

A Secure Nuclear Future

by Tariq Rauf and Zoryana Vovchok

Several mechanisms are under consideration to guarantee assurances of supply of nuclear fuel to States.

Early in the nuclear age, in 1946, the US diplomat Bernard Baruch called for States to transfer ownership and control over civil nuclear activities and materials to an international atomic development agency. Ultimately, however, it was the 1953 Atoms-for-Peace plan that provided the principles underlying international cooperation in the field of nuclear technology and the establishment of both the International Atomic Energy Agency (IAEA) and later the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). In so doing, it became not only the forerunner of international nuclear cooperation and non-proliferation efforts in an overarching sense, but also of recent efforts of possible multilateral approaches to the nuclear fuel cycle.

The line between the peaceful and the military atom is, in some cases, merely a reflection of the intentions of those making use of the technology. It remains essential that nuclear energy is used responsibly under the highest standards for non-proliferation, security and safety.

The first feasibility study on multilateral approaches to the nuclear fuel cycle was on *Regional Nuclear Fuel Cycle Centres (RFCC)* in 1975–1977, to examine the possibility of joining together to set up fuel cycle centres at selected sites. In keeping with the concerns in the 1970s, the emphasis in this and other studies of the time was on the back end of the cycle. *The International Nuclear Fuel Cycle Evaluation (INFCE)* study of 1977–1980 discussed the possibility of

regional fuel-cycle facilities and prospects for multilateral cooperation on plutonium storage. Both studies came to similarly positive technical conclusions, however, due in large part to diminishing concerns over the likelihood of a “plutonium economy,” the disinclination of some countries to give up national control over reprocessing, and the general lack of political will, neither the RFCC or INFCE studies resulted in any further pursuit of multilateral approaches.

The IAEA *Expert Group on International Plutonium Storage (IPS)* in 1978–1982, the next initiative in the field, moved away from the discussion of regional fuel-cycle centres to examine instead the prospects for IAEA-supervised management, storage, and disposition of spent nuclear fuel. Once again, no consensus was reached, as States were unwilling to renounce sovereign control over nuclear technology and fuel. The same fate met the studies undertaken by the IAEA *Committee on Assurances of Supply (CAS)* in 1980. The efforts that began in the 1970s in the area of multilateral approaches finally ended with the *UN Conference for the Promotion of International Cooperation in the Peaceful Uses of Nuclear Energy (UNCIPCPUNE)* in 1987, but like its predecessors, it yielded little in the way of concrete results in this regard.

All of these initiatives failed for a variety of political, technical and economic reasons, but principally because States could not agree on the non-proliferation commitments and conditions that would entitle them to participate in the multilateral activities — much as unfortunately seems to be the case now.

Recent moves

Over recent years, two approaches have been put forward: both seek to ensure that the global nuclear non-proliferation regime maintains its authority and

credibility in the face of new challenges. One is based on the further denial of nuclear technology to non-nuclear-weapon States and the reinterpretation of the NPT provisions governing the transfer of nuclear technologies. Not surprisingly, this approach did not succeed given the increasing unwillingness of many non-nuclear-weapon States to accept additional restrictions to their right to peaceful nuclear technology under the NPT. The other approach relies on assurances of supply and multinational alternatives to national operations of uranium-enrichment and plutonium-separation technologies, and to storage of spent nuclear fuel.

The first to suggest a fresh look at multilateral approaches was IAEA Director-General Mohamed ElBaradei at the September 2003 IAEA General Conference. He proposed 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 while not impeding the development of nuclear energy for States wishing to choose that option.

Since September 2003, some 12 mutually complementary proposals have emerged ranging from assurances of supply of low enriched uranium (LEU) to LEU reserves to new multilateral uranium enrichment centres.

By June 2009, three front runner concepts had emerged on assurances of supply of LEU: the establishment of an IAEA LEU Bank; Russian Federation Initiative to establish a reserve of LEU for supply to IAEA for its Member States; and the Multilateral Enrichment Sanctuary Project (MESP) of Germany. In addition, the United Kingdom is developing its enrichment bonds proposal in the form of Nuclear Fuel Assurances. These proposals aim to add to States' nuclear fuel options by backing up the commercial market with an assurance scheme, which would increase confidence in continuing reliance on nuclear energy.

