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## **Full Compliance with the NPT: Effective Verification and Nuclear Fuel Cycle\***

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Recent events have placed the Nuclear Non-Proliferation Treaty (NPT) and the nuclear non-proliferation regime under unprecedented stress, and in particular the miserable failure of the 2005 NPT Review Conference because of fundamental confrontation of opinions and priorities caused much concern on the regime.

The NPT and the regime consist of three pillars as almost all participating states in the Review Conference emphasized, that is, nuclear non-proliferation, nuclear disarmament, and peaceful uses of nuclear energy. This grand bargain is the base of the regime and the balance of obligations should be maintained.

In this paper, I will deal with the issue of securing full compliance with the NPT through effective verification and multilateral control of nuclear fuel cycle. As backgrounds of these issues, we can point out the rise of regional political and security agendas with the end of the Cold War, looming of a black market in nuclear technologies and items, and the increased threat of nuclear terrorism. In addition, the demand for nuclear energy has been and will be increasing.

As the most direct concern, we are afraid of the possibility of “break out” or withdrawal from the NPT by a non-nuclear-weapon state after getting advanced nuclear fuel cycle technology and stocks of enriched uranium or separated plutonium through assistance and cooperation in peaceful uses of nuclear energy through Article IV of the NPT.

### **EFFECTIVE VERIFICATION**

With the reveal of clandestine Iraq’s nuclear weapons program after the Gulf War in 1991, the IAEA reaffirmed the right of special inspections, early provision

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of design information and universal reporting scheme. The Agency launched a “program 93+2” in 1993 and the Board of Governors endorsed the Part I measures in 1995. In 1997, the Board of Governors approved a model additional protocol to the safeguards agreement that includes expanded information and access.

### *Universalization of the Additional Protocol*

We must strengthen the IAEA’s verification authority by making the additional protocol to the comprehensive safeguards agreements, an integral part of the Agency’s safeguards system in connection with the NPT. At the 2005 NPT Review Conference, many states, in particular western states, urged that the additional protocol should be a verification standard.

The response of the Non-aligned States was not a direct opposition to this demand, but they were reluctant to discuss the issue because it may have reverse effect to their right to use nuclear energy peacefully and because there was no progress in nuclear disarmament as a stronger reason.

At present, 70 states out of the 184 non-nuclear-weapon state parties to the NPT have additional protocols in force. 77 states with comprehensive safeguards agreements do not have additional protocols in force. The additional protocol is an independent agreement that does not legally obligate the parties to the NPT to sign and ratify under the Article III of the NPT.

It is necessary to develop the means to achieve universal application of the additional protocol. President Bush in his February 2004 address at Defense University proposed that by next year, only states that have signed the Additional Protocol be allowed to import equipment for their civilian nuclear programs. Nations that are serious about fighting proliferation will approve and implement the Additional Protocol<sup>1)</sup>.

One way to realize this purpose is through agreement among members of the Nuclear Suppliers Group (NSG) to make the ratification of the additional protocol by importing states as a necessary condition to permit export. The issue is discussed at the meetings of the NSG in 2004, 2005 and 2006. However, there has been no agreement yet<sup>2)</sup>. This is a supply side approach.

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1) George W. Bush, “Remarks by the President on Weapons of Mass Destruction Proliferation,” National Defense University, Washington D. C., February 11, 2004. [<http://www.whitehouse.gov/news/release/2004/02/20040211-4.html>]

2) NSG STATEMENT, NSG Plenary Meeting, Brasilia, 1-2 June, 2006. [<http://www.nuclearsuppliersgroup.org/PRESS/2006-07-Brasilia.pdf>]

The other way is through the review process of the NPT. As universal application of the additional protocol is the issue connected with Article III of the NPT, it is natural to discuss the issue among all states parties to the NPT, including both exporting and importing states. Under the NPT review process, the goal of the universalization of the additional protocol should be energetically pursued.

The third way is that the IAEA and cooperating states should persuade each country to sign and ratify by using incentives or disincentives. The Agency has been holding seminars to explain the relevance and importance of the additional protocol in order to persuade states that have not signed or ratified it.

