

# Iran, North Korea, and Missile Defense

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*“75 Years after Hiroshima: A new nuclear arms race?”*  
*New Challenges in Nuclear Arms Control*  
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# States of concern and how best to address them

There are several states of current concern

I will focus on Iran and North Korea

How best to address these concerns?

*Diplomacy and international agreements?*

- Nuclear Nonproliferation Treaty
- Treaty Prohibiting Nuclear Weapons
- The Iran nuclear deal

*Or missile defense? (a “technological” fix)*

# 1968 Nuclear Nonproliferation Treaty (NPT)

## Basic provisions

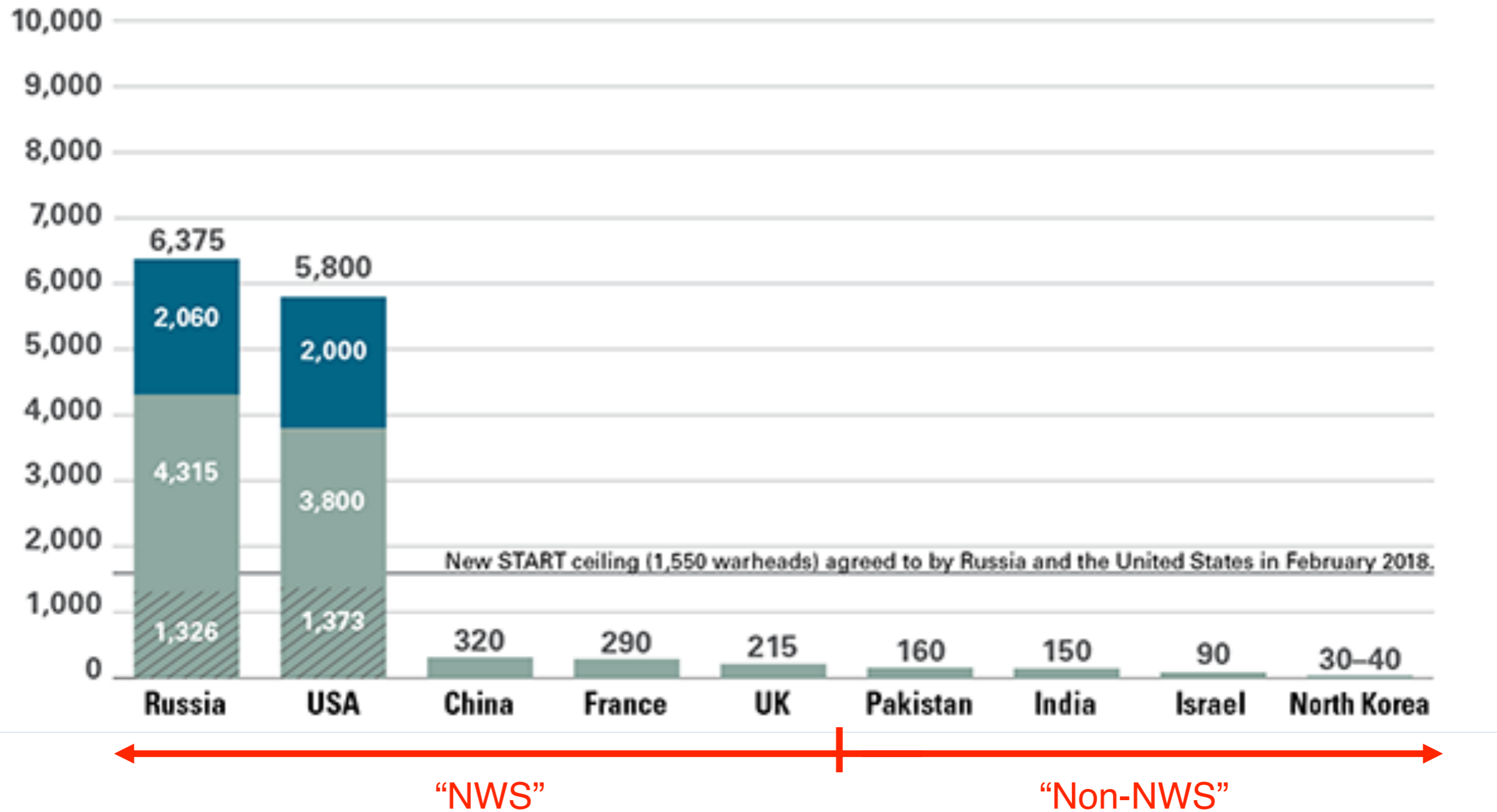
- The nuclear weapons states (NWS = China, France, Russia, United Kingdom, United States) must not give nuclear weapons to any non-nuclear weapon state (non-NWS = all others) or help them to develop nuclear weapons.
- The non-NWS must not accept or manufacture nuclear weapons.
- In return, the non-NWS are guaranteed access to peaceful nuclear technology, including uranium enrichment and plutonium production technology.
- The NWS must cease the nuclear arms race and give up their nuclear weapons.

