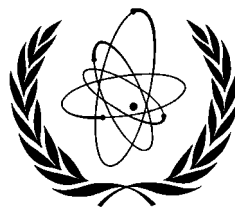


ASSURANCES OF SUPPLY: A NEW FRAMEWORK FOR THE
UTILIZATION OF NUCLEAR ENERGY

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ASSURANCES OF SUPPLY: A NEW FRAMEWORK FOR THE UTILIZATION OF NUCLEAR ENERGY

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The past few years have been a time of significant challenges and achievements for the International Atomic Energy Agency. In the area of nuclear non-proliferation, the Agency has been at the centre of attention and has demonstrated its ability to perform objective and credible verification. In the area of nuclear safety and security, we see overall improvement and our work is making a difference. In the area of nuclear technology, the Agency is contributing to sustainable development through its technical co-operation programme — with the benefits of nuclear applications increasingly recognized.

For the past five decades, the role of nuclear power has been shaped by many factors such as growing energy needs, economic performance, the availability of other energy sources, the quest for energy independence, environmental factors, nuclear safety and proliferation concerns, and advances in nuclear technology. And while nuclear power continues to hold great potential as an environmentally clean source of energy, it remains in a holding position due to a number of associated concerns.

NUCLEAR POWER

The urgent need for sustained human development will clearly necessitate increases in the supply of energy in the coming decades. There are currently 439 nuclear power reactors operating in 30 countries, and they supply about 16 per cent of the world's electricity. Nuclear remains the only energy source that can provide electricity on a large scale with comparatively minimal impact on the environment. To date, the use of nuclear power has been concentrated mostly in industrialized countries. But of the 30 new reactors currently under construction, 15 are in developing countries. And while the highest percentage of existing reactors is in North America and Western Europe, recent expansion has been primarily in Asia and Eastern Europe. In other regions, the more immediate focus is on power upgrades, restarts of previously shutdown reactors, and licence extensions. For example, in the United States of America, 16 reactors have had their operating licences extended to 60 years, and many more applications are under review.

Most of the recent expansion has been centered in Asia. Countries such as Indonesia, Thailand and Vietnam have concrete plans or have expressed their intent to introduce nuclear power - and plans for expanding existing nuclear power programmes are being implemented in China, India, Japan, the Republic of Korea and Pakistan.

And of course, this renewed interest is not limited to Asia. Other countries, such as Algeria, Belarus, Egypt, the Islamic Republic of Iran, Jordan, the Libyan Arab Jamahiriya, Nigeria, Turkey and Yemen are among those considering or moving forward with the infrastructure needed to introduce nuclear power programmes. And many others, such as Argentina, Bulgaria, Finland, France, South Africa, the Russian Federation and the United States of America, are working to add new reactors to their existing programmes.

The long term prospects for nuclear power, however, will depend on the industry's success in addressing concerns associated with waste disposal, proliferation, safety and security, while also improving economic competitiveness of future reactors. Nearly 20 IAEA Member States are currently involved in projects to develop reactor and fuel cycle designs that would address some of these concerns, and a number of countries are also exploring the nuclear co-generation of hydrogen, to address demands for cleaner energy in the transportation sector.

Multilateral Approaches

The current spectrum of proliferation and security issues should provide the impetus for greater innovation in *policy* as well as *technology*. One example relates to the operation of sensitive parts of the nuclear fuel cycle. It is time to re-consider the merits of limiting the *processing* of weapon-usable material (separated plutonium and high enriched uranium) in civilian nuclear programmes — as well as the *production* of new material through reprocessing and enrichment — by agreeing to restrict these operations exclusively to facilities under multilateral control and verification. These limitations would need to be accompanied by appropriate rules of transparency and — above all — assurance of supply for would-be users.

