

Fulfilling the NPT

Strengthened Nuclear Safeguards

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Executive Summary

- Strengthened nuclear safeguards will enhance the nuclear non-proliferation regime by increasing the mutual confidence of states parties that the Nuclear Non-Proliferation Treaty (NPT) is being fully complied with.
- A review of the benchmarks on nuclear safeguards contained in the 1995 NPT Review Conference's Principles and Objectives shows that small but important steps have been taken in strengthening safeguards since the conference.
- The International Atomic Energy Agency (IAEA) has begun implementation of its new Strengthened Safeguards System (SSS). This system will give the Agency and its member states the ability to gain a comprehensive picture of states parties' nuclear activities, clarify issues of concern and actively investigate cases of suspected non-compliance.
- Full implementation of the SSS is reliant on states concluding an Additional Protocol to their existing safeguards agreements with the IAEA based on a Model Additional Protocol approved in May 1997.
- NPT member states have not given the necessary political priority to concluding, signing and ratifying Additional Protocols. Since May 1997 the IAEA Board of Governors has approved just 49 Additional Protocols, only nine of which have entered into force.
- The situation is made more acute by the fact that, while there has been an increase in the number of full-scope safeguards agreements since the 1995 Review Conference, 55 NPT non-nuclear weapon states (NNWS) parties still have no safeguards agreement, putting them in breach of their legal obligation under Article III of the NPT.
- The record of the nuclear weapon states (NWS) parties to the NPT is also patchy: while all have signed Additional Protocols, they have negotiated them so as to exclude important nuclear activities and none have been ratified.
- The involvement of non-NPT member states in the safeguards regime can be broadened by gradually expanding the scope of safeguards to more facilities and commencing negotiations on a fissile material treaty.
- All states that have not done so should be urged to comply with Article III of the NPT and to adopt and implement an Additional Protocol at the earliest possible date.
- The 2000 Review Conference should clearly identify the reasons for the slow progress in implementing the SSS and renew the call for strengthened safeguards in its forward looking document.
- The IAEA should be given the necessary political, financial and technical support for the SSS.

INTRODUCTION

The Nuclear Non-Proliferation Treaty (NPT) faces many serious challenges, including the lack of progress in disarmament, a revival of the salience of nuclear deterrence, and attacks on central arms control norms, for example as a result of the nuclear tests by India and Pakistan. While these issues receive high political and public attention, the reform of nuclear safeguards¹ conducted by the International Atomic Energy Agency (IAEA) is proceeding largely unnoticed.

About ten years ago the IAEA began to revise its verification approach through what eventually became known as the Strengthened Safeguards System (SSS). This process culminated in the adoption in May 1997 by the IAEA Board of Governors of a Model Protocol additional to existing safeguards agreements, which would permit the application of new safeguards measures in states that signed and ratified such a protocol. The SSS will enable the Agency to first broaden and then focus its verification activities more effectively on areas of concern. This will bring NPT verification into line with other modern verification regimes, such as those of the Comprehensive Nuclear Test Ban Treaty (CTBT), the Chemical Weapons Convention (CWC) and the verification protocol for the Biological and Toxin Weapons Convention (BTWC) that is currently being negotiated in Geneva.

But progress in implementing strengthened safeguards is still slow and in danger of running out of steam. Some NPT member states are not giving adequate support to the IAEA's efforts, many have not concluded Additional Protocols, while others have not even fulfilled their legal obligations under Article III of the NPT to conclude full-scope safeguards agreements with the Agency.²

This report will look primarily at the role of NPT states parties in strengthening nuclear safeguards. First, the importance of strengthened safeguards is discussed, then a short summary of the strengthened safeguards measures is given. Progress made to date is described and some reasons why progress has been slow are identified. Finally, current efforts to strengthen safeguards are compared to the benchmarks laid out in the 1995 NPT Review Conference's Principles and

¹ Safeguards can be defined as 'the 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'. International Atomic Energy Agency, 'The Evolution of IAEA Safeguards,' *International Nuclear Verification Series*, no. 2, IAEA, Vienna, Nov. 1998, p. 32.

² For a summary of the relationship between the NPT and IAEA safeguards see Jan Priest, 'IAEA safeguards and the NPT: Examining interconnections', <http://www.iaea.org/worldatom/inforesource/bulletin/bull371/priest.html>.

Objectives and some recommendations for the 2000 NPT Review Conference are given.

In focusing on the role of states in strengthening safeguards, this paper does not imply that the onus is solely on states parties. The IAEA has a vital part to play in strengthening safeguards and in further reforming its operations. The Agency, in implementing the SSS, must fundamentally revise the way it verifies compliance of member states with their NPT obligations. It must shift from a quantitative accounting of nuclear materials to a proactive and qualitative verification policy. This shift will affect the way the Agency collects and analyses information, draws conclusions about states' compliance, applies modern verification technologies, and, last but not least, plans and conducts inspections. Any one of these changes would represent a formidable challenge for a large organisation affected by bureaucratic inertia and bound by an organisational culture developed over decades.

Because this report focuses on efforts to strengthen IAEA safeguards, other activities that aim to improve control over fissile materials and nuclear weapons technologies, such as export control regimes, unilateral and bilateral steps to increase transparency on fissile material holdings and place those materials under safeguards, as well as the Trilateral Initiative between Russia, the United States and the IAEA, are not dealt with in depth. These arrangements do, however, have an important role to play as long as safeguards are not universal.

THE IMPORTANCE OF STRENGTHENED SAFEGUARDS

There are good reasons why NPT states parties should give greater political attention to safeguards reform efforts.

