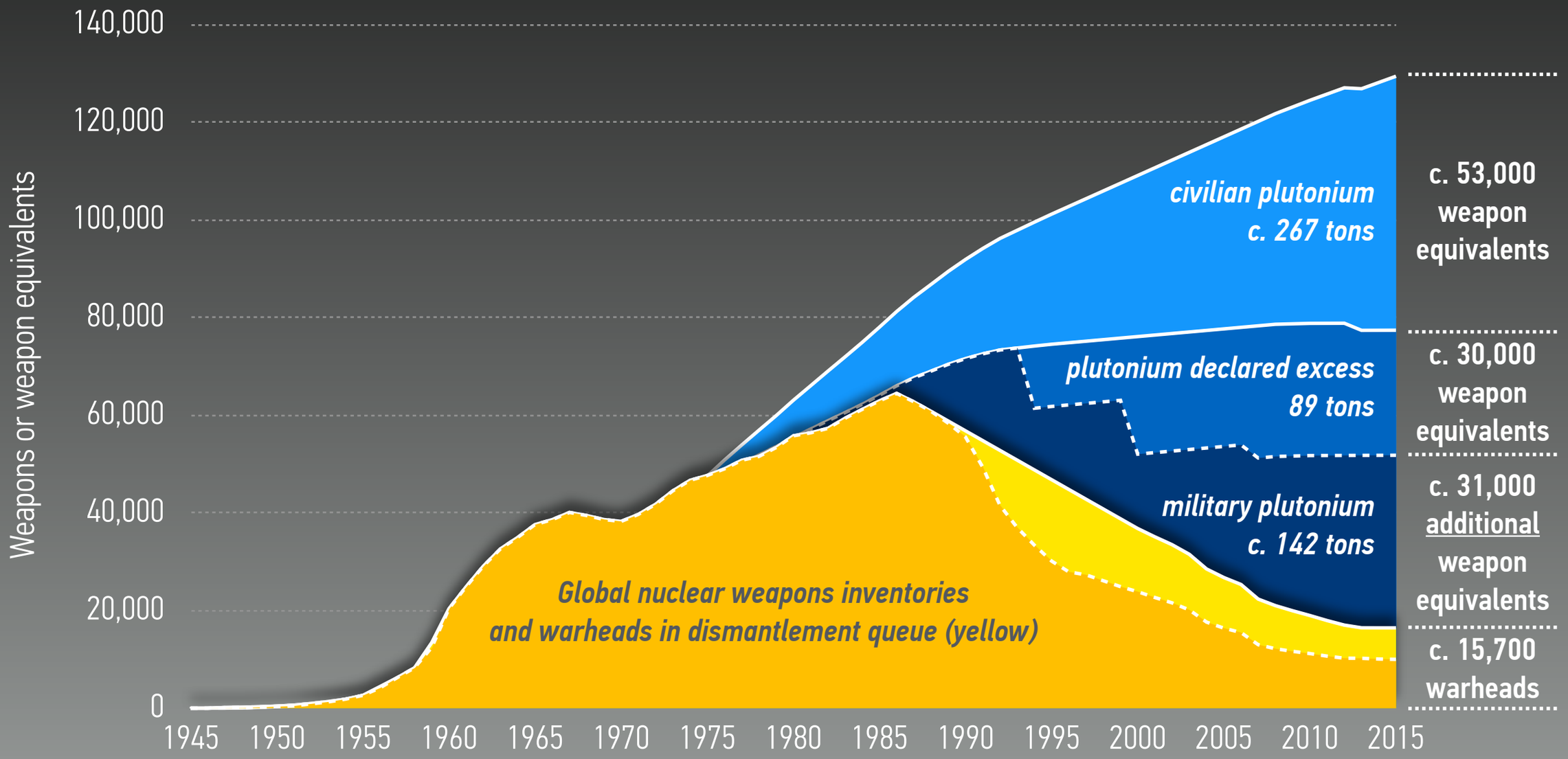


PLUTONIUM

NUCLEAR WEAPONS AND FISSILE MATERIALS

GLOBAL INVENTORIES, 1945–2015

THE CASE OF SEPARATED PLUTONIUM