#### *Advisory Committee on Safeguards and Verification*

In June 2005, the Board set up a new Advisory Committee on Safeguards and Verification, based on the initiative of President Bush on February 14, 2004, to explore how the safeguards system could be further strengthened. Areas that could be addressed could include more information sharing, the use of new emerging technologies, enhancing the Agency's independent analytical capabilities, and ensuring that the Agency has an adequate and uniform legal authority to conduct credible verification<sup>3)</sup>.

#### *U.S. Proposal on Global Nuclear Energy Partnership (GNEP)<sup>4)</sup>*

Under the GNEP announced in February 2006 by the U.S., an international safeguards program is an integral part of the global expansion of nuclear energy and the development of future proliferation-resistant fuel cycle technologies. In order for the IAEA to effectively and efficiently monitor and verify nuclear materials, GNEP will design advanced safeguards approaches directly into the planning and building of the expanding base of nuclear energy systems and fuel cycle facilities.

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3) Jack Boureston and Charles D. Ferguson, "Strengthening Nuclear Safeguards: Special Committee To the Rescue?" *Arms Control Today*, Vol.35, No.10, December 2005, pp.17-22.

4) U.S. Department of Energy, The Global Nuclear Energy Partnership. [<http://www.gnep.energy.gov/>]

## MULTILATERAL CONTROL OF NUCLEAR FUEL CYCLE

### —Restriction to or Denial of National Enrichment and Reprocessing—

#### *Past Efforts at Multilateral Approaches*

Since the birth of nuclear age, various attempts have been pursued to prevent proliferation of nuclear weapons by establishing multilateral institutions or control as follows;

- Baruch Plan proposed an International Atomic Development Authority in 1946.
- Atoms for Peace speech by U.S. President Eisenhower in 1963 proposed an IAEA.
- IAEA Statute of 1956 provides for Agency control over special fissionable material.
- IAEA study project on regional nuclear fuel cycle centers (RNFC) was conducted in 1975 to 1977.
- Committee on International Plutonium Storage (IPS) was held from 1978 to 1982.
- International Fuel Cycle Evaluation Programme (INFCE) was held from 1977 to 1980.
- United Nations Conference for the Promotion of International Cooperation in the Peaceful Uses of Nuclear Energy (UNCPICPUNE) was held in 1987.
- Committee on Assurances of Supply (CAS) was held from 1980 to 1987.
- International Symposium on Nuclear Fuel and Reactor Strategies: Adjusting to New Realities was held in 1997.
- Technical, Economic and Institutional Aspects of Regional Spent Fuel Storage Facilities (RSFSF) were examined in 2003.

#### *ElBaradei's Proposals*

At the 47<sup>th</sup> General Conference in September 2003, Director General Mohamed ElBaradei said that multilateral approaches, based on improved nuclear technology control, greater operational transparency, and nuclear fuel and power plant supply assurances, could serve to strengthen the nuclear non-proliferation regime.

In October 2003, the Director General in *The Economist* proposed to limit the processing of weapon-usable material in civilian nuclear programme, as well as the production of new material through reprocessing and enrichment, by agreeing to

restrict those operations exclusively to facilities under multilateral control; to deploy nuclear-energy system that, by design, avoids the use of materials that may be applied directly to making nuclear weapons; and consider multinational approaches to the management and disposal of spent fuel and radioactive waste. These limitations would be accompanied by an assurance of nuclear fuel and service supplies.

Following up on his proposal, during the summer of 2004, the Director General set up an independent international Expert Group on Multilateral Approaches to the Nuclear Fuel Cycle (MNA).

At the Carnegie International Non-Proliferation Conference in November 2005, he proposed the following four steps to control sensitive nuclear technology.

