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# The Increasing Risk of Nuclear Proliferation: Addressing the Challenge

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Over the last decade access to information on material sciences and to dual use technologies necessary to conduct a covert nuclear weapons programme have become easier to obtain, and the means to implement procurement, deception and concealment strategies have become increasingly sophisticated. The continuing development of technology, and the education and experience of scientists worldwide (who can move freely) combined with the readily available access to a wide range of information, have resulted in the increased risk that a

country intent on nuclear proliferation might be successful in developing the necessary capabilities without early detection. These developments have underscored the need for ensuring effective nuclear safeguards.

Recent events and findings by the IAEA highlight some of these risks. Based on lessons we have learned, however, there are measures that could be taken to mitigate these risks. Director General Mohamed ElBaradei, in his statement to the September 2003 IAEA General Conference, called upon the participants "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."

## Lessons Learned

### *Iraq*

In the early 1990s, when it was revealed that, despite the IAEA's safeguards activities on all declared installations in Iraq, a covert nuclear weapons programme had been developed, it became clear that the Agency needed to implement further measures to improve detection of clandestine and concealed nuclear activities. The measures include access to nuclear fuel cycle-related information and locations, and the use of new technical measures such as environmental sampling. In addition, there has been a shift in emphasis from evaluating information on a facility-by-facility basis to evaluation of the nuclear programme of each State as a whole. As former IAEA Safeguards Director of Concepts and Planning, Richard Hooper, noted in his IAEA Bulletin article of June 2003, the "changes in the structure and practices of the Safeguards Department have been accompanied by a change in culture that is more of a revolution than an evolution."<sup>1</sup>

(/NewsCenter/Statements/DDGs/2003/goldschmidt26112003.html#ftn1)

The level and scope of a variety of safeguards verification activities, for example, complementary access, requests for more information from States, and more detailed analysis of some of the information available, are determined through an

integrated analysis of the situation at the State level, rather than reporting on traditional safeguards accounting measures.

### **DPRK**

The Agency's experience with applying safeguards in the Democratic People's Republic of Korea (DPRK) revealed further proliferation risks. Although the DPRK became a party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in late 1985, the DPRK did not conclude a comprehensive safeguards agreement until 1992. Early in the implementation of comprehensive safeguards in the DPRK, in the course of verifying the correctness and completeness of the country's declarations concerning nuclear material and facilities, inconsistencies were discovered by the IAEA. The DPRK rejected the Agency's requests for access to sites and information which could have resolved these inconsistencies, and announced its intention to withdraw from the NPT. Its withdrawal was averted in 1994 with the conclusion between the United States of America and the DPRK of an accord referred to as the "Agreed Framework". Pursuant to the Agreed Framework the DPRK agreed, in exchange for the supply of light water reactors for generating electricity, to "freeze" its graphite-moderated reactors and related facilities (consisting of three reactors, a reprocessing plant and a fuel fabrication plant), and to come into compliance with its comprehensive safeguards agreement before key components of the light water reactors were delivered. The IAEA was requested by the United Nations Security Council to verify the DPRK's compliance with this freeze.

In the meantime, despite Agency attempts to implement the comprehensive safeguards agreement, the DPRK restricted Agency safeguards activities to those relevant to monitoring the freeze. The Agency was never allowed by the DPRK to conduct activities associated with determining the correctness and completeness of the DPRK's initial report under its comprehensive safeguards agreement on all nuclear material. In December 2002, Agency inspectors monitoring the freeze were expelled from the country. In January 2003, the DPRK announced its withdrawal from the NPT and has been reported as having declared its pursuit of a nuclear weapons programme. This experience has demonstrated that when a

State possesses both a reprocessing capability and spent nuclear fuel, if it decides to withdraw from its safeguards commitments, it may take only a short period of time to reprocess the spent fuel into weapon-usable material.

### ***Increasing Risks***

It cannot be discounted that if a State has been capable of indigenously mastering (with or without external assistance) advanced nuclear fuel cycle technologies such as centrifuge isotopic separation for peaceful purposes, it could conceal a replicate of such a facility at an undisclosed location.