Furthermore, it is also important to consider multilateral approaches to the management and disposal of spent fuel and radioactive waste. Over 50 countries currently have spent fuel stored in temporary locations, awaiting reprocessing or disposal. Not all countries have the appropriate geological conditions for such disposal — and, for many countries with small nuclear programmes for electricity generation or for research, the

financial and human resource investments required for the construction and operation of a geological disposal facility are daunting.

Energy for Development and Global Energy Security

Recently, the IAEA has begun emphasizing the role of “energy for development” - since it is becoming more and more clear that without energy there can be no development, and without development there is misery that can often lead to violence. The energy shortage in developing countries is a staggering impediment to development. To give you some perspective, it is enough to mention that the countries of the OECD, on average, consume electricity at a rate roughly 100 times that of the world’s least developed countries.

The IAEA offers energy assessment services that build a State’s capability for energy analysis and energy planning, taking into account the country’s economic, environmental and social development needs. These services treat all energy supply options equally. They are in increasingly high demand, and we have been expanding our capacity to offer them.

The G8 Summit in St. Petersburg in 2006 emphasized the importance of “global energy security”. At the expanded summit, the IAEA Director General emphasized that global energy security means fulfilling the energy needs of all countries and peoples - including the 1.6 billion people who have no access to electricity, and the 2.4 billion who continue to rely on traditional biomass fuels. He also emphasized at that meeting that the current global organization of energy resource management and distribution is quite fragmented - in terms of both geographical coverage and the types of energy resources managed. Global structures for setting norms, oversight and management exist in most other key areas of human activity - such as trade, civil aviation, labour relations and health. However, no similar structure currently exists for energy.

Nuclear energy might not be the choice of all countries - and some, such as Germany and Sweden, have decided to phase out their nuclear power programmes. Other countries have also adopted a policy against the use of nuclear power. However, for those Member States that choose to use nuclear power as part of their energy mix, there is much the Agency can do to make this option accessible, affordable, safe and secure.

ASSURANCE OF SUPPLY AND MULTILATERAL CONTROL OF FUEL CYCLE OPERATIONS

The expected expansion in nuclear power will drive a commensurate increase in demand for nuclear fuel cycle services and the need for an assurance of supply mechanism. This could also increase the potential proliferation risks created by the spread of sensitive nuclear technology, particularly if more countries decide to create independent uranium enrichment and plutonium separation facilities. These trends point clearly to the urgent need for the development of a new, multilateral framework for the nuclear fuel cycle, both the front and the back end.

Over the past two years, a number of proposals and ideas have been put forward. With respect to the front end, some parties have proposed the creation of an actual or virtual reserve fuel bank of last resort, under IAEA auspices, for the assurance of supply of nuclear fuel. This bank would operate on the basis of apolitical and non-discriminatory non-proliferation criteria. Others are proposing to convert a national facility into an international enrichment centre. Still others are proposing the construction of a new, multilateral enrichment facility under IAEA control. The Secretariat has examined these proposals and their associated legal, technical, financial and institutional aspects. In June, the Director General made a report to the Board on "options" for assurances of supply of nuclear fuel, which we trust will be of help to Member States in considering this important issue.

Controlling nuclear material is a complex process; yet if we fail to act, it could be the Achilles' heel of the nuclear non-proliferation regime. In the Director General's view, an incremental approach is the way to move forward, beginning with the establishment of an equitable system for assurance of supply. The next step would seek to bring any new operations for uranium enrichment and plutonium separation under multilateral control. Over time, these multilateral controls would also be extended to facilities that already exist - to ensure that all countries are treated equally in terms of their nuclear capabilities.

Assurances of Supply

It is useful to recall that the first echoes of fuel assurances came as far back as 1946 in the Baruch plan where what was stated by Baruch sounds current: "Behind the black portent of the new atomic age lies a hope, which seized upon with faith can work our

salvation. If we failed, then we have damned every man to be the slave of fear. Let us not deceive ourselves. We must elect world peace or world destruction. Science has torn from nature a secret so vast in its potentialities that our minds cower from the terror it creates. Yet terror is not enough to inhibit the use of the atomic bomb. The terror created by weapons has never stopped man from employing them. For each new weapon a defence has been produced in time, but we now face a condition to which adequate defence does not exist.”