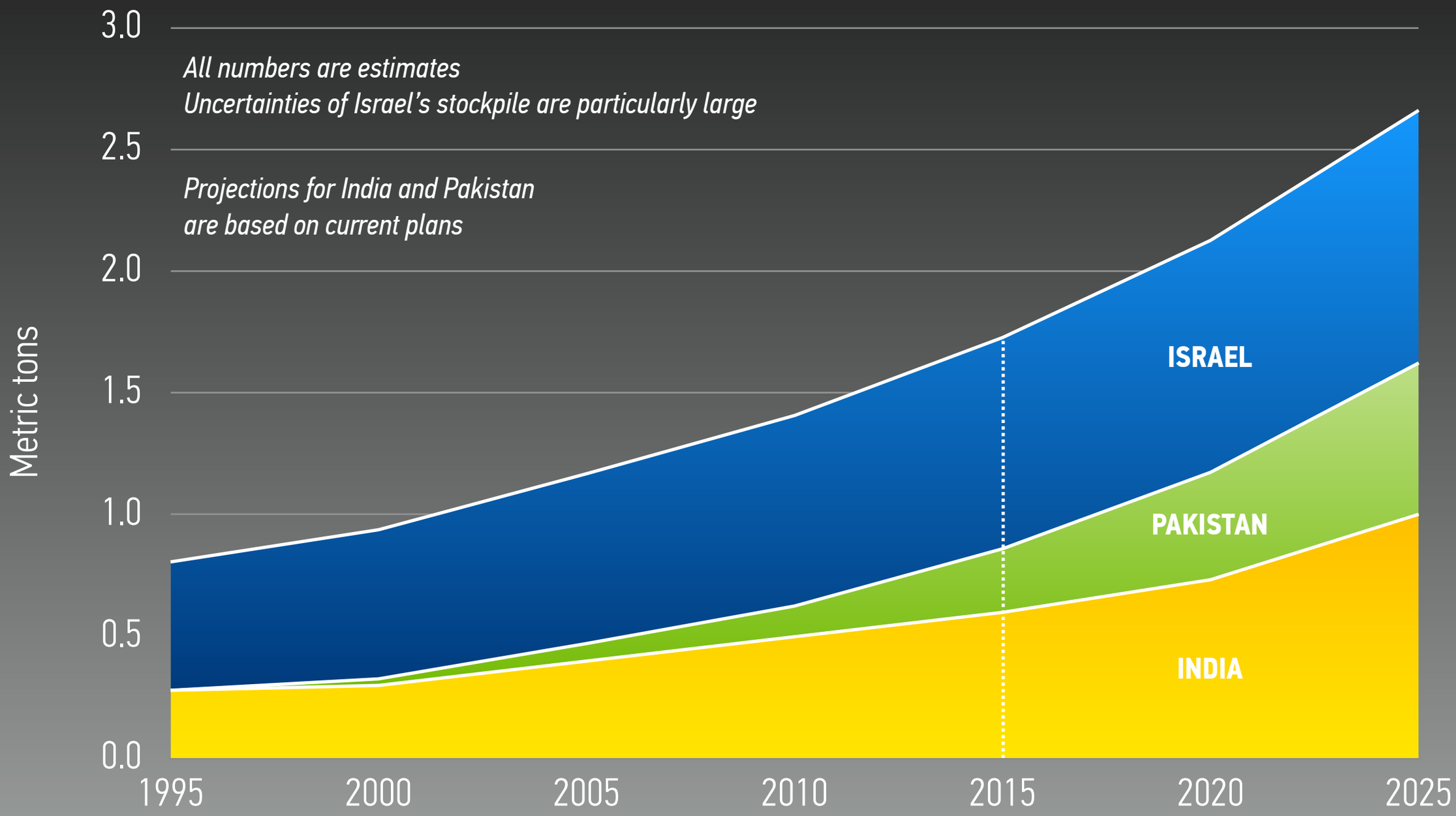
"Status of World Nuclear Forces," *Federation of American Scientists,* fas.org, April 2015

