

Nuclear Fuel Cycle

Which Way Forward For Multilateral Approaches?

An International Expert Group Examines Options
by Bruno Pellaud

For several years now, the debate on the proliferation of nuclear weapons has been dominated by individuals and countries that violate rules of good behaviour - as sellers or acquirers of clandestine nuclear technology. As a result, the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT) has been declared to be “inadequate” by some, “full of loopholes” by others.

Two basic approaches have been put forward to tighten up the NPT; both seek to ensure that the nuclear non-proliferation regime maintains its authority and credibility in the face of these very real challenges. One calls for non-nuclear weapon States to accept a partial denial of technology through a reinterpretation of the NPT’s provisions governing the rights of access to nuclear technologies. The unwillingness of most non-nuclear-weapon States to accept additional restrictions under the NPT makes this approach difficult. The other approach would apply multinational alternatives to the national operation of uranium-enrichment and plutonium-separation technologies, and to the disposal of spent nuclear fuel.

In this perspective, IAEA Director General Mohamed ElBaradei proposed in 2003 to revisit the concept of multilateral nuclear approaches (MNA) that was intensively discussed several decades ago. Several such approaches were adopted at that time in Europe, which became the true homeland of MNAs. Nonetheless, MNAs have failed so far to materialise outside Europe due to different political and economic perceptions.

International Expert Group

In June 2004, the Director General appointed an international group of experts to consider possible multilateral approaches to the nuclear fuel cycle. The mandate of the Expert Group was three-fold:

- 1 To identify and provide an analysis of issues and options relevant to multilateral approaches to the front and back ends of the nuclear fuel cycle;
- 2 To provide an overview of the policy, legal, security, economic, institutional and technological incentives and disincentives for cooperation in multilateral arrangements for the front and back ends of the nuclear fuel cycle; and

- 3 To provide a brief review of the historical and current experiences and analyses relating to multilateral fuel cycle arrangements relevant to the work of the Expert Group.

The overall purpose was to assess MNAs in the framework of a double objective: strengthening the international nuclear non-proliferation regime and making the peaceful uses of nuclear energy more economical and attractive.

In the report submitted to the Director General in February 2005, the Group identified a number of options — options in terms of policy, institutional and legal factors — for those parts of the nuclear fuel cycle of greatest sensitivity from the point of view of proliferation risk. In this context, multilateral may mean regional, multinational or international (that is, with the participation of international organisations).

All multilateral arrangements so far have been discretionary, resulting from government-to-government agreements or commercial arrangements across borders. Today again, there could indeed be good reasons for encouraging such schemes on a voluntary basis.

First of all, MNAs are powerful confidence-building endeavours. By applying the general definition of “confidence-and-security-building measures” (CSBM) proposed by UNIDIR (United Nations Institute for Disarmament Research), one could say that *a nuclear fuel cycle CSBM would seek to introduce transparency and thereby predictability in relations between States by clarifying national intentions, reducing uncertainties about national activities, and/or constraining national opportunities for surprise*. Such measures have been traditionally divided into three categories: “information and communication”, “observation and inspection”, and “reciprocally imposed constraints”. In the nuclear fuel cycle, the IAEA has played an important intermediary function in the first two categories. In some cases — e.g. the Argentina-Brazil control arrangements and the Euratom Safeguards Office — regional verification has been put in place in addition to that of the IAEA. An MNA would fall under the category of “reciprocally imposed constraints”, under which the participants would commit to carry out a given technology only within the MNA framework.

The first Indian test of a nuclear explosive device (ostensibly for peaceful purposes) occurred in 1974. The resulting concern led to a number of proposals for regional, multilateral and international arrangements. The proposals were intended, on the one hand, to reinforce the NPT objective of discouraging horizontal proliferation and, on the other hand, to buttress the right of all States to exploit nuclear energy for peaceful purposes.

Among the more visible efforts in the 1970s and 1980s were: the IAEA study on Regional Nuclear Fuel Cycle Centres (1975-77); the International Nuclear Fuel Cycle Evaluation programme (INFCE, 1977-80); the Expert Group on International Plutonium Storage (IPS, 1978-82); and the IAEA Committee on Assurances of Supply (CAS, 1980-87). These studies concluded that most of the proposed arrangements were tech-

nically feasible and that, based on the projections of energy demand, economies of scale rendered them economically attractive. All of these initiatives failed for a variety of political, technical and economic reasons.