These words do have a certain resonance in the era of today, but they also were accompanied by an approach to a complete international mastering of all components of the nuclear complex. And we saw that echoed again 30 years later in the 1976 international fuel cycle evaluation process in which people were talking about precisely multilaterally owned-and-operated nuclear structures. And then yet another 30-year period passed, and we found ourselves last year at a special event at the International Atomic Energy Agency’s general conference in September 2006, that began to put forward a number of these ideas again – such as, collective commitments to supply enrichment services, nationally held strategic stockpiles, international fuel centres, cradle-to grave fuel cycle services, multilateral security of supply arrangements, and even multilateral control over all fuel cycle facilities.

So the question then is: What is it about now, about this 30-year period or this third effort that makes any of these more likely to come into effect? Well, things are different now. We have a spread of dual-use materials, which contributes to the risk of catastrophic terrorism. We have a spread of dual-use technologies, which contributes to a risk of more States with nuclear weapons. And these increased nuclear threats, interact with the realities of the world to make nuclear disarmament less likely.

The spread of nuclear fuel cycle facilities and technologies is motivated in part by State’s interest in ensuring reliable fuel cycle services through indigenous capability. This then is our challenge: What needs to be added to the existing market fuel-cycle services to provide enough assurance of supply in order to obviate the need for indigenous fuel cycle facilities?

NEW FRAMEWORK

A new framework for nuclear energy should include swift and concrete action to achieve:

- robust technological development and innovation in nuclear power and nuclear applications;
- a new multilateral framework for the fuel cycle, both the front and the back end, to assure supply and curb proliferation risk;
- universal application of comprehensive safeguards and the additional protocol as the standard for nuclear verification, to enable the Agency to provide assurance about declared activities as well as the absence of undeclared activities;
- recognition of the linkage between non-proliferation and disarmament and therefore the need for concrete and rapid progress towards nuclear disarmament - through deep cuts in existing arsenals, downgrading of alert levels for deployed nuclear weapons, and the resuscitation of multilateral disarmament efforts;
- a robust international security regime, in light of the diverse threats we face;
- an effective and universal nuclear safety regime, a cornerstone for any expansion in the use of nuclear power; and
- sufficient funding for the Agency to meet its increasing responsibilities in an effective and efficient manner.

For the last two years, the IAEA Director General have been calling for the development of a new, multilateral approach to the nuclear fuel cycle, as a key measure to strengthen non-proliferation and cope with the expected expansion of nuclear power use. The establishment of a framework that is equitable and accessible to all users of nuclear energy acting in accordance with agreed nuclear non-proliferation norms will be a complex endeavour that needs to be addressed through progressive steps.

The first step would be to establish mechanisms for assurances of supply of fuel for nuclear power reactors - and, as needed, assurance of supply for the acquisition of such reactors. The second step would be to limit future enrichment and reprocessing to multilateral operations, and to convert existing enrichment and reprocessing facilities from national to multilateral operations.

A broad range of ideas, studies and proposals have been put forward on this topic. At the IAEA General Conference in September 2006 we organized a special event, in which experts from all relevant fields discussed ways and means to move forward. A report on this special event was submitted to the General Conference, and the IAEA Secretariat, in consultation with Member States, will continue to work on identifying options and alternatives to move this concept forward.

In the discussion on energy, there is now increasing talk about a potential nuclear renaissance. For the past two decades, 16 percent of the world's energy has come from nuclear sources, and this percentage has remained relatively stable. But over the next couple of decades, the projections are that this percentage will increase, and as the world's energy requirements increase, and as the pressures of reducing carbon emissions becomes more pressing on governments, there is expected to be an increasing reliance on nuclear energy. And if there is to be this nuclear renaissance, there will be a major new demand for nuclear energy, both in terms of reactors, but also in terms of fuel supply. The question then is where will the new fuel supply come from? Will it remain in the hands of the existing suppliers who would then perhaps expand the capacity? Would new countries develop their own national indigenous enrichment capabilities? The vision of the IAEA's Director General is that all enrichment and reprocessing over time should be exclusively under multilateral control.

