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CHAPTER 4: OTHER MODELS OF CONTROL

While the IAEA safeguards system became the global approach to nuclear energy control, it was not the only multinational initiative to address nuclear energy issues. Several regional models were also created. As in the global model, nuclear control objectives formed only part of an overall programme. As in the Baruch Plan negotiations, states pushed aside measures deemed desirable for control to protect their economic and political sovereignty. During the various regional negotiations, states saw merit in different elements proposed under the Baruch Plan. However, often the sacrifices needed to incorporate these elements were not forthcoming.

I. European Atomic Energy Agency (EURATOM)

The EURATOM control system was a regional model that attempted, like the Baruch Plan, to manage nuclear activities to prevent state rivalries. However, EURATOM's central focus was on nuclear promotion. By the pooling their capabilities Europeans would be able to build a competitive nuclear industry. As in the negotiation of the IAEA Statute, the architects of EURATOM found the early principles for a solid control system desirable, but the sacrifices required were difficult for states to accept. Ceding sovereignty over national nuclear activities to an international organisation was unpopular. Nuclear disarmament and transparency were also problematic. Attempts to coordinate national interests forced states to again split their control approach into civilian and military spheres. As in the global case, the split complicated and weakened the control mechanism.

EURATOM's creation has been widely attributed to US and European interests in addressing Western Europe's fuel shortage, their desire to support European cooperation through the Common Market and their wish to assure that FRG nuclear activities would remain peaceful. EURATOM's roots can be traced to a memorandum issued in the Spring of 1955 by the Benelux group within the European Coal and Steel Community (ECSC). The Memorandum advocated, *inter alia,* functional nuclear power integration among European states.[1] On 1 June 1955, European Ministers met in Messina to discuss economic integration and identified nuclear and non-nuclear energy as target areas. The Messina Plan viewed all nuclear production solely for peaceful purposes. It created a common market for materials and specialised equipment, and accorded EURATOM ownership over all nuclear materials throughout the fuel cycle. While national programmes would continue, the Commission would construct nuclear

[1] For an account of EURATOM's history see Howlett, *op. cit.*, pp. 19-31.

installations, communally owned and financed, and provide advisory services regarding them. The Messina Resolution differed from the Benelux Memorandum in considering a common organisation rather than extending the supranational concept of the ECSC. The change was influenced by the French position that an agreement would require "realistic solutions" rather than "what might be ideally desirable".[2]

While the EURATOM concept was being formalised, there was ample support for incorporation of Baruch era control system concepts. EURATOM was seen as a potential basis for an international control system.

> EURATOM's right of control covers not only imports but also production and extends to both supplier and user countries without discrimination; it may, therefore, be the first step towards world-wide control of atomic energy.[3]

In early 1956, the French diplomat Jean Monnet established, and became President of, the Action Committee for the United States of Europe. The Committee, open to the Benelux group of states, embraced the Messina resolution and proposed the establishment of EURATOM in January 1956. The control system was to be based on nuclear energy management principles. The new organisation would possess sole ownership over all fissile materials and would develop nuclear energy for peaceful purposes subject to tight safeguards.[4] Monnet also argued as a precondition that the organisation needed to provide "equality of rights".

Managing nuclear rivalry was a critical plan objective. On 31 January 1956, French Socialist Prime Minister Guy Mollet, supporting Monnet's proposal, renounced French claims to develop a nuclear weapon. Although the renunciation was short-lived, parts of the French government were motivated by fears that its past adversary, the FRG, would acquire nuclear weapons. At the time, there was a great sensitivity to the relation between nuclear fuel control and nuclear weapons capability. Mollet had noted that "Whoever owns the fuel...will be in a position to make nuclear weapons".[5] A nuclear weapons production prohibition prevented a situation where the FRG as an

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[2] Lawrence Scheinman, *Atomic Energy in France under the Fourth Republic*, Princeton University Press, Princeton, 1965, pp. 130, 135.

[3] EURATOM Commission, *First General Report on the Activities of the Community*, Brussels, 21 September 1958, p. 66.

[4] Goldschmidt, 1982, *op. cit.*, p. 133.

[5] *Ibid.*, p. 134.

equal member could legally manufacture weapons.[6] With this in mind, Belgian Foreign Minister Henry Spaak rejected an alternative plan by the Organisation for European Economic Cooperation (OEEC) which would not solve the question of Franco-German rapprochement.[7]

Members strove to construct a strong control system to provide assurances to the United States. Prospective members wanted the United States to see their regional organisation as a credible control system to obtain US light water reactors and fissile materials. Accordingly, EURATOM's control system elements were taken from US domestic and bilateral safeguards and the Baruch Plan.[8] EURATOM incorporated ideas on material ownership from the Atomic Energy Act of 1954, and ideas on multinational control, source material control, mines and supply ownership from the Baruch Plan.[9] The strategy of employing any time, anywhere inspections and data reviews, elements of the Baruch Plan, was aimed at convincing the United States of EURATOM's nuclear safeguards stringency.[10]

The United States also saw advantages to EURATOM. Initially, the United States and EURATOM members viewed regional control as a step towards a worldwide system.[11] Pending global control, EURATOM, managing Europe's nuclear programmes, could restrain member nuclear capabilities.[12] EURATOM also served a role in eliminating rivalry between France and the FRG in nuclear matters. According to a USAEC Brief:

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[6] CPNA USAEC, Elim O'Shaughness, American Embassy, Bonn to the Department of State, Washington, "Conversation with Minister Strauss on European Atomic Integration", Dispatch No. 1622, 6 February 1956.

