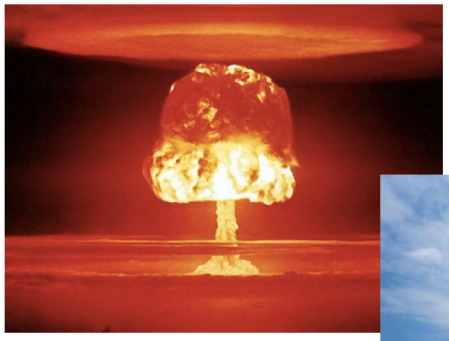
HARVARD Kennedy School
BELFER CENTER
FOR SCIENCE AND INTERNATIONAL AFFAIRS
Managing the Atom Project

Nuclear dangers and challenges

Matthew Bunn
Professor of Practice, Harvard Kennedy School
September 15, 2017
belfercenter.org/mta

A peril and a promise…

2



Effect of a single nuclear weapon

3

Source: Time-Life

Dateline: North Korea

4

- Unpredictable dictator armed with ~15-45 nuclear weapons, ballistic missiles
  - Regularly threatens to rain "nuclear fire" on ROK, United States
- Producing more HEU, plutonium, testing longer-range missiles
- Repeated provocations against ROK – could lead to conflict
- Agreements, sanctions, threats have all failed to stop DPRK program

Source: KCNA

Dateline: North Korea (II)

5

- Key dangers
  - Nuclear use – e.g., DPRK might use in conflict, under "use them or lose them" pressure or to scare off its enemies
  - Nuclear transfer -- to other states (e.g., al Kibar reactor in Syria), less likely to terrorist groups
  - Pressures on others in region to match DPRK capability
  - "Loose nukes" if regime collapses
- Options
  - Squeeze until DPRK collapses or capitulates (How feasible?)
  - Seek to negotiate at least an interim freeze and no-transfer pact (What price? What risk reduction?)
  - Military action (What risks? What could realistically be struck?)
  - Do nothing (What risks?)

Dateline: Iran

6

- Nuclear agreement reduces risk during Trump's term (if all sides stick with it)
- But key restraints on Iran's program end at 8, 10, and 15 years after implementation
- Iran continues to support terrorist groups, undermine countries in the region, threaten Israel, test longer-range ballistic missiles – and has never given an honest declaration of its past nuclear weapons efforts

Source: khamenei.ir

Dateline: Iran (II)

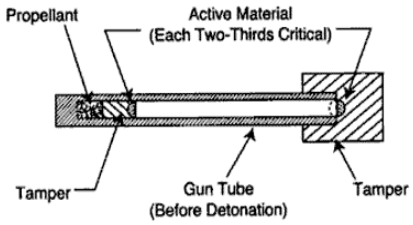
7

- Key dangers
  - Nuclear proliferation – especially as key restraints expire, and Iran is permitted to build up enrichment capacity, develop more advanced (and easier to hide) centrifuges…
  - Pressures on others in region to try to match Iran's capabilities
- Options
  - Build more cooperative relationship? (How feasible? What risks?)
  - Contain and deter, strengthen allies? (What risks and costs?)
  - Seek to convince Iran it is not in its interest to greatly expand its nuclear capabilities when restraints phase out? (How feasible?)
  - Rebuild sanctions regime? (How feasible?)
  - Military action? (How plausible? What risks?)
  - Do nothing? (What risks?)

Dateline: Unknown
Nuclear and Radiological Terrorism

8

- Numerous gov't studies: terrorist group *could* plausibly make a crude bomb if it got material
- ~20 cases of seizure of stolen HEU or plutonium
- Aum Shinrikyo, al Qaeda both pursued nuclear weapons
- ISIS intent unclear, but has more money, people, territory under control, ability to recruit globally than al Qaeda ever had – for now



Source: NATO

Dateline: Unknown
Nuclear and Radiological Terrorism (II)

9

- Terrorists could also sabotage nuclear facilities (potentially cause Fukushima-scale accident), use radioactive material in "dirty bomb"
- Options
  - Improve security for nuclear and radiological materials, facilities (How to sustain momentum after the summit process is over?)
  - Block nuclear smuggling (How to find the needles in the haystacks?)
  - Counter high-capability terrorist groups (How can we do better?)
  - Prepare to respond (How much can this mitigate the harm?)

Dateline: Russia

10

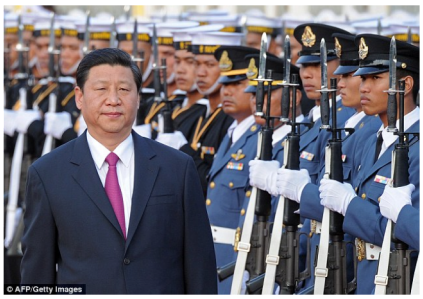
- Aggressive nuclear modernization, exercises, rhetoric; cyberattacks; disinformation…
- Heightened U.S.-Russian tensions – Ukraine, and other issues
  - Potential for conflict, e.g., in Baltics
- Russian forces, command and control vulnerable; no space-based early warning; potential for launch on false alarm

Source: ITAR-TASS

Dateline: China

11

- Much smaller nuclear force, but major modernization underway
- Some U.S.-China tensions – South and East China seas, cyber, other issues
- No arms control, verification, dialogue on strategic issues in place
  - China (and Russia) concerned over U.S. missile defenses, conventional strike capabilities, nuclear modernization



Source: ITAR-TASS

Dateline: South Asia

12

- Ongoing nuclear arms race between Pakistan and India – who have fought 4 wars
- Military doctrines with unclear redlines; terrorists might provoke conflict; could lead to blundering into war
- Pakistan has world's fastest-growing nuclear arsenal, and some of the world's most capable terrorists
- Some modeling suggests even Indo-Pakistani nuclear war could cause "nuclear fall"

