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B R I E F

93+10: strengthened nuclear safeguards a decade on

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Introduction

Ten years after the International Atomic Energy Agency (IAEA) launched the '93+2' programme to strengthen its nuclear safeguards system, it is possible only to report mixed success.¹ The initiative was prompted by anxiety about the efficacy of traditional safeguards following the discovery that Iraq had a nuclear weapons programme prior to its defeat in the Gulf War of 1990–91, and by ongoing concerns about North Korea's nuclear programme.

While certain aspects of safeguards have improved as a result of the IAEA's own efforts, the adoption by states of Additional Protocols to strengthen safeguards further has proceeded much slower than expected. The introduction of strengthened safeguards has been complicated by the need to balance comprehensiveness and intrusiveness with political acceptability and financial and technical practicality. Suspect nuclear activities revealed more recently in states like Iran and Libya, the emergence of non-traditional 'secondary' nuclear suppliers, such as Pakistan, and post-11 September fears about nuclear smuggling have reinforced the continuing need to improve nuclear safeguards.

This Brief assesses progress in strengthening the IAEA's safeguards system and examines how obstacles to the acceptance and implementation of strengthened safeguards might be overcome.

The 'classical' safeguards system

Nuclear safeguards constitute the chief means of verifying compliance with the 1968 Nuclear Non-Proliferation Treaty (NPT). These full-scope or 'classical' safeguards, as they are also known, seek to ensure that civilian nuclear industries in non-nuclear weapon states do not provide a cover for nuclear weapons programmes. Each state party to the NPT is required by the treaty to conclude a 'comprehensive safeguards agreement' with the IAEA to facilitate verification by the Agency of the state's compliance with its treaty obligations. However, a surprisingly

large number of states parties—45 out of 189—have not yet met this requirement.²

Under such safeguards agreements, non-nuclear weapon states parties declare to the IAEA their nuclear facilities (which, by definition, are assumed to be for peaceful purposes) and inventories of all nuclear materials. States are required to update this information annually, based on the model provided in a 1972 IAEA document, INFCIRC/153 (Corrected).³ The nuclear facilities and material inventories detailed in these confidential declarations will be subject to verification ('safeguarded') by the IAEA. Safeguards agreements provide for the application by the IAEA of specified active and passive verification measures.

Full-scope safeguards employ a quantitative approach in seeking to provide a reasonable level of assurance of the timely detection of the diversion of a 'significant quantity' of nuclear materials for the production of nuclear weapons.⁴ They focus on the accountability and control of nuclear materials, and are applicable to all stages of the civilian nuclear 'life cycle', with the exception of mining and ore processing.⁵ The IAEA confirms that full quantities of declared nuclear materials remain at safeguarded sites or can otherwise be accounted for. The IAEA's verification armoury includes active measures like routine on-site inspections (OSIs) and passive 'containment and surveillance' measures, such as the use of tamper-resistant seals and surveillance cameras at nuclear facilities.

Shortcomings of classical safeguards

While classical safeguards were considered adequate when introduced in the 1960s, the passage of time has revealed a number of serious shortcomings. The most fundamental was that the IAEA could only inspect or monitor materials and facilities formally declared to it by states parties. This provided would-be proliferators with the latitude to develop substantial undeclared nuclear capabilities undetected, either co-located with declared facilities or completely separate. While a so-called special inspection (the equivalent of a 'challenge' inspection in other disarmament regimes) could be

1. The IAEA defines nuclear safeguards as 'technical means used to verify that a State's nuclear activities are in conformity with the undertakings that the State has given about the nature and scope of these activities' (IAEA, *The Evolution of IAEA Safeguards*, International Nuclear Verification Series, no. 2, Vienna, Austria, 1998, p. 32).

2. Mohamed ElBaradei, 'Introductory Statement to the Board of Governors', 16 June 2003, www.iaea.org/worldatom/press/statements/2003/ebsp2003n011.shtml.

3. See 'The structure and content of agreements between the Agency and states required in connection with the Treaty on the Non-Proliferation of Nuclear Weapons', INFCIRC/153 (Corrected), IAEA, Vienna, June 1972.

