Verification Matters: The IAEA's Programme '93+2' JANUARY 1997

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Introduction

In 1993, the International Atomic Energy Agency's (IAEA) Board of Governors[1] formally requested the IAEA's Standing Advisory Group on Safeguards (SAGSI) to make proposals to tighten the safeguards regime and to make it more efficient. The wish to have a plan of action by the Non-Proliferation Treaty (NPT) Review and Extension Conference in mid-1995 demonstrated international concerns about the continued credibility of the non-proliferation regime given the experiences of Iraq and North Korea. The time-scale was reflected in the working title "Programme 93+2" — two years beyond 1993.

Iraq and North Korea were both Non-Nuclear-Weapon States (NNWS) party to the NPT and thus signatories to INFCIRC/153-type model protocols that NNWSs commit to agreeing with the IAEA to verify that nuclear facilities are used for peaceful purposes only. Therefore, the scenario of an NPT member deliberately embarking on a clandestine programme to develop nuclear weapons was a reality with which the IAEA safeguards system had not been designed to cope.

Learning Curve: Iraq, North Korea and South Africa

The IAEA discovered, while conducting inspections under the auspices of the United Nations (UN) Security Council after the 1991 Gulf War, that Iraq had been pursuing multiple paths to develop nuclear weapons at one declared facility and many undeclared sites. These included electromagnetic isotope separation, gas centrifuges, lasers and chemical enrichment of uranium, plus laboratory-scale plutonium separation. If all had gone smoothly, combined with other research into nuclear weapons and missile systems, Iraq could have produced a nuclear weapon as early as Autumn 1993.[2] The IAEA had difficulty — even within a defeated country, under a cease-fire agreement and Chapter VII UN Security Council mandates — to ascertain the extent of Iraq's nuclear-weapon programme and dismantle it.

The IAEA also gained valuable experience while verifying that South Africa had dismantled its nuclear weapons and ceased nuclear-weapon-related activities, having signed the NPT as a NNWS. Working in a voluntary atmosphere of transparency, the IAEA sought and received appropriate information on a Member State's previous activities to verify an initial declaration.[3] Such experience has since been applied to the process of verifying the non-nuclear status of newly-independent States of the former Soviet Union.

North Korea had signed the NPT in 1985. However, it only brought into force its safeguards agreement with the IAEA in 1992 — about five years overdue — and

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[1] *Made up of 32 member states — some with the largest nuclear power capacities and others on an annual regional rotation basis. Decisions have historically been made by consensus.*

[2] *Leonard S. Spector, Mark G. McDonough, with Evan S. Medeiros, "Tracking Nuclear Proliferation", Carnegie Endowment for International Peace, 1995, p.125.*

[3] *The IAEA has since been conducting a similar process in the newly independent States of the former Soviet Union that had nuclear weapons on their territory.*

submitted an initial declaration of, so it said, all its nuclear material and facilities.[4] When IAEA inspections began to verify the initial declaration, evidence swiftly materialised to suggest that all might not be in order. Two verification tools, High Performance Trace Analysis (HPTA) and National Technical Means (NTM) indicated possible inconsistencies with the initial declaration. HPTA results of swipes taken from glove boxes at the so-called 'radiochemical laboratory' pointed to North Korea having reprocessed more fuel than it had declared. Furthermore, US satellite pictures indicated an unlisted facility of the type customarily used for storing nuclear waste, of which a lower storey was subsequently concealed. This led to IAEA requests for further ad hoc inspections in order to verify North Korea's initial declaration and finally to the IAEA asking for a special inspection to be conducted[5]. Access needed to clarify the situation, however, was refused, tensions ran high and the IAEA had no option but to declare North Korea to be in non-compliance with its safeguards agreement.

Non-compliance or detection of clandestine activity is an issue that the IAEA must report to the UN Security Council. However, the contrast between North Korea and Iraq demonstrated that the earlier problems are indicated, the greater the diplomatic options available to the international community. The October 1994 US–North Korea Agreed Framework and the Korean Energy and Development Organization (KEDO), established in 1995 to implement the deal by supplying light-water reactors, may have taken time to negotiate and may not be following the smoothest of paths, but the situation is far less acute and confrontational than with Iraq. Moreover, where no other meaningful forum for dialogue with North Korea currently exists, it fills an important vacuum.

Both cases highlighted the need to develop the IAEA's tools to detect non-compliance and the contribution that information from Member States can make, including NTM. Furthermore, in both cases, at least some undeclared activity occurred at, or near to, declared nuclear sites. While care must be taken not to rule out other nuclear-weapon routes, these cases have furthered understanding about proliferation risks.

Complete as well as Correct

Current safeguards focus on verifying non-diversion of nuclear material at declared facilities. Every NPT NNWS is required to declare and accept safeguards on all its nuclear material (other than ore or concentrates, since they cannot be used directly in a reactor, or directly enriched) and at all locations where the nuclear material is present, and the IAEA is required to apply safeguards on all nuclear material in the NNWSs. This is not entirely nuclear material accountancy because tools used include, for example, cameras and inspections which could aid detection of covert activity. However, further tools and a revised focus were clearly needed to detect undeclared nuclear activity — to provide assurance that Member States' declarations were, and remained, complete and not just that nuclear material counts were correct within the framework presented to the IAEA.

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[4] *Article III.4 of the NPT commits parties joining the Treaty after its entry-into-force to enter into immediate negotiation with the IAEA and states that "[s]uch agreements shall enter into force not later than 18 months after the date of initiation of negotiations."*

[5] *See footnote 30 for explanation of special inspections.*

Measures proposed by the IAEA under '93+2' were intended to increase assurance among parties that any undeclared facility or diversion of nuclear material is detected, reduce costs, enhance co-operation with State and regional Systems of Accounting and Control (SSAC), make better use of information, or enhance the capabilities of IAEA inspectors, safeguards staff and SSAC to implement '93+2'.[6]

The 1995 NPT Review and Extension Conference's agreed "Principles and Objectives for Nuclear Non-Proliferation and Disarmament" confirmed that:

> 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.[7]

Although by then the "general direction" of '93+2' had been endorsed by the Board, the Programme's proposals had provoked political, economic, legal and technical debate. Importantly, although the details had yet to be drawn up, the Board of Governors had already noted in March 1995 that authority for certain measures to strengthen and improve safeguards was not contained within the original full-scope safeguards agreements and that it must be obtained in the form of an additional protocol from Member States. The Programme was thus split into two parts.[8] This move was regretted by States which strongly favoured its early and undiminished implementation, and which had hoped that the whole package of proposals could be acceptable within the existing INFCIRC/153-type framework, supported by original NPT commitments.

In June 1995, the Board of Governors agreed that Part I measures be implemented. Part I clarifies, consolidates and develops the IAEA's authority contained within the existing full-scope safeguards agreements between it and States or groups of States, such as the European Atomic Energy Agency (EURATOM), that have joined the NPT or regional treaties that require such agreements. Their parameters remain essentially nuclear material oriented, focusing on the diversion and movement of a "significant quantity",[9] although it is also designed both to economise on personnel time and enhance the detection of unreported activities. The Secretariat proposals under consideration that fell into Part II are largely those that depart more significantly from traditional nuclear material accountancy at declared locations, by establishing a bigger picture of Member States' nuclear-related activities between, as well as within, States and enhancing the IAEA's ability to detect undeclared activity via greater access for inspectors.

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[6] *Richard Hooper, "Strengthening IAEA Safeguards in an Era of Nuclear Cooperation", Arms Control Today, November 1995, p. 15.*

[7] *Rebecca Johnson, "Indefinite Extension of the Non-Proliferation Treaty: Risks and Reckonings", ACRONYM No.7, September 1995, p.72.*

[8] *For a breakdown of measures under Part I and II of Programme 93+2 see David Fischer, "1989–95: Radical Changes in IAEA Safeguards", in Poole and Guthrie, (eds.) "Verification 1996", VERTIC/Westview 1996, p.70.*

[9] *The NPT and the regional treaties prohibit <u>any</u> diversion of nuclear material. However, the IAEA sets itself the goal of being able to detect, with a reasonable degree of assurance, at least the diversion of a "significant quantity" — 8 kg of plutonium or 25 kg of highly-enriched uranium — though detection is possible at lower levels. This was estimated in 1977–8 as roughly the amount of nuclear material a beginner State would need for its first nuclear device. These values have been an area of debate as today they appear high. The issue has not been addressed directly in '93+2' and critics could point to a possibility of diverting small amounts over a long period and eventually amassing enough fissile material for a nuclear weapon. Others, however, note that no State with proliferation ambitions has been known thus far to have taken this route, and that it would be time-consuming and would risk detection.*

The Safeguards Committee

After discussions and revisions of a draft paper on Part II in December 1995 and a rough first sketch of measures proposed in March 1996, the IAEA Board of Governors met again on 10–14 June 1996 to considered a draft model of the additional protocol of Part II measures. Despite the draft Protocol having been written with many sensitivities already incorporated, as the Secretariat tabled it, objections to the degree of intrusiveness proposed became stark:-

> "The Board acknowledged that additional information, including the taking of environmental samples and increased physical access would strengthen the Agency's ability to detect undeclared nuclear material and activities. *It emphasised that the new measures should strike a balance between the Agency's need for information and access on the one hand and the State's need to protect its legitimate interests and to respect its constitutional obligations on the other.*"[10]

It was decided that a special Safeguards Committee be established to consider the outstanding political differences and the legal terminology of the Secretariat's proposals for enhanced safeguards that would require additional authority.[11] A similar Committee was established when the original model INFCIRC/153 agreement was negotiated. That this was 25 years ago also demonstrates that full-scope safeguards are indeed due for an update. The Committee is open to all IAEA Member-States, plus those that have concluded, or are legally obliged to conclude, an agreement with the IAEA.[12] It was presided over during most of 1996 by Board Chair Ambassador Johan van Ebbenhorst Tengbergen of the Netherlands. New Board Chair, Ambassador Peter Walker of Canada, has taken over this position. It is adopting a consensus approach. The IAEA Secretariat's corner can now be defended only in a supporting role as secretariat of the Committee, providing technical and legal guidance as necessary. To this end, the Director General, Hans Blix, maintains a permanent presence at these meetings.

