

A Study on Securing Uranium Enrichment Supply Assurance in Korea

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1. Introduction

As a non-nuclear-weapon state without sensitive fuel cycle facilities, Korea is keen about how to secure nuclear fuel supply assurance, especially uranium enrichment for their sustainable nuclear power. However when sensitive nuclear fuel cycle activity such as uranium enrichment is pursued by a national approach, neighboring countries and the world would show concerns about possibility of its proliferation. Therefore, it is critical to allay proliferation concerns by the international community if a country wants to have uranium enrichment capability for its fuel supply assurance. This study describes how to secure uranium enrichment supply assurance in Korea.

2. Status of and Prospects for Nuclear Power and Uranium Enrichment Demand in Korea

2.1 Nuclear Power in Korea

One of the most rapidly growing developed countries in the world today, Korea has been increasingly relying on nuclear power since 1978, when it started its first commercial nuclear power plant. Korea imported 96.0% of its primary energy resources (at a cost of 184.8 billion US dollars) from abroad in 2012, to compensate for its lack of domestic reserves. This high level of imports is the energy supply security consideration driving Korea's reliance on nuclear power. As of end of March, 2014, Korea had 23 power reactors in operation, with a total capacity of 20.7 GWe. Korea reactor fleets consists of 19 pressurized water reactors (PWRs) and four CANDU heavy water reactors (HWRs), the latter with a combined capacity of 2.8 GWe. An additional 6.6 GWe of PWRs were under construction, and additional PWRs capacity was planned that would bring Korea's total nuclear generating capacity up to 43 GWe by 2035 [1,2].

Fig. 1 shows the installed nuclear capacity in Korea through 2035.

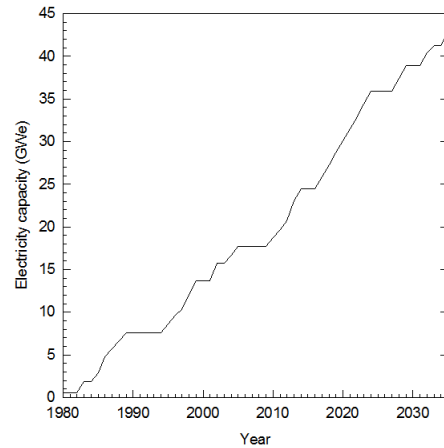


Fig. 1. Installed nuclear generation capacity in Korea (1980-2035)

2.2 Uranium Enrichment Demand in Korea

Fig. 2 shows uranium enrichment demand in Korea through 2035. Author assumes 120 tSWU required to feed 1 GWe PWR per year. By 2035, about 5,000 tSWU is required annually in Korea.

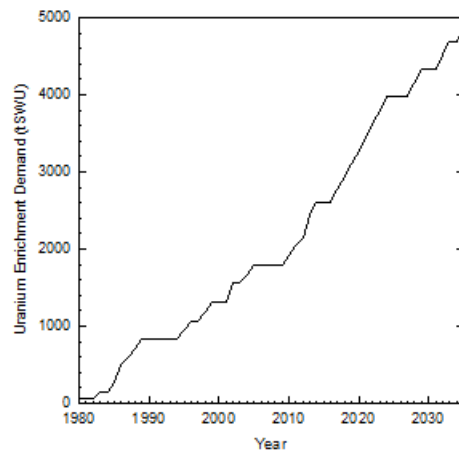


Fig. 1. Uranium enrichment demand in Korea (1980-2035)

3. Options in Securing Uranium Enrichment

Conceivable options for improving fuel supply assurances for Korea range from relying on the existing market with buying ownership to establishing a domestic enrichment capability.

3.1 Buying ownership in foreign enrichment plants

This option has already been exercised by KHNP in its investment in the AREVA Georges-Besse II plant and may also be pursued by KEPCO if it buys capacity in the URENCO LES plant. This approach raises no nonproliferation considerations and takes advantage of lower operating costs of existing, large plants as well as providing for a share in the profits. Korea could diversify its holdings by buying equity stakes in several of the enrichment enterprises.

3.2 Multinational enrichment plant in Korea using foreign black-boxed technology

Korea might choose to convince suppliers to provide centrifuge technology that would meet the specific criteria agreed upon within the NSG guidelines. Korea could either convince URENCO to set up a plant in Korea, owned by URENCO but perhaps with an equity share by Korean industry, or could convince Russian suppliers to build a turn-key facility in Korea owned wholly by Koreans.

3.3 Multinational enrichment plant in Korea using proliferation resistant technology

The purpose of developing a domestic enrichment facility under multinational auspices is to maximize nuclear fuel supply assurance while simultaneously minimizing the risk of proliferation. Developing proliferation resistant uranium enrichment technology, such as chemical uranium enrichment seems promising because it could minimize the risk of proliferation.

4. Concluding Remarks

From the aspect of securing uranium enrichment supply assurance, there are a few conceivable options in Korea from relying on the existing market with buying ownership to establishing a domestic enrichment capability. Among them, Korea could choose to establish a new multinational enrichment facility using a proliferation resistant uranium enrichment technology.

REFERENCES

- [1] Ministry of Trade, Industry and Energy, The 2nd National Energy Basic Plan, January 2014 (Korean).
- [2] Ministry of Trade, Industry and Energy, The 6th Basic Plan for Long-Term Electricity Supply and Demand (2013 ~ 2027), January 2013 (Korean).