

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

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ABSTRACT

Given the existence of strong civilian nuclear programs in Northeast Asia, it may be necessary to consider possible international framework that can fit with the need of Northeast Asia Nuclear Weapon Free Zone (NEA-NWFZ). This paper reviews such international framework for civilian nuclear energy, especially minimizing the risk associated with sensitive nuclear fuel cycle activities. The possible frameworks which this paper reviews are; 1) Low Enriched Uranium (LEU) Fuel Bank, 2) Multilateral Enrichment Corporation, 3) Regional Mutual Inspection/Monitoring Scheme 4) International Plutonium Management (including storage/disposition) and 5) No further reprocessing/enrichment agreement. Preliminary review suggests that option 1) would be the best and option 2) may have only limited benefit, while all other options may need more careful consideration.

Introduction

Since the Fukushima nuclear accident in 2011, global nuclear industry is facing tough challenges. Even in Northeast Asia which once enjoyed the fastest growth in nuclear energy, the future of nuclear energy programs in Japan, and ROK are very uncertain while Taiwan decided to phase out nuclear power. Under the current trends, however, China will have the only growing and have the largest nuclear power program in the world and, most notably, Japan will maintain its nuclear fuel cycle program with large plutonium stockpile. And there are common issues that need to be addressed by those countries with nuclear energy programs. When we envision the Northeast Asia Nuclear Weapon Free Zone (NEA-NWFZ), it would be better to consider possible new regional framework to minimize risks associated with nuclear energy program, especially for those with sensitive nuclear fuel cycle programs. In this paper, five possible international schemes to deal with nuclear fuel cycle programs.

They are; 1) Low Enriched Uranium (LEU) Fuel Bank, 2) Multilateral Enrichment Corporation, 3) Regional Mutual Inspection/Monitoring Scheme 4) International Plutonium Management and 5) No reprocessing/Enrichment agreement.

LEU Fuel Bank and Multilateral Uranium Enrichment Corporation

LEU Fuel Bank idea was originally proposed by Nuclear Threat Initiative (NTI) and its main aim is to provide fuel supply assurance to uranium imported countries, and to discourage them to acquire their own enrichment facilities. In August 2015, the government of Kazakhstan and International Atomic Energy Agency reached an agreement that LEU Fuel Bank, owned and operated by the IAEA, will be in Oskemen, Kazakhstan. It is planned to start its operation in 2017, and it can hold up to 90 tons of LEU. Another similar arrangement is the one established by Russian International Uranium Enrichment Center in Angarsk. The recipient countries must be a member of Non-proliferation Treaty (NPT) and accept full-scope safeguards.

Although this arrangement can be useful for some enrichment customers, it should be noted that it is still not owned by consumer countries. Compared with oil stockpile which is typically owned and operated by consumer countries, confidence level could be lower. In Northeast Asia, all countries are not exporters of uranium nor enriched uranium. Therefore, if LEU Fuel Bank is established regionally, its confidence in fuel bank could be much higher.

Another option is to establish multilateral enrichment corporation like URENCO. At present, though, only Japan and China has small enrichment capacity. It is possible that China may expand its enrichment capacity to meet growing demand. But it is likely that uranium enrichment market continues to be soft, and it may be difficult for such a regional enrichment corporation can be competitive with existing uranium enrichment suppliers.

Given the current market condition, LEU Fuel Bank is probably the more economical option than multilateral enrichment corporation and its fuel assurance benefit is also more certain.

Regional Mutual Inspection/Monitoring Scheme

The idea of regional safeguards or mutual inspection/monitoring scheme was proposed in Asia-Pacific region when the idea of PACATOM or ASIATOM concepts were discussed during the 1990s. However, due to different priorities and interests, any regional scheme has not been realized.

Now, it may be an appropriate time to revisit the idea under the scheme of NEA-NWFZ. The experiences of Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) could be quite useful for discussing such scheme in the Northeast Asia,

while we need to recognize the differences of two regions carefully. First, the potential benefits which such scheme can bring to the region can be summarized as follows.

- ① There are increasing regional concerns over civilian nuclear programs over sensitive nuclear fuel cycle activities and regional scheme could reduce such 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.

On the other hand, the following issues need to be considered carefully.

- 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)¹ 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.

Overall, mutual inspection/monitoring scheme can be a very effective one introduced in NEA-NWFZ and further studies should be encouraged.

¹ Fact Sheet, “An International Partnership for Nuclear Disarmament Verification”, August 2, 2016.
<https://2009-2017.state.gov/t/avc/rls/2016/260759.htm>

International Plutonium Management (including storage/disposition)

Global stockpile of separated plutonium, is increasing steadily mainly due to civilian reprocessing programs in limited number of countries. In Northeast Asia, DPRK, China and Japan have stockpile of separated plutonium, but Japan has the largest stockpile (47.9 ton as of the end of 2015²). This large stockpile of plutonium has become a source of international concern, especially among the countries in the region.

