

**Achieving the Vision of a World Free of Nuclear Weapons**  
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**How can increasing demand for nuclear energy be squared with disarmament objectives?**

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Two objectives have been always coupled together since the early years of nuclear power applications, namely: assurance of supply of equipment, fuels and services on the one hand, and assurance of non-proliferation on the other hand. Naturally, whenever there is a surge in demand for nuclear power plants, concern increases about risks of proliferation. We have seen it in the seventies and eighties of the last century, and we can clearly recognize it now.

The general question put forward to our session for discussion "How can increasing demand for nuclear energy be squared with disarmament objectives." We were asked to find answers to a number of specific questions namely:

- 1 - Will a global nuclear renaissance lead to proliferation?
- 2 - Is it desirable to prevent the spread of fuel cycle technology? & if so,
  - a) what can be done to prevent it?
  - b) what do non-nuclear weapon states think of the current models of fuel cycle guarantees that are on offer ?

In contribution to the discussion, I thought of addressing the issue through a number of questions and answers of my own.

**Question 1: Do We See Really A Nuclear Renaissance?**

The answer is for sure a big "YES ". We see this resurgence in developed as well as developing countries that are expanding their existing programmes, though with a faster pace in the Asia-Pacific region. New countries such as Indonesia, Vietnam, Turkey, Egypt, some Gulf States, Algeria, Morocco, Libya & Jordan are

proceeding with plans to introduce nuclear power programmes or announced active interest.

Reasons for such reviewed interest in nuclear power vary from one country to another, but the common factors are mainly:

- a) Energy security, stability and diversity. There are growing concerns regarding stability of oil & gas markets and potential influence of politics on relationships between consumers & large producers of oil & gas. Moreover, oil & gas are depletable while need for more power is increasing steadily. Not only that, but also there is much more value to oil & gas in other applications than to burn it. In other words, oil & gas is too expensive to burn.
- b) Environmental concerns related to climate change effects attributed to carbon emissions. Nuclear power emits almost no green house gases similar to wind or hydropower. The ongoing revisions of the Kyoto Protocol is expected to put more restrictions on carbon emissions, meaning more reliance on nuclear & renewables for power generation.
- c) Maturity of nuclear power technologies and strong performance records. Significant improvements in plant reliability and safety have been introduced to present designs. Shorter construction time and lower generating costs make nuclear power plants more competitive.
- d) Sustainability of nuclear power is assured mainly by the availability of uranium and front end fuel cycle capabilities necessary to produce needed nuclear fuel for many decades to come. NEA/IAEA reports tell us that with current once-through fuel cycle with light water reactors, the total conventional resources of uranium can cover the fuel need for the present reactors for 270 years. Applying pure fast reactor fuel cycle with recycling extends the availability of uranium to thousands of years.  
As for other front end fuel services, in particular uranium enrichment and fuel fabrication, there are presently a number of sources that provide it commercially and can be expanded if needed.

Therefore, what we see as clear signs of nuclear power renaissance is real. It is – as a sustainable clean energy source – of global benefit from both energy security and environmental considerations.

**Question 2: Should We Have Concerns Of Proliferation From Non- Nuclear Weapon States That Already Have Nuclear Power Programs?**

Here, we are only talking about NPT states. A Good number of these countries are technologically advanced and highly industrialized. Such countries have developed - long time back- some or all elements of sensitive technologies in the front end or back end of the fuel cycle or both. These countries as we know have decided voluntarily not to pursue non-peaceful applications. However, if for any reason any of them decides to change its policies, it may not take much time or effort to develop the non-peaceful capabilities. That is why they sometimes are called virtual or latent nuclear weapon states. However, with commitments of these countries to the objectives of the NPT, and IAEA control through its safeguard systems, concerns are minimized. Though it should not be totally put aside.

**Question 3: How About Non - NPT States ?**

Technologically advanced non-NPT states include India, Israel and in some relevant areas Pakistan. They all have advanced capabilities in the back end or front end of the fuel cycle or both. Such capabilities helped the three countries to develop military nuclear devices in defiance to NPT objectives. The international community should not leave those unfavourable examples to continue. Arrangements should be worked out towards creation of appropriate regional security schemes that would encourage each of the three countries to join the NPT or adopt its objectives. In addition, nuclear supply countries should tie up any transfer of nuclear technology, equipment or materials related to nuclear power with NPT arrangements – partial or total – appropriate. Such mechanisms help in attracting the three countries to the NPT objectives and in the same time reduce regional tensions that are sometimes the motive to acquire non-peaceful nuclear technologies that eventually might lead to proliferation.

#### **Question 4: What About Newcomers That Have No Nuclear Plants?**

As stated earlier, many developing countries in the Far East, Middle East and Africa are seeking to introduce nuclear power to satisfy their fast growing energy needs and diversify their energy resources. The list included Indonesia, Vietnam, Turkey, Egypt, some Gulf States, Algeria, Morocco, Libya and Jordan. The majority of the named countries have relatively reasonable technological base at different levels to build upon for introduction of nuclear power and parts of the fuel cycle technologies. Some of them have – long time back – acquired one or more research reactor and related facilities that acted as schools for experiences in nuclear power applications. It is necessary to mention that all of them are NPT States but not all are parties to the additional protocol.

