

## **Approaches for Securing the Nuclear Fuel Cycle**

Jae San Kim, Min Su Kim, Seong Youn Jo

*Korea Institute of Nuclear Nonproliferation and Control (KINAC)  
Division of Nuclear Control Policy, Office: +82-42-866-6998, E-mail: jaesan@kinac.re.kr*

### **1. Introduction**

The greatest challenge to international nuclear non-proliferation regime is posed by nuclear energy's dual nature for both peaceful and military purposes. Uranium enrichment and spent nuclear fuel (SNF) reprocessing (sensitive nuclear technologies) are critical from the non-proliferation viewpoint because they may be used to produce weapons-grade nuclear materials.

Therefore, since 1970s the world community started to develop further measures to curb the spread of sensitive nuclear technologies. The establishment of a Nuclear Suppliers Group (NSG) in 1975 was one such measure. The NSG united countries which voluntarily agreed to coordinate their legislation regarding export of nuclear materials, equipment and technologies to countries not possessing nuclear weapons. Alongside measures to limit the spread of sensitive nuclear technologies, multilateral approaches to the nuclear fuel cycle (NFC) started to be discussed. [1]

It's becoming increasingly important to link the objective need for an expanded use of nuclear energy with strengthening nuclear non-proliferation by preventing the spread of sensitive nuclear technologies and securing access for interested countries to NFC products and services.

### **2. Multilateral Approaches to the Nuclear Fuel Cycle and Other Proposal**

#### *2.1 The Multilateral Nuclear Approaches*

At the IAEA General Conference in 2003, IAEA Director General called for establishing an international expert group on multilateral nuclear approach. The proposal was supported, and in February 2005 the international experts issued a report (INFCIRC-640) with recommendations on different multilateral approaches.

In expert group, five suggested approaches were released in February, 2005.

1. Reinforcing existing commercial market mechanisms on a case by case basis through long term contracts and transparent suppliers' arrangements with government backing.
2. Developing and implementing international supply guarantees with IAEA participation.
3. Promoting voluntary conversion of existing facilities to MNAs, with the participation of NPT NNWS, NWS and non-NPT States.

4. Creating, through voluntary agreements and contracts, multinational, and in particular regional, MNAs for new facilities based on joint ownership, drawing rights or co-management for front and back end nuclear facilities.
5. The development of a nuclear fuel cycle with stronger multilateral arrangements by region or continent – and for broader cooperation, involving the IAEA and the international community.

The recommendations can be generalized as follows: reinforcement of existing market mechanisms; involvement of governments and the IAEA in the assurance of supply, including the establishment of low-enriched uranium (LEU) stocks as reserves; conversion of existing national uranium enrichment and SNF reprocessing enterprises into multilateral ones under international management and control, and setting up new multilateral enterprises on regional and international levels. [2]

As noted earlier, one of the instruments to enhance the security of supply of NFC products and services suggested in the expert's report is reinforcement of existing market mechanisms. In this connection it looked quite logical for the World Nuclear Association (WNA) to set up, in August 2005, a dedicated working group comprising experts from the world nuclear industry. Representatives of the four leading world uranium enrichment services suppliers were in the group: AREVA (France), TENEX (Russia), URENCO (Germany, the Netherlands and UK), and USEC (US). [3]

#### *2.2 Global Nuclear Power Infrastructure*

On 25 January, 2006 Russian President announced an initiative to develop a Global Nuclear Power Infrastructure (GNPI) capable of providing secured and non-discriminatory access to the benefits of nuclear energy to all interested countries in strict compliance with non-proliferation requirements. Establishment of a network of international NFC centers (INFCC), including enrichment services, under IAEA safeguards will become a key element of such an infrastructure. The GNPI-INFCC initiative is aimed primarily at countries that are developing nuclear power but not planning to establish indigenous uranium enrichment and SNF reprocessing capabilities. [4] At a first step, Russia volunteered to initiate a joint project to establish an International Uranium Enrichment Center (IUEC) on

the basis of its enrichment plant in the city of Angarsk (Irkutsk region).

### *2.3 Global Nuclear Energy Partnership*

The US Administration recently put forward a new initiative on a Global Nuclear Energy Partnership (GNEP). The main objective of the US initiative is to contribute to the development of a global partnership on the peaceful use of nuclear energy taking into account the global problems facing mankind.

In the area of non-proliferation of sensitive nuclear technologies, GNEP suggests establishing an international consortium comprised of developed countries with full NFC capabilities, including advanced nuclear technologies. The members of the consortium are assumed to become the main suppliers of uranium enrichment and SNF reprocessing services to other countries.[1] GNEP also assumes development by NFC services suppliers of a nuclear fuel leasing scheme with developing countries incorporation SNF return in order to discourage them from acquiring indigenous NFC capabilities.

### *2.4 Multilateral Mechanism for Reliable Access to Nuclear Fuel (RANF)*

In September 2005, the six enrichment service supplier states; France, Germany, Netherlands, Russia, UK, US under the leadership of the US, set up an intergovernmental working group to develop a multilateral mechanism for reliable access to nuclear fuel (RANF).[3] The group presented its proposal to IAEA Member States in June 2006 and consultations continue on the next steps regarding their offer, under certain conditions, to provide low enrichment uranium to States not pursuing sensitive nuclear activities.

### *2.5 Japan's Proposal*

In September 2006, Japan proposed to establish a system called the "IAEA Standby Arrangements System for the Assurance of Nuclear Fuel Supply" under IAEA auspices, that incorporates both an information system to contribute to the prevention of the occurrence of market failure and the back-up feature for supply assurance proposed in the six-country proposal for reliable access. [1]

### *2.6 Proposal from Other Countries*

In September 2006, the UK proposed an Enrichment Bond. This would enable prior consent for provision of enrichment services for qualifying recipient States. Germany and Netherlands have associated themselves with this initiative.

Also, the Nuclear Threat Initiative – a US NGO – proposed to set up a stockpile of low-enriched uranium, under the Agency's auspices, to serve as a last-resort

fuel reserve for countries that have elected not to build a national uranium enrichment program.

Furthermore, Germany proposed the creation of an international uranium enrichment facility – operated by the IAEA – at an extraterritorial (international) site.[3]

## **3. The Suggestion for Framing the National Policy**

If the enriched uranium is supplied enough and problem about back-end nuclear fuel cycle is solved, there is no reason to make an objection about these kinds of proposal. However, the problem is that these proposals started in recognition of vested interests such as existing sensitive nuclear facility (from developed countries) On the other hand, it is hard to secure objectivity and concreteness that nuclear fuel is supplied by reasonable price. Also, controversy is happening because it is very hard to define the dimension of sensitive nuclear technology correctly. In future, if such suggestions are realized, multilateral sharable assurance is necessary for long term (existing sensitive facility from supply group). In conclusion, our country must keep the close cooperation with DOE, six countries from RANF proposal, etc. And then, our country has to acquire the upper position of nuclear supply group or mediating group. And we have to continue to develop own sensitive technology about nuclear fuel cycle and waste disposal, etc.

## **4. Conclusion**

It's obvious that all the above initiatives (GNPI-INFCC, GNEP, RANF) have common elements related to the security of supply. Therefore, the initiatives may benefit from harmonization. The attempt should be made to develop an International Assured Nuclear Fuel Cycle Products and Services Supply Framework aimed at limiting the spread of sensitive nuclear technologies and strengthening the international nuclear non-proliferation regime.

## **REFERENCES**

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