In this context, one will also need to have a global internationally verifiable treaty on the prohibition of fissile material production for nuclear weapons, FMCT. As long as the loophole is there, any new framework for multilateral approaches to the nuclear fuel cycle will still have a backdoor. So in that context, the challenge is to find a way of balancing both non-proliferation and economic considerations and choices that are facing States.

Furthermore, in that context, we need to find a way where we can promote the expanded use of nuclear energy to those countries that have made a sovereign choice. The

IAEA is not in the business of pushing countries to go into the nuclear field, but we can assist them in making the energy choices, but at the end of the day, it's the decision of the State concerned to decide whether or not it goes for the nuclear power. And if it does decide so, then the IAEA is there to assist it in the safety, security, and non-proliferation, regulatory, legal, and other aspects.

In our discussions both with supplier States, but more importantly with consumer States, it has become abundantly clear that different States will choose different policies and solutions. And this will depend on their historic situation; it will depend on their geography, their technical abilities, and their individual choices. Thus, in this context, it is of the utmost importance that we retain flexibility in this area and not try and suggest solutions that are perceived to be imposed, particularly on the consumer States. This was something that became abundantly clear in September of 2006 at the IAEA special event on the nuclear fuel cycle.

Existing Proposal for a New Framework

A summary of various existing proposals is available on IAEA's website – there are, at the moment, 13 proposals that are mutually complimentary. These proposals range from providing backup assurance of the supply to establishing an IAEA-controlled fuel reserve to setting up international uranium enrichment centres where the IAEA would have some role in the decision making, and all of these proposals are currently under consideration in the secretariat of the IAEA. And based on these proposals, and relying to a certain extent on the study that was done by the four enrichment companies through the auspices of the World Nuclear Association that was released in May last year.

Drawing upon that study and drawing upon the various other proposals, we in the IAEA Secretariat are proposing to our Board of Governors and member States a possible framework that is based on three levels. The first is the existing market, based on existing commercial and other arrangements. The second would be backup commitments provided by suppliers of enrichment and fuel fabrication services, and the respective governments that would be utilized when predetermined conditions and criteria are met following a political supply disruption. And this can be viewed as a combined virtual enrichment and fuel fabrication reserve mechanism. Now there might be some States that still might not be fully assured by the first two levels, and therefore it is essential to also have a third level. The third level could be a real reserve of low-enriched uranium stored in one or several separate locations, and a set of arrangements and agreements between suppliers of fuel

fabrication services as well as owners of fuel intellectual property rights, creating additional fabrication possibilities. So, we need assurances not only of natural and low-enriched uranium, but also a fuel fabrication if that would be necessary for the consumer State.

INTERNATIONAL NUCLEAR FUEL CENTRES

The establishment of new international nuclear fuel centres (INFCs) also has been suggested as a possible framework to promote access to nuclear power and to strengthen nuclear non-proliferation. In the first instance, such centres are likely to focus on the provision of uranium enrichment services and the “assured supply” of LEU. They will thus provide additional sources of supply of enrichment services and/or LEU and may contribute to a physical fuel bank. The following are some of the factors considered relevant to international nuclear fuel centres and their contribution to assured supply of nuclear fuel:

- A clear, indisputable IAEA (Agency) claim on LEU, if needed for a last resort reserve (virtual or physical) or enrichment services;
- A commitment from INFCs for provision of back-up enrichment services and/or LEU, i.e. a commitment to covering a LEU supply contract in the event of a non-commercial cut-off by another supplier, guaranteed export licences, and non-retaliation commitments;
- A clearly defined legal basis;
- Multiple locations for storing physical reserves of LEU, including outside of the host State; and
- The extent of Agency involvement.