1. Provide assurance of supply of reactor technology and nuclear fuel;
2. Accept a time-limited moratorium (of perhaps 5-10 years) on new uranium enrichment and plutonium separation facilities.
3. Establish a framework for multilateral management and control of the 'back end' of the fuel cycle (i.e. spent fuel reprocessing and waste disposal); and
4. Create a similar framework for multilateral management and control of the 'front end' of the fuel cycle (i.e. enrichment and fuel production)<sup>5</sup>.

#### *President Bush's Proposal<sup>6</sup>*

President George Bush, in February 2004, announced new measures to counter the threat of WMD and made seven proposals. As a fourth step, he proposes, "The world's leading nuclear exporters should ensure that states have reliable access at reasonable cost to fuel for civilian reactors, so long as those states renounce enrichment and reprocessing. The 40 nations of the Nuclear Suppliers Group should refuse to sell enrichment and reprocessing equipment and technologies to any state that does not already possess full-scale, functioning enrichment and reprocessing plants. This step will prevent new states from developing the means to produce fissile material for nuclear bombs. Proliferators must not be allowed to cynically manipulate the NPT to acquire the material and infrastructure necessary for manufacturing illegal weapons.

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5) Mohamed ElBaradei, "Nuclear Non-Proliferation and Arms Control: Are We Making Progress?" Carnegie International Non-Proliferation Conference, Washington, DC, 7 November 2005. [<http://www.carnegieendowment.org/static/npp/2005conference/presentations/elbaladei.pdf>]

6) George W. Bush, note 1.

### *U.N. Secretary-General's Reports*

The Report of the Secretary-General's *High Level Panel on Threat, Challenges and Change*<sup>7)</sup>, of December 2004, urged negotiations without delay on an arrangement, under the IAEA Statute, for the Agency to serve as a guarantor of two fuel cycle related services: the supply of fissile material for fuel, and the reprocessing of spent fuel. It also urged that, while this arrangement is being negotiated, a voluntary time-limited moratorium on new fuel cycle facilities be put in place.

The April 2005 Report of the Secretary-General entitled *In Larger Freedom: Towards Development, Security and Human Rights for All*<sup>8)</sup> also proposed that states should be guaranteed supply of nuclear fuel at market rates for peaceful purposes with the IAEA acting as a guarantor.

### *Expert Group Report to the Director General of the IAEA*<sup>9)</sup>

The report of the Expert Group, stating the objective of increasing non-proliferation assurances associated with the civilian nuclear fuel cycle, while preserving assurances of supply and services around world, could be achieved through a set of gradually introduced Multilateral Nuclear Approaches (MNAs), suggested the following five approaches.

1. Reinforcing existing commercial market mechanisms on a case by case basis through long term contracts and transparent suppliers' arrangements with government backing. Examples would be fuel leasing and fuel take-back offers, commercial offers to store and dispose of spent fuel, as well as commercial fuel banks.
2. Developing and implementing international supply guarantees with the IAEA

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7) *A More Secure World: Our Shared Responsibility: Report of the High-Level Panel on Threats, Challenges and Change*, UN General Assembly, A/59/565, 2 December 2004.

8) Report of the Secretary-General Kofi Annan, *In Larger Freedom: Toward Development, Security and Human Rights for All*, UN General Assembly, A/59/2005, 21 March 2005.

9) *Multilateral Approaches to the Nuclear Fuel Cycle: Expert Group Report to the Director General of the IAEA*, International Atomic Energy Agency, Vienna, 2005, (INFCIRC/640). Tariq Rauf and Fiona Simpson, "The Nuclear Fuel Cycle: Is It Time for a Multilateral Approach?" *Arms Control Today*, Vol.34, No.1, December 2004, pp.17-21; Lawrence Scheinman, "The Nuclear Fuel: A Challenge for Nonproliferation," *Disarmament Diplomacy*, No.76, March/April 2004. [<http://www.acronym.org.uk/dd/dd76/761s.htm>]

- participation. Different models should be investigated, notably with the IAEA as a guarantor of service supplies, e.g. as administrator of a fuel bank.
3. Promoting voluntary conversion of existing facilities to MNAs, and pursuing them as confidence building measures, with the participation of NPT NNWS and 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, such as uranium enrichment, fuel reprocessing, disposal and storage of spent fuel (and combinations thereof). Integrated nuclear power parks would also serve this objective.
  5. The scenario of a further expansion of nuclear energy around the world might call for the development of a nuclear fuel cycle with stronger multilateral arrangements – by region or by continent – and for broader cooperation, involving the IAEA and the international community.