[7] AEC 751/55, p. 7.

[8] Howlett, *op. cit.*, pp. 68, 91.

[9] *Ibid.*, pp. 89-99.

[10] *Ibid.*, p. 69.

[11] For EURATOM views see CPNA USAEC, Butterworth, American Embassy, Luxembourg to Secretary of State, Telegram, 26 March 1958. For US views see Howlett, *op. cit.*, p. 81; United States Congress, *Proposed EURATOM Agreements, Hearings before the Joint Committee on Atomic Energy*, 85th Congress, 2nd Session, Washington, DC, July 1958, p. 85.

[12] CPNA USAEC, *Preliminary Observations on United States Atomic Policy for European Area*, Draft Memorandum, 15 March 1956, p. 11.

> A common atomic energy program with effective controls would provide a degree of security greater than that which would be possible were there to be competing, independent national atomic energy programs.[13]

Finally, EURATOM could contribute to preventing clandestine nuclear programmes in Europe.[14]

Political Realities

A strong control system was not on the cards. Realities associated with relinquishing economic and political sovereignty eroded interest in strong control and revealed that fusion of the IAEA with EURATOM was nearly impossible. By the time that negotiations were concluded, several important compromises on scope were made.

The Spaak Committee, chaired by Belgian Foreign Minister Paul Henri Spaak, negotiated EURATOM's foundations. Debate focussed on nuclear weapons prohibition, enrichment plant construction, supply monopoly and the creation of a third international force.[15] France was key in limiting safeguards as its negotiating premise was that French autonomy in both peaceful and military spheres would be maintained.[16] The French Government, facing support by internal domestic forces for a French nuclear weapons option, rejected Monnet's proposal for a denuclearised zone.[17] Reflecting interests in both the nuclear option and atomic energy, during an Assembly debate the French government asserted that EURATOM would never control more than 20% of France's nuclear energy programme.[18] European Ministers had to acquiesce to French demands on a weapons option to obtain French participation.

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[13] CPNA USAEC, *Wise Men - Spaak Visit*, Background Paper, 31 January 1957.

[14] CPNA USAEC, American Embassy Bonn to Livingston T. Merchant, Assistant Secretary of State, 10 February 1956.

[15] Howlett, *op. cit.*, p. 27.

[16] Scheinman, 1965, *op. cit.*, pp. 164-165.

[17] Howlett, *op. cit.*, pp. 56-63.

[18] "Letter from the Deputy Under Secretary of State (Murphy) to the Chairman of the Atomic Energy Commission, Washington, August 7, 1956", in *Foreign Relations of the United States 1955-1957*, Vol. 4, West European Security and International Integration, USGPO, Washington, DC, Department of State Publication No. 9453, 1986, pp. 458-459.

The French were blind to equality's role in a functional system, yet needed an effective rivalry management mechanism. The French Government agreed to a four year moratorium on nuclear device construction but demanded that EURATOM not limit the freedom of any participating state (except the FRG) to continue weapons research and development during the moratorium.[19] In addition, while France supported EURATOM safeguards in other countries on security grounds, it believed that they should not apply to France.[20] Arrangements lacking equality were intolerable to other participants. The Dutch in particular were not prepared to concede that France should be permitted a separate non-EURATOM military programme.[21]

France was not alone in seeking to limit EURATOM control. The German Government did not want EURATOM to own fissionable materials, possess a purchase monopoly, or compel patent information exchanges.[22] During negotiations, the FRG argued that EURATOM should have fissile material "custody" not ownership.[23] On 6 November 1956, the Germans compromised, giving EURATOM a purchase monopoly with provisos for review after definite periods of time and national procurement exceptions if the EURATOM material policies were abusive or supplies were very short.[24]

The Spaak Committee final report of April 1956 considerably modified the earlier strong proposal. It placed nuclear power utilisation under national direction and eliminated the requirement to renounce nuclear weapons. The final report acknowledged concerns that limited supply hampered energy growth, that sovereignty infringements be minimised, and that national nuclear policy decisions were left to sovereign states. Before the treaty was concluded, the report conclusions were

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[19] *Ibid.*, p. 458.

[20] CPNA USAEC, W. A. Chapin, Under Secretary to John A. McCone, Chairman, USAEC, 15 April 1960.

[21] PRO EG 1/86 27549, John Tahourdin, British Embassy to A. J. Edden, Esq., Foreign Office, 2 May 1956.

[22] "Memorandum of a Conversation, Department of State, Washington, DC, May 14, 1956", in *Foreign Relations of the United States 1955-1957, op. cit.*, p. 441.

[23] "Letter from the Deputy Under Secretary of State (Murphy) to the Chairman of the Atomic Energy Commission", Washington, May 14, 1956", in *Foreign Relations of the United States 1955-1957, op. cit.*, p. 458.