To reduce international concern and minimize the risks of large stockpile of plutonium, there have been some proposals for possible international schemes. For example, in 2014, Dr. Fred McGoldrick proposed that Japanese stockpile can be put under the IAEA custody.³ The UK Government published its policy for its own plutonium disposition, in which they announced their willingness to take titles of foreign owned plutonium stored in the UK.⁴ International cooperation in plutonium disposition with countries with large plutonium stockpile, such as the US, can also be an option to be considered. The bilateral cooperation agreement between Japan and the US on peaceful use of nuclear energy, which include “blanket approval” of reprocessing/plutonium programs in Japan, will expire in June 2018. It would be useful for both Japan and the US to consider possible bilateral cooperation on this issue.⁵

Such options can be pursued by Japan which could improve confidence in Japan’s civilian plutonium programs. However, this cooperative scheme could extend beyond Northeast Asia and thus can be less relevant to the NEA-NWFZ.

No reprocessing/Enrichment agreement

As of today, Japan and China have both enrichment and reprocessing facilities for civilian purposes while DPRK have both facilities for military purposes. In 1992, DPRK and ROK agreed not to possess reprocessing and enrichment facilities under the Joint Declaration, and it may be useful to reconsider such agreement under the NEA-NWFZ.

Given the fact that there are already running facilities in Japan, China and DPRK, one possible agreement could be to stop further production of plutonium and HEU, like the one

² Japan Atomic Energy Commission.

http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2016/siryo24/siryo1_e.pdf

³ Fred McGoldrick, “IAEA Custody of Japanese Plutonium Stocks; Strengthening Confidence and Transparency”, Arms Control Today, September 28, 2014. <https://www.armscontrol.org/print/6555>

⁴ UK Department of Energy and Climate Change, “Management of the UK’s Plutonium Stocks”, February 2011. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42766/1243-uk-plutonium-stocks.pdf

⁵ “PuPo 2017 Statement”, February 24, 2017. <http://www.cnrc.jp/english/?p=3701>

for Fissile Material Cutoff Treaty (FMCT) for military purposes. This, combined with clear commitment to reduce and eliminate existing stockpile of fissile materials, the risk of nuclear proliferation and security can be minimized.

It is often argued that reprocessing is necessary to deal with spent fuel, and thus it would be also useful to consider possible international storage of spent fuel in the region. However, it is quite difficult to site such an international spent fuel storage facility. One possible option is to use existing reprocessing facility in China or Japan as a possible host for such storage, under the NEA-NWFZ arrangement. But this It is also worth considering an international storage (or final repository) of radioactive waste as no country in the region has found a site for civilian nuclear waste. Viable options for such waste storage include; International Consortium approach and a Corporate Entity Approach.⁶

Overall Assessment

Although all options suggested above have merits and demerits, it would be useful to evaluate all options with certain criteria, such as; economics, energy security, non-proliferation, nuclear security, relevance to NEA-NWFZ and feasibility.

Table 1 summarizes the tentative evaluation made by the author. Option 1 is probably most cost-effective approach to ensure supply assurance and it could reduce the need to build unnecessary enrichment capacity for such purposes. The experiences from Russia and Kazakhstan could be useful and the existence of LEU Bank in the region would enhance fuel assurance for the countries in the region. Option 2 can be difficult as it may require larger investment and may not be economical, given the soft international market situation. Non-proliferation and security benefits are also limited. Option 3 is a good option to enhance mutual confidence in the region and can fit the scheme under the NEA-NWFZ. Option 4 is an important option, especially for Japan and other countries with large Pu stockpile and its benefits may go beyond this region. Option 5 could minimize proliferation and security risks associated with sensitive nuclear fuel cycle activities, but it may interfere with national sovereignty of some countries in the region.

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.

⁶ Robert D. Sloan, "Multinational Storage of Spent Nuclear Fuel and Other High-level Nuclear Waste: A Roadmap for Moving Forward," American Academy of Arts and Sciences, 2017.
https://www.amacad.org/multimedia/pdfs/publications/researchpapersmonographs/GNF-Spent-Nuclear-Fuel/GNF_Spent-Nuclear-Fuel-Storage.pdf

Table Comparison of various options for international scheme for sensitive nuclear fuel cycle and its implications for NEA-NWFZ (tentative review by the author)

	Economics	Energy Security	Non-Proliferation	Nuclear Security	Relevance to NEA-NWFZ	Feasibility
1. LEU Bank	A	A	B	B	B	A
2. Multilateral Enrichment Co.	C	B	C	C	C	C
3. Mutual Inspection Scheme	B	C	A	A	A	B
4. Plutonium Management	B	C	A	A	B	B
5. No reprocessing/ Enrichment (spent fuel/waste storage)	A	C	A	A	A	C

A: Excellent B: Good C: Not so Good