Countries that gave up their nuclear weapons or halted their nuclear programs:

*South Africa, Belarus, Kazakhstan, Ukraine; Algeria, Argentina, Brazil, Egypt, Iran, Libya, [North Korea], South Korea, Sweden, Taiwan; Iraq, Syria*

# The current situation

## 9 nations currently have nuclear weapons



Source: Hans M. Kristensen, Shannon N. Kile, Stockholm International Peace Research Institute, and the U.S. Department of State. Updated: August 2020



# 2017 Treaty Prohibiting Nuclear Weapons

## *Establishes a new norm*

Prohibits the development, testing, production, manufacture, acquisition, possession, stockpiling, transfer, use, and threatened use of nuclear weapons



Noble Peace Prize



Elayne Whyte Gómez, Permanent Representative of Costa Rica to the UN Office at Geneva (UNOG) and President of the United Nations conference

Adopted by the UN General Assembly in 2017 by a vote of 122 – 1

*No nuclear weapon or NATO states voted “yes”, but Oct 30, 2020 Canada, a NATO member 'acknowledged' understanding the reason for the Treaty*

**50 states-parties have now ratified; it will enter into force Jan 22, 2021**

# Components of the “Iran nuclear deal”

- Joint Comprehensive Plan of Action (JCPOA)
- *Nonproliferation Treaty (NPT)*
- *NPT Expanded Declaration*
- *NPT Additional Protocol*
- *Modified Code 3.1 Agreement*