[24] "Current Status of EURATOM Negotiations, December 3, 1956", in *Foreign Relations of the United States 1955-1957, op. cit.*, p. 495.

modified further, reducing the EURATOM's Commission's rights to oversee research and development and the purchase, sale and ownership of nuclear ores and fuel development.[25]

The Treaty Establishing the European Atomic Energy Community (EURATOM Treaty)[26] was adopted on 25 March 1957, entered into force 1 January 1958, and was touted by its Commissioners as a structure providing "true international control".[27] Despite weakening during negotiation, the framework came closer than the IAEA system to incorporating the elements endorsed in *The Acheson-Lilienthal Report*. The system was designed for universal European application without discrimination. All civilian programmes were eventually covered including those of France and the United Kingdom when it joined the European Union in 1973. The Community had a role in nuclear energy management. EURATOM owned all special fissile material[28] and its supply agency could acquire, use and consume all ores, source materials and special fissionable materials.[29] This common supply policy aimed to provide equal access to supply sources without discrimination regardless of intended use.[30] The structure also aimed to reduce national influences on control application as EURATOM regulators dealt directly with nuclear operators rather than governments. The Treaty attempted to promote nuclear development transparency by requiring communication of unpublished patents directly concerned with nuclear energy development throughout the Community.[31] Questions concerning safeguards application would be referred to the European Court of Justice whose decision was binding.[32] The Commission could also act against non-compliance, including issuing warnings, withdrawing benefits and assistance, taking over operations, and withdrawing source and special materials.[33]

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[25] Howlett, *op. cit.*, pp. 21-24; EG 1/165 27590, INTEL No. 30, *EURATOM*, 26 February 1958.

[26] The Treaty is also known as the Treaty of Rome.

[27] AEC 751/170, p. 2.

[28] EURATOM Treaty, Article 86.

[29] *Ibid.*, Articles 52-57.

[30] *Ibid.*, Article 52.

[31] *Ibid.*, Article 16.

[32] *Ibid.*, Articles 141-145.

[33] *Ibid.*, Article 80.

The adoption of Regulations 7 and 8 followed Treaty acceptance. Regulation 7 required declaration of basic technical characteristics for all installations engaged in production, separation, or use of source or special fissile materials or in irradiated nuclear fuels processing as referenced in Article 78. Regulation 8 defined the scope and nature of obligations of Article 79. It required the nuclear installation operator to maintain material accountancy, to submit materials and stock movement records, and to provide full operating record access on demand. These records updated Commission accounts of operator stockpiles, stockpile locations, material transfers between installations, imports and exports.[34] EURATOM also set up Particular Safeguards Provisions (PSPs) for facilities, similar to IAEA facility attachments. Unlike facility attachments, PSPs are not negotiated, thus giving EURATOM a much greater role in their design.

EURATOM's system utilised similar techniques to the IAEA's, including accounting, record auditing and inspection, but it retained a more rigorous technical flavour. The system was regulatory and not subject to negotiation. EURATOM Regulations 7 and 8, adopted in 1959 and 1960 respectively, formed a system focussed on tracking material, using account summary reporting.[35] This approach utilised monthly inventories with internal and international cross-checking of nuclear installation shipments and receipts.[36] Technical reporting on activities extended from mining and ore extraction through energy production.[37] EURATOM had no small quantity safeguards exemption clause for peaceful uses and inspectors had full operating record access.[38] It could enforce inspection through the Court of Justice.[39] States were obliged to supply design information, submit chemical processing

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[34] EURATOM Commission, *Fourth General Report on the Activities of the Community,* 18 May 1961, pp. 109-110, 113.

[35] For a summary of old system see Howlett, *op. cit.*, pp. 105-110.

[36] P. Bommelle, W. Gmelin, B. Love and B. Sharpe, "Development of the System of Safeguards in the European Atomic Energy Community" Paper presented to the International Conference on Nuclear Power Experience, IAEA, Vienna, IAEA-CN-42/419, 1982, pp. 370-373.

[37] For a discussion see Stephen Gorove, "The First Multinational Atomic Inspection and Control System at Work: EURATOM's Experience", *Stanford Law Review*, Vol. 18, No. 160, November 1965, pp. 170-171.

[38] EURATOM Treaty, Article 79.

[39] *Ibid.*, Article 81.

techniques for approval[40], and deposit excess special fissile materials with the Commission if instructed.[41] In theory, the Commission could obtain basic technical characteristics of a Member's nuclear facilities without any distinction between peaceful or military purposes.[42] The Treaty used the same inspection language as the IAEA Statute whereby inspectors had access to all places, data and persons.[43]

EURATOM and the United Kingdom

Although EURATOM's design was softened from its original conception, it infringed on economic and political sovereignty. It was too transparent for the British, who participated in early EURATOM negotiations, but later withdrew:

> Under the EURATOM regulations all secrets touching on nuclear development and all applications for patents must be shared with other members, even if they affect national defence. Therefore they would no longer remain secret.[44]

The United Kingdom also feared that by joining, it would compromise its technical lead.[45] The United Kingdom relied on nuclear weapons for security, and was not prepared to put its defence resources, including nuclear material supplies, into the Messina Pool.[46] Ultimate control of the British weapons programme would only be ceded to EURATOM upon a general disarmament agreement.[47] The British also identified EURATOM as a potential source of interference in its expanding civil programme. Because EURATOM would force it into relying on raw material supplies

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[40] *Ibid.*, Article 78.

[41] *Ibid.*, Article 80.

[42] A subsequent discussion will reveal that this was not the case in practice.

[43] EURATOM Treaty, Article 81.

[44] PRO EG1/165 27590, British Embassy, Paris to Mutual Aid Department, Foreign Office, London, 17 July 1957; also see EG 1/165 27590, INTEL No.30, *EURATOM,* 26 February 1958.

[45] PRO EG 1/165 27590, F. C. How, Atomic Energy Office, *EURATOM: A. (57) 2,* 17 July 1957.

