Civilian Nuclear Power Program in Northeast Asia: Possible Multinational Frameworks for Northeast Asia Nuclear Weapon Free Zone (NEA-NWFZ)

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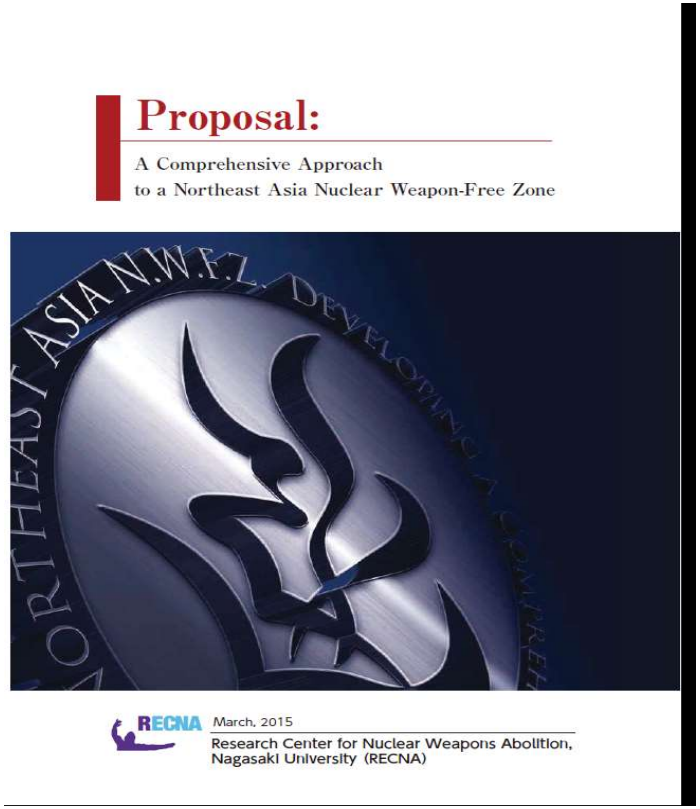
RECNA's proposal; A Comprehensive Approach to a Northeast Asia Nuclear Weapon Free Zone (NEA-NWFZ) (March 2015)

- Based on "three plus three" concept (i.e. Japan, ROK, DPRK will be NWFZ and China, Russia and the US will provide negative security assurance).
- "Comprehensive Framework for the Denuclearization of Northeast Asia"
  1. Declare to terminate the Korean War and provide mutual nonaggression.
  2. Assure equal rights to access all forms of energy, including nuclear energy.
  3. Agree on a treaty to establish a NEA-NWFZ
  4. Establish a permanent Northeast Asia Security Council.



http://www.recna.nagasaki-u.ac.jp/recna/bd/files/Proposal_E.pdf

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Issues-Background

- Without much uranium resources in the region, concern over fuel supply assurance is strong.
- Japan is the only non-nuclear weapon state in the region which has both enrichment and reprocessing facilities.
- ROK has been demanding that it should be allowed to reprocessing as Japan has been allowed since 1980s. China is now considering commercial reprocessing as well.
- Various regional nuclear cooperative scheme, such as ASIATOM, has been proposed but never realized.
- It may be a time to re-think regional scheme as a part of NEA-NWFZ.

Possible Options for regional nuclear cooperation

(1)“LEU Fuel Bank” : Enhanced fuel assurance can reduce need for development its own enrichment capacity.

(2)Multilateral enrichment corporation(“URENCO” approach): Treaty of Almelo establish multilateral commission to oversight the enrichment activities

(3)Mutual Inspection and Trust Building Scheme: Modelled after ABACC (Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials), mutual inspection scheme for nuclear fuel cycle activities

(4)International Plutonium Management Program: Establish an international program for storage/disposition of plutonium stockpile.

(5)No reprocessing/enrichment agreement (plus international spent fuel/waste storage and disposal).