Fissile material estimates and weapon-equivalents are authors' estimates; assumes an average of 3 kg for weapon-grade and 5 kg for reactor-grade plutonium per weapon

PLUTONIUM PRODUCTION FOR WEAPONS HAS ENDED IN NPT WEAPON STATES

Country	Plutonium production for weapons
China	stopped 1991 *(unofficial)*
France	stopped 1992
Russia	stopped 1994
United Kingdom	stopped 1995
United States	stopped 1988

WEAPONS PLUTONIUM PRODUCTION CONTINUES IN NON-NPT WEAPON STATES



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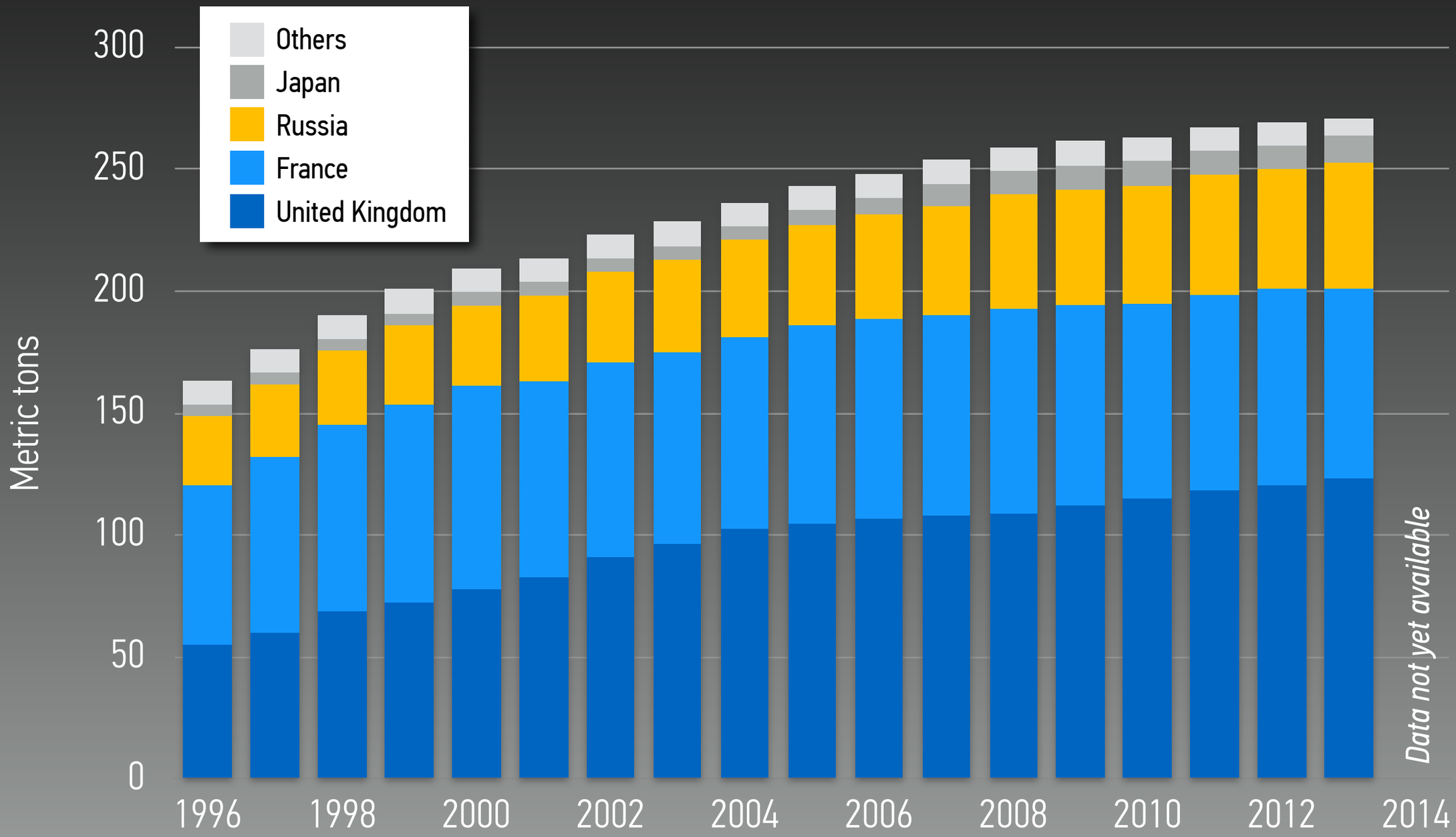
CIVILIAN PLUTONIUM, 1996–2014