[46] PRO EG 1/86 27549, A. J. Edden, FO Draft, 13 June 1956; PRO EG 1/86 27549, *MESSINA,* 1956.

[47] Edden, 13 June 1956, *op. cit.*

not under British control for both military and civilian purposes, the United Kingdom rejected EURATOM membership.[48]

The British case highlights the limited role of regional control (exemplified by EURATOM) from an international perspective. The motivation for the United Kingdom retention of weapons was not regional. The EURATOM plan did not meet British security needs such that it could relinquish its nuclear weapons programme. The United Kingdom needed the universal approach.

Additionally, by November 1955, the United Kingdom would have had difficulty in splitting its peaceful programme off from its military one. Over time, the two aspects had become fully integrated. Under EURATOM control, the two would have required separation especially considering the United Kingdom's nuclear cooperation with the United States.[49] The United Kingdom's programme depended on its civil programme development.[50] Thus, this case supported the idea that military and peaceful programmes are mutually beneficial and linked. The United States also recognised the problem presented by the integration of the two aspects in the British programme and doubted whether a two-track approach would work. Transparency and nuclear weapons retention were not considered compatible. The United States consequently anticipated difficulties in developing procedures that would reassure it about the security of shared nuclear programme information.[51]

Influence of the United States

During the EURATOM negotiations, the United States was pulled in three directions. The United States needed to address its nuclear weapons programme needs, its economic interests and prevent proliferation, especially in Europe. Balancing these needs had a negative impact on both EURATOM and international control.

The United States was concerned about the adequacy of material supplies to its own weapons programme, and feared it could not fulfill EURATOM commercial enriched material requirements. It supported a plutonium economy, believing in

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[48] *Ibid.*

[49] *Ibid.*

[50] How, 17 July 1957, *op. cit.*

[51] CPNA USAEC, *Implications of UK Membership in EURATOM*, c. 1956, p. 3.

European plutonium recycling, while opposing an independent European enrichment capability on security grounds, fearing it would be used for the manufacturing of weapons material.[52] EURATOM could ideally solve the security problem raised by plutonium or uranium-233 production in Europe's power reactors.[53] The United States figured that centralised reprocessing would ensure no concentration in weapons material production capability.[54]

The United States was torn between its long-term international goal to develop the IAEA system and establishing EURATOM, which was:

> [...] the best opportunity to fully establish a system of safeguards against diversion in a major area of the world where nuclear development is likely in the near future.[55]

The United States could then relax its drive to develop the IAEA. EURATOM served other US interests because it contributed to European integration, a primary U.S. objective, and would strengthen and stabilise the Atlantic Community in deterrence of the Soviet Union.[56] The United States also had commercial reasons to value the European nuclear market above preventing nuclear proliferation.[57]

The United States decided to support EURATOM. The consequence was the perception that the United States was undermining the IAEA and global control. The IAEA Director General Sterling Cole found the US-EURATOM relationship problematic, believing that US support of EURATOM violated the concept that the IAEA would eventually control all fissionable material. He also pointed out inequities in control

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[52] Edden, 13 June 1956, *op. cit.*

[53] CPNA USAEC, Howard A. Robinson, Special Assistant to the Ambassador to France to Robert R. Bowie, Director of the Policy Planning Staff, Department of State, 27 December 1955.

[54] CPNA USAEC, Philip J. Farley, *Reply to Chairman McCone's Letter, Memorandum for the Under Secretary*, 13 April 1960; CPNA USAEC, *Formulation of United States Atomic Policy for European Area*, Draft Memorandum, 15 March 1956, p. 11.

[55] AEC 751/68, p. 1.

[56] *Ibid.*, p. 1; Howlett, *op. cit.*, p. 79.

[57] Howlett, *op. cit.*, p. 71.

application by noting that the United States categorised nations in three groups: those it trusted, those it trusted more, and those it trusted not at all.[58]

The US willingness to accept differentiated controls complicated global control efforts. Despite US-inserted provisions for IAEA-EURATOM cooperation in its bilateral agreement with EURATOM, EURATOM members resisted IAEA cooperation.[59] Max Konstamm, a EURATOM official, explained to US officials:

> The real problem of Agency inspection is that it would involve inviting into the heart of Europe, European neighbours [the Eastern Block and Soviet Union] whom neither of us trust.[60]

EURATOM also rejected Agency inspection without Soviet Union and other nuclear power reciprocity.[61] The regional system did not address extra-regional rivalries and the global system neither provided security assurance nor universal application.

At the time of the EURATOM-US negotiations, the Europeans saw themselves as rising powers. While needing American materials and support, they were adamant about equal treatment in safeguard obligations. Like Sterling Cole, the Europeans realised the United States used different control levels with different partners. EURATOM members required the same treatment as other leading powers. Monnet had noted that it was "intolerable" that Europe should be controlled while the US,

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[58] CPNA USAEC, Sterling Cole, Vienna to Lewis Strauss, Washington, DC, 12 May 1958; CPNA USAEC, Department of State, *IAEA - EURATOM Inspection Systems*, Vienna to Secretary of State (Incoming Telegram), 3 May 1958, No. 3004. For additional criticism see David Fischer, 1997, *op. cit.*, p. 77.

[59] *Agreement for Cooperation between the Government of the United States of America and the European Atomic Energy Committee (EURATOM) Concerning Peaceful Uses of Atomic Energy*, Article XII, 18 June 1958.