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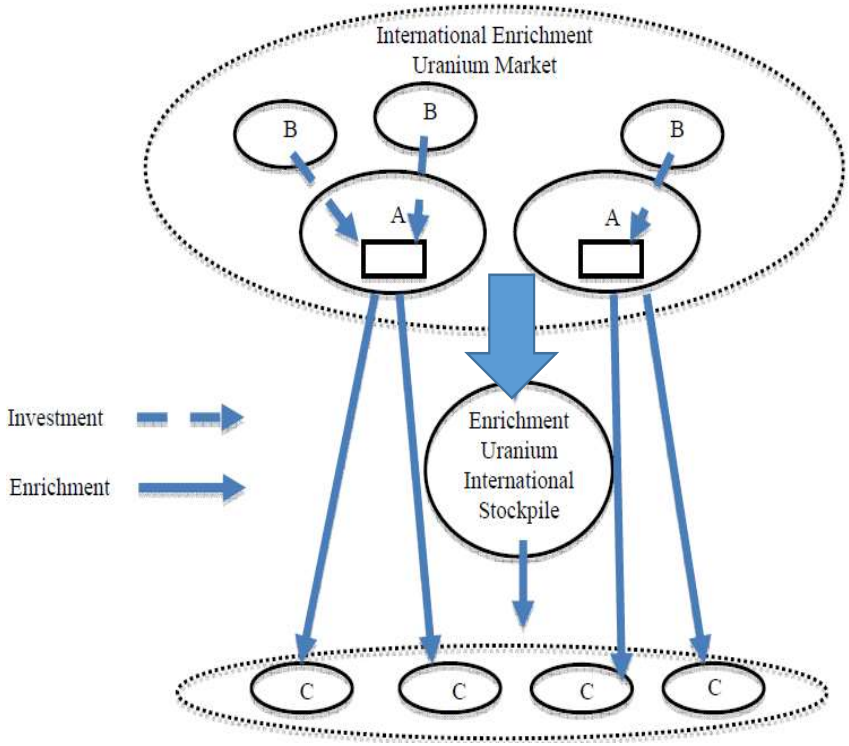
IAEA LEU Fuel Bank

- Owned and controlled by the IAEA, the LEU Bank will host a reserve of LEU, and act as a supplier of last resort for Member States in case the supply of LEU to a nuclear power plant is disrupted due to exceptional circumstances.
- Up to 90 MT LEU (~three reloads for 1GWe LWR). It will be located at the Ulba Metallurgical Plant in Oskemen, Kazakhstan. A Member State which needs to purchase LEU from the IAEA LEU Bank must have a comprehensive safeguards agreement with the IAEA.- No restriction on domestic enrichment capacity.
- The IAEA has received the following contributions for the IAEA LEU Bank: ~$150 million
  - Nuclear Threat Initiative: US $50 million
  - United States: US $49 million
  - European Union: €24.4 million
  - United Arab Emirates: US $10 million
  - Kuwait: US $10 million
  - Norway: US $5 million
  - Kazakhstan: US $400,000 plus in-kind contributions, including hosting of the IAEA LEU Bank

https://www.iaea.org/topics/iaea-low-enriched-uranium-bank

LEU Fuel Bank and Multinational Enrichment Corporation- a proposal

- Country A: Own enrichment capability in the country (with other international owners), should provide funding for LEU fuel bank (ex. Japan, China)
- Country B: Investor of enrichment corporation but not own the facility has an access to LEU fuel bank (ex. S. Korea)
- Country C: Non-owner of enrichment facility has a first priority to set up LEU fuel bank and/or access to LEU fuel bank in case of emergency (ex. N. Korea)