4. The IAEA defines a 'significant quantity' as eight kilograms of plutonium and uranium-233, 25 kilograms of uranium-235 enriched to 20 per cent or more, 75 kilograms of uranium-235 enriched to less than 20 per cent, 10 tonnes of natural uranium and 20 tonnes of depleted uranium and thorium (IAEA, *The Evolution of IAEA Safeguards*, p. 53).

requested in cases where there was strong suspicion of malfeasance, political expediency meant that these were almost impossible to initiate. The IAEA Board of Governors has only invoked this right once, in 1993, in regard to North Korea, which refused to accept such an inspection.

A second limitation concerns the peaceful nuclear activities that states are allowed to undertake under the NPT. Article IV permits states to assemble many of the elements of a future nuclear weapons programme, such as a uranium enrichment capability, as long as they declare them as being for peaceful purposes and subject them to safeguards. This provides proliferation-minded states with the scope to violate the spirit of the treaty without breaching its letter. Having mastered all of the relevant technologies, such a country can legally give notice of its withdrawal from the NPT and begin to produce nuclear weapons perfectly legally. This is what North Korea attempted to do, although it failed to declare significant activities. This underlined the need for more effective safeguards in respect of legitimate nuclear activities.

A third weakness of classical safeguards stemmed from the desire to avoid discriminating against particular states parties, regardless of the risk that they may contravene their treaty obligations. To date, the IAEA has applied its verification resources largely on a proportional basis: the amount of monitoring and the number of inspections that a state party is subject to has depended on the quantity of nuclear material that it possesses. This has led to the expenditure of considerable resources on verifying states with large, well-developed nuclear industries, like Canada, that are not of proliferation concern, while distracting attention from those that are, such as Iran.

Enter strengthened safeguards

Interest in strengthening the safeguards system arose in the mid-1980s, when the IAEA's Standing Advisory Group on Safeguards Implementation (SAGSI) began to

explore how to enhance safeguards within the confines of a limited budget.⁶ This occurred in the context of the prevailing 'zero real growth' budget environment. Much greater urgency was attached to the issue after inspections by the United Nations Special Commission (UNSCOM), beginning in 1991, revealed that Iraq's illicit nuclear weapons programme had circumvented NPT safeguards.

In December 1993 the IAEA launched the '93+2' programme, mandating the IAEA Secretariat to examine the legal, technical and financial aspects of strengthened safeguards and to propose enhanced and more efficient safeguards to the Board of Governors.⁷ The immediate result was two major initiatives. Part 1 involved safeguards enhancements that could be initiated by the IAEA within the scope of its existing mandate and legal authority, while Part 2 comprised measures that would be possible only by establishing a stronger legal basis for the Agency to act. Part 2 measures evolved into the Additional Protocol. Later the IAEA inaugurated a programme to develop 'integrated safeguards', which focuses on rationalising strengthened safeguards as applied to individual countries, thereby reducing the verification burden and costs.⁸

Strengthened safeguards are a vast improvement on classical safeguards. They are qualitatively different in that they provide a fortified legal foundation for the IAEA's efforts to develop a complete picture of each state party's nuclear activities. This facilitates its objective to 'provide credible assurance not only about declared nuclear material in a State but also about the absence of undeclared nuclear material and activities'.⁹

IAEA initiatives under its existing authority

The IAEA began in 1995 to introduce safeguards enhancements that fell within the scope of its existing legal authority, which it applies to all states with full-scope safeguards agreements. These Part 1 measures include requesting additional information on facilities that formerly contained nuclear materials subject to safeguards but no longer do so, or which are expected to do so in future, increasing the level of remote monitoring of

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5. See INFCIRC/153 (Corrected), p. 5. States parties recognised as nuclear weapon states by the NPT are not required to accept safeguards on their civilian nuclear industries, but all have made 'voluntary offers', accepting safeguards on certain facilities as a token of goodwill.

6. See Suzanna van Moyland, 'The International Atomic Energy Agency's Additional Protocol', VERTIC Briefing Paper, no. 97/2, VERTIC, London, 1997.