The Agency's ability to detect such a clandestine facility before it has produced significant quantities of weapons grade nuclear material depends on a number of factors, including: whether the State has a comprehensive safeguards agreement and an additional protocol<sup>2</sup>

(/NewsCenter/Statements/DDGs/2003/goldschmidt26112003.html#ftn2) in force; the extent to which it cooperates with the Agency; the transparency of the State's nuclear programme and the availability of open source and other information.

There is also a potential proliferation risk when a State can master, even on a modest scale, the extraction of plutonium from spent nuclear fuel, although it might be more difficult to build and operate such a facility covertly. However, nothing in the NPT prohibits a country from developing such a capability for peaceful purposes, even though there would be no apparent need for doing so given the State's nuclear fuel cycle. Indeed, under the NPT a State would be entitled to produce a stockpile of separated plutonium as long as this plutonium is placed under IAEA safeguards. States could also develop processes such as conversion of uranium into metallic form, as would be used in nuclear weapons, ostensibly for peaceful purposes such as research, use as shielding material or in non-nuclear applications. A State possessing nuclear material and advanced nuclear technology (such as enrichment or reprocessing) and, in parallel, mastering the know-how of assembling a nuclear weapon, could acquire such weapons in a short period of time if it so decided<sup>3</sup>

(/NewsCenter/Statements/DDGs/2003/goldschmidt26112003.html#ftn3).

Another major risk today might well be that a country (or individuals acting without government approval) that masters sensitive technologies such as uranium enrichment, could covertly provide its know-how, blueprints, equipment, expertise and/or training to other States seeking to acquire nuclear weapons.

How could these proliferation risks be minimized? This paper provides some personal suggestions for addressing these challenges.

## **Importance of Safeguards Agreements and Additional Protocols**

The NPT requires non-nuclear-weapon States (NNWSs) to conclude comprehensive safeguards agreements with the Agency within eighteen months of becoming party to the Treaty. As of the beginning of September 2003, more than 45 NPT States had yet to conclude such safeguards agreements long after joining the NPT. Their tardiness can be measured in years rather than months: 30 NNWSs have not yet concluded safeguards agreements after more than 10 years; 20 of those have not concluded agreements after more than 20 years. If NPT States recognize that this is an important issue they should consider taking the measures required to encourage States who have not already done so to conclude comprehensive safeguards agreements without further delay.

As an important measure to stem the risk of proliferation, having an additional protocol in force should become the norm for **all** States, including non-NPT States. The information provided by an NPT State pursuant to an additional protocol is extremely useful for assessing the State's nuclear programme. The information to be provided<sup>4</sup>

(/NewsCenter/Statements/DDGs/2003/goldschmidt26112003.html#ftn4) is also useful in allowing the Agency to get a better view of how the State's exports of specified equipment and non-nuclear material could unintentionally (or otherwise) contribute to another State's covert nuclear programme. Non-NPT States, despite the fact that they themselves may have nuclear weapons, should be encouraged to conclude and implement additional protocols to demonstrate their commitments not to assist any NNWSs with regard to nuclear related activities for non-peaceful purposes.

As of September 2003, only 37 States of the more than 185 NPT States had additional protocols in force<sup>\*\*</sup>

(/NewsCenter/Statements/DDGs/2003/goldschmidt26112003.html#ast2). Out of 70 States with known significant nuclear activities 47 did not yet have additional protocols in force.

Although the Agency has an active outreach programme to encourage States to conclude safeguards agreements and additional protocols, more active engagement and pressure by the international community could increase the likelihood that this will be achieved.