*U.S. Initiative for a Reserve of Nuclear Fuel<sup>10)</sup>*

At the General Conference of the IAEA in September 2005, U.S. Secretary Bodman announced to establish a reserve of nuclear fuel from materials previously declared excess to national security needs. Specifically, he announced that the U.S. would commit up to 17 metric tons of highly enriched uranium (HEU) to support assurances of reliable nuclear fuel supplies for states that forego enrichment and reprocessing.

He proposed that supplier states and the IAEA establish a reliable mechanism to resolve problems should a disruption in supply arise. Material made available by the United States under the initiative would serve to back-up this proposed mechanism.

*Russia's Initiative for International Fuel Cycle Centers<sup>11)</sup>*

In January 2006, President of Russia states that: We need to create the prototype of a global infrastructure that will give all interested countries equal access to nuclear energy, while stressing reliable compliance with the requirements of the

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10) INFCIRC/659, 29 September 2005.

11) INFCIRC/667, 8 February 2006.



non-proliferation regime. The creation of a system of international centers providing nuclear fuel cycle services, including enrichment, on a non-discriminatory basis and under the control of the IAEA, could become a key element in developing this new infrastructure. Russia has already made just such a proposal and is prepared to establish an international center of this kind on its territory.

*U.S. Proposal on Global Nuclear Energy Partnership (GNEP)<sup>12)</sup>*

President Bush, in February 2006, announced the Global Nuclear Energy Partnership (GNEP) that will use a nuclear fuel cycle that enhances energy security, while promoting non-proliferation. The U.S. will work with other advanced nuclear nations to develop a fuel services program that would provide nuclear fuel and recycling services to nations in return for their commitment to refrain from developing enrichment and recycling technologies.

Under the GNEP, a consortium of nations with advanced nuclear technologies would ensure that countries who agree to forgo their own investments in enrichment and reprocessing technologies will have reliable access to nuclear fuel. Moreover, once the advanced recycling technologies are demonstrated, the spent fuel would be returned to fuel supplier countries for recycling and possibly ultimate disposition. This builds on the moratorium on the sale of enrichment and reprocessing technologies that has been in place over the past two years among G-8 nations.

*Concept for a Multilateral Mechanism for Reliable Access to Nuclear Fuel<sup>13)</sup>*

In June 2006, France, Germany, the Netherlands, the Russian Federation, the United Kingdom, and the United States circulated a proposal entitled, "Concept for a Multilateral Mechanism for Reliable Access to Nuclear Fuel". This is a backup (or last resort safety net) mechanism when usual commercial access of nuclear fuel

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12) U.S. Department of Energy, The Global Nuclear Energy Partnership. [<http://www.gnep.energy.gov/>]

13) Concept for a Multilateral Mechanism for Reliable Access to Nuclear Fuel, Permanent Mission of France, Permanent Mission of the Federal Republic of Germany, Permanent Mission of the Netherlands, Permanent Mission of the Russian Federation, Permanent Mission of the United Kingdom of Great Britain and Northern Ireland, U.S. Mission to International Organization in Vienna, Vienna, 31 May 2006.

is interrupted. It focuses on assurances for reliable supply of enrichment services or enriched uranium.

It will formally establish a standing multilateral mechanism at the IAEA. If commercial supply arrangements are interrupted for reasons other than non-proliferation obligations and cannot be restored through normal commercial processes, the mechanism could be triggered by the receiving state or the supplier state, by approaching the IAEA. The IAEA would determine whether the receiving state meets the conditions for use of the backup mechanism.