7. Victor Bragin, John Carlson and Russell Leslie, 'Integrated safeguards: status and trends', *The Nonproliferation Review*, summer 2001, p. 103.

8. For an overview of the background to, and early development of, the NPT's strengthened safeguards system, including a chronology of major developments, see Oliver Meier, 'Fulfilling the NPT: strengthened nuclear safeguards', VERTIC Briefing Paper, no. 00/2, VERTIC, London, April 2000.

9. IAEA Director General Mohamed ElBaradei, quoted in 'Non-proliferation of nuclear weapons and nuclear security: IAEA Safeguards Agreements and Additional Protocols', IAEA, Vienna, 2002, p. 2.

'The Additional Protocol increases the IAEA's capacity to ensure that states parties' declarations are complete, as well as significantly improving its prospects for detecting undeclared nuclear material and activities'

movements of nuclear material, expanding the use of unannounced inspections and collecting environmental samples at sites to which the Agency already has access.¹⁰ These efforts have been aided by the greater use of open source information, including satellite imagery, as well as by intelligence provided to the IAEA by third parties and the increased information supplied by states parties themselves, as required under the Additional Protocol.¹¹

Additional Protocols

In May 1997 the Board of Governors agreed a Model Additional Protocol to Safeguards Agreements to supplement full-scope safeguards.¹² States parties are encouraged to conclude and bring into force an Additional Protocol to their existing safeguards agreement under which they accept more stringent reporting and verification measures.¹³

The Additional Protocol sets a much higher standard for safeguards and greatly expands the IAEA's verification responsibilities. It provides for increased transparency by extending states parties' declaration, reporting and site access obligations to previously exempt portions of the nuclear fuel cycle. The protocol encompasses the entire range of activities associated with the life cycle of states parties' nuclear industries. This stretches all the way from nuclear mining and processing to the storage of nuclear waste, including the activities of private firms involved in the nuclear fuel cycle, as well as any sites that house nuclear material intended for non-nuclear purposes. The Additional Protocol also requires states parties to report on the production of nuclear-related equipment, nuclear-related imports and exports, nuclear fuel cycle-related research and development, and future plans for nuclear facilities. This enables the IAEA to develop a much more comprehensive 'cradle-to-grave' picture of states parties' nuclear activities.

The Additional Protocol similarly expands the IAEA's rights to conduct inspections of states parties' nuclear industries, most importantly through 'complementary access'. This permits the Agency to inspect any part of a declared nuclear facility, instead of only

designated 'strategic points' that were accessible under full-scope safeguards. This can also be applied to nuclear-related sites, such as those that use unsafeguarded nuclear materials.¹⁴ Complementary access may be coupled with short-notice access to all facilities at a nuclear site and with the possibility of collecting environmental samples outside declared locations when the IAEA deems this necessary.

The Additional Protocol increases the IAEA's capacity to ensure that states parties' declarations are complete, as well as significantly improving its prospects for detecting undeclared nuclear material and activities. This offers a vastly improved basis for deterring prohibited activities and greatly reduces the potential for establishing an independent weapons-related nuclear fuel cycle.

Integrated safeguards

The increased burden in regard to finance and labour that accompanies the expansion of activity associated with strengthened safeguards, including the schedule of inspections possible under Additional Protocols, represents a potential obstacle to the implementation of strengthened safeguards. Integrated safeguards seek to allow this enlarged verification burden to be borne with substantially fewer resources than would otherwise be the case.¹⁵ They aim to accomplish this apparent miracle by enhancing the efficiency of safeguards overall and in relation to particular states, thereby enabling the Agency to focus its efforts where they are needed most. The conceptual framework for integrated safeguards was completed in March 2002, and the development of practical approaches to the framework's implementation is ongoing.

Integrated safeguards comprise two distinct possibilities. The first involves easing the verification burden by decreasing reliance on the traditional labour-intensive method of using OSIS to verify the accuracy of states parties' data declarations. This is accomplished through increased use of remote sensing devices and automated systems for data evaluation, as well as by utilising experience derived from the implementation of safeguards to refine verification modalities and techniques.