### **Transparency and Timeliness**

In verifying declared nuclear material and facilities, the safeguards criteria utilizes the concept of "timely" verification that significant quantities of nuclear material have not been diverted from declared facilities for non-peaceful or unknown purposes. However, there is a broad range of actions that States must undertake in fulfilling their safeguards obligations. The Agency should consider the merits of reflecting in the Safeguards Implementation Report submitted annually to the Board of Governors the "timeliness" of States with regard to those actions, for example:

- Providing to the Agency in a timely manner reports and declarations required by their safeguards agreements.
- Providing the Agency with access to installations for verification activities without unjustified restrictions or delays.
- Providing satisfactory responses to questions or inconsistencies relating to the correctness and completeness of the State's declarations, and to other requests for information, without delay (i.e. within days or weeks, not months).
- Providing, as required<sup>5</sup>  
(/NewsCenter/Statements/DDGs/2003/goldschmidt26112003.html#ftn5), and without delay, multiple entry/exit visas valid for at least one year to designated inspectors

The Board would then have a clearer picture regarding the extent to which States are meeting their safeguards obligations in a cooperative and transparent manner and how delays in providing information or access to facilities or other locations undermine the basis upon which safeguards conclusions are drawn, or reduce the Agency's efficiency in implementing safeguards.

### **Anytime, Anywhere**

In order to further support the verification activities of the Agency and to increase the efficiency, effectiveness and overall transparency of the NPT regime, all States with a comprehensive safeguards agreement should consider concluding with the Agency appropriate arrangements that would allow, in the spirit of Article XII A6 of the Agency's Statute, designated inspectors unannounced or short notice access rights "at all times to all places and data and to any [relevant] person". For States with a comprehensive safeguards agreement and an additional protocol in force, such voluntary confidence building agreements would allow the Agency to draw more quickly the conclusion of the absence of undeclared nuclear material and activities that is necessary before implementing "integrated safeguards"<sup>6</sup> (/NewsCenter/Statements/DDGs/2003/goldschmidt26112003.html#ftn6) in the State and further reduce the verification burden for the State, the operators and the Agency because of the increased confidence in safeguards conclusions.

### **Stronger Export Controls**

An increasing number of exporting States are considering strengthening their export controls to better ensure that they do not contribute, either directly or indirectly, to the development of non-peaceful nuclear activities in other States. Some such exporting States are said to be considering, as a necessary pre-requisite for export of sensitive nuclear fuel cycle related know-how, design, equipment and technology (particularly in the areas of uranium enrichment and plutonium separation), that the recipient State has an additional protocol in force, or even that the Agency has drawn the conclusion of the absence of undeclared nuclear material and activities in that State as a whole.

It would also considerably help the Agency in drawing such conclusions if exporting States would voluntarily undertake to provide to the Agency systematically and without delay relevant information, for example on denials of exports of sensitive technology and exports of dual use equipment and technology. In addition, States should strengthen their reporting to the Agency on information regarding illicit trafficking of nuclear-related material, equipment and technology, providing any information available on origin of the material and its possible destination. The Agency should be allowed to conduct, or be given access to the results of, forensic analysis of any seized nuclear material without undue delay.

## **The AIMBY Syndrome**

Most national laws are presently based on the principle that every country needs to store and dispose of its own nuclear waste within its national borders. This "All In My Backyard" (AIMBY) syndrome, which is currently deemed to be politically correct, should be reconsidered and modified as appropriate after recognising its disadvantages from an economic, safety and proliferation point of view when dealing, for instance, with spent nuclear fuel. In his opening remarks to the September 2003 General Conference of the IAEA, Director General ElBaradei noted that "considerable economic, safety, security and non-proliferation advantages may accrue from international co-operation on the construction and operation of international waste repositories." Indeed "for many countries with small nuclear programmes for electricity generation or for research, the financial and human resource investments required for research, construction and operation of a geologic disposal facility are daunting."

There have been recent developments in this respect. The Russian Federation has adopted new laws allowing spent nuclear fuel from reactors they have sold to other States to be returned to Russia. In addition there is an intergovernmental agreement, that should soon be signed by Moscow and Washington, for the retransfer to Russia of fresh and spent highly enriched uranium fuel from 20 Russian-made research reactors in 17 countries. From a non-proliferation point of view these can be seen as steps in the right direction.