The first of these Safeguards Committees, from 2–4 July, was attended by delegates from 65 IAEA Member States, with EURATOM and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) as observers. However, with the multi-faceted issue of universality — of how to address differentiation in safeguards commitments among States — pervading most debates and divisions remaining, it was agreed that informal discussions should take place among countries.[13] Such informality could enable the IAEA to hold close discussions with Member States to explain their proposals: they are, after all, the ones in the spotlight when safeguards are seen to be inadequate.

The issue of universality is the greatest hurdle to the Programme's objectives. Although '93+2' was specifically designed to provide increased assurance against horizontal proliferation in States which have agreed not to possess nuclear weapons, some NNWSs argue that divisions between nuclear 'haves' and 'have-nots' are exacerbated by the Programme. Some NNWSs have shown reluctance to the idea that they should provide

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10 *IAEA Press Release, PR/10, 14 June 1996, italics added.*

11 *During negotiations of the original safeguards agreement, Germany raised similar concerns about the degree of intrusiveness of inspections.*

12 *Thus, North Korea may also participate.*

13 *Gamini Seneviratne, NuclearFuel, 15 July 1996, p.15.*

more detailed information on nuclear-related activities and accept more intrusive inspections, holding that this will create burdens of time and money, and could compromise industrial secrets that would effect their commercial competitiveness, particularly in relation to Western NWSs. How, and how far, NWSs can be simultaneously brought into the process, however, remains to be seen.

The October Board Meeting heard progress of the Committee's work. The outcome was to be reported at December's meeting.[14] However, with a second sitting of the Safeguards Committee, which ended on 11 October, still inconclusive, another such Committee session will take place from 20–31 January 1997.

This paper will describe both Part I and Part II measures, and progress towards implementation of Part I. It will discuss in more detail measures under consideration in Part II, including bargains that have already been struck. Its central focus, however, is the assessment of remaining political, technical and legal issues and the prospects for retaining an effective additional protocol at this juncture. The hesitations by States in the light of burdens that they would be required to undertake are viewed in the light of the core reasons why Programme '93+2' was initiated — the crises regarding Iraq and North Korea, and the credibility of the NPT.

[14] *IAEA Press Release, PR/10, 14 June 1996.*

The Expanded Declaration

Part I

States with full-scope safeguards agreements are now required to submit an Expanded Declaration providing more thorough information of SSACs and relevant past nuclear activities, such as decommissioned nuclear facilities and historical records on nuclear material production. Additionally, more thorough design information (and its early provision), modifications, accounting and operating records, and operational programmes must be submitted. Nuclear fuel cycle (and related) research and development (R&D) that involves nuclear material, and finally, other activities involving nuclear material, must be detailed.

Part II

For the Expanded Declaration proposed under Part II, the operator at a nuclear site would provide information about all buildings on sites of facilities if requested, plus any relevant additional operational data. Part II also proposes that, wherever possible, information on activities beyond sites should be supplied.[15]

Other additional information would be provided by governments. Pre-fuel cycle, or small amounts outside safeguards, of uranium, thorium and other nuclear material[16] would be detailed, as would information on current and potential production capacity of uranium and thorium mines.

It is also proposed that information on all nuclear fuel cycle R&D — including conversion, fuel fabrication, power or research reactors, critical assemblies or accelerators, and information on planned future developments — would be provided. Information would also be supplied on nuclear R&D activities relating to enrichment, reprocessing and treatment of waste that contains nuclear material, and plans for further developments. Fuel-cycle R&D is proving a sensitive area but it is particularly relevant because all nuclear-weapon programmes begin at this point.

As part of the bigger picture, it is proposed that Member States would agree to submit information on the manufacture, assembly and maintenance of specified items relevant to the operation of nuclear facilities, and to other nuclear-related locations and R&D (including approximate annual production capacity of such items). Import and export information on such specified equipment and non-nuclear material would also be submitted. Again placing '93+2' in an evolutionary context, in February 1993, a voluntary 'universal reporting system', proposed by the European Union (EU), was established for reporting on the export, import and production of nuclear material, specified equipment and non-nuclear materials (such as heavy water) commonly used in the nuclear industry.[17]

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15 *In a few cases, additional access to other buildings at a location may already be granted, depending upon the configuration.*

16 *INFCIRC/153, paragraphs 36–38.*

17 *The list of items prepared by the IAEA Secretariat was reportedly subject to change. PPNN "Newsbrief", First Quarter 1993, p.6.*

An important debate here has been just how binding these reporting commitments would be under Part II. Some governments, for instance, have expressed concern about the ability to provide the IAEA with information about private research and dual-use specified technology that does not involve nuclear materials. However, as with other reservations about the Programme, the question must be asked: If we do not sanction the best effort to supply information about this, could it become a loophole for States trying to conceal clandestine activity? A second objection is that commerce in dual-use technology could be curtailed by reporting requirements.[18]

A third concern was that support could not be given for Part II's direction while it remained unclear just what information would be required and how detailed it would need to be.[19] Criticism has been levelled at those IAEA involved in forging '93+2' proposals for not moving earlier to address these concerns, as well as those about inspection burdens with governments and industry in key Asian and European countries. However, the IAEA has demonstrated flexibility and willingness to respond to such concerns and discuss ways in which Part II be implemented in the simplest way while not forgoing the fundamental objectives of the Programme. For instance, after States became perturbed at what were perceived to be requirements for detailed numbers of specified equipment manufactured, imported or exported, the IAEA clarified that only approximations, rather than precise figures, were needed. More generally, the IAEA may have been taken aback by the extent of opposition to their proposals.

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[18] *South Korea was reported to have expressed such concerns. See Mark Hibbs, "ROK Belatedly Weighs In on 93+2 Safeguards Terms", in "NuclearFuel", 2 December 1996, p.7.*

[19] *Reporter discussion, "Arms Control Reporter 1996" 602.B.300.*

Improving Information Analysis

To optimise safeguards-relevant information, the IAEA is improving its information analysis methods. Sources of information include that provided in Expanded Declarations, noted by inspectors, available from open-source material, from other States and from environmental monitoring. If States agree and commit to effective Part II measures, the more comprehensive Expanded Declaration's information, including imports, exports and fuel cycles will give the IAEA a better opportunity to spot inconsistencies. This variety of information will enhance the IAEA's ability to detect undeclared activity by moving beyond a State's internal consistency to cross-check with other States' information.

The utility of additional information is exemplified in the case of Iraq and North Korea. Although Iraq's 'closed' society enabled it to keep its clandestine nuclear-weapon programme secret for a significant period of time, it still eventually had to shop abroad for various technologies, demonstrating the usefulness of information on exports.

Under development are computerised information systems to process the increased amount of information flowing into the IAEA and programmes to model known proliferation paths. These will take time to develop and will involve financial outlays for sophisticated and secure databases, plus expertise to set them up, and then collect and analyse data. As Patricia Lewis points out, however, while they are necessary and useful:

> There could be a drawback to relying on such a [proliferation path] model, however. If the analysis turns out to be incomplete (as all analyses are), and if it is relied upon too heavily, the IAEA and the international community could be lulled into a false sense of security — believing that all is known and all is understood, thereby missing crucial information.[20]

Thus, additional information and enhanced information analysis should not be regarded as a pure substitute for other verification tools, particularly inspections.

Third-Party Information

In 1992, the Board acknowledged that the IAEA can use all available sources of information, including that provided by States,[21] thus again demonstrating the evolutionary aspect to '93+2'. The IAEA is now routinely receiving NTM and other intelligence information from the US and several other countries.[22] This clarification was prompted amid protestations by North Korea over the use of US satellite pictures. Previously, inspectors in Iraq had also utilised intelligence gathered by NTM.

Some States, however, continue to question the legitimacy of this and other forms of third-party information (that could be unreliable, biased or mischievous) which might

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[20] *Patricia M. Lewis, "Strengthening Safeguards", Verification Matters Briefing Paper 95/2, VERTIC, March 1995, p.4.*

[21] *Bruno Pellaud, "The Future of the IAEA's Safeguards System", in "Uranium and Nuclear Energy: 1994: Proceedings of the Nineteenth International Symposium held by the Uranium Institute", London 7-9 September 1994, p.110.*

[22] *Letter of 25 November 1995 from Marvin Peterson, Senior Science Attaché, US Mission to IAEA, on MIIS-INTERNET, in David Fischer, "1989–95: Radical Changes in IAEA Safeguards", in Poole and Guthrie, (eds.) "Verification 1996", VERTIC/Westview 1996, footnote 8, p.76.*

be used to prompt a special inspection. The counter-argument, however, is that the more States that contribute information, the less dependent the IAEA is upon information by only a few countries or from perhaps inaccurate media reports. In the case of information from satellites, were an inaccurate interpretation of data or misleading information to be given to the IAEA, other countries could contradict with their own data, or with ever-improving commercial satellite pictures which the IAEA may in the future make use of.[23]

China and Pakistan had reservations about the use of third-party information during the Comprehensive Test Ban (CTB) negotiations and might be taking a similar position regarding '93+2'.[24] It might now be a good time to build on CTB discussions between the US and China on the use of intelligence — formerly the domain of bilateral US-Soviet understandings during the Cold War. Utilisation of information gathered in the course of implementing other treaties might also be considered.[25]

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[23] *See Bhupendra Jasani et al, "The Role of Satellite and Remote Data Transmission in a Future Safeguards Regime", Proceedings of the IAEA Symposium on International Safeguards, 14–18 March 1994, 1994 Vienna, p.411–418, and Jasani et al "Civil Remote Sensing Satellites and IAEA Safeguards", 17th Annual Symposium of Safeguards and Nuclear Material Management, Proceedings of ISARDA Conference, Aachen, 9–11 May 1995, p.89–94.*

[24] *In the finalised CTBT text, the issue of the use of human intelligence (HUMINT) was left open to interpretation. Conversation with Rebecca Johnson of Disarmament Intelligence Review.*

[25] *Care would be necessary to ensure that such cross-referencing was agreeable by Parties to all treaties concerned, otherwise it could harm other treaties. However, in certain circumstances, it may be more acceptable than intelligence. One suggested example is information collected under the Open Skies Treaty (Europe), see R.J.S. Harry, "IAEA Safeguards and Detection of Undeclared Nuclear Activities", Netherlands Energy Research Foundation (ECN), March 1996, p.19.*

Inspections

Part I

Complementary access for inspectors has now been clarified under Part I to sites of nuclear facilities beyond 'strategic points' when necessary for nuclear material accountancy, to verify design information, the initial report and changes to it, plus to other locations necessary for material accountancy verification or to check containment and surveillance measures.