First, the means currently available to verify NPT commitments are insufficient to detect a secret nuclear weapons programme and to deter a determined proliferator from pursuing such a clandestine programme.

Second, strengthened safeguards add a new confidence building component to the NPT by giving fully compliant states a better opportunity to demonstrate their *bona fide* nuclear non-proliferation credentials. Accusations of violations continue to be raised by different intelligence services and weaken trust in the NPT's ability to curb nuclear proliferation. Strengthened safeguards will enable the international community to more effectively verify whether such allegations are true and provide accused states with better opportunities to demonstrate their compliance.

Additional Protocol: Background Chronology

Mid-1980s	IAEA Standing Advisory Group on Safeguards Implementation (SAGSI) explores ways to cope with rising demands for safeguards and limited budgets, but within existing framework of declared nuclear activities.
1991	Iraq found to have violated its comprehensive safeguards agreement and NPT in pursuing a multiple-path nuclear-weapon programme at declared and undeclared facilities since early 1980s. IAEA Director General Blix tells Board of Governors that IAEA needs: (1) better information of fuel cycles of states with comprehensive safeguards; (2) to be able to send inspectors anywhere on territory of a state that has accepted comprehensive safeguards if undeclared activity is suspected; and (3) to have full UN Security Council backing if a state blocks verification
January 1992	Security Council declares proliferation of weapons of mass destruction a threat to international peace and security and calls for appropriate action to be taken against IAEA-reported violators.
February 1992	IAEA Board of Governors: (1) affirms IAEA's right to carry out special inspections in states with comprehensive safeguards; (2) approves early provision of design information (and modifications); and (3) endorses voluntary reporting scheme, beyond safeguards requirements, for information on exports and imports of nuclear material, specified equipment and non-nuclear materials.
February 1993	North Korea refuses special inspection requested by the IAEA and is found to be in non-compliance with NPT and safeguards. US satellite pictures shown to the IAEA and environmental samples support non-compliance finding.
March 1993	South Africa announces it had developed a 'limited nuclear deterrent capability' and invites the IAEA to verify that all nuclear material has been recovered and safeguarded.
April 1993	SAGSI recommends that safeguards should provide confidence that there are no undeclared nuclear activities – a departure from traditional concept of focusing on declared nuclear material.
May 1993	Special task force created for the Programme to Strengthen the Effectiveness and Improve the Efficiency of Safeguards (dubbed '93+2'). This aims to develop broader information reporting and access, improve information analysis, better utilise technology, and increase co-operation with states and their systems of accounting and control.
March 1995	Board decides that additional authority, beyond existing comprehensive safeguards agreements (modelled on the 1970 INFCIRC/153 document), is necessary for some proposed measures. The Programme is thus split into two.
May 1995	NPT Review and Extension Conference's 'Principles and Objectives' supports strengthening safeguards to increase detection of undeclared activity.
June 1995	Part I measures adopted by IAEA Board to clarify, consolidate and develop provisions in existing comprehensive safeguards agreements.
June 1996	IAEA Board considers draft model protocol, but there are concerns about level of intrusiveness.
July 1996- April 1997	A special committee meets four times to negotiate text. Agreement reached on 3 April 1997.
15 May 1997	IAEA Board approves Model Additional Protocol.

Source: Adapted from Suzanna van Moyland, 'The International Atomic Energy Agency's Additional Protocol', *Verification Matters Briefing Paper* 97/2, VERTIC, July 1997.

Third, strengthened safeguards will foster nuclear disarmament by laying the foundations for a treaty on fissile materials and increasing transparency on more nuclear materials and facilities. Ultimately, strengthened safeguards are a stepping stone towards comprehensive disarmament measures such as a nuclear weapons convention.

Fourth, the failure of a significant number of NPT states parties to implement strengthened safeguards could be interpreted as weakening the international commitment to the NPT. Such a development would also weaken the IAEA, which is the only international institution mandated to implement components of the NPT.

IAEA SAFEGUARDS: TRADITIONAL AND STRENGTHENED

Article III of the NPT obliges 'each non-nuclear-weapon State Party to the Treaty ... to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency ...' within 18 months after accession to the treaty. For non-nuclear weapon states this means concluding full-scope safeguards (FSS) modelled on the 1972 document INFCIRC/153.³ Under this traditional safeguards system, the IAEA verifies compliance with the NPT under the assumption that states declare all relevant nuclear activities.⁴ The Agency inspects declared facilities and checks whether the information provided by the state is correct. The main tool is nuclear material accounting: inspectors go to pre-arranged locations and check the location, type and quantity of declared nuclear materials. The main purpose of IAEA verification is the timely detection of the diversion of significant quantities of declared nuclear weapon materials.⁵

Full-scope safeguards as implemented do not enable the IAEA to look for undeclared nuclear activities because it cannot check whether declarations are complete. The main purpose of traditional safeguards is therefore to 'make it much more difficult for states to use safeguarded nuclear facilities to make weapons

without detection'.⁶ Thus, while the IAEA is good at detecting the diversion from declared facilities of declared nuclear material for the secret production of nuclear weapons, it is less capable of detecting attempts to violate the NPT if wholly separate undeclared nuclear facilities are used.