In addition, since 1996 the US has been conducting the Foreign Research Reactor (FRR) Spent Nuclear Fuel (SNF) Acceptance Program to return spent fuel of US origin from many countries around the world. The goal of the program is to reduce, if not eliminate, civil commerce in HEU by facilitating the conversion of research reactors worldwide to new high density LEU fuel. The scheduled end of the FRR SNF Acceptance Program is May 2006, but many countries are requesting that the US DOE extend the Program until the new fuels can be qualified and full replacement cores can be delivered within the timeframe of the Program.

## **The UN Security Council**

In instances when the IAEA has referred cases of non-compliance to the UN Security Council, its response has been hampered at times by disagreement among the members of the Council. To facilitate its future response to such cases, the UN Security Council might consider the merit of adopting a resolution stating the principle that if a State is found in non-compliance with its Safeguards Agreements it should no longer be entitled to construct or operate any sensitive nuclear fuel cycle activity such as uranium conversion, isotopic separation or spent fuel reprocessing on its territory until the Security Council decides otherwise. Any existing such facilities would have to be dismantled under IAEA supervision. However, such a State, once it is deemed to be again in compliance with its NPT obligations, should continue to be entitled to the benefits of nuclear energy including the operation of nuclear power plants for heat and/or electricity production within its borders. The restriction on the State from developing its own independent nuclear fuel cycle would therefore have to be accompanied by guarantees of supply of fresh fabricated fuel assemblies at fair market price as long as the IAEA is able to draw its annual conclusion of the absence of undeclared nuclear materials and activities in the State as a whole.

This fuel supply guarantee could be obtained from the IAEA, backed by a group of supplier countries as foreseen in the Statute of the IAEA<sup>7</sup>

(/NewsCenter/Statements/DDGs/2003/goldschmidt26112003.html#ftn7).

Whether these fuel elements should be leased by the supplying State that would therefore retain ownership is a question to be considered. Under such a scenario, the exporting State would have the obligation, before delivering any fresh fuel, to

require the return of spent fuel either to a NWS, or to an international or regional storage site under IAEA control. Other States might well be tempted by such an approach and its adoption on a voluntary basis could be encouraged.

This notion is in line with the decision of certain States (which has been communicated to the IAEA<sup>8</sup> (/NewsCenter/Statements/DDGs/2003/goldschmidt26112003.html#ftn8)) that when considering the export of nuclear material, equipment or technology, that they will act in accordance with certain principles. Those principles specifically include that "if enrichment or reprocessing facilities, equipment or technology are to be transferred, suppliers should encourage recipients to accept, as an alternative to national plants, supplier involvement and/or other appropriate multinational participation in resulting facilities. Suppliers should also promote international (including IAEA) activities concerned with multinational regional fuel cycle centres."

## Conclusion

Effective IAEA safeguards remains the cornerstone of a nuclear non-proliferation regime aimed at stemming the spread of nuclear weapons and moving towards nuclear disarmament. Considerable progress has been achieved over the last few years in increasing the Agency's effectiveness by introducing new safeguards strengthening measures, evaluating a wider range of information for drawing safeguards conclusions for each State as a whole, and implementing additional protocols in an increasing number of States.

It is encouraging, after more than 15 years of zero growth budget, that in June 2003 the IAEA Board of Governors agreed to increase the budget of the Safeguards Department, reaffirming its confidence in the Agency's ability to provide safeguards assurances. The international community has explicitly recognized that there exists no substitute to the NPT and the non-proliferation regime, since no single State or even group of them could accomplish what the Agency is doing.

However, much remains to be improved. Crises like the one experienced in Iraq and the DPRK may have been inevitable, but it would be unforgivable for the international community not to draw from the lessons in order to reinforce the NPT regime and minimize the risks of similar crises occurring.

An MIT Study on the Future of Nuclear Power published earlier this year states that "Nuclear power should not expand unless the risk of proliferation from operation of the nuclear fuel cycle is made acceptably small". The measures outlined here would improve the confidence of the international community in the IAEA's capability to meet the objectives of the non-proliferation regime and would therefore be in the interest of all Member States seeking, on an increasing scale, the benefits of the peaceful use of nuclear energy.

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