*Iran agreed to comply with these agreements in perpetuity*

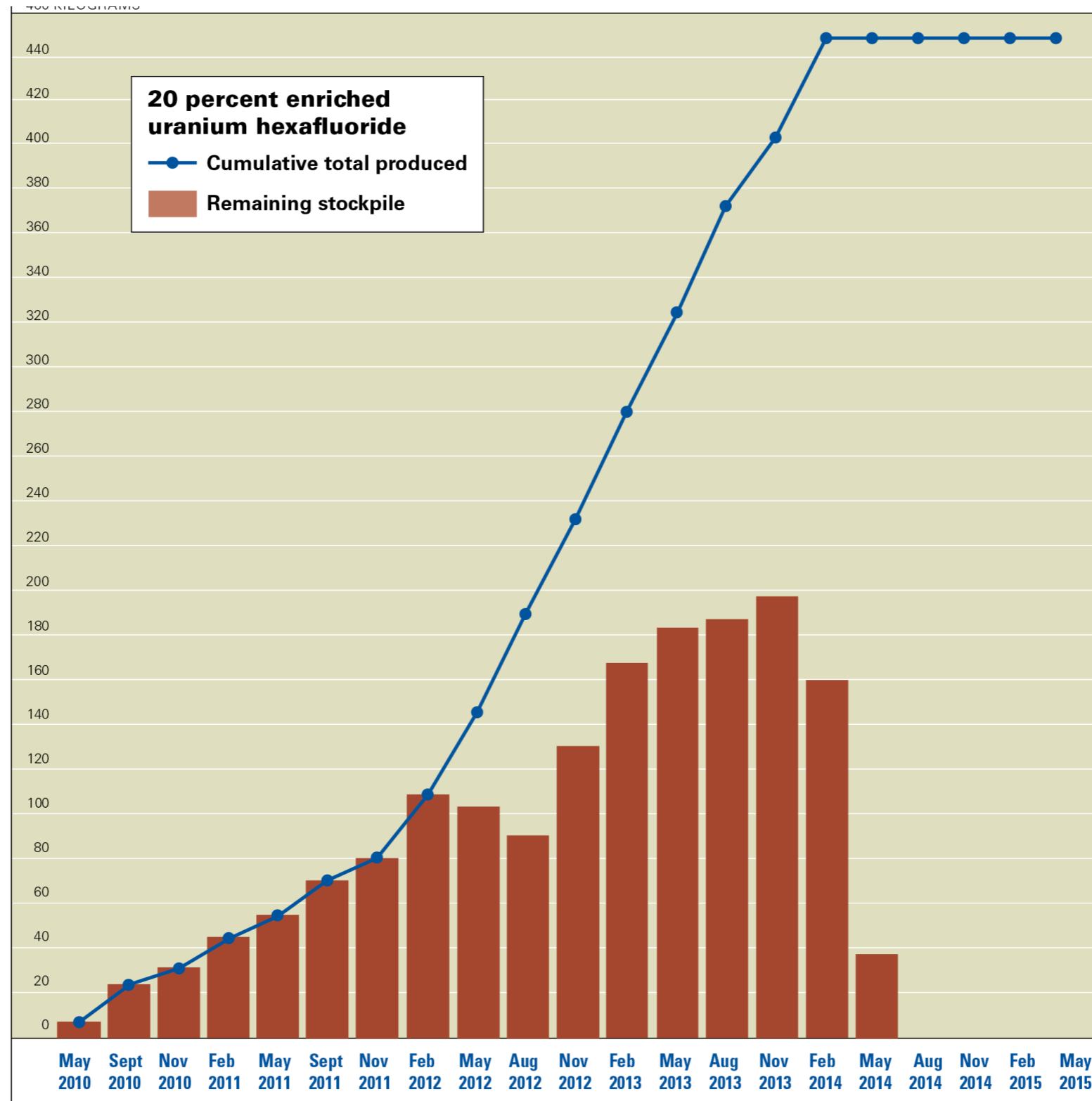
# Some key provisions of the Iran nuclear deal

- Prohibited Iran from ever researching, designing, or developing a nuclear bomb, or acquiring a nuclear bomb in any other way
- Provided assurance, in perpetuity, that Iran is not moving to acquire a bomb (e.g., it has so far placed 18 nuclear facilities and 9 other locations under IAEA safeguards)
- Prohibited Iran from ever acquiring any plutonium that could be used to make a bomb
- Guaranteed for 15 years that Iran would require 12 months or longer to make enough HEU for a uranium bomb
- Provided for 15 years exceptionally intrusive monitoring, to assure other countries that Iran is not covertly developing a bomb, and to provide adequate warning time if Iran should decide to abandon the agreement and race for a bomb

