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Kjernekraft i et ikkespredningsperspektiv

Morten Bremer Mærli, mbm@nupi.no

Norwegian Institute
of International
Affairs

Norsk
Utenrikspolitisk
Institutt

Presentasjon:

- * Ikkespredningsavtalen
- * Relasjoner kjernevåpen-kjernekraft
- * Thorium / U-233
- * Konklusjon



NPI

→ Non-Proliferation Treaty, NPT

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Our Nuclear World

"Haves"

"Have-nots"



"Transitional countries"

NPT Nuclear
Weapon States

- USA
- Russia
- China
- UK
- France

Non-NPT Nuclear
Weapon States

- India
- Pakistan
- Israel

North Korea

- past*
- Belarus →
 - Ukraine →
 - Kazakhstan →
 - South Africa →

present

← Iran??

The rest, more or less

Nuclear Non-Proliferation Treaty (NPT)

- Signed in July 1, 1968
- Entered into force March 5, 1970
- Indefinitely extended in 1995
- 187 signatories, five NWS
- NWS = Nuclear explosion prior to 01.01.67
- India, Israel, Pakistan non-members
- North-Korea non-member?!
- IRAN...

NPT Trade-Offs

- NWS: Not to transfer nuclear weapons, nuclear explosive devices, or to assist, encourage NNWS to manufacture or acquire such weapons (Art. I).
- NNWS: Not to manufacture nuclear weapons or nuclear devices directly or indirectly, or any assistance for manufacturing or acquiring such weapons (Art II).
- NNWS: Accept IAEA-safeguards (Art. III).

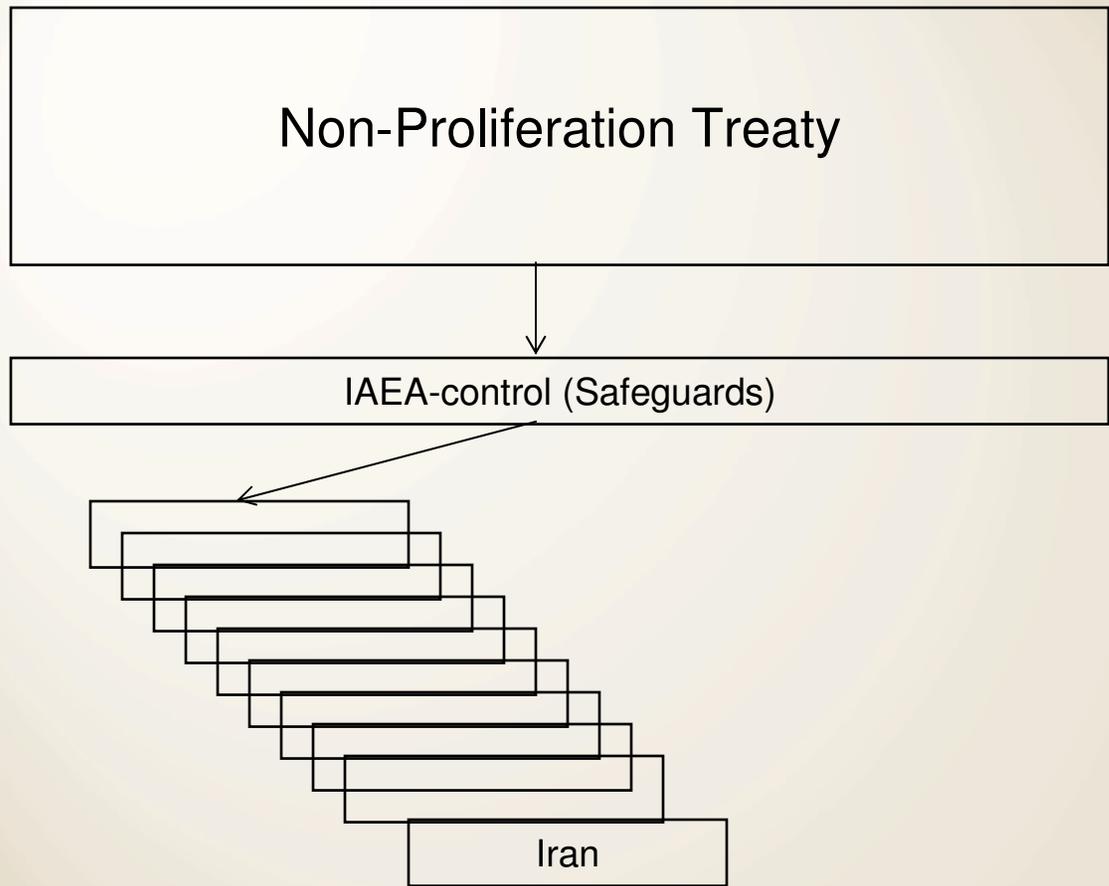


NPT Trade-Offs (cont.)