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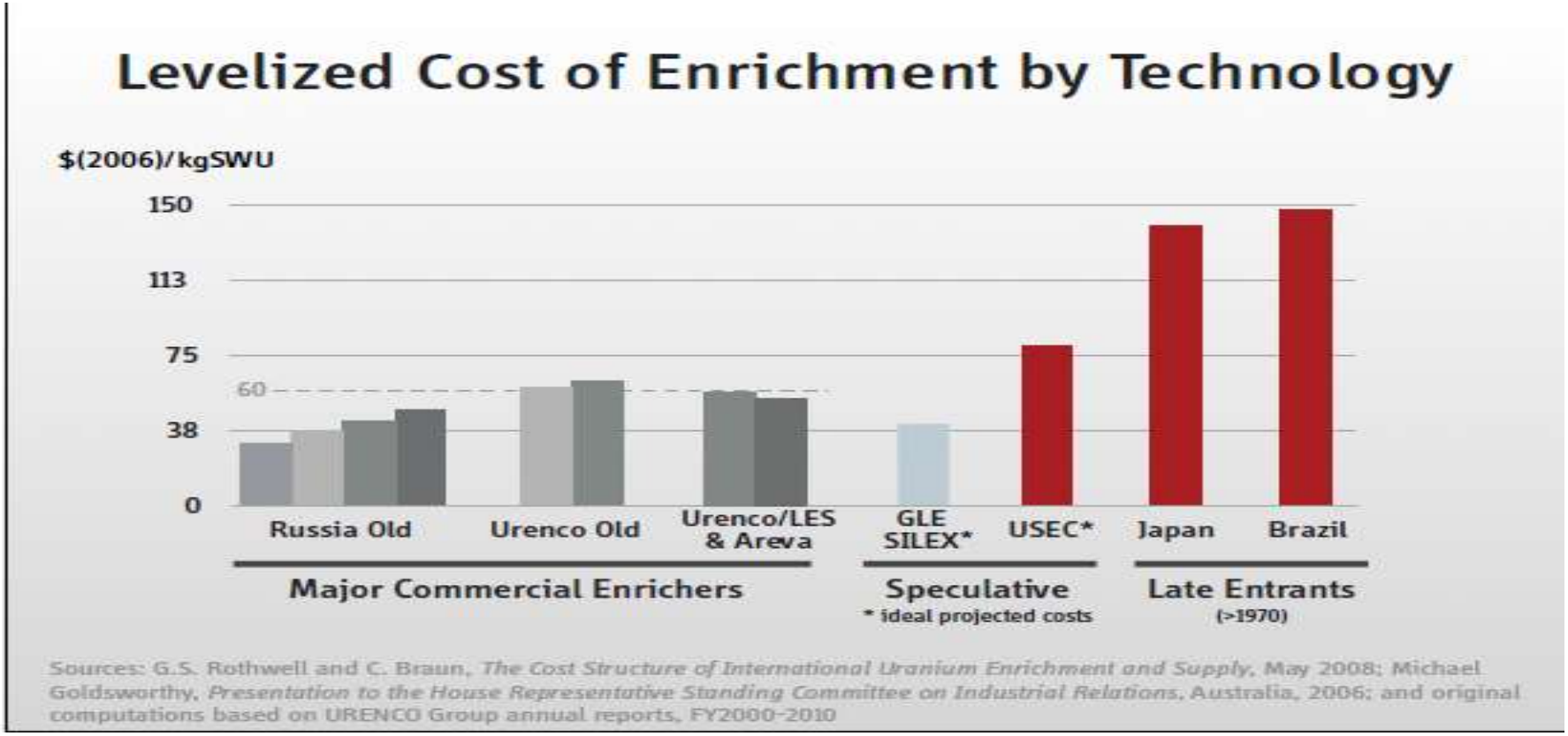
New enrichment plant is unlikely to be competitive



Source: Personal communication with R. Scott Kemp, June 6, 2015

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Only the domestic fuel reserve satisfies the all fuel supply assurance against fuel crises

	Fuel-Supply Security Metrics				Nonproliferation Metrics	
	Force Majeure (mine floods, earthquakes, technology failure)	Unexpected Bilateral Political Risk (political conflict)	Immune to Political Manipulation (IAEA BOG / Sanctions)	Full Front-End Protection (raw ore/conversion)	Limits Technology Diversion (e.g. parallel plant)	Protects from Capture & Overt Breakout
Market Diversification (current approach for most)	Some	Yes	No	Some	Yes	Yes
National Enrichment (US/Russia/Japan/Iran/Brazil)	No	Yes	Yes	No	No	No
Multinational On Territory (URENCO / Korea preference)	No	Yes	Yes	No	Yes	No
Supplier's Rules (NSG 10GW / 123 Standards ANFSI / INFCA)	No	No	No	No	Yes	Yes
Ownership Stake Foreign Plant (EURODIF / Angarsk / GLE)	No	No	No	No	Yes	Yes
International Fuel Bank (IAEA-NTI)	Yes	Yes	No	Yes	Yes	Yes
Domestic Fuel Reserve	Yes	Yes	Yes	Yes	Yes	Yes

Source: Personal communication with R. Scott Kemp, June 6, 2015

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Mutual Inspection and trust building scheme - ABACC approach

- In order to increase transparency of civilian nuclear energy programs, in particular, the one with sensitive nuclear materials and technologies, mutual inspection scheme can be established within the concerned parties.
- This could be a part of the “Comprehensive Approach” to a Northeast Asia Nuclear Weapon Free Zone (NEA-NWFZ).
- ABACC can be a good model for both trust building and enhanced transparency.