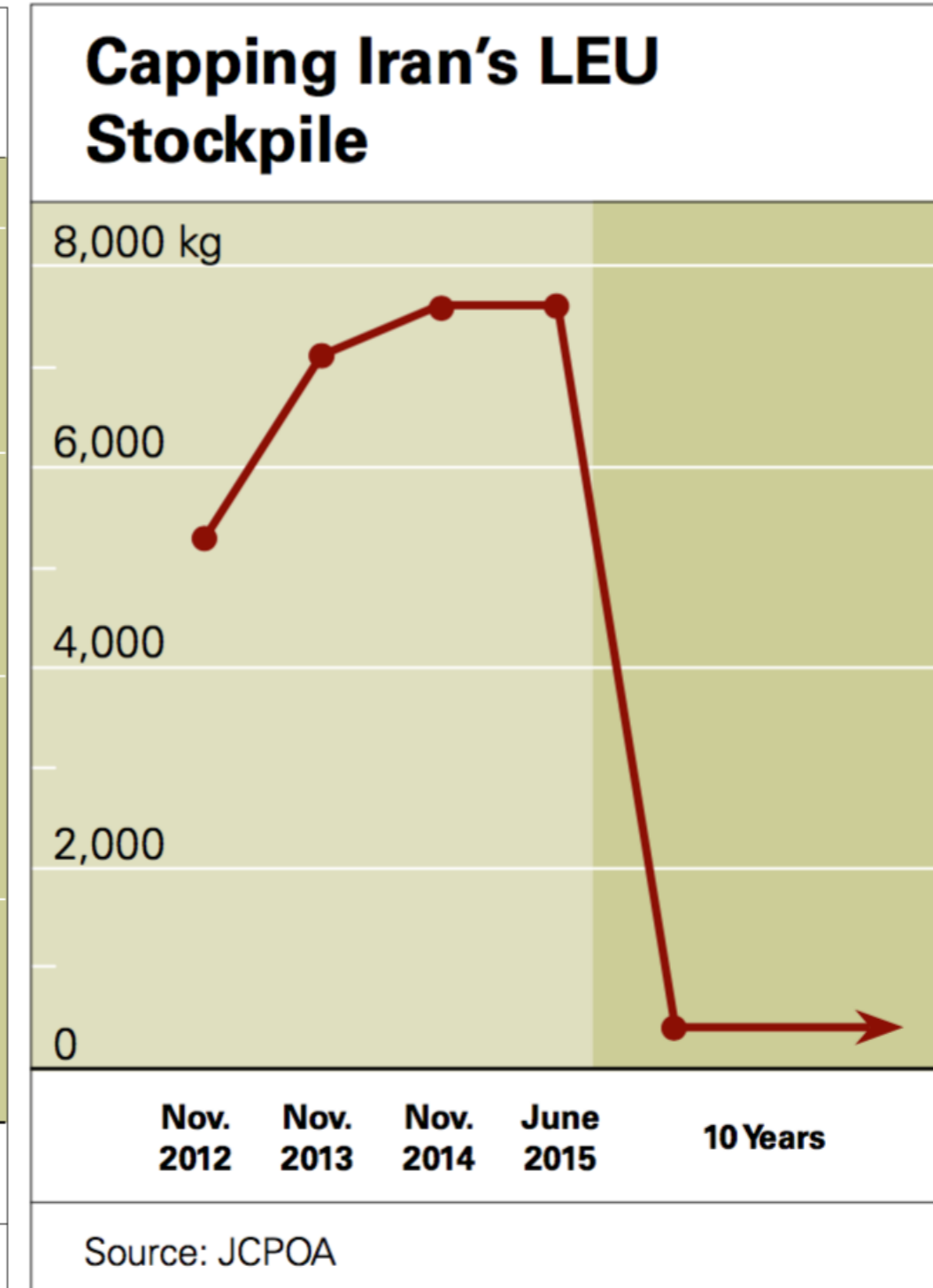
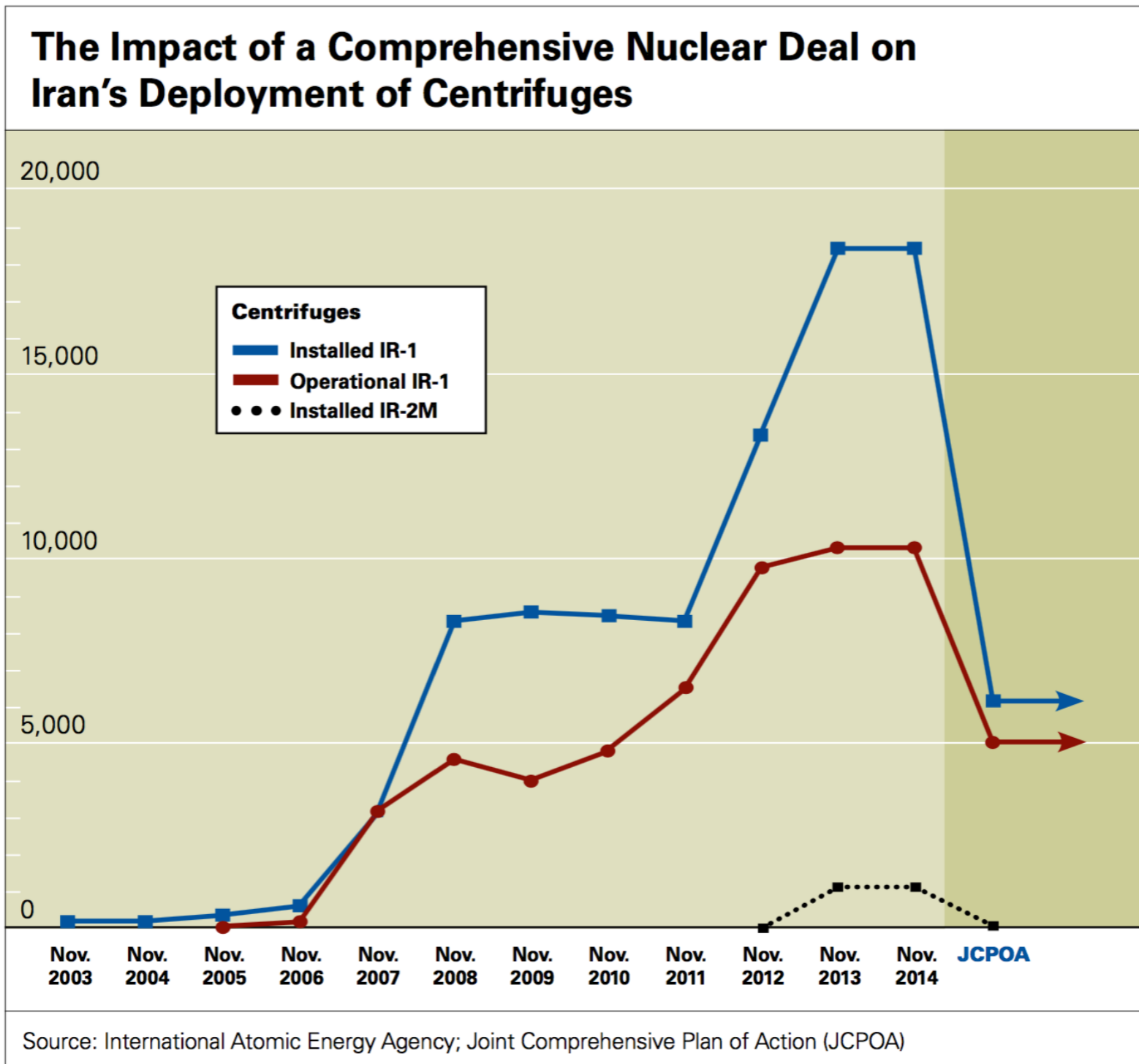
*Iran has no long-range missile program and is currently obeying a self-imposed moratorium on testing missiles with ranges > 2,000 km*