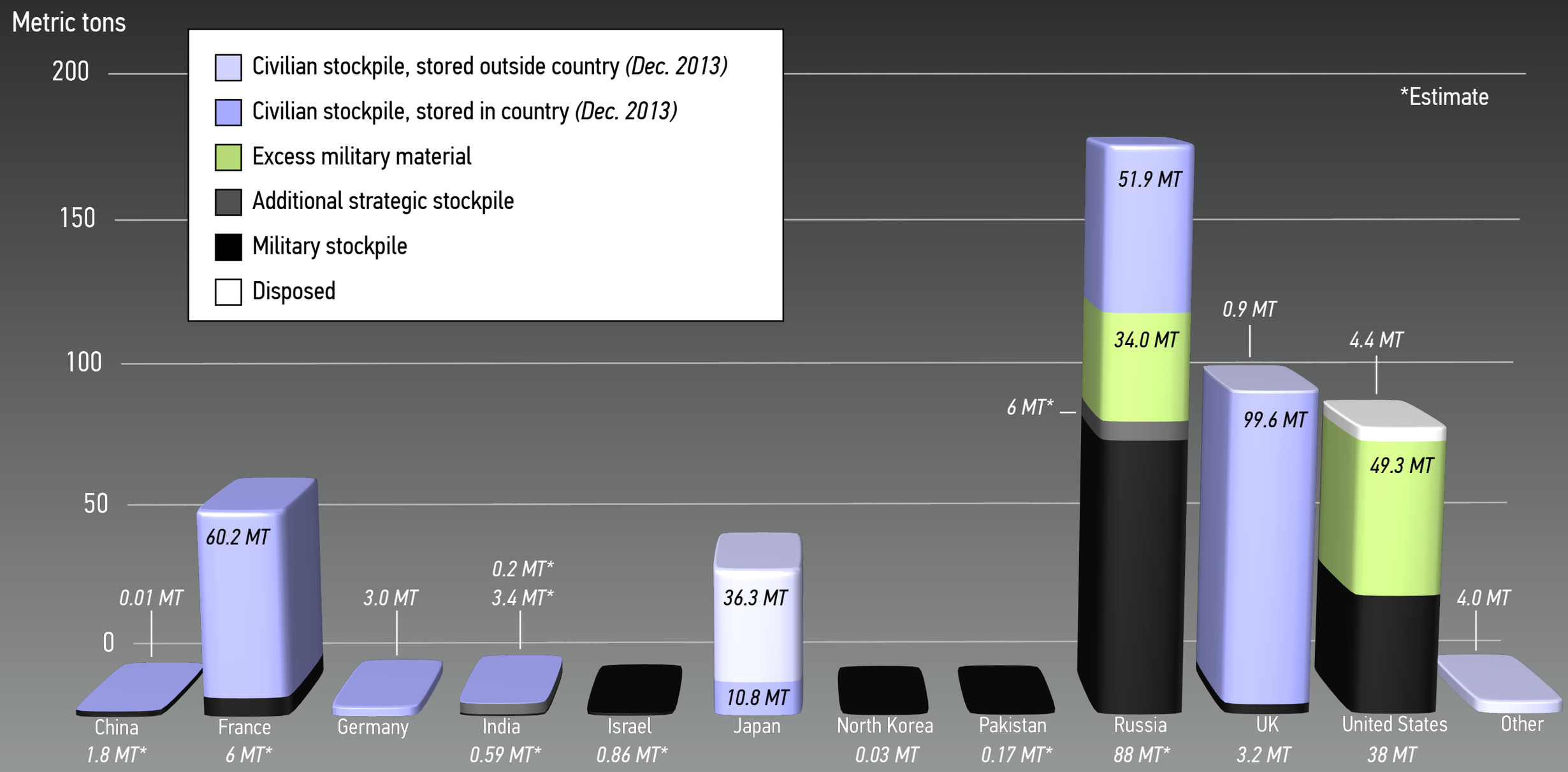
EVOLUTION OF DECLARED STOCKPILE (BY LOCATION)