- *Peaceful uses*: Exchange of equipment, materials and technology for peaceful uses of nuclear energy (Article IV).
- *Nuclear disarmament*: Pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a Treaty on general and complete disarmament under strict and effective international control (Article VI).



International Control



Common views on linkages between nuclear power and nuclear weapons:

Two extremes



“Cannot have one without the other”

“International control is ensuring waterproof barriers between the two”



The first statement is obviously wrong

Of the (44) states with significant nuclear activities – only a fraction (eight, or nine counting DPRK) possess nuclear weapons

And, if the second statement is true,
why all the fuzz about Iran?

- The International Atomic Energy Agency (IAEA) has found evidence of Iran's failure to disclose elements of its program,
- ... but no evidence that it has a program to make nuclear weapons.

As often, the truth is probably found somewhere "in the middle"...

- Rest of talk:
 - devoted to exploring this middle ground,
 -in search for any "family ties" between nuclear power and nuclear weapons.

Look at a set of interrelated factors, like:

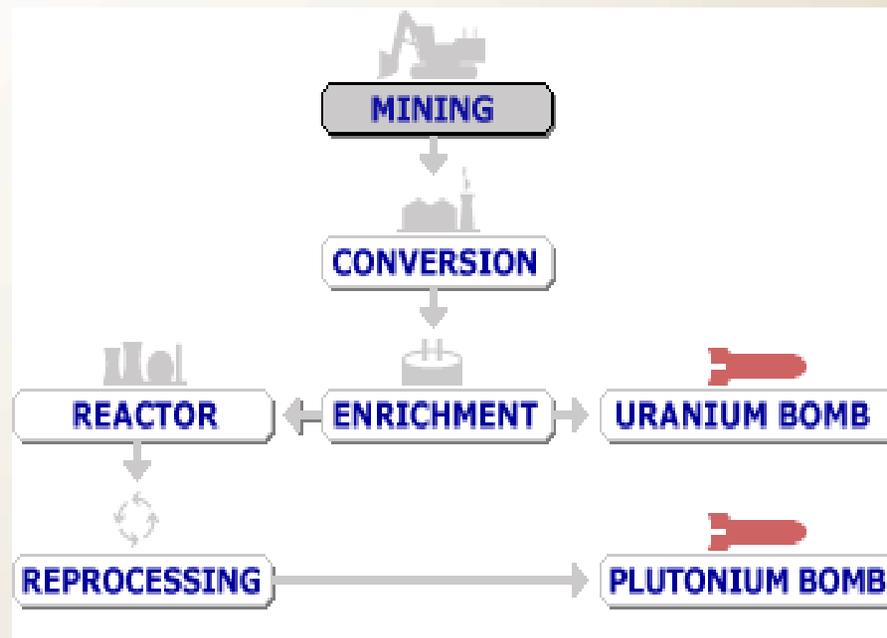
- legal or formal linkages
- social, economic or political relations
- technical infrastructure needed
- scientific basis developed

- A "warning":
 - This is not an in-depth quantitative analysis
 - Rather some qualitative observations



To clarify similarities and dissimilarities:

Start out with some of the technical issues



Source: http://news.bbc.co.uk/1/hi/in_depth/world/2003/nuclear_fuel_cycle/mining/default.stm

Enrichment a critical factor:

- Fuel for nuclear reactors: low enrichment (< 5% U-235)
 - Nuclear explosives: high enrichment (> 80% U-235)
 - Same equipment used for civilian and military purposes
- ⇒ potential clandestine activities under civilian cover

(“What IS Iran up to nowadays..?!”)

Need to establish a “firegate” between peaceful and non-peaceful uses



- IAEA-safeguards in all non-nuclear weapon states
 - In accordance with the Nuclear Non-Proliferation Treaty (Art. III)
- Suggested:
 - Ban on enrichment and reprocessing
 - International fuel centre
 - Guaranteed fuel supply

Legal or formal linkages

- The NPT aims at limiting the spread of nuclear weapons and related technology
- However, NPT Article IV calls upon member states to:
 - “to facilitate,.., the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy.”

Similar dualism in IAEA statutes

- IAEA has two basic responsibilities
 - ensure "so far as it is able" that nuclear programs under its' purview are not used to further any military purpose.
 - seek "to accelerate and enlarge the contribution of atomic energy for peace, health, and prosperity throughout the world."