The traditional safeguards system does contain some elements to check for undeclared activities in declared plants. Examples include unannounced inspections in certain parts of centrifuge enrichment plants and strict inspection criteria for unreported production of nuclear weapons material at large research reactors. Moreover, the Agency has long had the right to conduct 'Special Inspections' of declared and undeclared facilities. However, this right was not invoked until 1993 and then only once (in the case of North Korea).⁷ 'Special inspections' have gained a political sensitivity that makes them difficult to use as effective verification tools.⁸

The shortcomings of this safeguard system became apparent when the IAEA discovered the nature and scope of the clandestine Iraqi nuclear programme after the Gulf War in 1991. Calls for reform of nuclear safeguards were reinforced by the inconsistencies discovered during initial inspections in North Korea in 1992 and the subsequent refusal of the government in Pyongyang to live up to its safeguards commitments. The positive demonstration by South Africa of the effectiveness of verification when a state co-operates with the IAEA in surrendering its nuclear weapons capability after the country signed the NPT in 1991 and entered into a comprehensive safeguards agreement was another contributing factor for safeguards reform. But it was really the Iraqi 'shock' that triggered the most comprehensive reform of the safeguards system since the early 1970s. 'Programme 93+2' was officially launched in November 1993, when the Board of Governors of the IAEA adopted a report which tasked the Director-General (DG) with developing proposals to reform IAEA safeguards. The expectation at the time was that a stronger (and more efficient) safeguards package could be adopted before the NPT Review and Extension Conference in May 1995. The report submitted by the DG to the Board of Governors in March 1995 was, however, unacceptable

to some member states because it was too general in its recommendations and did not clearly lay out the financial implications of reform. 'Programme 93+2' turned out to be 'Programme 93+4' because of differences between IAEA members about the scope, character and legal status of additional verification measures.⁹

However, in June 1995 the Board of Governors identified measures to strengthen safeguards which could be implemented under existing legal arrangements. These so-called Part 1 measures included improved use of remote monitoring technologies (remote control, electronic seals), unannounced routine inspections at declared facilities, better information measures such as environmental samples (swipe samples at designated points during routine safeguards activities), information on past nuclear activities and deeper co-operation with States' Systems of Accounting and Control (SSACs).¹⁰ The fact that 'Part 1' turned out to be quite extensive indicated that the IAEA could have applied more stringent safeguards in FSS countries such as Iraq even before 'Programme 93+2' was launched.

In July 1996 the new 'Committee on Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System' ('Committee 24' or COM.24) started its work. COM.24 was in charge of developing a new legal instrument for so-called Part 2 verification measures. The committee was open to participation by all IAEA member states and all other NPT states parties and chaired by the DG. In April 1997, after intensive negotiations, COM.24 presented a 'Draft Model Protocol' to the IAEA Board of Governors.¹¹ During a special session on 15 May 1997, the Board of Governors adopted INFCIRC/540, entitled Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards.

Verification Under the Additional Protocol

The Protocol outlines rights and obligations of the IAEA and of any state that signs and ratifies such a

⁹ See Reinhard Loosch, 'From 'Programme 93+2' to Model Protocol INFCIRC/540: Negotiating for a Multilateral Agreement in the International Atomic Energy Agency', in *Tightening the Reins: Towards a Strengthened International Nuclear Safeguards System*, Erwin Häckel and Gotthard Stein (eds.), Springer, Berlin, 2000, pp. 32-33.

¹⁰ See Suzanna van Moyland, 'Programme "93+2": Evolution in Nuclear Safeguards', in *Verification 1997: The VERTIC Yearbook*, Boulder, CO and Oxford, Westview Press, 1997.

¹¹ Report of the Committee on Strengthening the Effectiveness and Improving the Efficiency of the Safeguards System (Committee 24) to the Board of Governors, GOV/2914, International Atomic Energy Agency, Board of Governors, Vienna, 10 April 1997.

Reporting Requirements Under the Additional Protocol

States that ratify an Additional Protocol will have to supply the IAEA with expanded annual declarations.¹ These should include:

- information about application-oriented, state-funded, specifically authorised or controlled nuclear fuel cycle-related research and development not involving nuclear material
- a general description of each building on each nuclear or nuclear-related site including a site map
- a description of the scale of operations of firms engaged in nuclear fuel cycle-related activities
- details of activities on the 'front-end' of the nuclear fuel cycle, such as location and status of uranium mines, concentration plants and thorium concentration plants
- data on the combined annual production of nuclear source materials and, on request, production of individual mines and mills¹
- data on holdings as well as exports and imports of source materials if they exceed a certain amount
- information on exports and, on request by the IAEA, on imports of specified equipment and non-nuclear materials listed in the Protocol
- a general description of not state-funded, specifically authorised or controlled research and development activities related to enrichment, reprocessing or processing of intermediate or high-level waste containing plutonium, HEU or uranium-233
- a ten-year plan for any development of the nuclear fuel-cycle, including research and development activities.¹

Source: Article 2 of the 'Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards,' INFCIRC/540, IAEA, Vienna, September 1997

³ '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 Pierre Goldschmidt, 'The IAEA Safeguards System Moves Into the 21st Century,' *Supplement to the IAEA Bulletin* vol. 41, no. 4, Dec. 1999, p. 3.

⁵ Currently, the Agency defines a 'significant quantity' as 8 kilograms of plutonium or uranium-233, 25 kilograms of uranium enriched to 20 per cent or more, 75 kg or uranium-235 enriched to less than 20 per cent, 10 tonnes for natural uranium and 20 tonnes for depleted uranium and thorium.

⁶ US Congressional. Office of Technology Assessment, 'Nuclear Safeguards and the International Atomic Energy Agency,' Washington DC, 103rd Congress, April 1995, OTA-ISS-615.