Enriched Uranium Reserves

Two current proposals call for the establishment of LEU reserves under IAEA auspices. An IAEA LEU Bank is envisaged with 60 tonnes of LEU that would be sufficient to meet the electricity needs of 2 million average Austrian households for 3 years. In addition, a Russian LEU reserve is envisaged with 120 tonnes of LEU, which would provide 6 years of electricity supply for the same number of households.



Why only LEU and not also fuel fabrication?

The creation of dedicated LEU stocks under IAEA auspices for assurance of supply would be a historic first in the era of nuclear energy. To provide nuclear fuel ready for use in power plants would also require the availability of fuel fabrication services that would fabricate LEU into fuel assemblies. According to the latest IAEA data, there are now 13 enrichment facilities in 9 countries versus 34 fabrication plants in 18 States. This shows that fuel fabrication services are more widely dispersed than enrichment services; thus justifying an initial focus on supply assurance of LEU. It needs to be understood that assurance of LEU supply is a first step and fuel fabrication would be considered at a later stage.

Why LEU and not also natural uranium?

Another relevant question pertains to assurance of supply of natural uranium (NU) which is the fuel source for certain types of power reactors. The data show that the vast majority of nuclear power plants (NPPs) comprise of light-water reactors (LWRs) using LEU, while the number of CANDU (heavy-water) reactors using natural uranium is relatively small and such fuel is easier to fabricate as it does not require uranium enrichment services.

Currently, only 48 NPPs use natural uranium — 44 PHWRs and 4 MAGNOX reactors, this amounts only to 11% of all NPPs available world wide. In contrast, 388 NPPs or 89% of NPPs in the world use LEU. Thus, it is clear that at the outset of setting up a new framework for nuclear energy, an initial focus on LEU supply assurance is both warranted and necessary.

Assurance of supply mechanisms have two co-equal objectives. They are designed to facilitate the continuing and future use of nuclear energy in IAEA Member States as well as to strengthen the nuclear non-proliferation regime by offering alternatives to the establishment of new enrichment facilities.

Similar assurance for NU supply, though important, could follow at a later stage.

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Uranium supply to the IAEA

Uranium exporters and suppliers have formed themselves into a grouping of nuclear suppliers and regulate their exports and/or transfers of nuclear items through guidelines and national export controls. These criteria are designed to ensure peaceful, non-explosive, uses of nuclear items in conformity with international and national legal instruments. For purposes of assurance of supply of LEU through or by the IAEA, it will be essential that such suppliers provide LEU, NU and enrichment services to the IAEA in the framework of the IAEA Statute and free of any other national and/or international constraints. The necessary non-proliferation, peaceful and non-explosive use obligations governing the supply of LEU by the IAEA through an assurance mechanism would be regulated by the eligibility and supply criteria consistent with the IAEA Statute and approved in advance by the IAEA Board of Governors.

Funding

An IAEA LEU Bank would be funded by extra-budgetary pledges and contributions currently amounting more than \$150 million, of which, \$51 million have already been deposited in a suspense account with the IAEA. This would be sufficient to purchase some 60–80 tonnes of industry standard LEU (under 5% enrichment level) as well as the required number of storage cylinders. One or more Member States could offer to host the LEU bank at an existing civilian nuclear facility, in which case no additional “running costs” would be incurred. Safeguards costs are estimated for one annual and three interim inspections. Any LEU supplied would be at the prevailing market price, and the proceeds would be used for replenishment. Thus, the LEU bank would be fully funded for the foreseeable future. Additional voluntary contributions in funds or in-kind would be encouraged as a back up.

The Russian LEU Reserve of 120 tonnes of LEU valued at roughly \$300 million is fully funded by the Russian Federation, including the cost of the LEU, storage, safety, security, safeguards and other related costs, and the IAEA would not incur any costs. Any LEU supplied to a State would be at the prevailing spot market price, and the proceeds could be used for the replenishment of the reserve.

Who would benefit?

All eligible IAEA Member States would benefit from LEU supply. Both the IAEA LEU Bank and the Russian LEU Reserve would be used as a last resort by a State experiencing a nuclear fuel supply disruption for non-commercial or technical reasons. In the event that any Member State finds itself in circumstances where it needs to call on the reserve, it can request the triggering of the mechanism, and if the State's request fulfils the established criteria, it would receive the LEU from the IAEA.

What are the eligibility criteria?