None of the said countries are known to have any nuclear fuel cycle capabilities. Though some may have uranium as a natural ore or could be produced as a byproduct from processing other minerals like phosphate.

When those named countries or others parties to the NPT seek to have nuclear power plants, they rely on their rights and obligations provided in the NPT Articles, namely in Article IV :

their inalienable right to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II which spells out the non-proliferation objectives;  
obligation of all parties to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for peaceful uses of nuclear energy, and to cooperate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes.

The above rights and obligations are part of the deal between NWS and NNWS incorporated in the NPT. The deal simply calls for all States Parties to cooperate in the further development of nuclear energy, NWS to work towards disarmament, and NNWS to abstain from acquiring nuclear weapons.

### **Question 5: What Then Might Lead Newcomers to Develop Sensitive Technologies?**

Generally, the supply of nuclear power plants and the fuel necessary to operate them is subject to state-to-state agreements (supply countries to nuclear power plants, fuel and services are members of the Nuclear Supply Group (NSG) that include NWS and NNWS). Non proliferation requirements are usually included in such agreements. The IAEA, generally, is identified as the actor of implementing safeguards requirements. In the short term there may be no problem between the supplier and recipient country. But nuclear plants live now to 60 years and may be extended longer. Guarantees for sustained healthy relations may not extend that long.

Here where the main concerns come:

- Recipient countries on the one hand want assurance of supply of equipment, fuel and services to run the plants through their long life-time.
- Supply countries on the other hand want the assurance of non-proliferation. In other words, they worry about risks of diversion of materials supplied for use in non-peaceful applications or to fall in unauthorized hands. Not only that, but also there are worries about the development of clandestine programs in fuel cycle technologies.

It is not practical to address one concern without addressing the other. Non-proliferation should go hand-in-hand with assurance of supply. In my opinion, assurance of supply is the key incentive for new comers not to develop their individual fuel cycle capabilities, particularly enrichment and/or reprocessing. Concentrating on the non-proliferation side through imposition of restrictions on the supply of equipment or fuel needed to run the nuclear power plants would automatically be taken as imbalance in applying the NPT. It is simply seen as restrictions on the application of Article IV, while no progress is seen in application of Article II by NWS. In fact, countries that fell under sanctions especially as related to nuclear technologies were able to develop their own and even go beyond peaceful purposes. We have seen that in India, S. Africa, Pakistan and N.Korea as clear examples.

Restrictions on the supply of nuclear power equipment and fuel would also mean discouraging new comers of advanced developing countries from using nuclear power as part of their fast growing energy demand. That way, we are not helping global energy concerns, be it to ensure energy security or to overcome environmental degradation.

Therefore, efforts should concentrate more on arrangements that provide assurance of supply of power reactor technologies and the fuel needed for it to NPT countries that have a good standing record. The assurance arrangements should not contain restrictions or conditions that help growing perceptions that they are as sort of denial to rights in Article IV of the NPT or are meant to maintain monopoly of current nuclear suppliers for political or commercial reasons. In the same time, such arrangement should have built-in assurances of non-proliferation. This is not an easy task. But we should rely on the fact that there is growing understanding worldwide that non-peaceful applications of nuclear energy are a menace to all. If one country breaches provisions of NPT, it leads to collective restrictions on others from using nuclear power.

#### **Question 6: What Is In Offer To Secure The Assurance Of Supply, While Assuring Non-Proliferation?**

Nuclear power plants – contrary to some research reactors – are not a proliferation concern themselves. Therefore, supply of the power plants should not be included in addressing the assurance issues. What is to be assured in fact is supplies of natural uranium, low enriched uranium and associated conversion services, and even more the nuclear fuel itself.

Unfortunately, present fuels of light water reactors (LWR), which compose the largest portion of the nuclear power plants operating and the most popular in the international market, vary in type, design and fuel composition. This adds to the complexity of the assurance issue. Not only we need to consider natural uranium oxides –  $U_3O_8$  or  $UO_2$  -, conversion facilities to fluorides, low enriched uranium at different % of enrichment

depending on type of plant and position within its core, but also fabrication to the special type or design of fuel assembly.

Since the mid-seventies of the past century, the IAEA and its member states have had studied several proposals on multilateral nuclear approaches to the nuclear fuel cycle and the assurance of supply, they all reached no practical conclusion. In all these studies no consensus was reached since no state was willing to give up its right as stipulated in Article IV of the NPT.

In the past few years we have seen revival of this subject of multilateral approaches due to the rise of non-proliferation concerns you all know about coupled with what is seen as worldwide expansion of and new interest in nuclear power, which by necessity would mean need for more fuel supply assurance.