⁷ The IAEA did conduct another 'Special Inspection', but it was at the invitation of the Romanian government.

⁸ See R.J.S. Harry, 'IAEA Safeguards and Detection of Undeclared Nuclear Activities', *ECN Report*, Petten, Netherlands Energy Research Foundation ECN, March 1996, ECN-C-96-018, p. 13.

document. Despite its name, the Protocol and the SSS are not simple 'add-ons' to traditional safeguards, but could result in a fundamental shift in the way NPT safeguards are implemented. The Additional Protocol is intended to increase the Agency's ability to detect secret nuclear weapons programmes connected either to declared or undeclared facilities. Under Article 2 of the Protocol, the state party is required to provide the

Agency with far more information about its nuclear activities than previously required under traditional safeguards. This will permit the Agency to develop a comprehensive picture of a country's nuclear programme, enabling it to place declared nuclear materials and facilities in a broader context. The inclusion of previously unavailable information (from open sources and data collected by modern verification means such as environmental sampling and satellite imagery) and the ability to cross-check between different sources of information will help verify that states are in compliance with their safeguards agreements. In a best case scenario, the IAEA will have a complete picture of a state's nuclear activities, from the 'front-end' of the nuclear fuel cycle, namely the import or production of nuclear materials, including source and pre-safeguards materials, to the 'back-end', the disposition of nuclear waste. Expanded declarations will also enable the Agency to place reported activities in a historical context, as states are obliged to declare certain past activities as well as future plans.

Since it is the job of the IAEA to verify that states' declarations are complete and correct, expanded declarations necessitate increased physical access for inspectors to nuclear facilities. Because many non-nuclear weapon states (NNWS) (and some nuclear weapon states (NWS)) feared that the new verification measures required under the Additional Protocol would unduly increase the burden on their nuclear industry, it was decided that 'the Agency shall not mechanistically or systematically seek to verify the information' provided in expanded declarations.¹² Verification activities under the Additional Protocol are expected to be driven in part by questions, including with regard to inconsistencies, which arise from the declarations, and in part by random checks. This is a fundamental shift from the mechanistic accounting for nuclear materials undertaken under the traditional approach.

'Complementary access' arrangements will greatly expand the scope of IAEA on-site activities. Article 5 of the Additional Protocol gives the Agency access to any place on a site, research facilities, firms and any location specified by the Agency to conduct location-specific environmental sampling. Inspectors will be able to 'look around' at declared sites and request access to any buildings on such sites in order to resolve questions arising from the IAEA's inconsistency analysis or to assure the absence of undeclared activities or material. They are also able to check the status of decommissioned sites and facilities. For complementary access to buildings at a declared site, inspectors are instructed to give two hours' advance notification (but in exceptional cases may demand

faster access). For access to other sites (declared or undeclared) 24 hours' advance notice is mandatory.¹³ If necessary, managed access provisions are to be applied. Access under the Additional Protocol will thus cover the middle ground between 'Special Inspections' and routine inspection under the traditional safeguards regime.

THE CURRENT STATE OF PLAY

The Record of States Parties

States are under no legal obligation to conclude Additional Protocols. However, when the negotiations on the Model Additional Protocol were finished, there was a general expectation that the majority of NPT states parties would sign or ratify them by the 2000 NPT Review Conference. Today, only 49 out of 187 NPT states parties have concluded a Protocol, and only nine of these have entered into force.

The low number of Additional Protocols that have entered into force is the most striking weakness in efforts to strengthen safeguards. With the exception of Japan, a Protocol has not entered into force for any state with substantial nuclear activities. The small number of signatories is also worrying. The record of some regions is especially bad: only two African countries (Ghana and Namibia) and only three Latin American countries (Ecuador, Peru and Uruguay) have signed. In the Middle East, Jordan is the only country to have signed and ratified a Protocol.

There are a number of reasons for the slow progress. First, negotiations on the Model Protocol took longer than expected. The two-year delay may have given the impression that the additional measures are less urgent than had been initially argued by the proponents of 'Programme 93+2'.

Second, states may not see an immediate benefit from signing a Protocol, beyond contributing generally to non-proliferation. Indeed, in the short-term, expanded declarations increase the burden on member states. Increased inspection activities are likely to take place immediately after a Protocol enters into force because the Agency will be eager to verify the new information it receives from the state party.

Third, national legislative processes are slow, causing a delay in the entry into force of Additional Protocols. Both expanded declarations and complementary access provisions may require approval of member states' parliaments, as may ratification. In the case of the EU, all non-nuclear EURATOM members have to ratify before the Protocol before can enter into force for them. While France and the United Kingdom are EURATOM members, they have separate safeguards

Strengthened Safeguards System: Additional Protocols (49 Approvals, 48 Signatories, 9 Contracting States)