A Spectrum of Options

Whether for uranium enrichment, spent fuel reprocessing, or spent fuel disposal and storage, MNA options span the whole spectrum between existing market mechanisms and a co-ownership of fuel cycle facilities. As a framework, the following types have been considered:

Type I: *Assurances of services not involving ownership of facilities:*

- ◆ Suppliers provide additional assurances of supply.
- ◆ International consortia of governments.
- ◆ IAEA-related arrangements.

Type II: *Conversion of existing national facilities to multinational facilities.*

Type III: *Construction of new joint facilities.*

For each of these options and for each of the technologies (enrichment, reprocessing, disposal and storage), the Group has assessed the associated *pros* and *cons* with respect to such factors as “non-proliferation value” (diversion of materials from declared facilities, clandestine parallel programme, breakout, etc.), “assurance of supply” value (guarantees, economics, etc.), choice of host country, access to technology and degree of multilateral involvement.

For enrichment and reprocessing services, a healthy market exists in the world. Therefore, the legitimate objective of assurances of supply can be fulfilled to a large extent by current market mechanisms, possibly improved by some governmental guarantees. Furthermore, the IAEA could become a guarantor of uranium services, through assured access to the resources, in a kind of virtual fuel bank. Should a new facility be required, an MNA would take the form of a jointly owned facility, like the Anglo-Dutch-German Urenco, or provide for drawing rights based on pre-financed arrangements like in the EURODIF model in France.

The final disposal of spent fuel is a prime candidate for multilateral approaches. It offers major economical benefits and substantial non-proliferation benefits as well. The Expert Group recommends that the IAEA should assume a political leadership to encourage such undertakings. For example, the IAEA could launch a “Siteless Pilot Project of a Spent Fuel Repository” that would elaborate in detail all related technical, economical, legal and institutional aspects. Beyond the IAEA, other regional organisations should become active, such as the Organisation for Economic Cooperation and Development, the European Union, the North American Free Trade Agreement and the Mercosur in South America.

The system of “fuel leasing-fuel take back”, as practiced by the former Soviet Union with its customer countries, is a com-

bined option that offers major economical and non-proliferation benefits as well as assurance of supply for the full fuel cycle. The fuel could be leased to the customer and after usage and an intermediate storage time for cooling at the customers’ facility, the fuel could be taken back by the supplier for storage, reprocessing and final disposal. This “fuel leasing-fuel take back” model should ideally become a “standard” product offered by all major nuclear fuel companies.

Towards Consensus

“Are multilateral nuclear approaches: an old idea whose time has come?” Surely so. Much work has been done in the past decades on the institutional, economical and technical aspects of MNAs; the findings remain amazingly relevant for the world of today. Many of the reasons for the failure of previous initiatives on multilateral approaches may still be pertinent today. However, in the light of current challenges to the non-proliferation regime, the time might be right for making progress in achieving international consensus in support of multilateral approaches to the nuclear fuel cycle. How might that be done?

Perhaps one of the most critical steps is to devise effective mechanisms for assurances of supply of material and services, mechanisms which are commercially competitive and free of monopolies. Effective assurances of supply will have to include back-up sources of supply in the event that an MNA supplier is unable to provide the required material or services. In this context, the IAEA could play a central role as a guarantor and end-user free of national consent rights.

Apart from the crosscutting factors related to the implementation of MNAs, such as the technical, legal, institutional and safeguards, there are a number of overarching issues, primarily of a broad political nature, that may have a bearing on perceptions as to the feasibility and desirability of MNAs. These issues may well be decisive in any future endeavour to develop, assess and implement such approaches at the national and international level:

① **Article IV of the NPT.** Specifically relevant are the references contained therein to the “*inalienable right*” of non-nuclear weapon States to develop nuclear energy and the obligations by all to “*facilitate*” and “*cooperate in*” the development of nuclear energy.