Numbers are based on the annual INFCIRC 549 Declarations and are for the end of the reported year

SEPARATED PLUTONIUM, 2014

GLOBAL STOCKPILE IS ABOUT 500 TONS, MORE THAN HALF IS CIVILIAN AND THIS STOCK IS GROWING



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PLUTONIUM CHALLENGES

MILITARY AND CIVILIAN PLUTONIUM PRODUCTION CONTINUES

Civilian production, use, and stockpiling would not be covered by FMCT

Next nuclear security summit could focus on minimizing (civilian and excess military) plutonium stockpiles

IMPLEMENTING VIABLE PLUTONIUM DISPOSAL OPTIONS

MOX disposition path has proven extremely expensive

Need alternative disposition options for both civilian and excess military material (based on cost, irreversibility, security, and verifiability)

Sources: Getty Images (top) and UK Nuclear Decommissioning Authority (bottom)

LOOKING FORWARD

A FISSILE MATERIAL AGENDA

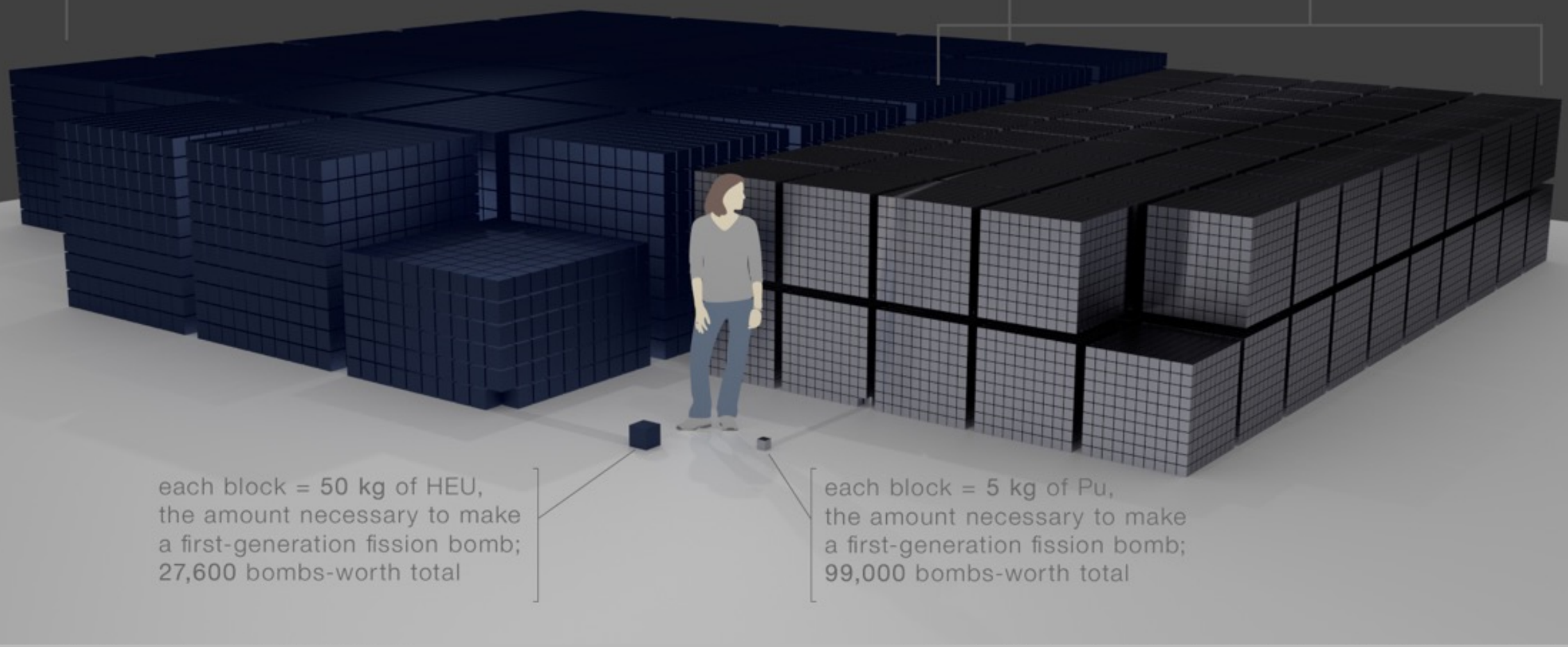
World Stockpiles of Fissile Materials

1345

1380 tons of highly-enriched uranium

499

495 tons of separated plutonium



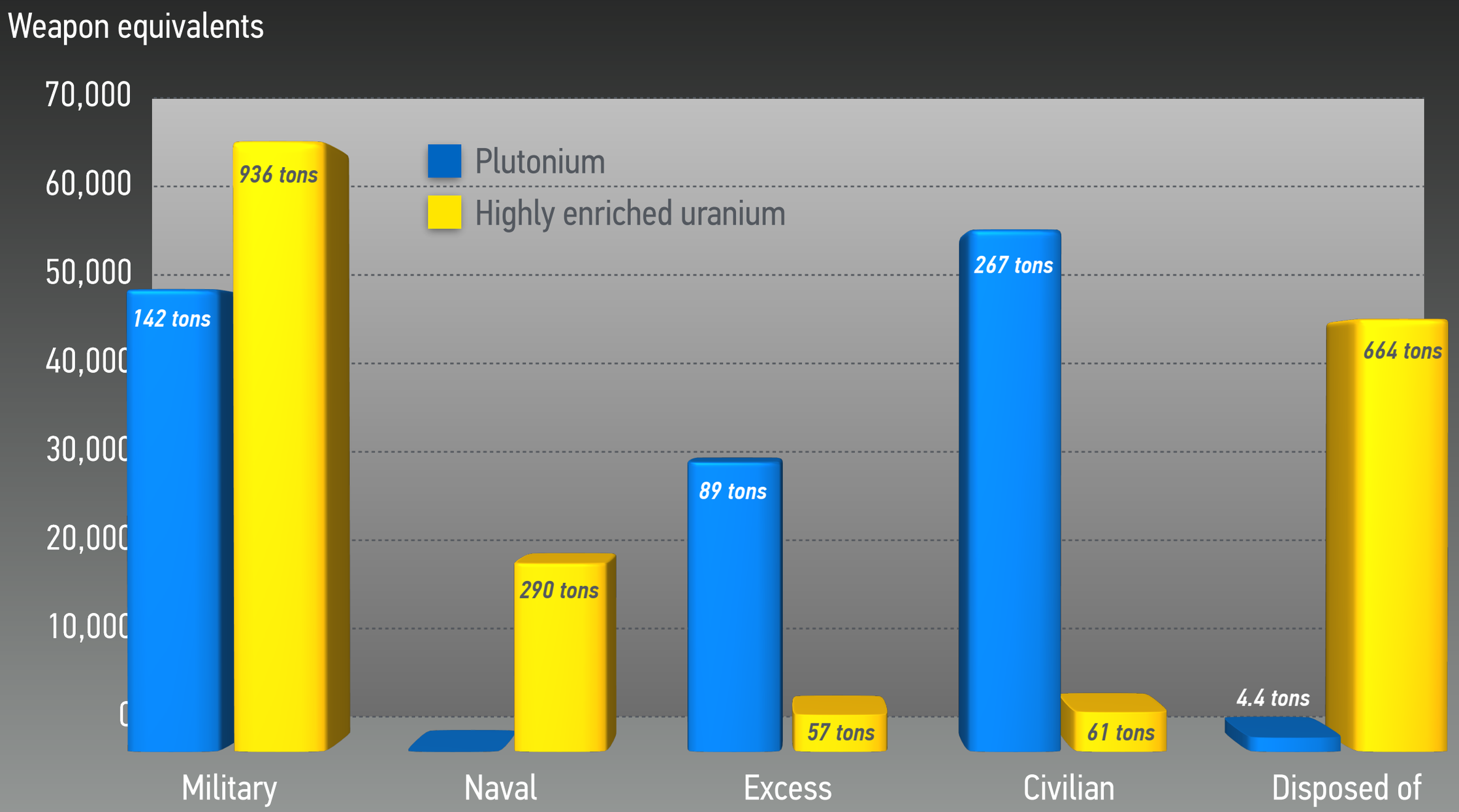
each block = **50 kg** of HEU,
the amount necessary to make
a first-generation fission bomb;
27,600 bombs-worth total