IAEA inspectors may carry out no-notice inspections (unannounced) at 'strategic points' at nuclear facilities and at other sites where nuclear materials are located. Provision is made for a number of routine inspections to be no-notice in INFCIRC/153, Article 84. The potential utility of irregularly-timed no-notice inspections is exemplified in the case of Iraq:

> The sixth-month time frame [of Iraq's crash nuclear-weapon programme] apparently coincided with the time of the next scheduled IAEA inspection, when the diversion would have been discovered.[26]

Yet the authority of the IAEA to do so was not well exercised prior to the implementation of Part I.

The shape and formalised procedures for no-notice inspections have been developed with the aid of voluntary field trials conducted in Sweden and Japan, among others. Inspectors have arrived at site gates without prior notice and have been provided access within two hours, when they are joined by a counterpart — probably from that facility. Inspectors can see if noticeable activity is occurring prior to their entry. They then examine the areas agreed to be relevant to nuclear material safeguards. No-notice inspections are already being conducted at centrifuge enrichment plants.[27]

Part II

It has been proposed under Part II that States would commit to inspections — including no-notice inspections — anywhere on the site of a nuclear facility (not merely at strategic points) or at other locations relevant to material accountancy during a routine inspection. Previously, this kind of access had been limited to ad hoc inspections, which verify a State's initial declaration or changes to it. Once these inspections had been conducted and the safeguards plan (or 'facility attachment'), which identifies 'strategic' or 'key measurement' points, had been agreed between the IAEA, the NNWS and the Operator, if the IAEA wished to go beyond these points it would have, in theory, to request a special inspection.

For example, under Part II, during a routine inspection of strategic points at a site, an inspector could ask questions perhaps about the function of another building at the site, and if s/he wishes, put on a Part II hat (metaphorically speaking), request complementary access to that building and have a look at it. The idea is that giving

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26 *Richard Hooper, "Strengthening IAEA Safeguards in an Era of Nuclear Cooperation", Arms Control Today, November 1995, p. 15.*

27 *R.J.S. Harry, "IAEA Safeguards and Detection of Undeclared Nuclear Activities", Netherlands Energy Research Foundation (ECN), March 1996, p.13.*

inspectors the early ability to be satisfied that no clandestine or ambiguous activity is occurring will save time and money, limit the possibilities of false suspicions raising political tensions, and create earlier opportunities to address the issue if inspectors are dissatisfied.

Part II proposes complementary access for IAEA inspectors to closed-down and decommissioned facilities, and to places where a small quantity[28] of nuclear material exempted from safeguards, or material (such as uranium concentrates) that has not reached the stage when safeguards measures would traditionally be applied, is located. Such access to other locations that the State identifies as relevant is also proposed.

Complementary access for visual inspection and environmental sampling at locations of nuclear-related R&D and nuclear-related specified items declared in the Expanded Declaration is also sought under Part II. Additionally, access is sought anywhere on a State's territory for environmental sampling.

Inspector Training and Practice

The IAEA is large, bound by tight procedures and has been functioning in a similar way for a long time. Its inspectors will need to develop and practice skills beyond the accounting for nuclear materials which they have been more accustomed to, in order to make best use of no-notice and complementary access inspections. Training programmes are taking place to improve observational, visual and memory skills, understanding of different reactor models, and generally sharpen awareness of possible signs of nuclear-weapon-related activity.

The objective is to promote greater inquisitiveness among inspectors and give them the authority to satisfy their queries. This should be welcome among inspectors, although it is to some extent a departure from traditional roles. They may also be apprehensive that the relationship developed between inspector and personnel involved with the facilities s/he is assigned to may be damaged if they raise questions or request access to other buildings. Therefore, it is particularly important that questions and requests for additional access are expected by personnel and routinely asked. Furthermore, all personnel involved at inspected locations need to be well informed about the adaptation of the inspection regime under '93+2' so that they do not feel singled out or under suspicion.

Some debate exists about the best kind of inspectors for spotting ambiguities. On the one hand, IAEA inspectors with experience of a particular facility are well-placed to spot changes or unusual activity. On the other hand, IAEA inspectors with a fresh eye and unexpected questions, or with specialist areas, could be useful. Thus, a combination of the two would be most practical. That the IAEA's 200 field inspectors[29] are currently very stretched due to budget limitations makes such flexibility more difficult.

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[28] *Gram quantities or less (INFCIRC/153, para. 36) which can be requested by operators to be exempted.*

[29] *David Fischer, "1989–95: Radical Changes in IAEA Safeguards", in Poole and Guthrie, (eds.) "Verification 1996", VERTIC/Westview 1996, p.68.*

Complementary Access: Compromise, Concession and Continued Concern

Increased use of no-notice and complementary inspections aims to expand the IAEA's options to address doubts or inconsistencies at an earlier time, and in an atmosphere that builds confidence and is not politically charged. Complementary access under Part II, particularly, aims to achieve middle ground between a show-down with the request of a special inspection and a routine material accountancy inspection, whereby inspectors can be more active and inquisitive. In practice, at certain more sensitive plants, such as for reprocessing and fuel fabrication, additional access has in the past been agreed informally with the operator. On occasion, complementary access will also give inspectors the opportunity to visit nuclear-related locations identified in the expanded declaration.

None of these measures would affect the existing provision for special inspections, already contained within INFCIRC/153. The Board of Governors confirmed the right to conduct such inspections in 1992.[30] However, given the confrontational atmosphere after a special inspection was called in North Korea, this unusual measure may now be regarded more of a signal, if refused, that the IAEA has exhausted its options. It is then a matter for the UN Security Council.

There has been reluctance to commit to what will initially be a more burdensome process for fully safeguarded States with large nuclear industries. Many private operators of nuclear facilities in Germany have opposed Part II proposals, holding that they would require much additional effort, could interfere with facility operation and would require a considerable increase in personnel time.[31] John Ritch, US Ambassador to the IAEA, who supported the adoption of Part II as it stood in June, did acknowledge that Germany and Japan would incur the greatest burdens initially but countered that "the enormous benefits to global security from deterring, or at least detecting, a future Saddam Hussein overwhelm the modest burdens involved."[32]

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30 *Bruno Pellaud, "The Future of the IAEA's Safeguards System", Proceedings of the Nineteenth International Symposium held by the Uranium Institute, London, 7-9 September 1994, p.110. Analysts have occasionally questioned the right to conduct such inspections if not agreed to by the State. See, for example, Terry Taylor, "Escaping the Prison of the Past: Rethinking Arms Control and Non-Proliferation Measures", Center for International Security and Arms Control, Stanford University, April 1996, p.11 and Steve Fetter, "Verifying Nuclear Disarmament", Occasional Paper No.29, October 1996, Henry L. Stimson Centre, p.30. During negotiation of INFCIRC/153, Germany's reluctance to commit to more intrusive inspections may have led to a softening of the text. INFCIRC/153, para. 73, states that a special inspection may be conducted "[i]f the Agency considers that information made available by the State, including explanations from the State and information obtained from routine inspections, is not adequate for the Agency to fulfil its responsibilities under the Agreement." Access is dependent upon consultations between State and Agency, and the latter "...may obtain access in agreement with the State to information or locations." (para.77). Importantly, however, this paragraph ends with "...in case action by the State is essential and urgent, paragraph 18 above shall apply", and this states that "...if the Board, upon report of the Director General decides that an action by the State is essential and urgent in order to ensure that verification of nuclear material ... is not diverted to nuclear weapons or other nuclear explosive devices the Board shall be able to call upon the State to take the required action without delay, irrespective of whether procedures for the settlement of a dispute have been invoked."*

31 *Information Paper, June 1996, representing concerns by German nuclear utilities and industry, referred to in Bruno Pellaud, "The Strengthening of Safeguards and the Nuclear Industry", paper presented at the Uranium Institute, 4 September 1996, p.2–3.*

32 *William Drodziak in "The Washington Post", 10 June 1996, Raymond Bonner in "New York Times", 4 June 1996, Nihon Keizai Shimbun, 18 June 1996, all in "Arms Control Reporter 1996", 602.B.299.*

Complementary access where no nuclear material is declared to be located is a particularly sensitive issue. These include locations declared by NNWSs under Part II where fuel-cycle-related R&D is conducted (including universities or private/commercial laboratories), areas where listed nuclear-related equipment is being produced or maintained, and anywhere on a State's territory for environmental sampling. The more limited the IAEA's scope to conduct complementary access inspections, the more valuable a solid commitment to "anywhere" sampling becomes. Yet this may also be controversial. Germany, Belgium, Japan, and more recently South Korea, have objections about inspections of R&D locations, and other areas with no nuclear material.[33] Germany and Belgium, for example, have expressed concerns that commercially-sensitive information could be misappropriated.[34]

In response to these concerns, the IAEA has clarified that:-

> For the locations under additional access, the IAEA will not use cameras and seals as for nuclear materials; its inspectors will walk around for visual observation and, when appropriate, they will take an environmental sample... [Also, it] will not systematically verify *on site* the additional information received, it will simply assess in its offices and on occasion ask questions to check the plausibility and consistency of such information.[35]

Managed access, including shrouding of commercially-sensitive technology, can also be applied. Such inspections are unlikely to be very intrusive, time-consuming or frequent. In practice, budget constraints will limit the amount of inspection time the IAEA is able to spend checking information provided in expanded declarations.