# JPOA eliminated Iran's 20% enriched uranium

Credit: Arms Control Association



# Iran deal drastically reduced the number of centrifuges Iran had and its stockpile of LEU



Credit: Arms Control Association



# Achievements of the Iran nuclear deal

The Iran nuclear deal is a major arms control achievement —

- Confirmed Iran's commitment not to research, develop, or acquire nuclear weapons, in perpetuity
- Increased to 12 months the time required for Iran to acquire enough fissile material to make a bomb
- Established monitoring provisions that are more rigorous and intrusive than ever previously agreed to by any country
- Provided a 15-year breathing period in which to build confidence and work toward a longer-term agreement
- Created a template for future agreements to restrict the nuclear activities of other states of concern

Viewed by both sides as a “grand bargain” that would open the door to direct negotiations between Iran and the United States to resolve or diminish many other issues, leading eventually to normal relations.

Viewed more broadly as a key to strengthening the NPT, which will be reviewed in January 2021.

# Current status of the Iran nuclear deal

- Iran raced to complete implementation much sooner (January 2016) than had been expected and complied with all the strict and intrusive verification provisions. But it never received the economic, financial, and other benefits it had been promised, leading to severe economic hardship. Then the United States reneged on the agreement in May 2019, putting in place even more damaging economic sanctions and forcing other nations not to grant Iran the benefits promised by the agreement.
- Iran continued to strictly comply with the JCPOA for a full year, waiting for the EU and other nations to comply, but then gave up and began to openly make one small, fully reversible violation every 60 days, to induce other countries to comply: breaching limits on heavy water (of no significance) and LEU (now 2,443 kg vs. limit of 203 kg), enriching LEU to 4.5% U-235 rather than  $< 3.7\%$ , carrying out research on advanced centrifuges (IR-2m, IR-4, IR-6), and resuming enrichment at Fordow.
- All the while Iran allowed IAEA inspections to fully monitor its compliance, and then its reversible noncompliance, and met all but one request for additional information.
- Iran has now produced enough 4.5% U-235 that, if enriched further to 90% U-235, it could be used to make two nuclear weapons, if Iran so chose. But Iran says it is not going to make a nuclear weapon and IAEA verification shows that it is not, so far.
- President-elect Biden has said he will return to the JCPOA once in office. Today Iran said “the way back is open” for the U.S. re-enter the Deal. But this may be difficult.

## NK nuclear weapon tests

2006 Oct 9	~ 1 kiloton	(likely Pu)
2009 May 25	~ 2–7 kilotons	(likely Pu)
2013 Feb 12	~ 7–14 kilotons	(Pu or HEU)
2016 Jan 6	~ 7–14 kilotons	(possible H-bomb proof of concept)
2016 Sep 9	~ 15–25 kilotons	(possible H-bomb proof of concept)
Sep 3, 2017:	~ 200–250 kilotons	(possibly a two-stage H-bomb)

## NK intermediate- and long-range missile tests

Hwasong-10	IRBM	3,500 km	2016 Jun 21
Hwasong-12	IRBM	4,500 km	2017 May 14
Hwasong-14	ICBM	10,400 km	2017 Jul 28
Hwasong-15	ICBM	13,000 km	2017 Nov 29