For the IAEA LEU Bank, any Member State could request supply when its LEU supplies are disrupted for reasons not related to technical or commercial considerations, it has brought into force a safeguards agreement that applies to any LEU supplied from the IAEA bank, has a conclusion on peaceful use / non-diversion of nuclear material in the latest IAEA Safeguards Implementation Report, and no specific safeguards implementation issues are under discussion in the IAEA Board of Governors. The criteria in the case of the Russian LEU Reserve are the same except for the requirement that a requesting State must be a non-nuclear-weapon State and a Member of the Agency, which has placed all of its peaceful nuclear activities under IAEA safeguards.

What are the non-proliferation objectives?

Assurance of supply mechanisms have two co-equal objectives. They are designed to facilitate the continuing and future use of nuclear energy in IAEA Member States as well as to strengthen the nuclear non-proliferation regime by offering alternatives to the establishment of new enrichment facilities. However, neither of the two proposals in any way seeks to limit the nuclear fuel cycle choices of Member States. The rights of Member States, including establishing or expanding their own production capacity in the civilian nuclear fuel cycle under IAEA safeguards, would remain intact and would not in any way be compromised or diminished by the establishment of assurance of supply mechanisms.

In other words, having the right to receive LEU from the bank or the reserve would not require giving up the right to establish or further develop a civilian national fuel cycle or have any adverse impact on it. The additional options for assurance of supply would be over and above the rights that exist at present.

Safeguards

Regarding Member States' safeguards obligations concerning the supplied LEU, it would be required that all Member States would fully honour all of their safeguards obligations that they have freely undertaken with the IAEA, at all times without reservations. Should a Member State regrettably choose to act contrary to its safeguards obligations with respect to the supplied LEU, the IAEA Board would have to be informed as provided for under relevant safeguards agreements and the IAEA Statute as in all cases of failure to respect safeguards obligations. The supplied LEU would remain under safeguards as long as it is relevant from a safeguards perspective as defined by the Agency.

Location of an IAEA LEU bank?

One or more Member States could offer to provide a location for the IAEA LEU bank at existing nuclear facilities. For this purpose, the IAEA would conclude a Host State Agreement providing for, inter alia, privileges and immunities, including provisions for impediment free independent operation of the bank by the IAEA, all authorizations for the IAEA to transport of the LEU to/from the storage location, including transit through any neighbouring States, if required.

On 18 May 2009, the IAEA received from Kazakhstan a position paper noting that it would consider providing a location in Kazakhstan for the IAEA LEU Bank, once the Board has authorized its establishment.

Fears and suspicions

Evidently, despite numerous discussions on fuel assurances and multilateral approaches to the nuclear fuel cycle, suspicions linger on among potential customer or so-called recipient States. First, they remain sceptical as all current proposals for multilateral approaches to the nuclear fuel cycle emerge from nuclear supplier States. Second, they tend to view fuel assurances and multilateral approaches to the nuclear fuel cycle as a projection of future restrictions of the use of sensitive technologies by additional States, even under appropriate

IAEA safeguards in accordance with the NPT. This has provoked a backlash from many States which regard such moves as limiting their inalienable right to peaceful uses of nuclear energy as enshrined in the NPT.

The proponents of fuel assurances have assured repeatedly that none of the proposals seeks to limit or restrict any rights to the nuclear fuel cycle for peaceful uses. Nonetheless, doubts and suspicions persist regarding supplier State restrictions on peaceful uses of nuclear energy, and are exacerbated by perceptions of broken promises for nuclear disarmament by States possessing nuclear weapons. It is hoped that the recent "reset" of US-Russian negotiations on verified nuclear arms reductions would lead to an improved context for progressing fuel assurances.

None of the front-runner proposals noted above restrict the rights of States to peaceful uses of nuclear energy. They offer possibilities for assurances of supply that would not only increase options for securing LEU but also increase confidence in reliable access to nuclear fuel over the longer term.

Next Steps

Establishing LEU reserves under IAEA auspices would be the first step in setting up a new framework for the utilization of nuclear energy. Such reserves could in time be bolstered by assurances of fuel fabrication. Any fuel banks under IAEA aegis would be equally accessible by all Member States in accordance with criteria established in advance by the Board of Governors. It is unrealistic to expect that any LEU supplies by or through the IAEA would be unconditional — they would be in full conformity with the provisions of the IAEA Statute.

It is increasingly clear that the future of nuclear energy lies in enhanced non-proliferation, security and safety. Nuclear fuel banks, multilateral enrichment centres, and assurances of supply will remain key to the continued reliance and future expansion of nuclear energy. In this regard, results-oriented open and transparent discussions are vital and the IAEA remains the logical forum for Atoms for Peace in the 21st century. ☸

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