Supplier states and recipient states would participate actively in the consultations. Supplier states would welcome and facilitate arrangements for commercial suppliers of enriched uranium to establish a mutual back-up system. In addition, the mechanism could be supported by reserves of low enriched uranium. The U.S. has announced it will convert up to 17 tons of HEU excess to national security needs to LEU and hold it as a reserve to support fuel supply assurances.

#### *Proposals by Japan and Other States*

In September 2006, Japan submitted a proposal on IAEA Standby Arrangements System for the Assurance of Nuclear Fuel Supply<sup>14)</sup>, which is supposed to be complementary to the above-mentioned six-nation proposal on the Concept for a Multilateral Mechanism for Reliable Access to Nuclear Fuel. Japan deems it proper to take care of not only uranium enrichment services but also all important activities of the front-end of nuclear fuel cycle, namely, uranium supply, uranium storage, conversion, enrichment, and fuel fabrication as market failure might occur at various junctures; and to focus not only on remedial responses to market failure for uranium fuel supply, but also on the prevention of the occurrence of such failure by reporting the IAEA up-to-date information about the market, that is, each state's capacity in various activities related to fuel supply to nuclear power generation, so as to improve the transparency of the market and to alert the degradation of its adequacy if it is recognized.

In addition, the United Kingdom suggested issuing "enrichment bonds" as a means of guaranteeing enrichment services and Germany proposed to place multilateral uranium enrichment under the auspices of the IAEA and its export control.

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14) INFCIRC/683, 15 September 2006.

*Analysis*

Since Director General's statement in 2003, multilateral approaches to nuclear fuel cycle have been proactively referred, and several proposals have been submitted and discussed.

As the first necessary condition, there is a general consensus on the need for an assurance of supply of enriched uranium and services. The key feature of such an arrangement is not simply availability, but reliability. For this assurance of supply mechanism to be credible, it must be based on apolitical, objective non-proliferation criteria.

Under the IAEA Statute, the Agency is authorized to serve as the guarantor of two fuel cycle related services: the supply of fissile material for fuel, and reprocessing of spent fuel. The IAEA could act as the facilitator and guarantor of a virtual or actual fuel bank, as a supplier of last resort.

The most critical issue is whether a multilateral approach presupposes that beneficiaries have to abandon its own enrichment and reprocessing activities altogether.

All U.S. proposals presuppose the denial of enrichment and reprocessing facilities and technologies as shown in the February 2004 Bush proposal, the September 2005 Initiative and February 2006 GNEP proposal.

Bush proposed that the NSG members should refuse to sell enrichment and reprocessing equipment and technologies to any state that does not already possess full-scale, functioning enrichment and reprocessing plants. Discussions in the NSG for last three years have not produced any agreement on this point.

It seems to be difficult to get consensus on the condition, because it will be understood to be tantamount to establish a new division between those who are permitted to enrich uranium and reprocess plutonium and those who are not.

Some members rather prefer "criteria-based approach", that is, if states fulfill certain criteria (e.g. ratification of the additional protocol, etc.), then they should be able to access enrichment and reprocessing technologies.

ElBaradei's proposal does not exclude the possibility that a state have an access to enrichment or reprocessing technologies under multilateral control, just like the URENCO. His proposal mainly prohibits operation of enrichment or reprocessing by one nation only and recommends doing so under multilateral control, though he would like to see many states abandoning the option of enrichment and reprocessing.

## CONCLUSION

Facing with the proliferation crisis mainly through possible abuse of nuclear energy in civilian sector, the international community, in particular the IAEA and advanced nuclear powers, is now working hard to prevent further proliferation of nuclear weapons. It is urgent for effective measures to be agreed as soon as possible to deal with emerging threat.

Measures to strengthen the IAEA safeguards and to establish multilateral nuclear fuel cycle that are examined above are two of many measures to buttress the nuclear non-proliferation regime.

The measures that will be acceptable to almost all states should fulfill the condition of legality, legitimacy and effectiveness. They also take the whole structure of the nuclear non-proliferation regime into account, that is, the three pillars of the regime, not only nuclear non-proliferation, but also nuclear disarmament and peaceful uses of nuclear energy.