[60] CPNA USAEC, Department of State Memorandum of Conversation, *Proposed Letter Interpreting Memorandum of Understanding on Joint US-EURATOM Program*, 9 June 1958.

[61] Since EURATOM's system was functional before the IAEA's and operated reasonably well, EURATOM ministers believed that the organisation had little reason to alter its own system to suit the IAEA. (CPNA USAEC, *Proposed US-EURATOM Exchange of Letters*, Memorandum for File, 10 June 1958; CPNA USAEC Records, *Testimony of Mr. Dillon with Respect to the Safeguard Arrangements of the Joint US-EURATOM Program*, 9 July 1958, p. 5.)

Canada, the Soviet Union and the United Kingdom were under no such restraint.[62] In its bilateral agreement with the United States, EURATOM sought safeguards formulations resembling the US-UK or US-Canada agreements.[63]

Also behind Europe's demands for equality was a desire to protect its industry. EURATOM pushed for the United States to accept EURATOM safeguards in lieu of direct US inspection to avoid exposing commercial secrets. Relinquishing its inspection right was problematic for the United States. By accepting EURATOM inspection, the United States would abandon its principle of requiring external control over its exports. The United States feared that Japan and other states would demand similar arrangements if it assented to Europe's demand,[64] but USAEC negotiators were convinced that EURATOM would terminate negotiations rather than give inspection rights to either the United States or the IAEA.[65] Therefore, they acquiesced to EURATOM self-inspection and relinquished their rights to restrict internal transfers and exercise prior consent over reprocessing.

The softening of the US position could also be attributed to the US need to mollify non-nuclear NATO partners, unsatisfied with US nuclear security guarantees *vis-a-vis* the Soviet Union and Europe's lack of control over US nuclear weapons in Europe.[66] To the United States, the EURATOM approach was not excessively risky. A UK official at the British Embassy in Washington noted that the nations involved "were

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[62] CPNA USAEC, Howard A. Robinson to Bowie, *Monnet's Views on EURATOM Atomic Security Controls,* 5 July, 1956. For similar sentiments by Max Konstamm see *Proposed Letter Interpreting Memorandum of Understanding on Joint US-EURATOM Program, op. cit.*; CPNA USAEC, Mr. Farley, *EURATOM Safeguards and the IAEA,* 21 May 1958.

[63] CPNA USAEC, *Safeguards Provisions of Proposed US-EURATOM Agreement for Cooperation,* Department of State Memorandum of Conversation 13 May 1958; CPNA USAEC, *Controls and Safeguards - EURATOM: Report to the General Manager by the Director for International Affairs,* undated, p. 3; also see Hewlett and Holl, *Atoms for Peace and War, op. cit.,* p. 441.

[64] *Safeguards Provisions of Proposed US-EURATOM Agreement for Cooperation, op. cit.,* p. 2.

[65] *Ibid.,* p. 2; USAEC CPNA, Richard C. Breithut, *Relationship of Proposed United States-EURATOM Program to the International Atomic Energy Agency*", 6 May 1958, p. 4.

[66] Howlett, *op. cit.,* pp. 76-78.

worthy of trust", and the system contained ample built-in checks.[67] Likewise, the United States saw EURATOM controls as providing wide coverage and that WEU controls would start where EURATOM controls ceased:

> Although the Treaty of Rome does not preclude the military use (France) of materials, it does provide a complete control mechanism, since the controls of the Western European Union take over at the point of weapon fabrication, which is the point where EURATOM controls end.[68]

The US interpretation of the EURATOM Treaty was that all nuclear material was tracked under safeguards:

> The ownership rights and control authority would be exercised up to the point at which fissionable materials are actually withdrawn from the system for fabrication into weapons. In this way, the Community would have knowledge of, as well as the general scope of, any nuclear weapons program initiated by any one of its members."[69]

The United States felt secure in accepting the European Ministers' compromise with the French on the nuclear option, noting:

> Presumably the Brussels group will insist, however, upon the inspection and control authority of the Community being complete, which means that the Community will have access to French weapons research and development work as well as to any subsequent weapons inventory, should the French decide to take advantage of this permissive right.[70]

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[67] *Safeguards Provisions of Proposed US-EURATOM Agreement for Cooperation, op. cit.*, p. 2.

[68] AEC 751/170, p. 2; Also see *Controls and Safeguards - EURATOM: Report to the General Manager by the Director for International Affairs, op. cit.*, p. 2; *Testimony of Mr. Dillon with Respect to the Safeguard Arrangements of the Joint US-EURATOM Program, op. cit.*, p. 2.

[69] CPNA USAEC, *EURATOM Control Authority*, Brief Background Paper, 15 March 1957.

[70] "Current Status of EURATOM Negotiations, December 3, 1956", in *Foreign Relations of the United States 1955-1957, op. cit.*, p. 495.

The only reflection of US caution was in its decision to offer low enriched uranium at reduced prices which, while serving to promote a market for enriched uranium, would discourage Europe from building enrichment plants.[71]

Assuming that fissile materials would remain under control in both peaceful and military applications, the United States supported EURATOM and signed an agreement setting EURATOM safeguards principles. The cooperation agreement gave the United States a role in establishing EURATOM's safeguards system, called for EURATOM to consult frequently with the United States, and required Europe to engage in reciprocal visits to provide assurance that the Community's safeguard and control system functioned effectively.[72] In essence, it provided transparency to assure the United States of system effectiveness. The principles contained many technical precepts found in US bilateral agreements including plant design examination, maintenance and production record review, submission of reports to the EURATOM Commission, deposit and storage under safeguards of special nuclear material not in use, and full access inspections.[73]

To minimise damage to international control goals, the United States attempted to ensure EURATOM would not impair development efforts by requiring in EURATOM agreements that the Commission would:

- consult with the IAEA to establish a reasonably compatible system;
- accord the IAEA the first option to purchase any special nuclear material derived from reactors fuelled with US supplied materials over and above Community requirements; and

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[71] Scheinman, 1965, *op. cit.*, p. 177.