10. *The IAEA's Safeguards System: Ready for the 21st Century*, IAEA, Vienna, 1997, p. 17.

11. John Carlson, 'Nuclear safeguards: developments and challenges', in Trevor Findlay and Oliver Meier (eds.), *Verification Yearbook 2001*, VERTIC, London, 2001, p. 66.

12. The Additional Protocol is not a protocol to the NPT as is often incorrectly claimed.

13. See INF/CIRC/540 (Corrected), May 1997.

14. Carlson, p. 68.

15. For a comprehensive analysis see Jill N. Cooley, 'Integrated nuclear safeguards: genesis and evolution', in Trevor Findlay (ed.), *Verification Yearbook 2003*, VERTIC, London, 2003, pp. 29–44.

The second seeks to ‘customise’ verification for each individual states party, by identifying redundancies and consolidating and rationalising measures applied to it, thereby reducing the verification burden for both the state and the IAEA. This includes minimising the effort expended on verifying previously verified material, wherever possible.¹⁶ Scope for the harmonisation of safeguards in particular cases will depend on factors like the state party’s nuclear fuel cycle, the relationship between nuclear facilities, the effectiveness of the state’s accounting and control system for nuclear materials and the IAEA’s ability to conduct unannounced inspections successfully.¹⁷ Developing the optimal mixture of particular verification instruments to be applied in each case enables the IAEA to economise in the verification of states that are of little or no interest in terms of proliferation, while applying more rigorous measures in states of greater concern. Strengthened safeguards are much more flexible than classical safeguards in this respect.

Integrated safeguards will, however, only be applied to states parties that have negotiated and brought into force both a full-scope safeguards agreement and an Additional Protocol. Both are needed before the Agency can identify potential verification synergies. There are a number of other conditions that also must be met before integrated safeguards can be applied to a particular state:¹⁸

- it must have complied with its safeguards agreement and Additional Protocol in a timely manner;
- it must have had a comprehensive evaluation conducted by the IAEA;
- the Agency must have concluded that there has been no diversion of declared nuclear material; and
- the IAEA must have been able to implement complementary access, if this was necessary, and to have found no indications of undeclared nuclear activities or materials.

Each state needs to meet these criteria annually in order for integrated safeguards to be applied.

Progress and problems in implementation

After a decade of efforts, the record of strengthened safeguards remains mixed. Enhanced safeguards that fall under the IAEA’s existing authority have only slowly supplemented classical safeguards. Progress has also been slow in terms of the negotiation, signing, ratification and entry into force of Additional Protocols. As of 7 April 2004, only 83 NPT states parties had signed Additional Protocols, and only 39 of these had brought them into force.¹⁹ The introduction of integrated safeguards has proceeded even more slowly: as of April 2004 they were being implemented in only three countries: Australia, Indonesia and Norway, all with relatively small nuclear programmes.²⁰ The Agency expects to begin implementing integrated safeguards in states with much larger programmes in the near future, including Canada, Hungary and Japan.

The failure of particular nations to adopt strengthened safeguards does not necessarily reflect intent to develop or otherwise acquire nuclear weapons. It may simply result from preoccupation with other priorities, legislative or other technical difficulties, political or bureaucratic indifference or incompetence in the state concerned. Some hold-outs that are in full compliance with their existing obligations resent being pressed to accept increased verification when other countries retain nuclear weapons despite being bound under Article VI of the NPT to work towards their elimination, or when others have attempted to acquire nuclear weapon capabilities under cover of safeguards.

Among the key NPT states parties that do not yet have Additional Protocols in force are all of the nuclear weapon states (NWS) parties, except China. France, Russia, the United Kingdom²¹ and the United States²² have all signed but not yet ratified. Iraq and North Korea have been found in non-compliance with both the NPT and their nuclear safeguards agreements and have not signed an Additional Protocol, although non-compliers Iran and Libya have now done so. India, Israel, Pakistan and now North Korea are all outside of the NPT and its comprehensive safeguards regime.

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16. For a more detailed account of the IAEA’s strengthened safeguards initiatives see Bragin, Carlson and Leslie, pp. 103–105.

