

# The Increasing Risk of **Nuclear Proliferation:** **Lessons Learned**

by Pierre Goldschmidt

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 IAEA 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>

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 IAEA’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 IAEA’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 at that time 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 IAEA attempts to implement the comprehensive safeguards agreement, the DPRK restricted IAEA safeguards activities to those relevant to monitoring the freeze. The IAEA 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 late 2002, IAEA 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 IAEA'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> in force; the extent to which it cooperates with the IAEA; 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. 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>.

However, one of the greatest risks 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 article provides some suggestions for further strengthening the role of the IAEA in order to address these risks.

### Importance of Safeguards Agreements and Additional Protocols

The NPT requires non-nuclear-weapon States (NNWS) to conclude comprehensive safeguards agreements with the IAEA within eighteen months of becoming party to the Treaty. As of the beginning of September 2003, around 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 NNWS 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.

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> is also useful in allowing the IAEA 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 NNWS 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. Out of 70 States with known significant nuclear activities 47 did not yet have Additional Protocols in force. Although the IAEA 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.

### Small Quantities Protocols

Many States having only very small quantities of nuclear material have concluded a protocol to their comprehensive safeguards agreements which holds in abeyance some of the operative provisions of their safeguards agreements until the time when the State has more than specified quan-

ties of nuclear material<sup>5</sup>, or any quantity of nuclear material in a nuclear facility<sup>6</sup>. This protocol, commonly referred to as the “Small Quantities Protocol”, or SQP<sup>7</sup>, imposes several constraints on the IAEA’s ability to certify the continuing validity of the SQP status of such States and to conduct activities that may be necessary to detect undeclared nuclear material and activities. Most significantly, the provisions of the safeguards agreements that allow for inspection are held in abeyance. In addition, contrary to the normal requirement in the safeguards agreement on the timing of the provision of design information on new nuclear facilities, the SQP requires only that the IAEA be notified six months before the introduction of nuclear material into a facility. These restrictions make it very difficult for the IAEA to evaluate the nuclear programme (or lack thereof) for SQP States as a whole. Therefore it might be worthwhile to consider ways of strengthening the basis upon which safeguards conclusions are drawn for those States.



Credit: Calma/IAEA

High profile cases before the IAEA, such as North Korea’s nuclear programme, have underscored the importance of safeguards and verification.

### 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 IAEA 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 IAEA in a timely manner reports and declarations required by their safeguards agreements.
- ✓ Providing the IAEA 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>8</sup>, 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.

### 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.

### Anytime, Anywhere

In order to further support the verification activities of the IAEA 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 IAEA appropriate arrangements that would allow IAEA inspectors unannounced or short notice



access rights “at all times to all places and data and to any [relevant] person”.<sup>9</sup> For States with a comprehensive safeguards agreement and an Additional Protocol in force, such voluntary confidence building agreements would allow the IAEA to draw more quickly the conclusion of the absence of undeclared nuclear material and activities that is necessary before implementing “integrated safeguards”<sup>10</sup> in the State. It would also further reduce the verification burden for the State, the operators and the IAEA because of the increased confidence in safeguards conclusions.

## 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.”

## 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 IAEA’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 IAEA’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 IAEA 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<sup>11</sup> 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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## References

<sup>1</sup>IAEA Bulletin, Vol. 45, No. 1, June 2003, “The Changing Nature of Safeguards”, Richard Hooper.

<sup>2</sup>Additional protocols are based on the Model Protocol Additional to Safeguards Agreements between States(s) and the IAEA for the Application of Safeguards, INFCIRC/540(Corr). With an Additional Protocol in force, a State would be required to declare to the IAEA a wider range of nuclear fuel cycle-related information and provide further information as requested to resolve questions or inconsistencies regarding its declarations. In addition, the IAEA would have broader access rights to nuclear-related locations.

<sup>3</sup>Under Article X of the NPT a Party has the right to withdraw from the Treaty within three months “if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country.”

<sup>4</sup>Ref. INFCIRC/540 (Corr.) Article 2.a.(ix).

<sup>5</sup>As defined in INFCIRC/153 (Corr.) Article 37.

<sup>6</sup>As defined in INFCIRC/153 (Corr.) Article 106.

<sup>7</sup>Ref. GOV/INF/276 Annex B, standard for “Small Quantities Protocols” to NPT safeguards agreements.

<sup>8</sup>N.B. All States with significant nuclear activities that have concluded comprehensive safeguards agreements have committed to this except two States. However, more than ten States do not comply with their commitments.

<sup>9</sup>IAEA Statute—Article XII A6.

<sup>10</sup>Integrated Safeguards are defined as the optimum combination of all safeguards measures available to the IAEA under comprehensive Safeguards Agreements and Additional Protocols to achieve maximum effectiveness and efficiency.

<sup>11</sup>The Future of Nuclear Power, by Prof. Stephen Ansolabehere et al, ©2003, ISBN 0-615-12420-8.