[72] *Agreement between the European Atomic Energy Community (EURATOM) and the Government of the United States of America*, Articles XII.B, C and E. EURATOM and the United States were to verify by mutually approved scientific methods, the effectiveness of the safeguards and control systems applied to nuclear materials received from the other party or to fissionable materials derived from theses materials (CPNA USAEC, *Testimony of Commissioner John Floberg at Hearing of the Joint Committee on Atomic Energy on EURATOM Agreements and EURATOM Legislation*, undated, p. 20.)

[73] *Background Material for the Review of the International Atomic Policies, op. cit.*, pp. 839.

- consult with the United States on the IAEA's assumption of safeguards over implementation of the US-EURATOM joint program.[74]

In an additional memorandum, the Parties agreed that material could not be exported by the Community without obtaining US permission, providing a guarantee that it would stay under an approved control system and that material would be utilised only for peaceful purposes.[75]

The United States, however, failed to anticipate EURATOM's aversion to the IAEA. Between 1956-1958, EURATOM nations individually indicated to the United States during bilateral negotiations of nuclear energy cooperation agreements that they were unwilling to have US-assisted projects inspected by the International Agency.[76] What was stated in the US-EURATOM agreement and how it was implemented were two different matters. EURATOM failed to initiate consultations enabling IAEA takeover of activities relating to the US agreement.[77] At an early stage, the United States encountered difficulties with EURATOM in developing procedures for safeguards and control. EURATOM endeavoured to restrict US access to facilities by manoeuvring to force US evaluation of EURATOM safeguards to take place at EURATOM headquarters.[78] The USAEC was not allowed to review actual records or inspection reports, but was restricted to verifying and validating information on safeguards techniques. The United States was denied visitation rights to compare actual material on hand with that shown in EURATOM's records because such visits were viewed as an infringement of EURATOM sovereignty.[79] By 1967, the USAEC

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[74] *Agreement between the European Atomic Energy Community (EURATOM) and the Government of the United States of America*, Articles III.E and XII.A and D.

[75] *Memorandum of Understanding Regarding the Joint Nuclear Power Program Proposed between the European Atomic Energy Community (EURATOM) and the United States of America*, Brussels, 29 May 1958, and Washington, 12 June 1958.

[76] Breithut, *op. cit.*

[77] "Nuclear Narks", *The Economist*, 25 March 1967, Vol. 222, No. 6448, pp. 1114-1115.

[78] CPNA USAEC, *Summary Report on Joint US- EURATOM Discussions*, 31 March 1959, p. 7; CPNA USAEC, Stanley M. Cleveland to Philip J. Farley, *EURATOM Safeguards*, Memorandum, 16 April 1962.

[79] GWU, Dixon B. Hoyle, Division of International Affairs to Steven R. Rivkin Office of Science and Technology, *US Implementation of Safeguards Rights Under US-EURATOM Agreements*, October 1964, GWU Doc. No. 1013.

concluded that the United States could not evaluate EURATOM safeguards effectiveness.[80]

EURATOM and Control

EURATOM's structure failed to meet control principles in several important respects thus complicating control implementation. Superficially, the system appeared strong, with EURATOM having rights to apply safeguards throughout the fuel cycle, own materials and conclude supply contracts both inside and outside of the Community. However, the controlling body was not entitled to have comprehensive knowledge of state activities nor was its scope of control complete. Since nuclear energy policy was under the direction of individual states, only a limited range of nuclear activities were under Commission management. All states had the right to declare a nuclear or non-nuclear weapon status. In addition, control objectives were limited in that: (1) ores, source materials and special fissile materials could not be diverted from their intended uses as declared and (2) EURATOM members complied with the nuclear supply regulations and safeguarding obligations set out in agreements with third parties.[81] The US hopes that EURATOM would have a strong hand in managing EURATOM members' nuclear programmes and prevent them from developing sophisticated nuclear capabilities went unfulfilled.

EURATOM's limitations were highlighted in its relationship with France. Commission powers to exercise materials management through supply control were constantly tested or attacked by the consequences of France's military nuclear programme. The French disregard for EURATOM became evident in 1959 when the French government attempted to supply unsafeguarded materials to Denmark and Sweden, both of which requested that the purchased materials be unrestricted.[82] France felt that the Commission had no role in non-proliferation policy, which was part of national foreign and defence policy. EURATOM objected to France's actions and subsequently prevented French transactions with Canada and Sweden by demanding that conditions of use be set. However, France did manage to establish an arrangement with South Africa and attempted to bypass EURATOM supply

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[80] Allan D. McKnight, *Nuclear Non-Proliferation: IAEA and EURATOM*, Carnegie Endowment for International Peace, Occasional Paper No. 7, June 1970, p. 20; "Nuclear Narks", *op. cit.*, pp. 1114-1115.

[81] EURATOM Treaty, Article. 77.