② **Safeguards and export controls.** Some have argued that, if the objective of MNAs is merely to strengthen the non-proliferation regime then, rather than focussing on MNAs, it may be better to concentrate instead on the existing elements of the regime itself, for example, by seeking the universality of the Additional Protocol (AP) to IAEA safeguards agreements and by the strengthening of export controls.

③ **Voluntary participation in MNAs versus binding norm.** There is no existing legal norm requiring participation in MNAs. Thus, the establishment of one rests upon voluntary participation. States will enter into such multilateral arrangements on the basis of economic and political incen-

tives and disincentives offered by these arrangements. A verifiable fissile material cut-off treaty is likely to be viewed by non-nuclear weapon States as a precondition for a subsequent universal and binding acceptance of MNAs.

④ **Nuclear-Weapon States.** As long as MNAs remain voluntary, nothing would preclude commercial and government entities in nuclear-weapon States from participating in an MNA with non-nuclear weapon States. In fact, France (in the frame of the EURODIF arrangement) and the United Kingdom (in connection with Urenco) are examples of such participation.

⑤ **Breakout from the NPT.** Whether voluntary or binding, multinational nuclear fuel cycle centres share a potential weakness with their national counterparts, namely the risk of the host country “breaking out” by creating a political emergency, expelling multinational staff, withdrawing from the NPT (and thereby terminating its safeguards agreement), and operating the multilateral facility without international control. For multinational nuclear fuel cycle centres to be acceptable, this risk would need to be addressed, even though MNAs offer in that case a better protection than national facilities, thanks to the intertwining multilateral activities.

A joint facility with multinational staff puts all participants under a greater scrutiny from peers and partners, a fact that strengthens non-proliferation and security. This is the fundamental non-proliferation benefit of MNAs.

The potential benefits of MNAs for the non-proliferation regime are both intangible and tangible. As a confidence-building measure, multilateral approaches have the potential to provide enhanced assurance to the international community that the most sensitive parts of the civilian nuclear fuel cycle are less vulnerable to misuse for weapons purposes. Moreover, multilateral approaches also have the potential to facilitate the continued use of nuclear energy for peaceful purposes and enhance the prospects for the safe and environmentally sound storage and disposal of spent fuel and radioactive waste. Multilateral approaches can also provide the benefits of cost-effectiveness and economies of scale for smaller countries or those with limited resources, while ensuring the benefits of the use of nuclear technology. Similar benefits have been derived in other advanced technologies and high security sectors, such as aviation, aerospace and high-speed computing.

Indeed, non-proliferation and economic considerations can coincide and be mutually reinforcing. The acceptance of restraints in order to achieve a broader based assurance of supply can work to a State’s advantage, both economic and non-proliferation advantage. In the final analysis, the decision will amount to a question of political will: the political will to consider alternatives to the development of independent national fuel cycles.

The lack of political will was the main reason for the failure of previous similar initiatives. Proliferation concerns were perceived as not serious enough. Economic incentives were seldom decisive enough. Concerns about assurances of supply

5 Suggested Multilateral Nuclear Approaches

The objective of increasing non-proliferation assurances concerning the civilian nuclear fuel cycles, while preserving assurances of supply and services around the world, could be achieved through a set of gradually introduced multilateral nuclear approaches (MNA):

- 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: commercial fuel banks, fuel leasing and fuel take-back and commercial offers to store and dispose of spent fuel.
- ② Developing and implementing **international supply guarantees** with IAEA participation. Different models should be investigated, notably the **IAEA as guarantor**, 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 non-nuclear weapon States and nuclear weapon States, 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-end 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 strong multilateral arrangements** — by region or by continent — and **broader cooperation** involving the IAEA and the international community.

were overriding. National pride also played a role, alongside great expectations about the technological and economic spin-offs to be derived from nuclear activities. Many of those considerations may still be pertinent. Nonetheless, the political environment is possibly more conducive today towards voluntary, confidence-building MNAs.

On the horizon, there is the likely scenario of a strong expansion of nuclear energy around the world. This will ultimately call for a new world system with a more orderly nuclear fuel cycle, with strong multinational and multilateral arrangements — by region or by continent — and a stronger degree of international cooperation, involving the IAEA, the NPT community and even the Security Council.

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