Germany and Japan have also held that such inspections would contravene domestic legislation and constitutional obligations relating to searches of private property. A German representative commented, for instance, that under Part II proposals IAEA inspectors would have more legal rights to search property than a German police officer. Japan's Ministry of Foreign Affairs had stated that "...it will be difficult to agree to the plan for tightening inspections when viewed from the standpoint of domestic laws" and had linked its participation to the precondition that such private research institutes were excluded from inspections.[36]

Many of these bridges have already been crossed in the Chemical Weapons Convention (CWC), which will enter into force on 29 April 1997. In the agreed treaty text, challenge inspections can be conducted anywhere, including at nuclear-related R&D locations.[37] Ways to protect commercially sensitive information were established

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[33] *Mark Hibbs, "EURATOM Governments, Industry Aren't Buying IAEA's 93+2 Plan", in "NuclearFuel" 26 February 1996, p.12 and "ROK Belatedly Weighs in on 93+2 Safeguards Terms", in "NuclearFuel" 2 December 1996, p.7.*

[34] *"Arms Control Reporter 1996", 602.B.295.*

[35] *Bruno Pellaud, "The Strengthening of Safeguards and the Nuclear Industry", paper presented at the Uranium Institute, 4 September 1996, p.2.*

[36] *William Drodziak in "The Washington Post", 10 June 1996, Raymond Bonner in "New York Times", 4 June 1996, "Nihon Keizai Shimbun", 18 June 1996, all in "Arms Control Reporter 1996", 602.B.299.*

[37] *See Richard Guthrie, "The Chemical Weapons Convention: a Guide", in Poole and Guthrie (eds.) "Verification 1993", p.30. Under the CWC, inspections are initiated by States Parties, rather than by a an international secretariat.. See David Fischer, op. cit., p.74. Some debate exists as to whether States are more comfortable with intrusive or challenge inspections conducted by an organisation or by parties themselves (as with the CWC). See Terry Taylor, "Escaping the Prison of the Past: Rethinking Arms Control and Non-Proliferation Measures", Center for International Security and Arms Control, Stanford University, April 1996, p.27.*

Indeed Germany has been at the forefront in advocating and defending the intrusive verification process laid down in the CWC, while other states, perhaps uneasy of the commitments they have made in negotiating the treaty text, attempted to back-pedal as verification details are worked out. Germany ratified the CWC in 1994 and Japan in 1995. Therefore, they must already have considered constitutional implications and made any necessary legal adjustments, as other countries also appear willing to do for '93+2'. It is also hard to imagine that auditors, health and safety inspectors, and customs and excise personnel are not granted intrusive spot-check powers. Therefore it would appear that satisfactory ways around these problems can be found without diminishing the objective of complementary access.

Objections over the issues of confidentiality, constitutional obligations and intrusiveness led to compromises in the June draft Protocol. For example, inspection of buildings in the immediate vicinity of nuclear facilities had originally been proposed under Part II. However, Germany objected to this on the grounds that such inspections of private property without permission would normally require a search warrant. Thus, this proposal was dropped prior to the draft protocol's consideration in June 1996.[38]

Compromises have since been sought for complementary access particularly relating to R&D locations and nuclear-related technology. One proposal has been that such inspections would be subject to a State's constitutional obligations that preserve the sanctity of private and individual property, and they would be only be upon request by the IAEA, with 24 hours notice. That these inspections would not be no-notice are thought not to impact greatly upon detection, as the emphasis is likely to be upon taking environmental samples, which are not so time-sensitive.

The scope of inspections may have slipped more significantly from their original objectives in the Safeguards Committee negotiations. A more recent compromise proposal, for example, suggests that the IAEA make a written request for *all* complementary access inspections. If this were to happen, it would also impact upon, for example, access to other buildings at a nuclear facility and to radioactive waste. With another compromise proposal, the IAEA would need a reason for inspections where nuclear R&D and specified nuclear-related technology are located. These two proposals could impair implementation and open the way to delays, bureaucratic foot-dragging and wrangling over how justified the IAEA's request for access is. In a more recent step backwards, it has been proposed that the IAEA will have to give a reason for inspecting *all* complementary access locations. Furthermore, at R&D locations and for listed nuclear-related technology, specific doubts or inconsistencies would have to be spelled out prior to access.

Yet the many reasons for complementary access have already been given. For one thing, the IAEA wishes not to be seen to be singling out particular States. Using a domestic analogy, even captains of industry and leading politicians go through customs along with everybody else. This is a further dimension to the universality issue, in that all States obliged by Treaty to accept full-scope safeguards must be seen to accept and receive the same treatment. Complementary access seeks to generate a norm whereby all States with full-scope safeguards are subject to these kinds of inspections. Giving no specific reason for an inspection is not a new concept. For example, no justification is

[38] *Reporter Discussion with David Fischer, 13 May 96, in "Arms Control Reporter 1996", 602.B.295. Reporter discussion with IAEA official, 30 July 1996, in "Arms Control Reporter 1996", 602.B.300.*

needed for inspections under the Conventional Forces in Europe Treaty (CFE). Seeking prior justification defeats the object, making them akin to special inspections, which the IAEA already has the authority to carry out but which create tension and raise the political stakes.

Though other States share these concerns, reservations by Germany and Japan to complementary access — strongest where no nuclear material is declared to be located — have a particular impact because they are leading economic powers, have large nuclear industries, are major players in arms control and disarmament, and are leading examples of States that have not developed nuclear weapons as a means of exerting power. Reservations by some EU countries — among them Germany, Belgium and Spain — about Part II,[39] makes EU policy-making difficult and effects EURATOM's relationship with the IAEA. As David Fischer wrote at the end of 1995:

> It is crucial that the EU should take the lead in accepting the more effective safeguards that will result from '93+2' as the EU did in establishing the universal reporting system. Without an EU lead it is unlikely that Japan or other countries in east Asia will be ready to accept additional obligations... Once they have been accepted by the leading industrialised states and thus become an international norm it will be more difficult for states in regions of political tension to resist them.[40]

In the final analysis, States with reservations must consider whether compromises they seek could impede the IAEA in cases where it might really matter. Moreover, no one can be the judge as to which States might wish to develop nuclear weapons in the longer-term. The IAEA will need to have a range of tools flexible enough to deter or detect clandestine activity, and the authority and resources to exercise them — remembering that under Part I it has had to re-establish the authority for many measures theoretically permitted under INFCIRC/153 — and the mechanisms to avert deliberate procrastination in implementation.

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[39] *Mark Hibbs, "ROK Belatedly Weighs in on 93+2 Safeguards Terms", "NuclearFuel", 2 December 1996, p.6.*

[40] *David Fischer, op.cit. p.75.*

Environmental Sampling

Minuscule traces of nuclear material inevitably migrate beyond the immediate environment where they are being processed. The particles' radioactivity makes them easy to detect and they have isotopic signatures that identify them with specific nuclear operations, such as reprocessing, enrichment, fuel fabrication or reactor operations. Environmental sampling — also known as High Performance Trace Analysis (HPTA) — constitutes an important element of Programme '93+2', in enhancing the IAEA's ability to detect clandestine activity both at declared and undeclared locations. A sample can be measured in two ways: by bulk analysis, which explores a sample for average properties and the presence of anomalous components; and by particulate analysis, where suspect particles can be isolated and analysed, by optical analysis, using an electron microscope, and by Thermal Ionisation Mass Spectrometry (TIMS) or other types of mass spectrometry.[41]

Sampling was used effectively in the cases of both Iraq and North Korea. In Iraq, samples were taken by the IAEA's Special Action Team at various sites of nuclear materials and construction metals, and in the environment. The results helped inspectors to map Iraq's nuclear programme. Prior to this, the US's evidence of Iraq's nuclear weapon programme was obtained from traces on the clothing of hostages held by President Saddam Hussein.[42] In North Korea, the IAEA conducted environmental monitoring at facilities under inspection. Analysis of the decay product beryllium in samples from glove boxes at a facility indicated that North Korea had nuclear material downloaded on three separate occasions, rather than, as North Korea claimed, just the once when it extracted a tiny amount of plutonium from a broken fuel rod for experimentation.[43]

Beyond these experiences, twenty countries have participated in field trials to assess the utility of environmental monitoring in different circumstances and at varying distances, including Argentina, Australia, Canada, Hungary, Indonesia, Japan, Netherlands, South Africa, South Korea, Sweden and the UK. Samples were distributed to specialised laboratories in several states, including Australia, Canada, Finland, Hungary, Russia, the UK and the US.[44]

A new laboratory has been built at Seibersdorf, the location of existing IAEA Safeguards Analytical Laboratories, to handle these environmental samples. It is