[82] Goldschmidt, 1982, *op. cit.*, p. 286.

mechanisms during negotiations with the United States and the United Kingdom on additional material supplies.[83]

Questions arose as to whether EURATOM was truly supranational and whether it effectively enforced its authority over Member States.[84] EURATOM had no power to compel a state to furnish information on research underway and could not prevent states from pursuing nuclear energy development as they saw fit. It experienced data collection difficulties during its early years with enterprises filing inadequate, incomplete or late reports, or failing to file at all.[85] The French were accused of limiting the number of scientists and technological personnel available to EURATOM to the point of hindering EURATOM development and undermining the sense of cooperation that EURATOM had been trying to foster.[86] EURATOM's difficulties with the French left doubts whether or not the organisation represented only the interests of its most advanced state.[87]

France worked to prevent EURATOM from applying measures to military-related nuclear activities. France and EURATOM locked horns over when the use of materials for national defence purpose began.[88] Under the Treaty, safeguards "may not extend to materials intended to meet defence requirements which are in the course of being specially processed for the purpose or which, after being so processed, are, in accordance with an operation plan, placed or stored in a military establishment".[89] The Commission attempted to strictly interpret the Treaty and asked to inspect all the nuclear installations in France with the exception of those actually manufacturing weapons. According to EURATOM, the organisation was obligated to verify declared uses; the formulation did not exclude defence installations. EURATOM argued that the complete fuel-cycle from mining ore through fissionable material manufacture was

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[83] Howlett, *op. cit.*, pp. 107-108; Delbert D. Smith, "The European Atomic Energy Community, EURATOM: Limits of Supranationalism", *California Western International Law Journal*, Vol. 1, No. 1, Fall 1970, p. 45.

[84] Gorove, November 1965, *op. cit.*, p. 180; Delbert D. Smith, *op. cit.*, p. 33.

[85] Gorove, November 1965, *op. cit.*, p. 173.

[86] Delbert D. Smith, *op. cit.*, p. 45.

[87] *Ibid.*, p. 45.

[88] Lawrence Scheinman, "EURATOM: Nuclear Integration in Europe", *International Conciliation*, No. 563, May 1967, p. 37.

[89] EURATOM Treaty, Article 84.

a single-track system coming under EURATOM jurisdiction, and that control only ceased when special preparation for defence purposes took place.[90] France, however, argued that the exemption applied to the entire fuel cycle when the objective of the operations was nuclear weapons production. In 1961, it bitterly opposed EURATOM inspection of military materials production, insisting that EURATOM could not apply safeguards to France's "defence cycle" including the Marcoule plutonium producing plant and Pierrelatte enrichment facilities.[91]

France thus successfully undermined the limited transparency measures that EURATOM wished to apply to its nuclear weapons programmes. Commission control over all materials until they were prepared for use in warheads might have increased awareness of nuclear weapon stockpile developments and enabled states to react accordingly. As noted by the USAEC, without access to military facilities:

> [...] there would be no way of knowing whether other materials were being surreptitiously brought into the program as well. It thus would seem that the concept of application of control to military activities can be meaningful only if access of inspectors to military operations is as complete as it is for civilian operations.[92]

Hence, the Dutch were accurate in suggesting during EURATOM negotiations that any military programme external of EURATOM would "break down the whole conception of control".[93]

EURATOM's case demonstrated how the existence of nuclear weapons negatively impacts control. By allowing a nuclear weapons programme to be pursued under EURATOM, states complicated the organisation's control procedures, reduced its credibility and lowered its capability to promote security. Without safeguards application to the military programmes of EURATOM states, the United States concluded that US and IAEA bilateral agreements with EURATOM states would require that EURATOM physically separate activities subject to bilateral arrangements from

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[90] Gorove, November 1965, *op. cit.*, p. 165.

[91] Goldschmidt, 1982, *op. cit.*, p. 146.

[92] AEC 751/89, p. 5.

[93] Tahourdin, 2 May 1956, *op. cit.*

those furthering military programmes.[94] Any other state wishing to ensure its transfers to the Community would not support a nuclear weapons programme was in a similar situation. The separation was not easy to maintain. The French weapons programme was a US problem since information and assistance to EURATOM risked improving French weapons production.[95]

EURATOM's loss of credibility and ability to provide security was plainly evident in Soviet-EURATOM relations. The concerns regarding other member's activities could be addressed, but not those of outsiders without access to EURATOM operations. For EURATOM's chief protagonist, the Soviet Union, EURATOM's weapons policy was aggressive and its lack of transparency in its operations, especially regarding inspections, aggravated their suspicions.[96] Unfortunately, EURATOM made no effort to rectify the transparency problem with either adversaries or extra-regional allies.

Fearing new nuclear neighbours, the Soviet Union proposed on 16 March 1957 an alternative plan for pan-European cooperation in nuclear- and hydro-energy research and development, fuel and power resource development, European trade, and economic assistance.[97] The plan would give the Soviets a look at Western nuclear activities and an indirect role in promoting control over them through resource management. The plan sought to direct states away from focussing on the use of nuclear energy to meet growing energy needs, thus avoiding the development of capabilities it found threatening.[98] It is hardly surprising that the Europeans were uninterested in the Soviet proposal. The initiative was another control plan where leading nuclear powers addressed their threats, limited their own sacrifice and retained their nuclear advantage.

Like the IAEA, EURATOM was not primarily devoted to nuclear control, but rather to peaceful nuclear promotion. The EURATOM Treaty identified the central task of the Community as:

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[94] AEC 751/114, p. 18.