	State	Board Approval	Date signed	In Force
1.	Armenia	23 Sept 1997	29 Sept 1997	
2.	Australia	23 Sept 1997	23 Sept 1997	12 Dec 1997
3.	Austria ¹	11 June 1998	22 Sept 1998	
4.	Belgium ¹	11 June 1998	22 Sept 1998	
5.	Bulgaria	14 Sept 1998	24 Sept 1998	
6.	Canada	11 June 1998	24 Sept 1998	
7.	China	25 Nov 1998	31 Dec 1998	
8.	Croatia	14 Sept 1998	22 Sept 1998	
9.	Cuba	20 Sept 1999	15 Oct 1999	
10.	Cyprus	25 Nov 1998	29 July 1999	
11.	Czech Republic	20 Sept 1999	28 Sept 1999	
12.	Denmark ¹	11 June 1998	22 Sept 1998	
13.	Ecuador	20 Sept 1999	1 Oct 1999	
14.	Estonia	21 March 2000		
15.	Finland ¹	11 June 1998	22 Sept 1998	
16.	France ¹	11 June 1998	22 Sept 1998	
17.	Georgia	23 Sept 1997	29 Sept 1997	
18.	Germany ¹	11 June 1998	22 Sept 1998	
19.	Ghana	11 June 1998	12 June 1998	provisional
20.	Greece ¹	11 June 1998	22 Sept 1998	
21.	Holy See	14 Sept 1998	24 Sept 1998	24 Sept 1998
22.	Hungary	25 Nov 1998	26 Nov 1998	1 April 2000
23.	Indonesia	20 Sept 1999	29 Sept 1999	29 Sept 1999
24.	Ireland ¹	11 June 1998	22 Sept 1998	
25.	Italy ¹	11 June 1998	22 Sept 1998	
26.	Japan	25 Nov 1998	4 Dec 1998	16 Dec 1999
27.	Jordan	18 March 1998	28 July 1998	28 July 1998
28.	Lithuania	1 Dec 1997	11 March 1998	
29.	Luxembourg ¹	11 June 1998	22 Sept 1998	
30.	Monaco	25 Nov 1998	30 Sept 1999	30 Sept 1999
31.	Namibia	21 March 2000	22 March 2000	
32.	Netherlands ¹	11 June 1998	22 Sept 1998	
33.	New Zealand	14 Sept 1998	24 Sept 1998	24 Sept 1998
34.	Norway	24 March 1999	29 Sept 1999	
35.	Peru	10 Dec 1999	22 March 2000	
36.	Philippines	23 Sept 1997	30 Sept 1997	
37.	Poland	23 Sept 1997	30 Sept 1997	
38.	Portugal ¹	11 June 1998	22 Sept 1998	
39.	Republic of Korea	24 March 1999	21 June 1999	
40.	Romania	9 June 1999	11 June 1999	
41.	Russia	31 March 2000	22 March 2000	
42.	Slovakia	14 Sept 1998	27 Sept 1999	
43.	Slovenia	25 Nov 1998	26 Nov 1998	
44.	Spain ¹	11 June 1998	22 Sept 1998	
45.	Sweden ¹	11 June 1998	22 Sept 1998	
46.	United Kingdom of Great Britain and Northern Ireland ¹	11 June 1998	22 Sept 1998	
47.	United States of America	11 June 1998	12 June 1998	
48.	Uruguay	23 Sept 1997	29 Sept 1997	
49.	Uzbekistan	14 Sept 1998	22 Sept 1998	21 Dec 1998
TOTALS		49	48	9

¹ All 15 EU States have concluded Additional Protocols with EURATOM and the Agency.

Sources: Private communication with the IAEA and www.iaea.org/worldatom/Programmes/Safeguards/sg_protocol.shtml. Information correct as of 15 April 2000.

¹² INFCIRC/540, Article 4(a).

¹³ INFCIRC/540, Article 4(b).

agreements with the Agency which could enter into force before the ratification of all other EU states.

Fourth, there is a lack of political pressure towards conclusion of Additional Protocols. In comparison with other nuclear arms control issues, safeguards range low on the political and public agendas. Safeguards are often perceived to have no immediate effect on nuclear disarmament. It is left to some states with an interest in universal adoption of the Protocol

to 'lead by example'. The IAEA is actively trying to persuade member states to conclude Additional Protocols in bilateral consultations and through regional agreements like Nuclear Weapon-Free Zones. There have also been repeated calls during meetings of the NPT Preparatory Committees for broader acceptance of strengthened safeguards measures.

Last, but not least, the poor historical record with regard to the fulfilment of Article III safeguards obligations has set a bad precedent for the Additional Protocol. Thirty-eight NPT states parties have not concluded any safeguards agreement with the IAEA. Fourteen states have negotiated such agreements but have not ratified them, thereby preventing their application. All of these states are in violation of their treaty obligations under Article III of the NPT. The fact that a quarter of all treaty parties neglect to fulfil a substantial part of their treaty obligations is unique in multilateral disarmament.¹⁴ Since some kind of safeguards agreement needs to be in place before an Additional Protocol can be concluded, this situation needs to be urgently addressed.

The challenge in the future will be to bring more Additional Protocols into force and to convince those states to sign that have so far shown no intention of doing so.

The Nuclear Weapon States

Because the NPT is discriminatory, so are nuclear safeguards. China, France, Russia, the United Kingdom and the United States are under no obligation to conclude safeguard agreements with the IAEA. As nuclear weapon states, they have the 'right' to keep their nuclear weapons complexes off-limits to international inspections. All NWS have concluded so-called 'voluntary offer agreements' with the IAEA which place some of their facilities under international safeguards. The United Kingdom and France have gone one step further: they are the only NWS that have

¹⁴ Many of these countries have little or no nuclear activities. The IAEA has developed a 'Small Quantity Protocol' (SQP) for these states which legally suspends the implementation of some verification requirements contained in INFCIRC/153.

put all non-military nuclear material under safeguards.¹⁵ But all NWS can withdraw nuclear materials from their civilian activities for military purposes.¹⁶

While NNWS are obliged to accept the Model Additional Protocol without substantial changes, NWS can depart from the Model when negotiating their Additional Protocols. All have done so. The United States' Protocol, for instance, excludes 'instances where its application would result in access by the Agency to