The Director General of the IAEA formed in 2004 an expert group to consider multilateral approaches to the civilian nuclear fuel cycle. The expert group covered activities and facilities that may involve proliferation risks: U-enrichment spent fuel reprocessing or spent fuel disposal and storage. The group were of the view that diverse options should include three patterns:

- 1) Assurance of services not involving ownership of facilities;
  - a – Suppliers provide additional assurance of supply;
  - b – International consortia of governments broaden the assurance;
  - c – IAEA related arrangements provide even broader assurance;
- 2) Conversion of existing national facilities to multinational facilities.
- 3) Construction of new joint facilities.

The report of the expert group, published by the IAEA as INFCIRC/640 April 2005, ended up with a set of approaches that would enhance non-proliferation assurances with the civilian nuclear power plants together with preserving assurances of supply and services around the world:

- 1- Reinforcing existing commercial market mechanisms on case by case basis through long term contracts and transparent suppliers` arrangements with government backing.

- 2- Developing & implementing international supply guarantees with IAEA participation.
- 3- Promoting voluntary conversion of existing facilities to MNAs, and pursuing them as confidence building measures.
- 4- Creating multinational and regional MNAs or new facilities based on joint ownership, drawing rights or co-management.
- 5- 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.

The outcome of INFCIRC/640 received supportive comments at the 2005 NPT review conference by some 45 MS both developed and developing (planning to introduce nuclear power).

2006 witnessed many MNA initiatives proposed by nuclear suppliers (countries or industries):

- January 2006: President Putin proposed the creation of a system of international nuclear fuel cycle centers (INFCC) to provide nuclear fuel cycle services on a non-discriminatory basis and under the supervision of the IAEA .
- February 2006: The US proposed the Global Nuclear Energy Partnership (GNEP) to work with other nations to develop and deploy advanced nuclear recycling and reactor technologies (Statement of Principles signed by 16 countries in September 16, 2007).
- May 2006: AREVA, TENEX, URENCO, USEC through WNA, offered ensuring security of supply of the international fuel cycle, if the country forgoes domestic enrichment activities.
- June 2006: Six countries (that have commercial enrichment activities) offered reliable access to nuclear fuel if the country forgoes domestic enrichment activities.
- September 2006: Nuclear Threat Initiative (NTI) proposed setting a stock-pile of LEU as last resort for countries that give up national uranium enrichment. (NTI offered US\$ 50M. as supporting fund).
- September 2006: Germany proposed creation of an International Uranium Enrichment Facility operated by the IAEA at an extraterritorial site.

All these MNA proposals for assurance of supply were elaborately discussed at the IAEA special event on " New Framework for the Utilization of Nuclear Energy in the 21<sup>st</sup> Century: Assurance of supply and Non-proliferation" September 2006. Pros, cons, difficulties and stumbling blocks of each proposal were discussed. Some participants even offered ideas on how to go forward to reach practical arrangements on assurance of supply accepted by suppliers and prospective users.

One can easily recognize that all assurance proposals referred to above that were put forward after publishing INFCIRC/640 are made by suppliers. No proposal was put forward from users particularly prospective countries that intend to go for nuclear power. Thus the proposals seem to be one sided. They may appear as carrying the intent of monopolizing nuclear fuel technologies and putting the goods and the bads in one basket vis-à-vis development of nuclear fuel technologies.

To overcome such perceptions it is necessary to energize serious dialogues between suppliers and users within the IAEA to discuss the proposed MNAs aiming to reach agreeable arrangements for the short term and longer term. As one participant at the IAEA Special Event put it: "It is unlikely that MNA approaches will prove successful unless the sense of ownership is credibly offered and widely felt by users".

Issues to be tackled between suppliers and users should include:

- Conditions governing eligibility for benefiting from assurance arrangements.
- What would be the role(s) of :
  - The IAEA.
  - Supply countries.
  - Supply industries.
- Financial arrangements for implementation of MNAs.
- Interaction with NPT provisions.

This, as experience tells us will take relatively long time and effort. However, the issues in hand cannot wait for that to happen. A practical way, in my opinion, is to go in a gradual manner by concentrating in the short term on the first suggested approach

proposed at the end of INFCIRC/640, i.e. "reinforcing existing commercial market mechanisms on a case by case basis through long term contracts and transport suppliers` arrangements with government backing." this will provide the confidence building between suppliers (countries and industries) and users required before going into more complex MNAs. Some of them in fact look attractive and promising in the long range.

**In conclusion,**

1. Global nuclear renaissance may not necessarily lead to proliferation if we provide equitable assurance of supply arrangements coupled with appropriate controls by the IAEA and suppliers.
2. Preventing the spread of fuel cycle technologies is not the solution. Partnerships and cooperation in multilateral arrangements and facilities give the sense of ownership to users that reduce motives to develop or acquire fuel cycle technologies.
3. Some of the proposed arrangements of assurance of supply have practical elements to satisfy both assurances of supply and non-proliferation. Sincere concentrated efforts need to be done by suppliers and "serious" users to reach lasting model arrangements.

**Thank You.**