17. ‘Strengthening the effectiveness and improving the efficiency of the safeguards system and application of the Model Additional Protocol’, IAEA document GC(45)/23, 17 August 2001, p. 6.

18. Carlson, p. 70.

19. See www.iaea.org/worldatom/programmes/safeguards/sg.protocol.shtml.

20. ‘Statement to the forty-seventh regular session of the IAEA General Conference 2003 by IAEA Director-General Dr Mohamed ElBaradei’, 15 September 2003, www.iaea.org/NewsCenter/Statements/2003/ebsp2003no20.html.

21. The entry into force of British and French Additional Protocols is dependent on all of the members of the European Union (EU) being in a position to do so simultaneously. When this happens it will boost the total number of Additional Protocols by at least 15 in one go.

22. The US Senate unanimously approved ratification of the US Additional Protocol on 31 March 2004, but Congress must pass national implementing legislation before it can enter into force.

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Increased resource demands

One factor complicating the implementation of strengthened safeguards is the increased resources required. While integrated safeguards were intended to save costs, and still promise eventually to do so, their introduction necessitates an initial investment of time and resources. At the same time, the verification demands on the IAEA have been heightened by the placing under IAEA supervision of considerable quantities of fissile material and numbers of nuclear facilities in the Soviet successor states. Many of these are verification-intensive due to their former military nature and sensitivity.²³ In addition the Agency has been involved in crucial verification activities in Iraq, Iran and now Libya.

The danger of discrimination

The option of directing verification efforts toward states parties of particular proliferation concern, made possible under the strengthened safeguards system, is not without its prospective hazards. Singling out individual states may be perceived as unfair discrimination and create a backlash, especially among non-aligned nations that already suspect the motives of the Western states that have been pressing them to accept strengthened safeguards. Many are concerned about the inequitable nature of the nonproliferation regime, as enshrined in the NPT. This group includes a number of the countries that have the greatest potential for nuclear proliferation.

Official indifference

The failure of some states to accept strengthened safeguards and the slow rate of progress made by others towards introducing them often seem to result from a lack of concern about nuclear proliferation and ignorance of the importance of strengthened safeguards. This is most common among states that have relatively minor nuclear activities and are preoccupied with more pressing developmental tasks. These countries probably do not harbour nuclear ambitions, peaceful or otherwise, but their unwilling-

ness to agree to strengthened safeguards sends an unfortunate signal regarding the value of the NPT and the nuclear nonproliferation regime in general. It may also leave them vulnerable to unregulated and even undetected nuclear activities being conducted on their territory, including nuclear smuggling. Recognition of this problem has led the IAEA to develop a Small Quantities Protocol, which involves simplified procedures for states that have no nuclear material or limited amounts of it to report.

Resistance to transparency and intrusiveness

There is definite resistance to the introduction of strengthened safeguards by states concerned about the much higher degree of transparency and intrusiveness involved. This is particularly evident on the part of the nuclear weapon states themselves. In addition to excluding all of their weapon-related nuclear activities from strengthened safeguards (as in the case of traditional safeguards), they have offered little, if anything, in the way of expanded voluntary safeguards on their peaceful nuclear activities. Although this is not required under the Additional Protocol, this nevertheless sets a negative example to the non-nuclear weapon states, potentially discouraging them from supporting strengthened safeguards. It also reinforces suspicions that the NWS have no intention of ever abandoning their nuclear arsenals.

Advancing strengthened safeguards

The IAEA, supported by concerned states parties, is working to remove the barriers hindering efforts to strengthen the NPT's verification regime. This has included an active campaign to convince states of the value of strengthened safeguards and to encourage them to adopt Additional Protocols as soon as possible. The IAEA has, to this end, organised regional and other conferences, often with encouraging results in terms of the number of nations commencing

23. See 'International response: IAEA needs budget boost, officials say', Global Security Newswire, 13 February 2003, www.nti.org. See also Carlson, p. 75.

negotiations on an Additional Protocol and/or comprehensive safeguards agreement.²⁴

Overcoming the obstacles confronting efforts to strengthen the NPT safeguards system will not be easy, but there are a number of additional useful approaches that should be pursued.