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41 *See D.L. Donohue and R. Zeisler, "Behind the Scenes: Scientific Analysis of Samples from Nuclear Inspections in Iraq", IAEA Bulletin, 1/1992 and US Congress, Office of Technology Assessment, "Environmental Monitoring for Nuclear Safeguards", OTA-BP-ISS-168 (Washington, DC: US Government Printing Office, September 1995, for detailed explanations about environmental monitoring.*

42 *Interview with John B. Ritch, US Ambassador to UN Organisations in Geneva, in "UN's Nuclear Watchdog Is Sharpening Its Teeth", International Herald Tribune, June 1996. This example also demonstrates that countries have anyway been obtaining samples for this kind of analysis and that it might be considered better for the practice to be institutionalised, with regulated procedures, rather than the IAEA perhaps receiving covert, unregulated information.*

43 *David Albright "How Much Plutonium Does North Korea Have?" in "Bulletin of the Atomic Scientists", September-October 1994, p.47.*

44 *Richard Hooper, "Strengthening IAEA Safeguards in an Era of Co-operation", in "Arms Control Today," November 1995 and US Congress, Office of Technology Assessment, "Environmental Monitoring for Nuclear Safeguards", OTA-BP-ISS-168 (Washington, DC: US Government Printing Office, September 1995, p.29-30.*

designed using pressure and filters, and is self-cleaning, to avoid contamination. This 'clean lab' is completed and, having conducted test sampling, is now continuing with the most time-consuming and expensive stage — conducting base-line sampling mostly at key facilities during routine inspections.

The 'clean lab' will be the centre-point of all environmental sampling. It will make up the sample kits (to avoid contamination of the sample bags). It will then receive two of the three samples collected at any one point — the third, sealed sample will remain with the host country as an insurance policy, were the possibility of a mix-up to be raised. A bulk analysis will be conducted on a range of the samples collected, after which some will be sent for more specialised testing at one or more of the laboratories in the IAEA-approved network of laboratories around the world. All samples will be catalogued and stored at the 'clean lab', and their results will remain confidential.

The new laboratory at Seibersdorf does not have the facilities, the expertise or resources to conduct particulate testing and other specialised techniques, but instead will utilise a range of laboratories for further testing of samples. At the moment, only the US, Russia and the UK are able to conduct particulate experiments. However, China, France, Germany and Japan may develop the facilities and expertise in this area.

Importantly, the identity of environmental samples must be protected, in line with IAEA commitments of confidentiality.[45] Samples will only be subject to isotopic analyses of alpha, beta and gamma radiation. Most importantly, samples sent to a network laboratory must be analysed 'blind', as is also the case for technical personnel handling incoming samples at Seibersdorf, so that the location from which the sample was obtained remains confidential.

Concerns about accidental or deliberate contamination, unrepresentative samples or misleading results have been raised, yet there are many precautionary measures in place. Samples may be sent to more than one laboratory within the network. If a result indicated activity beyond that declared, further analyses would be made, then further information and inspections would be sought, and further samples taken to avoid the damage that a premature or false alarm would do to this monitoring technique and to the IAEA's credibility generally. The IAEA will also be keen to ensure that their procedures are tight enough to withstand technical arguments used for political battles. Notably, North Korea disputed, on technical grounds, the discrepancies that the IAEA found between samples taken and the country's initial declaration and explanations.[46] From another angle, were a State to attempt to mask results, perhaps by 'flooding' the area with radioactivity, this would in itself trigger suspicion and further investigation by the IAEA.

Practical elements for the IAEA in introducing this process include the training of inspectors to use the sample kits, including, for example, reminding them that their clothes must be cleaned to avoid contamination. Arrangements for shipping potentially radioactive materials must be made and procedures to avoid bottlenecks in receiving and analysing the samples established.

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[45] *During CWC negotiations, industry confidentiality has also been a significant hurdle.*

[46] *"Detailed Report of Ministry of Atomic Energy of DPRK on Problems in Implementation of Safeguards Agreement", 21 February 1993, North Korea New Agency (KCNA) in English, 22 February 1993, FBIS-EAS-93-033, 22 February 1993, in "Arms Control Reporter 1993", 457.D.2-4.*

After initial baseline sampling, not every sample that is taken will be analysed, largely due to financial constraints. Providing a satisfactory cross-section is analysed, known only to the IAEA, a high level of deterrence is maintained.

Part I

Part I clarifies that environmental sampling can be conducted during ad hoc, routine and special inspections. Its implementation is underway and there have been a couple of teething problems. Confusion over notification and procedures, for example, led to inspectors being refused access to hot cells for baseline sampling at Chalk River Laboratories in December 1995. However, with procedures and necessary facility preparation worked out, sampling was conducted the following June.[47] Iran was reported recently to have raised concerns about confidentiality of samples both within the IAEA and if sent abroad for analysis, plus related concerns that the samples may be analysed for other types of information. Its representatives were expected to tour the new laboratory to provide reassurance.[48]

Germany also expressed reservations, its Federal Ministry of Education and Research doubting that it was the best method for discouraging unsafeguarded activities or diversion.[49] However, in both North Korea and Iraq, undeclared activity occurred at sites of safeguarded facilities and if sampling had been conducted at Iraq's safeguarded Al Tuwaitha facility, clandestine enrichment activity occurring there may well have been detected. Notably, EURATOM already carries out sampling or 'High Precision Trace Analysis'.[50] As a US Congress Office of Science and Technology report summarised:

> Use of environmental monitoring can significantly increase the ability of safeguards to detect undeclared nuclear activities at declared sites. [It] is not a panacea and must be used in conjunction with other non-proliferation tools. However, some relaxation of conventional safeguards may be warranted as the new techniques are implemented in a broader, more integrated scheme.[51]

Part II

Part II proposes, firstly, that those with full-scope safeguards agree that inspectors may conduct environmental sampling during complementary access.

Secondly, it proposes that samples be taken anywhere on a State's territory. Were information to arise about the possibility of clandestine activity at an undeclared location, the IAEA would have the opportunity to go to that location to take samples, thus establishing either the need for further discussion and investigation or that there appeared from sample analysis to be no grounds for concern at that location. Again this offers a more gentle mechanism than that of a special inspection.

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47 *Ray Silver and Mark Hibbs, "AECB Report Says IAEA Failure to Confer Led to Safeguards Snag", "Nucleonics Week", 21 November 1996, p.1–3.*

48 *Mark Hibbs, "Iran Balking at Approval of IAEA Environmental Monitoring", in "NuclearFuel", September 23, 1996, p.3. The report also noted discussions between the IAEA and Iran about its nuclear research centre at Isfahan, to which the IAEA has not been granted access, as requested, for logistical reasons.*

49 *Mark Hibbs, op.cit.*

50 *Bruno Pellaud, op.cit.*

51 *US Congress, Office of Technology Assessment, "Environmental Monitoring for Nuclear Safeguards", OTA-BP-ISS-168 (Washington, DC: US Government Printing Office, September 1995, p.2.*

According to Steven Fetter:

> Environmental sampling would be especially effective in detecting plutonium separation, since large amounts of radioactive gases are released into the environment when the spent fuel is dissolved. These gases can be trapped with considerable difficulty and expense, but releases cannot be eliminated entirely. Uranium enrichment is much harder to detect because emissions are low and uranium exists in nature; depending on the enrichment process used, enriched uranium might be detected only a few kilometres or less downwind. High concentrations or unusual chemical forms of uranium in the air or water, however, could indicate the presence of undeclared uranium mining, purification, or conversion operations. ...
>
> ... An enrichment, reactor, or reprocessing facility sized to produce only a few bombs-worth of material each year, however, would be more difficult to detect, especially if precautions were taken to disguise the facility and to minimize emissions. In those cases, detection would rely primarily on the possibility of accidents. That may be a larger possibility than it seems, given that even minor accidents can lead to detectable releases, and that some of the precautions taken to minimize routine emissions, such as storing volatile and reactive wastes can increase the probability of accidents.[52]

There are currently both financial and technical limitations to the scope of wider-area environmental monitoring, although it is envisaged that this may well change:

> "Technologies under development can significantly increase the chances of detecting and locating undeclared sites. ...Wide-area monitoring of the atmosphere to detect undeclared facilities would be very expensive. Wide-area monitoring of waterways appears more practical, but its application must be further investigated."[53]

While it is hard to judge when technical and financial conditions might change to conduct wide-area sampling, it seems practical to build the provision in as the expanded declaration is being drafted, rather than revising it at a later date.[54]

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[52] *Steve Fetter, "Verifying Nuclear Disarmament", Occasional Paper No.29, October 1996, Henry L. Stimson Centre, p.28-9.*

[53] *US Congress, Office of Technology Assessment, op.cit.*

[54] *For instance, a broader context of the International Monitoring System's radionuclide monitoring stations within a verified CTBT and a global radionuclide monitoring system if an agreement to stop production of fissile material for nuclear weapons was to be negotiated.*

Improved Technology

Under Part I of '93+2', better use is made of improved technology for unattended equipment, remote monitoring and transmission of inspection data. Some efficiency measures already implemented under Part I or being assessed in field trials include using computerised log-sheets for inspectors and greater use of remote-monitoring technology — for example, the assessment of competing systems of cameras that could send information back to IAEA Headquarters remotely and the introduction of automatic transmission of encrypted data (necessary for confidentiality).[55] This aims to provide greater assurance and reduce the number of on-site inspections, also by dispensing with the need for inspectors to visit the locations to collect the data.

These initiatives will again mean an initial financial outlay, and already in 1995 the release of "deferred" regular budget funds and extra-budgetary funds were needed to help alleviate equipment shortages and replace older equipment.[56]

Deeper Co-operation with States & SSAC

Under Part I, the IAEA will deepen co-operation with State and regional Systems of Accounting and Control (SSAC). This includes examining where its procedures can facilitate inspections, joint safeguards support programmes, conducting joint SSAC–IAEA inspections, and some joint support activities between SSAC and the IAEA, such as the joint use of laboratories.