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Possible merits of regional monitoring/inspection scheme

1. Regional monitoring/inspection scheme could reduce regional concern with increased transparency and confidence.
2. Such scheme can be also utilized to enhance regional cooperation in other areas such as nuclear safety/security and research activities.
3. DPRK, which is not a member of NPT and does not have an effective international safeguards agreement with IAEA, could accept regional inspection first.
4. International confidence in civilian nuclear programs in the region could be also enhanced with if the scheme is designed consistent with international inspection scheme
5. Possible application of advanced technologies (such as satellite imaging) could be more feasible under the regional framework.

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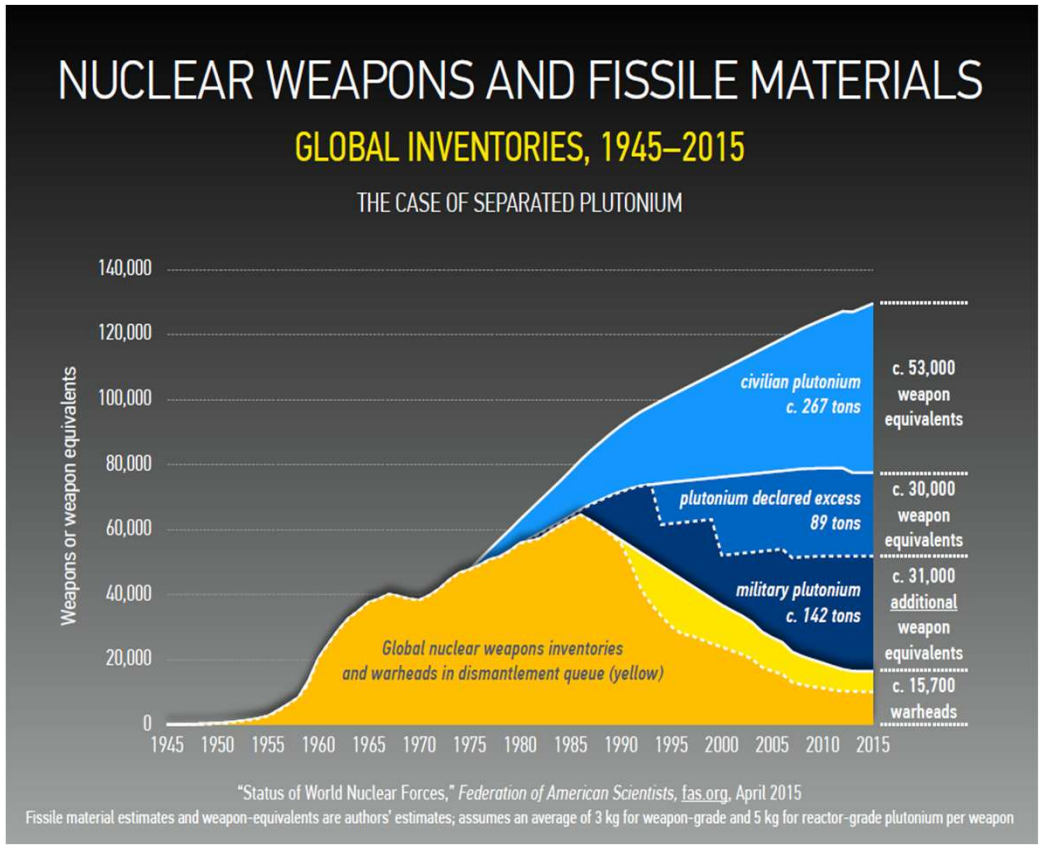
Issues to be considered further

1. Additional costs could be significant as the scale of nuclear energy programs in the NE Asia are much bigger than those in ABACC region. By utilizing existing inspection schemes effectively, such additional costs could be minimized.
2. Verification of dismantlement of nuclear weapons of DPRK (or inspection of possible military facilities) is a difficult and challenging task for NEA-NWFZ. Regional inspection scheme could be tailored from the beginning for that purposes.
   - Lessons can be learned from the International Partnership for Nuclear Disarmament Verification (IPNDV) where non-nuclear weapon countries cooperate with nuclear weapon countries to explore technical options to verify nuclear disarmament without compromising management of sensitive information.
3. Consistency with IAEA safeguards regime need to be maintained, while there are some concerns over the ABACC regional scheme such as applying additional protocol.