NPT States Parties That Have Not Concluded Safeguards Agreements With The IAEA

Andorra, Angola, Bahrain, Benin, Botswana, Burkina Faso, Burundi, Cape Verde, Central African Republic, Chad, Comoros, Congo, Djibouti, Eritrea, Guinea, Guinea-Bissau, Kenya, Liberia, Macedonia, Mali, Marshall Islands, Mauritania, Federated States of Micronesia, Mozambique, Niger, Republic of Palau, Qatar, Rwanda, Sao Tome and Principe, Saudi Arabia, Seychelles, Somalia, Tajikistan, Turkmenistan, Uganda, United Arab Emirates, Vanuatu and Republic of Yemen

NPT States Parties That Have Concluded Safeguards Agreements, Which Have Not Entered Into Force

Cambodia, Cameroon, Equatorial Guinea, Gabon, Georgia, Haiti, Kuwait, Kyrgyzstan, Laos, Oman, Moldova, Sierra Leone, Tanzania and Togo.

NB. Albania has a *sui generis* comprehensive safeguards agreement, while Colombia and Panama have comprehensive safeguards agreements pursuant to the 1967 Treaty of Tlatelolco.

Source: Annex 3, IAEA Annual Report 1998, Vienna, 1999 and private communication with the IAEA. All information correct as of 15 April 2000.

¹⁵ See Annette Schaper, 'The case for full-scope safeguards on nuclear material', *The Nonproliferation Review*, vol. 5, no. 2, Winter 1998.

¹⁶ Between May 1997 and the end of 1999 the UK, for example, gave 20 advance notifications of the withdrawal of small quantities of nuclear material from safeguards. The British government has also made clear that it does not intend to give up the right to withdraw nuclear material from safeguards. See House of Commons, Written Questions, 'Nuclear Materials (Safeguards)', 19 Jan. 2000, Column: 487W.

activities with direct national security significance to the United States or to location and information associated with such activities'. The US also maintains the right to use 'managed access in connection with activities with direct national security significance to the United States'.¹⁷ This exception severely limits the application of extended declarations and inspection rights.

The United Kingdom has not included such a broad lacuna in its Additional Protocol, but its version requires it to declare only such activities that are conducted 'for or in co-operation with, or otherwise relevant to, a non-nuclear weapon state'.¹⁸ This important restriction applies, *inter alia*, to all nuclear research and development activities, enrichment facilities and exports and imports of nuclear materials to and from non-EURATOM countries.

Some argue that implementing Additional Protocol measures in the nuclear weapon states has little or no value since they are mainly intended to detect clandestine activities, while the NWS are overt possessors of nuclear weapons under the NPT. But strengthening safeguards in NWS is not a waste of IAEA resources for several reasons. First, a regime where the NWS would be free of all safeguards would be perceived as unjust by many NNWS, especially those with large nuclear industries.

Second, NWS can be a source of proliferation. The Additional Protocol, which also affects the 'supply side' of the proliferation equation through its expanded declarations on exports and imports of nuclear materials and technologies, has an important role to play in NWS.¹⁹

Third, safeguards can 'lock in' some of the unilateral and bilateral transparency and disarmament measures that some NWS have taken with regard to their fissile materials. These measures are usually only politically binding, while safeguards agreements with the IAEA are legally binding. Agreements concerning withdrawal of material from weapons programmes should

¹⁷ Protocol Additional to the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America, GOV/1998/24, 14 May 1998, Article I (b), (c).

¹⁸ 'Protocol Additional to the Agreement between the United Kingdom of Great Britain and Northern Ireland, the European Atomic Energy Community and the International Atomic Energy Agency for the Application of Safeguards in the United Kingdom of Great Britain and Northern Ireland in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons', GOV/1998/30, Attachment.

¹⁹ This point is made by See Annette Schaper, 'The case for full-scope safeguards on nuclear material', *The Nonproliferation Review*, vol. 5, no. 2, Winter 1998.

therefore be covered by safeguard agreements and made irreversible.²⁰

Fourth, expanding the scope of safeguards in NWS can pave the way for the creation of a truly comprehensive and non-discriminatory verification system, for example in the context of a nuclear weapons convention. The creation of such a system is likely to be a long and incremental process. The more nuclear material and facilities put under safeguards now, the fewer questions are left to be resolved. By voluntarily accepting as many of the verification responsibilities contained in the Additional Protocol as possible, the NWS can send a signal that they accept their Article VI obligations to eliminate nuclear weapons.

The IAEA's Role in Implementing Additional Protocols

Given the small number of Protocols that have entered into force, the IAEA is under little pressure to quickly develop its new verification procedures to implement them. It has started to revise many aspects of its safeguards procedures.

A strengthened safeguards system will require the incorporation of new information into its analyses, the application of new verification technologies, changes in the conduct of inspections, and the integration of traditional and strengthened safeguards. Eventually, these different building blocks need to be harmonised and united in a single new safeguards system.

Probably the most important innovation of the safeguards system is the analysis of new sources of information to assist the Agency in making judgements on compliance. Such new information comes mainly from 'open sources'²¹ and new monitoring technologies. The information provided by a state in its declaration, collected during inspection activities and obtained through the analysis of open sources, will enable the Agency to ask wider questions about that state's nuclear programme. It will be thus more difficult for a treaty violator to maintain a secret nuclear weapons programme without inconsistencies appearing in the different kinds of information obtained by the Agency.