It will also deepen co-operation with States. The IAEA will utilise any available, secure systems for communication between Headquarters and inspectors on site. Particularly important are multiple-entry or long-term visas, or visaless entry, because unrestricted access to a country by inspectors is an essential prerequisite if States are to fulfil existing safeguards obligations to accept no-notice inspections.

Under Part II of '93+2', it is proposed that states commit to deeper co-operation with the IAEA to simplify designation procedures for allocating inspectors and accept direct communication systems between field and headquarters when unavailable in a State. A further Part II measure proposes streamlined procedures for appointing inspectors. According to INFCIRC/153, a State may object to the designation of inspectors, provided that repeated refusals do not impede verification.[57] Shortening States' deadlines for turning down an inspector and assuming an inspector to be acceptable unless otherwise notified would facilitate prompter inspections and reduce paper work.

A recent safeguards implementation report cited the continuing problems of both restrictions by some states on inspector designations and multiple-entry-type visas.[58] A growing number of States are already responding to a request by the Director General to accept any inspector approved by the Board,[59] highlighting the evolutionary aspects of '93+2'. The more States that adopt these measures even prior to implementation of Part II, the greater the momentum.

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[55] *David Fischer, op.cit. p.70.*

[56] *Gamini Seneviratne in "NuclearFuel, 12 August 1996, p.15.*

[57] *INFCIRC/153 paragraph 9.*

[58] *Gamini Seneviratne in "Nuclear Fuel", 12 August 1996, p.15.*

Greater Efficiency of Safeguards

Programme '93+2' developed a second emphasis alongside that of strengthened effectiveness — improved efficiency. Japan has been a notable proponent of this element. The changes envisaged in '93+2' provide an opportunity to assess cost-effectiveness and explore options for stream-lining procedures, which would be more cost-effective for both the IAEA and for industry.

The Secretariat projects that while '93+2' will initially cost more money to implement, there will also be savings and costs should even out over time. The most significant pay-off postulated is that broader access and, in particular, no-notice inspections — in conjunction with other measures, such as streamlining procedures, maximising use of technical equipment, environmental monitoring and more thorough information — will enable the IAEA to conduct fewer routine on-site inspections. As Bruno Pellaud, Head of Safeguards at the IAEA, explained:

> Up to now, the system has been rather narrowly focused, leading to perhaps overly thorough safeguards activities on large and visible facilities such as nuclear power plants, while other smaller facilities with a potentially larger proliferation risk would or could only be less well inspected.[60]

This goes to the heart of '93+2'. It aims to change the mix from the traditional, laborious, routine inspection regime at large facilities, to maintaining the levels of assurance for throughput at those facilities while committing more energy to areas demonstrated as more likely to reveal signs of clandestine activity.

Light-water reactor models can facilitate this pay-off because they are considered more proliferation resistant and they are the usual choice of nuclear power plant in the only regions where nuclear power is significantly expanding — the Far East and South-East Asia.[61] Two regional offices in Toronto and Tokyo, by contributing to savings on travel and communication costs, help streamlining and facilitate no-notice inspections. Reducing routine inspections, which are costly in terms of travel and working hours, should mean savings for both the IAEA and the nuclear industry.

Despite this, Germany and Japan have objected that IAEA proposals for more information and inspections will be costly and burdensome to their industries in terms of person-hours for the required form-filling, and personnel and support for inspectors.[62] It is probable that there may be additional burdens initially, as the IAEA establishes and practices procedures to retain continuity of safeguards with this change

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[59] *David Fischer, op. cit.*

[60] *Bruno Pellaud, "The Strengthening of Safeguards and the Nuclear Industry", paper presented at the Uranium Institute, 4 September 1996.*

[61] *Both pressurised water reactors (which include Russian VVERs) and boiling-water reactors are types of light water reactors. They are considered more proliferation resistant because it is difficult and dangerous to down-load fuel rods and divert fissile material without switching them off, which would be detected in reactor running records. Graphite moderated reactors and usually heavy water reactors are considered less proliferation resistant because they do not need to be switched off before down-loading, making undetected swapping of fuel rods easier and it is easier to moderate the speed of neutron capture to form higher-grade plutonium for weapons.. However, the use of mixed oxide fuel in such reactors increases the number of inspections needed to verify non-diversion.*

[62] *William Drodziak in "The Washington Post", 10 June 1996, Raymond Bonner in "New York Times", 4 June 1996, "Nihon Keizai Shimbun", 18 June 1996, all in "Arms Control Reporter 1996", 602.B.299.*

— which also includes ensuring reliability and utility of new technologies, and arrangements with SSAC — but this is to be expected with any new system

Against projected savings under '93+2', however, are near-term costs. Implementation costs of Part I are set at an additional US $4.3 million, to cover the costs of environmental monitoring (as base-line samples must be gathered and analysed) and the additional workload at new facilities.[63] There are other costs, such as information analysis, which requires skilled personnel, information-gathering, and specialised and secure computer hard-ware and soft-ware), that will be an increased financial burden upon the IAEA, particularly in early stages of development.

The bottom line, however, is that savings of time and money are only possible if the qualitative assurances generated by implementation of an integrated, credible two-part Programme, are supported.

Beyond the factors outlined above, cost projections will be difficult to make because the IAEA's safeguards responsibilities seem likely to grow. In 1995, 2,285 inspections were conducted at 554 of the 885 nuclear facilities or locations other than facilities (LOF), involving 10,167 person-days.[64] Four new reactors were connected in 1995 to power grids, another was finished in Romania in mid-1996 and 38 nuclear power plants were under construction in 14 countries.[65] The amount of spent fuel that must be safeguarded grows each year, and the increasing use of mixed oxide fuel (oxides of plutonium and low-enriched uranium) means more inspections at the power reactors in question.

With the newly independent states of the former Soviet Union, particularly Belarus, Kazakhstan and Ukraine (which had nuclear weapons on their soil within the Soviet Union), and other States, such as South Africa, joining the NPT, safeguards responsibilities have risen sharply. Further nuclear arms control and disarmament measures will increase the burden of the IAEA over time. Nuclear-weapon dismantlement will impact upon IAEA responsibilities in the future. Already, for instance, in the US many weapons are being destroyed under the Strategic Arms Reduction Talks (START) and some US fissile material from military stockpiles has now been placed under safeguards.[66] Moreover, the IAEA looks set to take on other responsibilities, such as co-operation with a Comprehensive Test Ban Treaty (CTBT) international monitoring Organisation[67] (which is to be co-located at the Vienna International Centre) and potentially verifying agreements relating to fissile materials for weapon production.[68]

Yet the IAEA's budget has been at zero growth since 1985, which has taken its toll. The safeguards regular budget for 1995 was (US)$88,603,000. Another $14,031,521

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[63] *Summary of the 1996 IAEA General Conference in "Arms Control Reporter 1996", 602.B.307.*

[64] *Safeguards implementation report (SIR), in PPNN Newsbrief, Second Quarter 1996, p.6 and Gamini Seneviratne in "NuclearFuel, 12 August 1996, p.15.*

[65] *"IAEA Says 438 Nuclear Plants Operating Worldwide", Reuters, 2 May 1996.*

[66] *In April 1996, the US made seven additional facilities eligible for IAEA Safeguards. See "ACDA Fact Sheet " 8 May 1996.*

[67] *When the CTBT enters into force or if a body of countries decide to establish some of these international verification facilities for themselves prior to entry-into-force.*

[68] *An international Agreement relating to fissile material looks problematic in the current environment, and thus Nuclear-Weapon States may agree to proceed alone prior to such an agreement.*

has been provided by eight member states. On the other hand, some developing States, known as "shielded" countries, pay significantly less than normal financial contributions. This not only impacts upon the IAEA's budget but also further exacerbates a perception in some developing countries that they are not part of the process but the focus, even though "shielded" States enjoy the benefits of technical co-operation with the IAEA on their peaceful programmes.

Cost-effectiveness is the key, not cost-cutting. It is an unfortunate reflection on the reluctance to fund adequately verification of agreements, and international organizations generally, that the IAEA Secretariat and SAGSI felt that '93+2' had to be sold by emphasising that the cost would balance out over time. Despite the best intentions by the Secretariat, some suggest that '93+2' could have been an opportunity to secure a much-needed budget increase. Instead, the uncertainties that are hard to factor into such cost-neutrality projections have bolstered arguments of States with reservations about other aspects of the Programme.

Universality

The multi-dimensional issue of universality in an international system where States have not accepted equal safeguards responsibilities or have different safeguards arrangements, has pervaded all aspects of '93+2' negotiations. Firstly, there is the differentiation between the nuclear 'haves' and 'have-nots' under the NPT. Secondly, there is the "Why me?" argument among NNWSs who question the need to accept further safeguard burdens in light of their excellent safeguard records. Thirdly, there are those States that are party to regional safeguards organizations or nuclear-weapon-free zones. Fourthly, discrimination is perceived between the advanced industrial countries and the developing ones. Finally, there are those who are outside the NPT or any regional full-scope safeguards agreements.

Non-Nuclear-Weapon States: Obligations and Interests

A significant hurdle is the differentiation inherent in the NPT between the five NWS parties that are permitted nuclear weapons (NWS) and around 177 that have forsworn the option to possess nuclear weapons (NNWS). The tension between the nuclear 'haves', who are not legally obliged to accept safeguards, and the 'have-nots', who are, has effected '93+2' negotiations in two ways. Firstly, '93+2' is a horizontal non-proliferation measure to provide greater assurance that NNWSs are sticking to their commitments under the NPT not to develop nuclear weapons. It does not, therefore, seek to address vertical proliferation and the NWSs' commitments under the NPT to move forward with disarmament. Linked to this, secondly (and as mentioned above), some NNWSs are reluctant to accept wider and more intrusive safeguards if competitors in nuclear industries in NWSs do not have to.