Global Inventory of plutonium is increasing



- HEU: 1,369.8 ton(2016) → 1,338.6 ton (2017)
  - ~ 20,916 Hiroshima bombs (64kg/bomb)
- Pu: 504.6 ton(2016) → 511.4 ton (2017)
  - ~ 85,241 Nagasaki bombs (6kg/bomb)
- HEU inventory is declining and most of them are for military use.
- Pu inventory is increasing due to civilian reprocessing and more than 70% is non-military use.
- Japan has the largest Pu stockpile (47.9 tons) as a non-nuclear weapon state.

Source; Zia Mian, Alex Glazer, "Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Production," presented at NPT ReviewConference, May 8, 2015.
http://fissilematerials.org/library/ipfm15.pdf

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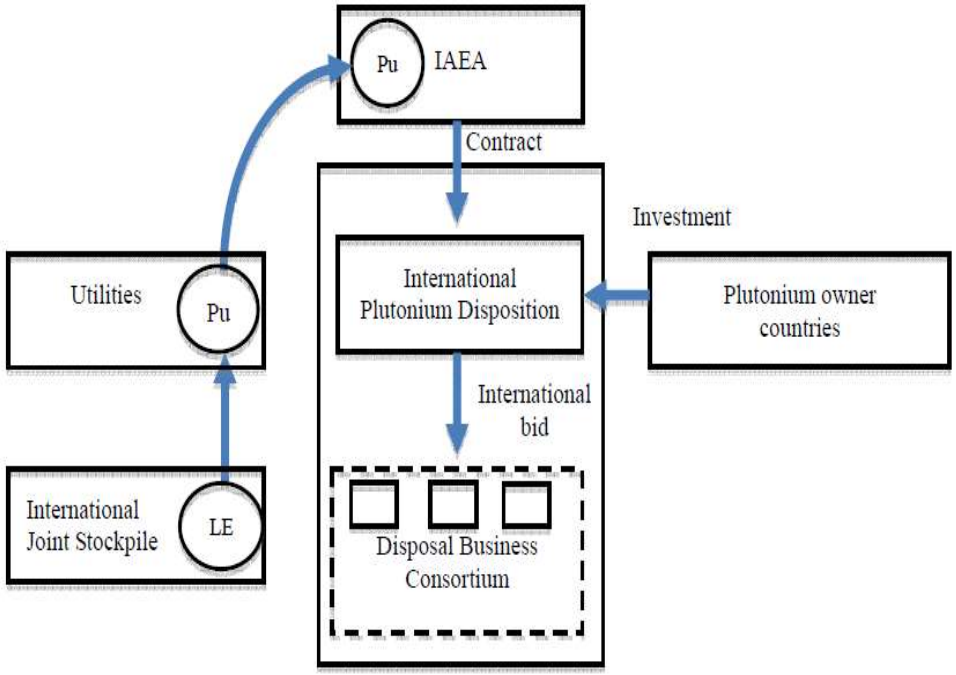
International Plutonium Management

- "Japan could alleviate international apprehensions and strengthen the global nonproliferation regime by placing its excess plutonium under the custody of the International Atomic Energy Agency (IAEA)".
  - Fred McGoldrick, *"IAEA Custody of Japanese Plutonium Stocks: Strengthening Confidence and Transparency",* Arms Control Today, September 28, 2014
- UK has offered to take the title of "foreign owned plutonium stored in UK" as a commercial business base with their own plutonium disposition program.
- Taiwan (Chinese Taipei) and the US agreed that Taiwan can send spent fuel to France for reprocessing under the condition that plutonium will not be returned to Taiwan. Can it apply to Japanese plutonium?

Possible International Scheme for Pu Disposition

- Utilities can declare “excess” civilian plutonium and give its title to IAEA. (Can purchase LEU for energy equivalent from international LEU fuel bank).
- Plutonium owner governments (or utilities) should pay plutonium storage/disposition costs.
- IAEA can give commercial contract to plutonium disposition consortium.



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Overall Assessment (preliminary)

	Economics	Energy Security	Non-Proliferation	Nuclear Security	Relevance to NEA-NWFZ	Feasibility
LEU Bank	A	A	B	B	B	A
Multilateral Enrichment	C	B	C	C	C	C
Mutual Inspection	B	c	A	A	A	B
Plutonium Management	B	C	A	A	B	B
No reprocessing & Enrich.	A	C	A	A	A	C

A:Excellent B: Good C: Not so good

This quick review suggests that Option 1 could be the best one but all other options except Option 2 may be worth considering and may need further analysis.

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