# Model of a miniaturized implosion weapon



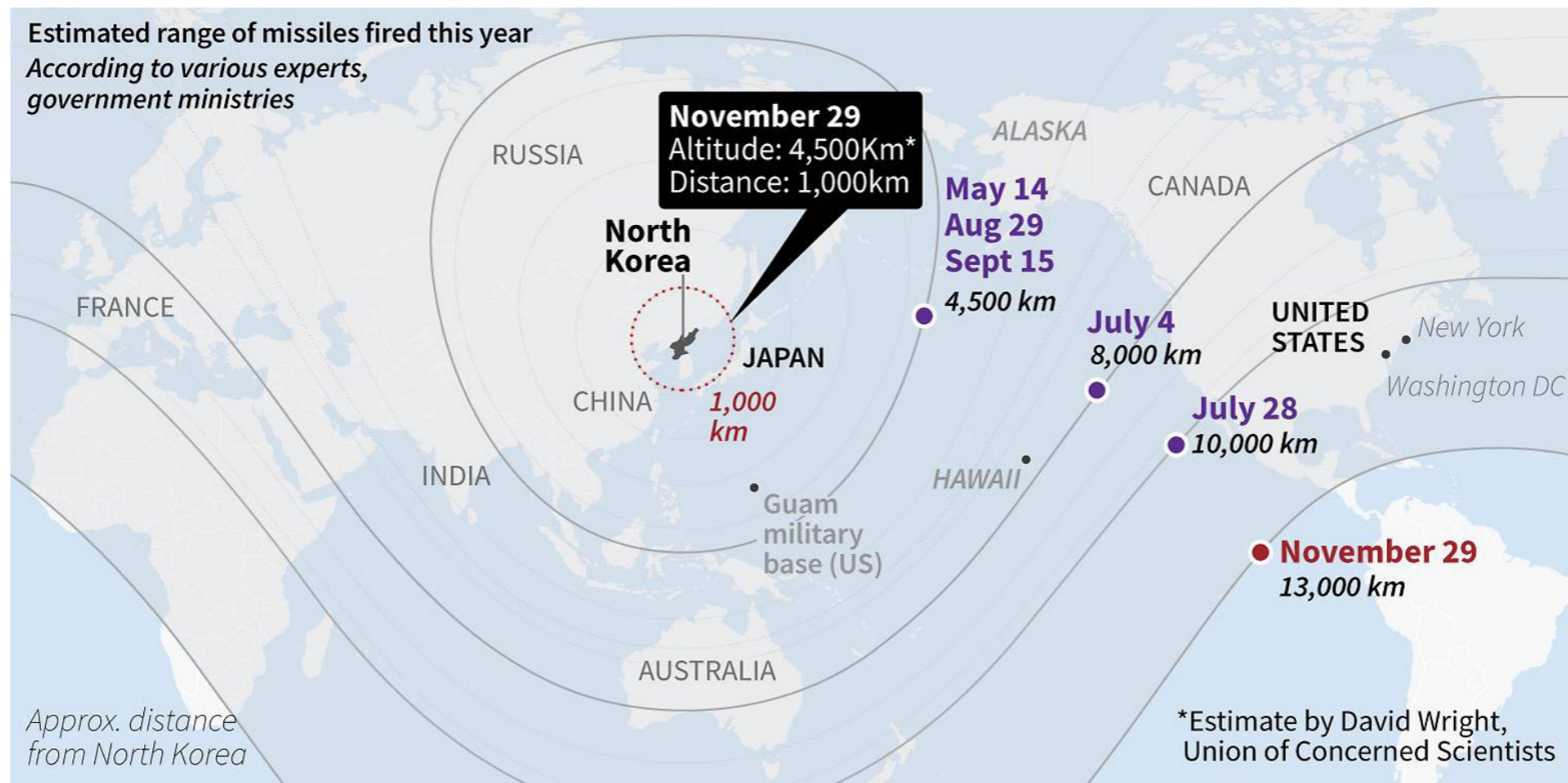


# Model of a two-stage thermonuclear weapon





# North Korean Missiles Tested in 2017



# North Korea's missile development continues

Hwasong-16 "super heavy" ICBM, October 11, 2020



Credit: Reuters

## Possible purposes

Political: technical prowess, permanence of its nuclear status

Operational: penetration aids, MRVs, MIRVs, FOBS

Kim's message: North Korea is a military force to be reckoned with, but not a threat



# Can the United States rely on its missile defense to defend against North Korean ICBMs? No.

- In highly scripted tests, GMD interceptors have destroyed the target in 5 of 11 tries (45%) since the system was nominally deployed in 2004.

TABLE 2. The probability that at least one warhead survives the defense in an attack of five warheads, given the targeting scheme (the number of interceptors targeted on each warhead), and the single shot kill probability SSKP.

1-on-1	0.50	97%
2-on-1	0.50	76%
3-on-1	0.50	49%
4-on-1	0.50	28%

(Grego UCS)

Currently, the United States has deployed 40 interceptors at Fort Greely, Alaska and 4 at Vandenberg Air Force Base, California, so the system could fire 4 interceptors per missile against 11 ICBMs.

- Countermeasures against GMD are simple and do not require much money or skill when compared with the effort needed to develop ICBMs.

One 200 kt airburst over a major U.S. city could kill 1 million people and seriously injure millions more



A highly accurate missile would not be needed to devastate San Francisco, New York, or Washington, DC

# What approach might work with North Korea?

A fundamental change, adopting a step-by-step approach that remains consistent over many years, even with changes in the political party in power, to build confidence and trust.

Possible actions by the United States:

- Provide formal assurances that it will not attack North Korea and offer a step-by-step approach to normalizing relations.
- Offer a step-by-step approach to removing sanctions.

Possible actions by North Korea:

- Formally extend its current moratorium on testing nuclear weapons and intermediate- and long-range ballistic missiles.
- Halt production of plutonium and highly enriched uranium.
- Allow regular IAEA inspections of its facilities at Yongbyon, and perhaps later, its uranium enrichment facilities