HARVARD Kennedy School
BELFER CENTER
FOR SCIENCE AND INTERNATIONAL AFFAIRS

The War in Ukraine: Impact on Nuclear Energy, Safety, and Security

Matthew Bunn

James R. Schlesinger Professor of the Practice
of Energy, National Security, and Foreign Policy

NEREC-Sejong Conference on Nuclear Nonproliferation,
August 2, 2022

http://scholar.harvard.edu/matthew_bunn

1

Russia's war on Ukraine has upended much of the international order

2

- A founding member of the United Nations – charged with ensuring international peace and security – is waging large-scale aggressive war
- A state that gave up the nuclear weapons on its soil in return for security assurances is being torn apart
- Impacts on security, food, energy are reverberating around the world

Source: Reuters

2

The war in Ukraine requires rethinking most aspects of nuclear policy

3

- With a more aggrieved Russia more willing to use military force, nuclear deterrence needs new thinking
  - With weakened conventional forces, Russia will be more dependent on nuclear weapons than before
  - U.S. allies seeking still stronger assurances
- The future of nuclear arms control is in doubt
  - Intense U.S.-Russian hostility means more nuclear danger, fewer chances to take steps to reduce it
- The future of nuclear nonproliferation is uncertain
  - Ukraine's fate may lead other countries to reconsider nuclear options
- Requires rethinking nuclear energy, nuclear safety, and nuclear security with the possibilities of wars, political unrest, state collapse in mind (more in a moment)

3

There have also been other major changes in the nuclear landscape

4

- China is building 100s of new nuclear missile silos
  - No participation in arms control or nuclear risk-reduction
  - Growing U.S.-Chinese hostility
- North Korea is dramatically strengthening its nuclear forces
  - Massive missile testing program, nuclear test could come any time
- Iran's nuclear program poses ever-growing dangers
  - Without return to the JCPOA, crisis likely in the next 2 years
- Evolving technologies may undermine nuclear balances
- Ongoing tensions between nuclear haves and have-nots
- Climate change, energy security, local pollution driving more countries to express interest in nuclear energy
  - Many advanced reactor concepts being explored – each has different implications for safety, security, nonproliferation

4

The war's impact on nuclear energy is equivocal

5

- Strengthens the search for alternatives to Russian gas
  - Including nuclear energy – though not a quick alternative
  - High energy costs make nuclear energy more attractive
- But the war offers a new reminder that war is one of the dangers nuclear plants may face
  - Over the long lifetime of a nuclear project, could be a problem almost anywhere
  - May increase concerns over widespread deployment

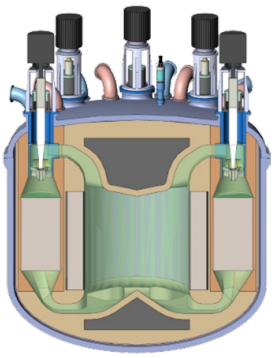
Zaporizhzhya Nuclear Power Plant
Source: Energoatom

5

Nuclear energy and energy security

6

- Churchill: "security lies in diversity, and diversity alone"
- Energy security, climate, and local pollution leading to more countries exploring nuclear options
- Japan's experience after Fukushima suggests nuclear energy can also be a major energy security problem
  - Biggest disruption in Japanese energy system since World War II
- Plutonium fuel cycles are certainly not a reliable path to energy security
  - Nuclear terrorism anywhere would lead to major disruptions, calls for shutdown



Molten chloride fast reactor concept
Source: Terrapower

6

Nuclear energy, war, state collapse, or social unrest…

7

- With planning, construction, operation, decommissioning, a new nuclear plant is a 100-year proposition
- Who can predict where war, state collapse, social unrest may occur over 100 years?
- What if Syria had a 1-GWe LWR when the civil war began?
- Advanced reactors with enhanced passive safety may reduce concern
  - Should be seen in context of other terrible dangers of war

Source: AP

7

Rethinking nuclear safety and security in light of the war in Ukraine

8

- Past efforts have focused on accidents, small groups of adversaries
- Now need to at least consider the armed forces of a state
  - Accidental harm in the course of war
  - Intentional action to cause radioactive releases – "nuclear plants as weapons of the enemy"
- Clearly beyond what operators should be expected to defend against
  - States need to rethink their role in protecting against "beyond design basis" threats

Fighting at the Zaporizhzhya Nuclear Power Plant
Source: Energoatom

8

Rethinking reliance on Russian nuclear supplies

9

- Rosatom is the dominant nuclear reactor vendor in the world
  - Offers low prices, low-cost financing (including "BOO"), spent-fuel take-back…
- Rosatom is also a major player in international fuel markets
  - Enrichment, uranium, fabrication…
- Rosatom is taking part in the illegal occupation of Ukraine
  - Should they be subject to sanctions?
- Reaction to the war creates opportunities for other suppliers
  - Finland already canceled Russian-supplied reactor project – but others going ahead
  - Countries looking for non-Russian options for reactor supply
  - Governments in Europe, the United States, may be more inclined to subsidize expanding capacity in enrichment, other market segments to reduce reliance on Russian supply

9

Rethinking nonproliferation

10

- NPT remains highly successful, cornerstone of global effort to stem the spread of nuclear weapons
- But Ukraine's fate – following those of Iraq and Libya – may lead some countries to reconsider their nuclear weapons options
- Expansion of nuclear energy implies spread of nuclear energy – but need not greatly increase proliferation risks
  - Key is limiting risks from the fuel cycle – enrichment and reprocessing
  - Reprocessing uneconomic, established enrichers likely lowest-cost suppliers

Source: AEOI

10

Further reading and background material

11

- Full text of Managing the Atom publications: *http://belfercenter.org/mta*
- Selected Matthew Bunn presentations and publications: https://scholar.harvard.edu/matthew_bunn
- Risk of nuclear weapons use in Ukraine: https://tinyurl.com/23newkw2
- Why Russia's nuclear exports will continue: https://tinyurl.com/2c4fov8x
- Impact of the war on the global nuclear order: https://www.conversationsix.com/p/BJxKYR27i52BBBHua
- *Revitalizing Nuclear Security in an Era of Uncertainty* (2019): https://www.belfercenter.org/NuclearSecurity2019

11