The proposals that have been made to date concerning the possible establishment of INFCs have been based either on the use of a national facility (e.g. as proposed at Angarsk) with the Agency’s role being focused on decisions regarding the release of nuclear material, or on the concept of an “IAEA centre” where the Agency’s role would be extended to cover the construction, running and monitoring of a uranium enrichment plant.

Angarsk IUEC

In January 2007, the Russian Federation established an IUEC at Angarsk. The Angarsk IUEC would provide LEU and enrichment services to all its Member States subject to the conditions outlined in the government to government founding agreement. The operations of the IUEC would be governed by an agreement at the commercial level between the commercial operators. It is envisaged that the LEU stores of the IUEC would be placed under Agency safeguards. Active consideration is currently being given by the Russian Federation to set aside a specific quantity of LEU, as a fuel reserve, which might contribute to a broader assurance of supply mechanism. It has also stated that “a regulatory basis will be developed in the sphere of export control such that the shipment of material out of the country at the request of the Agency is guaranteed.”

The main function of the Angarsk IUEC would be to provide guaranteed access to uranium enrichment capabilities to the Centre’s participating organizations, based on intergovernmental agreements, preferably (but not exclusively) from States not developing on their territory uranium enrichment capabilities. Importantly, no political conditions are being set regarding the potential participating countries of the IUEC. The Russian Federation would not transfer to IUEC participants the uranium enrichment technology. The first intergovernmental agreement for the IUEC was signed on 10 May 2007 between the Russian Federation and the Republic of Kazakhstan.

States participating in the Angarsk IUEC would have the opportunity to purchase enriched uranium (or enrichment services) from a company that they partly own. In addition they would benefit from the sales of uranium to other customers. A stated intention of the initiative is “to provide an economic incentive for potential IUEC participants to refrain from developing their own enrichment capabilities”. An initial assessment suggests that the Angarsk IUEC would appear to be a promising approach for further consideration.

IAEA International Enrichment Centre (IIEC)

It has been suggested by Germany that an enrichment plant under sole Agency control, and located outside the current provider States could help diversify enrichment sites and strengthen security of supply. The establishment of such an IAEA international enrichment centre (IIEC) could complement assurances of supply.

In the case of an IIEC, a host country would have to be willing to cede administration and sovereign rights over a certain area on its territory where an IIEC would be located. One or more commercial enrichment plants could then be constructed on the basis of arrangements that would not offer comparative advantages to an IIEC.

An IIEC would not involve any transfer of technology to the Agency. The enrichment plant would be built as a “black box” and would be accessed and maintained solely by the technology supplier.

An IIEC would not be owned or subsidized by the Agency, but financed on a commercial basis or, alternatively, by interested Member States. Operation of the centre would be on a commercial basis by management independent of the Agency, and under the control and responsibility of its owners. The criteria for siting the centre would include: reliable infrastructure, good accessibility, and a politically stable host country that does not operate an enrichment capacity. Further consideration of this proposal will require additional consultations with Germany and other interested countries.

CONCLUSION

The Agency continues to play a key role in ensuring that the benefits of nuclear technology are shared globally for economic and social development, that nuclear activities are conducted safely, that nuclear and radioactive materials and facilities are adequately protected, and that a credible inspection regime exists to verify compliance with non-proliferation commitments. Last year marked the 50th anniversary of the ‘Atoms for Peace’ speech by US President Eisenhower, in which he articulated a vision, shared by many world leaders, that would enable humanity to make full use of the benefit of nuclear energy while minimizing its risk. This vision led to the establishment of the International Atomic Energy Agency. Much has changed since that time, and we believe it is appropriate for us to take stock of our successes and failures — and to resolve to take whatever actions are required, including new ways of thinking and unconventional approaches, to ensure that nuclear energy remains a source of hope and prosperity for humanity, and not a tool for self-destruction.