each block = **5 kg** of Pu,
the amount necessary to make
a first-generation fission bomb;
99,000 bombs-worth total

Graphic by Alex Wellerstein, nuclearsecrey.com

FISSILE MATERIALS BY CATEGORY

GLOBAL STOCKPILE OF PLUTONIUM AND HIGHLY ENRICHED URANIUM, 2014



Assumptions for weapon equivalents: 3 kg of weapon-grade plutonium, 5 kg of reactor-grade plutonium, 15 kg of highly enriched uranium
(As of 2014, more than 200,000 weapon-equivalents in the global stockpile of fissile material)

LOOKING FORWARD

A FISSILE MATERIAL AGENDA TO SUPPORT NUCLEAR DISARMAMENT AND NONPROLIFERATION

ABOUT 1845 TONS OF FISSILE MATERIAL ARE IN THE GLOBAL STOCKPILE

Major reductions of Cold War stockpiles of HEU have been accomplished

The stockpile of civilian plutonium is growing

REDUCING UNCERTAINTIES: TOWARD NUCLEAR TRANSPARENCY

Fissile material declarations establish baselines and are required for deeper reductions in the nuclear arsenals

DECLARING MORE MATERIAL EXCESS

No new material has been declared excess in past 10 years

Warhead reductions have not been matched by declarations of new excess material

2010 NPT REVIEW CONFERENCE

SELECTED ACTION ITEMS FROM FINAL DOCUMENT

Action 19: Transparency and Verification for Nuclear Disarmament

"All States agree on the importance of supporting cooperation among Governments, the United Nations, other international and regional organizations and civil society aimed at increasing confidence, improving transparency and developing efficient verification capabilities related to nuclear disarmament."

Action 21: Standard Reporting Form

"As a confidence-building measure, all the nuclear-weapon States are encouraged to agree as soon as possible on a standard reporting form and to determine appropriate reporting intervals for the purpose of voluntarily providing standard information ..."

TRANSPARENCY SCORECARD, 2015

INFORMATION ON NUCLEAR WARHEAD AND FISSILE MATERIAL INVENTORIES AND STATUS

	United States	Russia	Britain	France	China
Number of total warheads	Approximate	No	Yes (upper limit)	Yes (upper limit)	Relative (out of date)
Number of deployed warheads	Yes (strategic only)	Yes (strategic only)	Yes (planned)	Yes	No
Dismantlements	Yes	No	Yes (no details)	Yes (no details)	No
Verification	Partial	Partial	No	No	No
Fissile material stockpiles	Yes	No	Yes (no details)	No	No
Production histories	Yes	No	No	No	No
Excess/Disposal	Yes (nothing new)	Yes (nothing new)	Yes (nothing new)	No	No
Verification	Partial	Partial (but no longer)	Partial (some plutonium)	No	No
International R&D Activities	Yes	No	Yes	No	Some