Tackling perceived discrimination

Altering the perception on the part of some states that the NPT and its safeguards system discriminate against them will be crucial to gaining their support. One approach, although obviously one with cost implications, is to apply gradually increased safeguards to all of the peaceful nuclear activities of the nuclear weapon states. The overall tone of discrimination that hangs over the NPT could be more readily dissipated if the NWS moved faster towards nuclear disarmament as required under Article VI. Such states, particularly the US, cannot relentlessly seek to impose greater restrictions on the nuclear options of other nations without foregoing some options themselves.

Increased funding

The IAEA has recently seen its verification budget boosted, with strong US support, after a decade of zero budgeting. The substantial increase will enable the Agency to fund its safeguards activities without resort to supplemental funding, as in recent years. This will also provide an improved financial basis for expanding the application of strengthened safeguards to increasing numbers of states as they adopt Additional Protocols and will hasten the advance of integrated safeguards. Existing funding levels should be further increased: from the perspective of spending on nuclear weapons, nuclear safeguards are a security bargain.

New restraints on fissionable material production

In December 2003, the IAEA Director General, Dr Mohamed ElBaradei, in his annual report to the United Nations General Assembly,

argued that the only way, ultimately, to prevent non-nuclear weapon states from illicitly acquiring their own plutonium and high enriched uranium for weapons purposes, whether under putatively peaceful and safeguarded programmes or otherwise, is to restrict enrichment and reprocessing activities by individual states. He suggested examining the merits of producing fissionable materials multilaterally in a limited number of locations. These ventures would be under safeguards and would supply nuclear materials, also under safeguards, for peaceful purposes. This proposal deserves serious consideration, although there are a host of political, economic and technical issues that will need to be addressed before it could bear fruit.

Conclusion

The nature of the present international environment, in which the NPT faces increasing threats from several sources, makes it essential to continue to strengthen the safeguards system envisaged when 93+2 was launched a decade ago. This is a complex and difficult task, but it is vital to continued credible verification of compliance with the NPT and to the global nuclear nonproliferation regime as a whole. It will require concerted and sustained efforts on the part of the IAEA, supportive states and concerned non-governmental groups.

Paradoxically, the recent cases of Iran and Libya may hasten the advance of strengthened safeguards. Both have already agreed to sign and implement an Additional Protocol and post-occupation Iraq will be strongly enjoined to follow suit. If and when North Korea rejoins the nonproliferation regime, the resulting verification package is likely to include an Additional Protocol, among other strengthened measures. All of this will expand the IAEA's experience in the application of strengthened safeguards to the 'hard cases' and should build momentum among the NPT's law-abiding states parties to strengthen the safeguards regime further, both individually and collectively.

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24. See Mohamed ElBaradei, 'Strengthening the nuclear non-proliferation regime: an international priority', IAEA news release, Vienna, 10 December 2002.

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About this paper

Kenneth Boutin examines efforts by the International Atomic Energy Agency and its member states over the past decade to strengthen nuclear safeguards through what was originally known as the '93+2' programme, so called because it began in 1993 and was expected to take two years to set up. The paper concludes that progress has been modest and that much work remains. Particularly important is to speed up the adoption and implementation of Additional Protocols to states' existing comprehensive safeguards agreements to ensure cradle-to-grave information on, and monitoring of, their peaceful nuclear programmes. This is a prerequisite for avoiding future cases like those of Iran, Iraq, Libya and North Korea, which used nuclear safeguards as a cover for illicit nuclear weapons programmes. The attainment of integrated safeguards in fully compliant states that adopt Additional Protocols is also essential in order to achieve more efficient use of limited verification resources and to avoid over-verification of states that pose no threat to the nonproliferation regime.

Building trust through verification

VERTIC is the Verification Research, Training and Information Centre, an independent, non-profit making, non-governmental organisation. Its mission is to promote effective and efficient verification as a means of ensuring confidence in the implementation of international agreements and intra-national agreements with international involvement. VERTIC aims to achieve its mission through research, training, dissemination of information, and interaction with the relevant political, diplomatic, technical, scientific and non-governmental communities.

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