Source: Wikimedia Commons

Dateline: United States
Strategic modernization

13

- Existing U.S. strategic weapons are aging
- Obama administration has laid out a plan for new ICBMs, SLBMs, submarines, bombers, and cruise missiles, with "life extended" (upgraded) warheads
- $1 trillion cost over 30 years
- Likely to be unsustainable in the face of conventional needs, other priorities
- Need broader debate over what is needed for deterrence, how to achieve it cost-effectively, integration with arms control

Source: DOD

Dateline: Global
Strengthening the global regime

14

- Many states unhappy with Nonproliferation Treaty – failed treaty review in 2015, another coming in 2020
- Ongoing challenges controlling sensitive technologies – new tech. such as additive manufacturing makes more difficult
- Possible spread of ostensibly civilian enrichment and reprocessing as nuclear energy grows and spreads – steps needed to reduce risks

Source: AFP

Dateline: Global
Strengthening the global regime (II)

15

- States threatened by powerful neighbors or major powers may still seek nuclear weapons – or "hedging" capability that would allow them to build weapons quickly
  - Much to do reduce "demand" for nuclear weapons, especially in Middle East and East Asia
- IAEA needs more resources and authority
- Given U.S.-Russian tensions, accusations of violations, little near-term prospect for further arms reductions – means more political tension in nonproliferation regime
  - Little near-term prospect for bringing Comprehensive Test Ban Treaty into force or negotiating fissile cutoff
  - Little near-term prospect of real progress toward Middle East Weapons of Mass Destruction Free Zone
  - All nuclear powers modernizing their forces

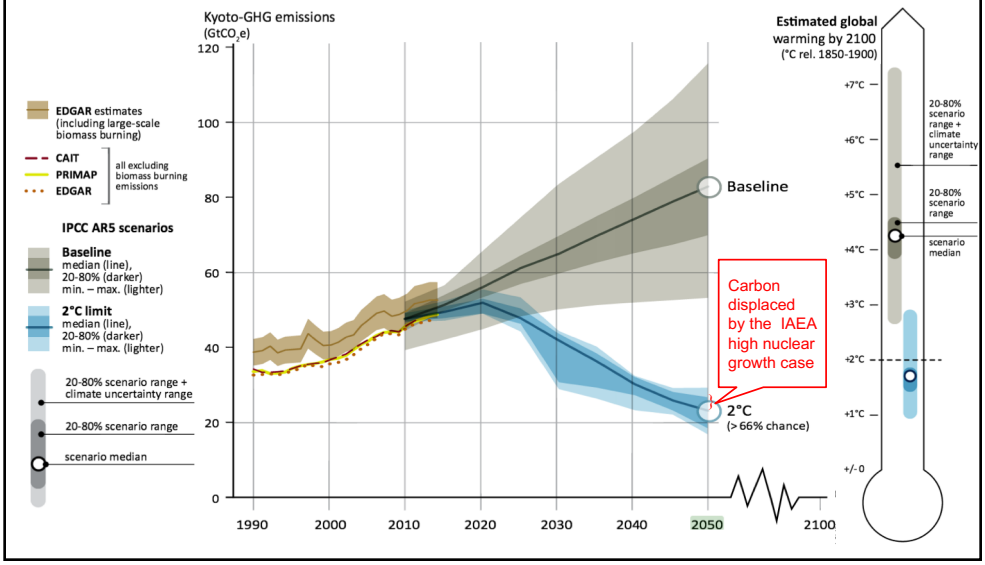
Nuclear weapons: some good news

16

- Global nuclear weapons stockpiles down ~85%
- Only 9 states with nuclear weapons – same as a quarter century ago
- More states have started nuclear weapons programs and given them up than have nuclear weapons – our efforts to talk countries out of it succeed more often than they fail
- >50% of the states that once had potential nuclear bomb material on their soil have eliminated it
- Nuclear material around the world far more secure than it was 25 years ago

Huge, transformational nuclear growth needed for substantial climate role

17



Particulates may be even more important than climate in driving clean energy

18

Smog in Beijing. *Source:* inhabitat.com

- **>3 million deaths/yr globally from fine particulates**

Key constraints on large-scale nuclear energy growth – can they be loosened?

19

- Economics
- Safety risks – real and perceived
- Security risks – real and perceived
- Nuclear waste management – mostly politics
- Siting and public acceptance
- Limited government and industry capacity
- Stringent regulation
- Proliferation risks – mainly from the nuclear fuel cycle
- U supply: Not likely to be a constraint this century

In each area, both new policies and new technologies have the potential to loosen past constraints on growth

Maintaining U.S. nuclear influence

20

- U.S. role in the nuclear market is now greatly reduced
- But the United States offers world-leading innovation, and approaches to safety, security, and nonproliferation
- Both economic and security benefits to maintaining a significant U.S. position in nuclear markets
  - Important to U.S. influence over other countries' nuclear choices
- Next president will have to grapple with:
  - How to avoid losing nuclear's domestic low-carbon contribution
  - How to ease the path to commercializing new technologies
  - How to help U.S. firms compete against state-owned (or assisted) firms from other countries
  - How best to advance U.S. nuclear safety, security, nonproliferation objectives

The importance of presidential judgment

- Cuban Missile Crisis:
  - Initially, Kennedy's advisors called for air strikes followed by an invasion
  - Kennedy pushed back, asking for another option
  - The recommended course might well have led to nuclear war
- Kennedy: Key lesson was always to offer the adversary a face-saving way to back down
- The world relies on sober judgment by the leaders of nuclear states

Source: JFK Library