²⁰ For the relationship between IAEA safeguards and a future treaty on fissile materials see Thomas E. Shea, 'Reconciling IAEA Safeguards Requirements in a Treaty Banning the Production of Fissile Material for Use in Nuclear Weapons or other Nuclear Explosive Devices', *Disarmament Forum*, no. 2, 1999.

²¹ Open sources include human sources, published literature, 'grey' literature, electronic media, organisational contacts. See Hans Hermann Remagen and Bernd Richter, 'Implications for Research and Development in Safeguards Technologies', in Häckel and Stein, p. 123.

New Verification Techniques

Data from two new monitoring technologies—environmental sampling (ES) and satellite imagery—will be used to complete the picture. ES is a powerful surveillance tool because the leakage of fissile isotopes into the environment cannot be completely and reliably prevented in any nuclear weapons programme. Modern ES technologies can detect and identify isotopes in nanogramme quantities and particles as small as a micron.²² There are two kinds of environmental sampling: IAEA inspectors can take (swipe) samples at inspected facilities. Radionuclide stations can collect air-samples on a permanent or *ad hoc* basis, monitoring for the presence of isotopes that are indicative of non-civilian nuclear activities (this is known as wide-area environmental sampling). Wide-area sampling can detect the production of weapons-grade material at undeclared sites. While the Additional Protocol mentions the use of wide-area environmental monitoring, its implementation requires approval by the IAEA Board of Governors and the consent of the individual member state in which it is used.

The potential for verifying compliance with NPT obligations from space is better than in other weapons of mass destruction regimes because of the size of certain nuclear facilities and their characteristic features. Advances in satellite technology and decreasing costs of commercial satellite images strengthen the case for incorporating the use of satellite images into NPT verification.²³ The IAEA can use satellite imagery to verify site designs, observe the operational status of power plants and certain production facilities and detect structural changes at sites or facilities. Satellites provide an efficient means to monitor remote locations such as mines and can be used to detect and identify undeclared facilities.²⁴ Satellite imagery can also be useful in pinpointing the targets of on-site inspections, thereby making them more efficient.

²² US Congress, Office of Technology Assessment, 'Environmental Monitoring for Nuclear Safeguards', Washington D.C., 103rd Congress, September 1995, OTA-BP-ISS-168, pp. 5-6.

²³ An excellent summary on this trend and the impact on international security is given in Yahya A. Dehqabzada and Ann M. Florini, 'Secrets for Sale: How Commercial Satellite Imagery Will Change the World,' *Carnegie Endowment for International Peace Report*, Washington DC, Carnegie Endowment for International Peace, 2000.

²⁴ Bhupendra Jasani, 'Commercial Satellite Imagery and Safeguards: Some case studies using multi-spectral and radar data: An Executive Summary', King's College London, Department of War Studies, University of London, Aug. 1999, and Federal Republic of Germany Safeguards R&D Programmes, SRDP-R266/JOPAG/05.99-PRG-293/Task JNT D00988, p. 4

Complementary access provisions will change the way IAEA inspectors do their job. In the past, inspectors focused on accounting for declared material and applying containment and surveillance measures. In their new role, inspectors will become familiar with the entire nuclear programme of the country they are inspecting. They will have increased authority to request complementary access to a site that they inspect and to note inconsistencies. Finally, a whole new category of nuclear installations will be inspected, including front- and back-end sites, as well as research and development facilities. To implement this new approach the IAEA has instituted a (re-)training programme for IAEA inspectors. Courses include environmental sampling, enhanced observation, understanding the nuclear fuel cycles and their proliferation pathways, information evaluation, enhanced design of information review, and the electronic transmission of encrypted data.²⁵ With the first Additional Protocols being applied, the Agency has also begun to conduct trial inspections under new complementary access provisions.²⁶

Integrated Safeguards

The strengthening of nuclear safeguards will enable the IAEA to redirect verification resources towards those countries where questions about the completeness and correctness of declarations persist. 'Integrated Safeguards' aims to harmonise traditional and new safeguards by reducing the verification 'burden' on certain NNWS without affecting verification effectiveness.²⁷ To master this challenge, the Agency has started to develop a comprehensive approach on how to integrate traditional and new safeguards. A reduction of 'traditional' safeguards activities will also become inevitable because the Agency has to take on additional verification responsibilities under a 'zero growth' budget. The first hard test for the integration of safeguards is likely to be Japan, which ratified its Additional Protocol in December 1999.

There are three different fora looking at how new safeguards measures can be brought in line with the old system: several IAEA member states have volunteered to develop proposals on the integration of safeguards

²⁵ Pierre Goldschmidt, 'The IAEA Safeguards System Moves Into the 21st Century,' *Supplement to the IAEA Bulletin*, vol. 41, no. 4, Dec. 1999, p. 11.

²⁶ Complementary access has been requested on a trial basis in Uzbekistan and Australia.

²⁷ The IAEA defines 'integrated safeguards' as the 'optimum combination of all safeguards measures available to the Agency under comprehensive safeguards agreements and Additional Protocols which achieves the maximum effectiveness and efficiency within available resources ...', 'The Development of Integrated Safeguards: A report by the Director General,' GOV/INF/2000/4, International Atomic Energy Agency, Board of Governors, Vienna, 9 March 2000, p. 2.

for specific fuel-cycles and state-level approaches to verification. Second, a small group of experts, nominated by the IAEA Director-General is looking at the basic conditions that have to be fulfilled before safeguards can be integrated. Third, an inter-departmental working group is analysing integrated safeguards approaches for specific types of nuclear facilities.²⁸

When and how these different processes result in unified recommendations on 'integrated safeguards' remains to be seen. Among the questions to be resolved is a revision of the criteria for 'significant quantities' and 'timely detection', a redirection of inspection efforts to countries with high proliferation potential and developing a 'state centred' verification approach.