The IAEA maintains substantial technical cooperation programs

- To extend the benefits of peaceful nuclear technology
- In areas like nuclear power, nuclear medicine, and nuclear safety

Social, economic and political aspects

Energy: vital for progress and development

- In the 1950: nuclear energy was “too cheap to meter” and would “eradicate poverty”.
- Today: some 440 commercial nuclear power reactors operating in 31 countries, supplying 16% of the world's electricity
- Fraction increasing? CO₂-emissions and new - and somewhat surprising - lobbying constellations

Nuclear weapons may ensure power, positions, prestige – and pride

- Power:
 - Ultimate military strength. Perceived security benefits. Ability to act independently.
- Position, prestige:
 - Nuclear weapon states under the NPT permanent UNSC-members
- Pride:
 - Domestic feature, important for identity-building, nationalism – and political re-elections

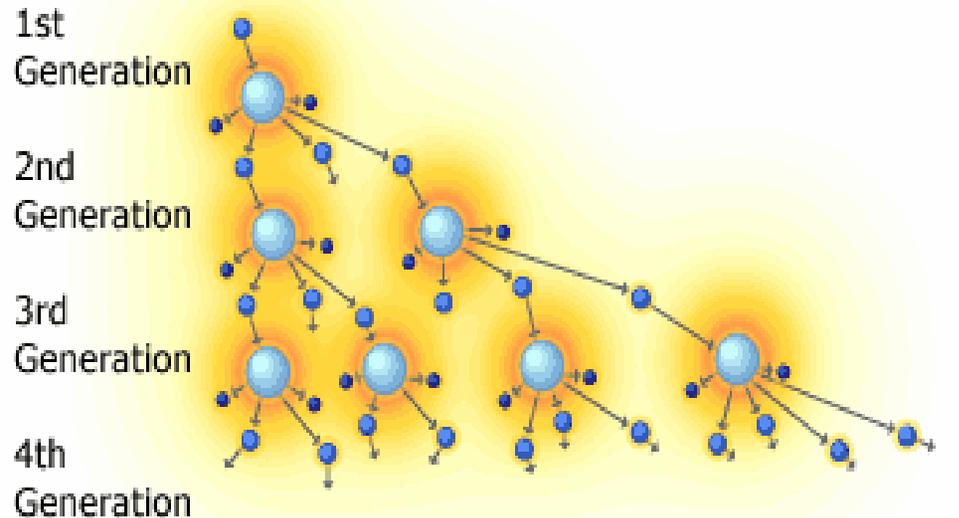
- No direct social, economic or political linkages between nuclear power and nuclear weapons
- However some common sought-after features, like perceptions of
 - Development, progress, strength, security
 - Domestic pride
 - International positions
 - ...

Scientific base developed

- Physics is physics
 - Used for civilian purposes
 - or used for military purposes

- Fundamentally, both nuclear power and nuclear weapons rest upon nuclear fission (or fusion)
 - Power plants: Controlled chain-reaction
 - Bombs: Non-controlled, exponential chain-reaction

Fission chain reaction



● Neutron
 ● Uranium-235 atom
 ● Fission fragment e.g. Kr, Cs, Rb, Ba, Xe or Sr

Civilian nuclear activities as “test-beds” and “training-grounds”...?

⇒ Build a competent, domestic knowledge-basis, both theoretical and practical

⇒ Recruitment and continuity, long-term planning

⇒ Independence and maintain future options

- Possibly, parallel
 - Nuclear material stockpiling
 - Nuclear infrastructure development
 - Data-simulation
 - Missile programs
- ⇒ Rapid nuclear weaponization
- ⇒ Break-out of non-proliferation regimes

Thorium cycle

- Like [uranium-238](#), thorium-232 is a [fertile material](#).
- The thorium fuel cycle has [thorium-232](#) absorbing a [neutron](#) under neutron bombardment in either a fast or thermal reactor.
- The thorium-233 then forms [uranium-233](#) through two beta decays; which in turn is burned as fuel.

- As a fuel, uranium-233 is superior to uranium-235 and plutonium-239 from a neutronic standpoint, because of its higher neutron yield per neutron absorbed.
- Another positive is that [thorium dioxide](#) melts around 3300 °C compared to 2800 °C for [uranium dioxide](#).

U-233: **Special fissionable material**

- Pu-239, **U-233**, uranium enriched in the isotopes 235 or **233**
- ***Better*** bombs with U-233??

Conclusions (1)

- Several ways nuclear power and nuclear weapons could be linked. No striking connections.
 - Most obscure is probably the linkages related to progress and national pride, etc.
 - Most problematic is probably the build-up of a scientific knowledge-base and stockpiles of fissile material

Conclusions (2)

- International control regime, but
 - The NPT carries with it inherently contradictory goals
 - Peaceful nuclear uses vs weapons control
 - The IAEA as a nuclear technology facilitator
 - Could challenge its NPT responsibilities

Conclusions (3)

- On the “familyhood” nuclear weapons and nuclear weapons:
 - No siamese *twins*
 - Not even *siblings*
 - Rather, close *cousins*

Conclusion (4)

- Thorium cycles demand strict U-233 control at all times, all locations
- Sufficient will and resources ?