Article II of the NPT commits NNWSs not to receive, control or manufacture nuclear weapons or their devices, nor seek or receive assistance in nuclear weapon development. Under Article III of the NPT "[e]ach non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards ... for the exclusive purpose of *verification of the fulfilment of its obligations assumed under this Treaty.*"[69] Furthermore, the Vienna Convention on the Law of Treaties states that a treaty "shall be interpreted *in good faith* in accordance with the *ordinary meaning* to be given to the terms of the treaty and in the light of its *object and purpose*".[70] Thus, the IAEA has a responsibility to verify the completeness as well as the correctness of Member States' declarations, and NNWS have the responsibility to negotiate and agree to measures towards this.

When Programme '93+2' was launched, optimists held that the whole package of measures might be adopted without additional safeguards agreements on the basis of NPT commitments and interests among parties in being assured that all comply with their obligations. Even though this was not the case, the obligations and interests in negotiating and adopting a strong Part II remain.

Moreover, at the heart of the NPT is a bargain between NWSs and NNWSs, whereby NNWS Parties agree to full-scope safeguards to create the confidence necessary to facilitate transfer of equipment and materials, share scientific and technological

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[69] *Emphasis added.*

[70] *Article 31.1, emphasis added.*

information and co-operate in research for peaceful nuclear energy. Were more cases of clandestine nuclear programmes to emerge, the credibility of the NPT would be jeopardised and with it that confidence to co-operate in civilian nuclear energy.[71] Were States with full-scope safeguards to accept implementation of a strong Part II additional protocol, confidence for new nuclear supply contracts would be greatly enhanced. States could adopt this as a criterion for exports or technical co-operation. If some States hold that export controls, such as the Nuclear Suppliers Group, undermine the fabric of the NPT and the authority of the IAEA,[72] strengthened safeguards and a boosted universal reporting system on imports, exports and manufacture of nuclear-related technology could help bridge this problem.

The Nuclear-Weapon States

To the extent that Programme '93+2' was designed to detect more effectively clandestine nuclear-weapon activity, it was never intended for application in the five declared Nuclear-Weapon States (NWS) — such application would only confirm that they have nuclear weapons. However, all the NWSs have accepted NPT-type safeguards on part or all of their civilian nuclear activities in an endeavour to encourage acceptance of the NPT by the NNWSs and to demonstrate that they are equally prepared to accept the "burden" of safeguards — the "equality of misery" principle, as the German Governor described it when the Board drew up INFCIRC/153. The US and the UK offered to accept INFCIRC/153-type safeguards on all their civilian nuclear plants, while France, the USSR and China accepted safeguards on a more limited selection.[73]

The same logic should apply today — the NWSs should be prepared to accept '93+2' measures on the plants and material they have offered for safeguards, just as they were prepared to accept INFCIRC/153 in the 1970s and '80s. It is, for instance, difficult to understand why Germany and the Netherlands should be expected to accept '93+2' in the plants on their territory that make gas centrifuges for their enrichment facilities while a similar gas centrifuge manufacturing facility in the UK, belonging to the same Anglo-Dutch-German consortium, should be beyond the reach of '93+2'. The example could be multiplied.

In this way, NWSs can contribute to aspects of '93+2' and ease the concerns of States with full-scope safeguards about discrimination within the NPT and the worries of some, such as Germany's Foreign Ministry, who see this as perpetuation of discrimination within '93+2'.[74] Such concerns have two elements: military/political and economic. Not only are five States acknowledged as having nuclear arsenals under the NPT, but those NWSs therefore are not obliged to submit their nuclear infrastructure to international safeguards. In a highly competitive industry, NNWSs are concerned that

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[71] *Patricia M. Lewis, "The Dilemma of Article IV and the Adequacy of Safeguards", Verification Matters Briefing Paper 95/1, January 1995.*

[72] *Iran, backed by Indonesia, Syria, Nigeria and Algeria, held this view at the 1995 NPT Review and Extension Conference. See Rebecca Johnson, "Indefinite Extension of the Non-Proliferation Treaty: Risks and Reckonings", ACRONYM No.7, September 1995, p.45.*

[73] *In practice, the IAEA, perennially short of funds, could only apply safeguards on one or two plants in each of the NWSs and has had to give up most of these.*

[74] *Mark Hibbs, "EURATOM Governments, Industry Aren't Buying IAEA's 93+2 Plan", in "NuclearFuel" 26 February 1996, p.12.*

they will be unfairly disadvantaged by the increased transparency and new inspection types in relation to the NWSs.

NWSs can report to the IAEA exports of sensitive or dual-use technologies to NNWS. Two debates surround this issue: whether reporting should be a binding commitment or merely one that makes reporting dependent on domestic legislation; and whether NWSs should also report imports. Regarding the former debate, it seems that there is not consensus within the NWSs. The UK, for example, is rumoured to be happy with a more binding commitment, while France has had reservations. As regards the latter debate, some NWSs have questioned the need to report imports, given that they are known already to have nuclear weapons, though the US supports doing so.[75]

There are other measures that NWSs can adopt. They can make expanded declarations on safeguarded facilities, which would also set a positive agenda for other states with INFCIRC/66-type agreements to do the same. They can transfer increasing amounts of fissile material from the military to the safeguarded civil sector, which would also help lay foundations for an international agreement about fissile material. They can also enhance transparency at locations where fuel-cycle-related R&D is being conducted.

In a broader context, the accusations that '93+2' deepens the discrimination between NWSs and NNWSs demonstrate the increasing difficulty that NWSs are likely to encounter if they advocate non-proliferation measures without following through on their own commitments within the NPT to move towards disarmament.[76] On the other hand, NWSs have insecurities about nuclear proliferation — indeed this is now increasingly their justification for maintaining nuclear weapons. Therefore, a robust safeguards regime helps create the conditions for disarmament. As Steve Fetter explains:-

> [T]he nuclear-weapon states are likely to require that barriers to the acquisition of nuclear weapons by current non-weapon states be increased as one condition for agreeing to dismantle their own arsenals.[77]

Programme '93+2' also contributes to conditions for disarmament as it begins to establish the better safeguards standards that will be needed as NWSs disarm.[78]

The Nuclear-Capable States

As with the NWSs, many measures sought by Programme '93+2' are also potentially applicable to the nuclear-capable States, India, Pakistan and Israel, which have only site- or material-specific safeguards agreements, modelled on INFCIRC/66. These could include giving information on imports and exports, no-notice inspections[79] at declared

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[75] *Text from ACDA, in "Arms Control Reporter 1996", 602.B.308.*

[76] *Article VI*

[77] *Steve Fetter, "Verifying Nuclear Disarmament", Occasional Paper No.29, October 1996, Henry L. Stimson Centre, p.26.*

[78] *"Report of the Canberra Commission on the Elimination of Nuclear Weapons," Department of Foreign Affairs and Trade, Canberra, Australia, 1996, p.81.*

[79] *Paragraph 50 of INFCIRC/66/Rev. states that "Whenever the Agency has the right of access to a principal nuclear facility at all times, it may perform inspections of which notice as required [in] the Inspectors Document need not be given, in so far as this is necessary for the effective application of safeguards. The actual procedures to implement these provisions shall be agreed upon between the parties concerned in the safeguards agreement".*

facilities, and other measures to create confidence that that facility is not being used for undeclared activity.

However, nuclear-capable States might have broader reservations that information about nuclear-weapon activity could be obtained, though the IAEA's only objective would be to verify that locations open to inspection were for exclusively peaceful purposes. In South Asia, regional tensions may need to be addressed alongside. In the future, Israel might consider setting an example to the other nuclear-capable States by accepting some '93+2' measures — a regional Middle East forum addressing civil nuclear energy issues offers a confidence-building first step. This might also ease the tensions surrounding Israel's IAEA membership position as a member of IAEA in the Middle East regional grouping, which is unrecognised by other IAEA members from that region.

In contrast with NPT NNWSs and parties to the Treaty of Tlatelolco, no legal obligation exists for India, Israel and Pakistan to enter into negotiation on strengthening safeguards. They have only voluntary, site- or material-specific safeguards agreements. Indeed, it was likely earlier in the Programme that India and Pakistan would be hostile to such measures. After the first Special Committee discussions, its Chair, van Ebbenhorst Tengbergen, confirmed that:

> [M]embers with INFCIRC/66-type agreements were of the view that any extension of the proposed measures to [them] would go beyond the original purpose of ['93+2'] and would be unacceptable.[80]

Regional Organizations

ABACC and the Tlatelolco Treaty

Argentina and Brazil, as parties to the Treaty for the Prohibition of Nuclear Weapons in Latin America (also known as the Tlatelolco Treaty) "undertake to use exclusively for peaceful purposes the nuclear material and facilities which are under their jurisdiction, and to prohibit and prevent [nuclear weapon activities] in their respective territories."[81] Under a 1991 bilateral agreement, responsibility for the implementation and administration of their Common System of Accounting and Control of nuclear materials (SCCC) lies with the Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials (ABACC). This has been a particularly successful set-up considering that the two had previously been conducting nuclear-weapon research programmes.