THE NPT AND STRENGTHENED SAFEGUARDS

The Principles & Objectives agreed by the 1995 NPT Review and Extension Conference laid out a five-year roadmap for the development of safeguards.²⁹ An evaluation on the eve of the 2000 Review Conference reveals limited, but important progress:

'The International Atomic Energy Agency is the competent authority responsible to verify and assure, in accordance with the statute of the Agency and the Agency's safeguards system, compliance with its safeguards agreements with States parties undertaken in fulfilment of their obligations under article III, paragraph 1, of the Treaty ... Nothing should be done to undermine the authority of the International Atomic Energy Agency in this regard.'

The May 1997 agreement on the strengthening of safeguards and the adoption of the Model Additional Protocol by the Board of Governors has been a big step forward in strengthening the authority of the IAEA. At the same time, the small number of signatures and ratifications of Additional Protocols is an indication that NPT states parties' support for strengthening the authority of the NPT varies widely.

'All States parties required by article III of the Treaty to sign and bring into force comprehensive safeguards agreements and which have not yet done so should do so without delay.'

Here, the record is mixed. Since 1995 an additional nineteen NPT states parties have brought comprehensive safeguard agreements into force. Four

²⁸ 'The Development of Integrated Safeguards: A report by the Director General,' GOV/INF/2000/4, pp. 6-7.

²⁹ The 1995 Principles and Objectives for Nuclear Non-Proliferation and Disarmament can be found at <http://www.un.org/Depts/dda/WMD/1995dec2.htm>

have negotiated such agreements which have not yet entered into force. However, a substantial number of NPT parties remain in breach of their treaty obligations.

'International Atomic Energy Agency safeguards should be regularly assessed and evaluated. Decisions adopted by its Board of Governors aimed at further strengthening the effectiveness of Agency safeguards should be supported and implemented and the Agency's capability to detect undeclared nuclear activities should be increased.'

A review of this paragraph's exhortations reveals a mixed picture: The process of assessing and evaluating safeguards has been partly completed. Whether the IAEA's Strengthened Safeguards System and further reforms will be successful, remains to be seen. Support of IAEA members for these efforts, except for the conclusion of Additional Protocols has been good so far.

'Also, States not party to the Treaty on the Non-Proliferation of Nuclear Weapons should be urged to enter into comprehensive safeguards agreements with the Agency.'

No progress has been made on this issue. On the contrary, India and Pakistan's nuclear tests have made it more unlikely that universality of the NPT (and the corresponding safeguard agreements) can be achieved in the near future. Bringing 'countries under suspicion'³⁰ into the strengthened safeguards regime will be one of the biggest challenges.

'Nuclear fissile material transferred from military use to peaceful nuclear activities should, as soon as practicable, be placed under Agency safeguards in the framework of the voluntary safeguards agreements in place with the nuclear-weapon States. Safeguards should be universally applied once the complete elimination of nuclear weapons has been achieved.'

Again, the record since 1995 reveals a mixed picture. Bilateral efforts of the United States and Russia to secure fissile material from weapons programmes have been making some progress. Both countries are also consulting with the IAEA in the context of the Trilateral Initiative to put some of these materials under international safeguards. However, no nuclear weapon state to date has ratified an Additional Protocol. Nuclear weapon states have extensively used their rights as nuclear weapon possessors to negotiate significant exemptions from the application of strengthened safeguards measures under their Additional Protocols.

³⁰ See Annette Schaper, 'Implementing Safeguards in Countries Under Suspicion,' in Häckel and Stein.

RECOMMENDATIONS

The 2000 NPT Review Conference should conduct a thorough review of efforts to strengthen safeguards and should:

- clearly identify states in continued breach of their treaty obligations by not concluding full-scope safeguards agreements with the IAEA
- express regret that the DPRK is still in breach of safeguards obligations and that Iraq has not complied with the relevant UN Security Council Resolutions by disclosing the full scope of its nuclear activities
- welcome the agreement in May 1997 on the Model Additional Protocol and its adoption by the IAEA Board of Governors
- express disappointment at the small number of signatures and ratifications of Additional Protocols
- welcome the progress made by the IAEA in implementing the Strengthened Safeguards System
- welcome the unilateral and bilateral steps towards increased transparency in fissile material holdings
- express regret that India, Israel and Pakistan have not accepted additional safeguards.

The Review Conference should, in establishing clear benchmarks for strengthened safeguards for the next Review Conference in 2005:

- repeat the urgent call on NPT states parties that have not concluded full-scope safeguards agreements to do so as soon as possible
- call on NPT states parties that have not concluded, signed and ratified Additional Protocols to do so as soon as possible, so that Additional Protocol measures are applied in all states parties no later than 2005
- call on the DPRK to live up to its safeguards obligations and Iraq to comply with relevant UN Security Council resolutions
- pledge to give the IAEA the necessary political, technical and financial support
- call on NWS that have not yet done so to irreversibly place all their civilian nuclear activities under international safeguards
- encourage Russia and the United States to reach an agreement with the IAEA on the Trilateral Initiative as soon as possible
- call on India, Israel and Pakistan to undertake to cease production of fissile materials for nuclear weapons purposes and place all their civil nuclear activities under IAEA safeguards.

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