Though Brazil is not party to the NPT, as a party to this regional treaty , it is committed to negotiating safeguards agreements with the IAEA "[f]or the purpose of verifying compliance with the obligations ... in accordance with article I."[82] A quadripartite agreement between Brazil, Argentina, ABACC and the IAEA entered into force in 1994. Thus there is a parallel commitment to that of NNWSs party to the NPT to enable conditions which provide maximum assurance that all nuclear activity is for peaceful purposes. As both States have extensive nuclear industries and uranium mines, measures under Part II of '93+2' would be a further step in the successful bilateral

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80 *Gamini Seneviratne, Nuclear Fuel, 15 July 1996, p.16*

81 *Article I.*

82 *Article 12.*

confidence-building process and set an example to others in the region. Cuba, which has nuclear facilities (all of which are under INFCIRC/66 safeguards) but is outside the NPT, signed the Tlatelolco Treaty in 1995, though it has yet to ratify the agreement.

EURATOM

EURATOM conducts nuclear safeguards among EU States and the IAEA verifies their application. INFCIRC/193 was negotiated from 1971 to 1977 between the IAEA and EURATOM NNWSs. This closely resembled the standard model, INFCIRC/153, but with a Protocol defining the relationship between IAEA and EURATOM safeguards and integrating as far as possible the safeguards operations of the two agencies.[83]

Along with Japan, EURATOM NNWSs have the most safeguards. The more recent partnership agreement with EURATOM substantially reduces the inspection burden of the IAEA in the EU's 13 NNWSs, which the IAEA's 1995 SIR acknowledged had contributed to budget savings in implementation and R&D.[84] EURATOM is well funded and has high standards in security, safety and technology relating to nuclear material. For example, it already practices HPTA and no-notice inspections, and it reports on specified items for the EU under the existing voluntary universal reporting system. Its experience and members, encompassing leading nuclear industries, makes it an important agenda-setter. However, it is a more complex membership too because it includes NWSs France and the UK.

There has been some strain between the IAEA and EURATOM over '93+2', in part because of reservations by some EU Member States and also because to EURATOM's authority would need to be revised if it were to have equally intrusive inspection powers (see below). A more specific example is over who decides when a facility is decommissioned, which could be seen to question the ultimate authority of the IAEA in the realm of nuclear safeguards. Originally, it was established that a facility remain a facility until mutual agreement between the IAEA and the Member State of decommissioned status. EURATOM, however, holds that a facility is decommissioned when the member state declares that there is no more nuclear material in it. Although there may have been some subsequent inconsistency in implementation on the part of the IAEA, the '93+2' overhaul of IAEA safeguards provides a good opportunity to clarify this point.

Regional organizations already exist in the South Pacific (the Rarotonga Treaty), Africa (the Pelindaba Treaty) and in South-East Asia, and a more extensive treaty may emerge in Asia.[85] However, all these treaties rely exclusively on the IAEA for the application of safeguards and this is likely to be the pattern elsewhere except in the Middle East and South Asia if it becomes politically possible to create nuclear-weapon-free zones in those troubled regions. In that case, certain features of the IAEA/EURATOM and IAEA/ABACC agreements may be useful in providing for more adversarial and intrusive inspections.

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[83] *There are similar Protocols to the IAEA/EURATOM/UK and IAEA/EURATOM/France safeguards agreements, as well as to the IAEA/Japan and IAEA/ABACC agreements. My thanks to David Fischer for clarifying these points.*

[84] *Gamini Seneviratne in "NuclearFuel, 12 August 1996, p.15.*

[85] *Kathleen Hart, "Nuclear Energy Boom in Asia-Pacific Sparks Proposals for an 'Asiatom'", in "NuclearFuel", November 18, 1996, p.9-10.*

Adopting the Additional Protocol

The mechanism by which an agreed additional protocol will be applied has yet to be decided, however the simplest and most likely option would be for the Protocol to come into effect for the State concerned once it has been signed or ratified. Part II's application could be subject to more complex entry-into-force mechanisms, perhaps becoming dependent upon agreement by a certain number of States, or linked to specific States agreeing to the additional protocol or parts of it. The recently agreed CTBT serves as a warning against this kind of leverage. Its entry into force is dependent upon ratification by a list of States that includes India, which has stated that it will not sign and this jeopardises the CTBT verification regime.[86] Attempts to bind States into the Part II process at this early stage in regions of particular tension, such as the Middle East and South Asia, could be counter-productive and could also be interpreted as a delaying tactic among reluctant States. Greater willingness to export nuclear technology where Part II measures are in place might be considered as another option to encourage States to sign up. If Part II's implementation becomes delayed in a State, arrangements whereby it can be provisionally applied could temporarily bridge gaps prior to full adoption.[87]

There are understandable concerns about the existence in the short term of a 'two-tier' system among States with full-scope safeguards. Advantages of this approach, however, include: leading by example and generating a momentum for other NNWSs to sign — leading to a point whereby those NNWSs which have not agreed the additional protocol will become increasingly isolated; enabling the IAEA to establish and further tighten procedures; NNWSs benefitting, at an earlier point, from the potential pay-offs of reduced inspections; and enhancing the Non-Proliferation Treaty's credibility. The NPT's declared NWSs are obliged, and will be expected, to contribute to the Programme.

The sooner that States or groups of States then set about incorporating Part II measures into their own safeguards agreements, the greater the weight and momentum of the Programme. Yet it should not be assumed that States or groups of States involved in the Safeguards Committee consensus approval of the additional protocol's text will necessarily be prepared immediately implement it. After the 1971 Safeguards Committee had negotiated INFCIRC/153, it still took six years for INFCIRC/193 to be negotiated between the IAEA and EURATOM NNWSs. To negotiate it, the EU Commission had to obtain a mandate from the EU Council of Ministers, which was a lengthy process. Japan and others waited for implementation within EURATOM.

Opinion about the relationship between the IAEA and EURATOM regarding implementation of Part II is divided. One view is that EURATOM's mandate under the Treaty of Rome (its Statute) is limited to safeguarding nuclear material, which would imply that the IAEA would have to secure complementary access by direct negotiation

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86 *Indeed this "strong-arm" approach appears in the current climate to have backfired, in particular further isolating India from the process and handing it a veto. The Open Skies Treaty, agreed in 1992, is similarly blocked despite being a more gentle confidence-building measure because Russia, Ukraine and Belarus, three countries required to ratify prior to entry-into-force, have not yet done so.*

87 *This approach has proved effective for the Conventional Forces in Europe Treaty and the Treaty of Tlatelolco.*

with the governments concerned. However, in February 1996 it was reported that EURATOM wished to seek revisions to INFCIRC/193 and possibly to the EURATOM–IAEA "New Partnership Agreement" which would authorise both agencies to carry out Part II activities.[88] It can only be hoped that the process this time will not be so lengthy as this could encourage other hold-outs and devalue the whole process. For EURATOM to adopt Part II quickly, the role of the UK, France and the US in supporting the process will be crucial. It must also be hoped that Asian NNWSs — particularly Japan, given that it is such a significant player in the arms control and disarmament process — will forge ahead with implementing Part II, rather than wait for EURATOM.

Conclusion

The cases of Iraq and North Korea actually underlined the value of the NPT, the progress of non-proliferation regimes and what was at stake if things started to unravel — hence the broad support initially for drawing up a tighter safeguards regime. These cases highlighted that comprehensive safeguards were not ends in themselves, but means by which international legal commitments not to develop nuclear weapons were to be assured. Safeguards needed to be improved so as to identify problems and report violations to the UN Security Council at an earlier point. Notably, a Security Council declaration on 31 January 1992 stated that the proliferation of nuclear and other weapons of mass destruction are a "threat to international peace and security"[89] — meaning that Chapter VII enforcement action could be taken.

Yet those in the IAEA responsible for '93+2' have not subsequently had the easy ride that might have been expected from initial signals by States. An earlier and more pro-active approach to doubts among some States about the Programme might have been helpful. In the final analysis, however, it is the will of the States involved that is most crucial to the adoption of an effective Programme '93+2'.

It is possible that an additional protocol for Part II will be approved by April 1997, which would provide an excellent backdrop for the first Preparatory Committee of the NPT's enhanced review process which begins on 7 April for two weeks. More important than time-frames for negotiating Part II's additional protocol, however, is substance, as it presents an opportunity to strengthen safeguards that may be difficult to revisit in the near future.

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[88] *Mark Hibbs, "EURATOM Governments, Industry Aren't Buying IAEA's 93+2 Plan", in "NuclearFuel" 26 February 1996, p.12.*

[89] *David Fischer, "1989–95: Radical Changes in IAEA Safeguards", in Poole and Guthrie, (eds.) "Verification 1996", VERTIC/Westview 1996, p.69.*

Glossary

ABACC	Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials
CFE	Conventional Forces in Europe Treaty
CTBT	Comprehensive Test Ban Treaty
CWC	Chemical Weapons Convention
DPRK	Democratic Peoples' Republic of Korea (North Korea)
EU	European Union
EURATOM	European Atomic Energy Agency
HEU	Highly-Enriched Uranium
HPTA	High-Performance Trace Analysis (or environmental sampling)
HUMINT	Human Intelligence
KEDO	Korean Energy and Development Organization
LOF	Location Outside a Facility (where nuclear material is customarily situated)
LWR	Light Water Reactor
NAM	Non-Aligned Movement
NTM	National Technical Means
NNWS	Non-Nuclear-Weapon State
NPT	Non-Proliferation Treaty
NWS	Nuclear-Weapon State (declared)
R&D	Research and Development
SAGSI	Standing Advisory Group on Safeguards
SAL	Safeguards Analytical Laboratory
SCCC	Common System of Accounting and Control of Nuclear Materials (Brazil and Argentina)
SIR	Safeguards implementation Report
SSAC	State's System of Accounting and Control
UK	United Kingdom of Great Britain and Northern Ireland
UN	United Nations
UNGA	United Nations General Assembly
UNSCOM	United Nations Special Commission in Iraq
US	United States of America

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