[95] CPNA USAEC, *1269th AEC Meeting*, Meeting Record, 27 February 1957.

[96] CPNA USAEC, Mathews, Vienna to Secretary of State, No. 3400, 16 June 1958.

[97] *Keesing's Contemporary Archives*, Keesings Publications Ltd., Bristol, Vol. 9, 1952-1954, p. 15461.

[98] Howlett, *op. cit.*, pp. 54-55.

> [...] to contribute to the raising of the standard of living in the Member States and to the development of relations with other countries by creating the conditions necessary for the speedy establishment and growth of nuclear industries.[99]

The mandates to:

- promote research;
- facilitate investment;
- guarantee supply;
- ensure wide commercial outlets and access to the best technical facilities by creation of a common market in special materials and equipment; and
- establish foreign relations to foster progress in peaceful uses;

accorded promotion greater status than control. The advantage that EURATOM had over the IAEA was that as a regional organisation, control generated less fear since fewer nationalities were conducting inspections.

II. Western European Union (WEU)

The WEU, established in 1954 by the *Protocol Modifying and Completing the Brussels Treaty*, addressed the FRG's rearmament and its role in West European defence, and strengthened Western European defence against the heightened Soviet threat.

The roots of the WEU were in an initiative by Jean Monnet establishing the European Defence Community (EDC), a scheme to provide peacetime joint planning and military collaboration under a supranational authority. The scheme contained a control mechanism covering both civilian and military energy production. A central authority was accorded managerial powers over the research, production, import and export of nuclear weapons (as well as other weapons). All were forbidden except as authorised by the EDC Board of Commissioners. All members required authorisation for fissionable material production above 500 grams per year. Nuclear decisions were effectively removed from state control, while nuclear production was subject to inspection.

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[99] EURATOM Treaty, Article I.

While the plan did not embody absolute equality in application, it was acceptable to the FRG. Under the EDC, strategically exposed areas, i.e., the FRG, required a unanimous decision of the Council to engage in nuclear material and weapons production. In a written exchange between France and the FRG, German Chancellor Konrad Adenauer acknowledged that nuclear energy control was the key to nuclear weapons control. The FRG undertook to:

- accept controls over the import, production and storage of nuclear fuel and uranium and the development, construction and possession of nuclear reactors;
- create legislation prohibiting the development, production and possession of nuclear weapons; and
- secure sensitive nuclear information.[100]

The proposal was defeated in 1954 on broad security and sovereignty grounds, rather than narrow nuclear ones. The EDC's supranational character was not esteemed by the French government which was seeking to keep its nuclear options open while minimizing nuclear threats from the FRG by denying it the same privilege. The EDC could prevent French nuclear weapon development, subject production and reprocessing to control and interfere with peaceful research.[101] France also feared the FRG could gain access to weapons technology.[102] While desiring to place constraints on the FRG, it was not reconciled to the idea that similar constraints could be applied to itself, virtually precluding France from pursing a nuclear weapons programme. In 1954, it proposed amendments that would have placed nuclear restrictions only within "strategically exposed areas", allowing France to keep its option open on a national programme. For the Germans, such extreme inequality was unacceptable.[103]

The WEU control mechanism was a feeble attempt to establish a threat management system. France, Italy and the Benelux countries agreed that the WEU Council would preside over nuclear production, set target weapon stock levels, and control any nuclear weapons beyond the experimental stage. No verification mechanism for the arrangement existed until the Armaments Control Agency (ACA)

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[100] *The European Defence Community Treaty*, April 1954, HMSO, London, Cmd 9127. Also see Edward Fursdon, *The European Defence Community: A History*, The Macmillan Press Ltd., London, 1980, pp. 164-165, 187.

[101] Scheinman, 1965, *op. cit.*, p. 104.

[102] Goldschmidt, 1982, *op. cit.*, pp. 127-129.

[103] Ibid., p. 128; Fursdon, *op. cit.*, pp. 281-285.

was established in 1957 to implement inspection.[104] On paper, the ACA had broad authority to receive reports on procurement expenditures, production, holdings, losses and exports of major nuclear and non-nuclear weapon systems from member states. It was to verify the reports through on-site inspection at production facilities and storage units utilising multinational teams with unlimited site and record access. The scope of reporting and inspection applied to arms held by alliance forces, territorial defence troops, police, and paramilitary units.[105]

WEU nuclear controls were poorly designed and half-heartedly implemented. As under the EDC, the system was structured to verify regional military nuclear activities, including nuclear weapons production. WEU controls potentially could prevent member rivalries through transparency and partial elimination of individual nuclear weapons programmes. By removing the decision-making process from national hands, regional nuclear rivalries could have been checked. Applying nuclear controls for global security was not, however, a primary WEU objective. The control mechanisms were more a coordinating process for the stable development of a European nuclear force directed at the Soviet Union. Parties could receive nuclear weapons by transfer, engage in indigenous research and development and participate in nuclear weapons proliferation activities taking place in other WEU states.

WEU measures were not equally applied. The United Kingdom was exempt from the nuclear control provisions and a separate protocol restricted FRG operations, including a renunciation of nuclear weapons production and a limitation on civilian material production to 3,500 grams per year.[106] This unilateral action constrained the FRG less than the EDC would have. While the FRG agreed not to manufacture nuclear weapons, it made no promise not to possess or procure nuclear weapons.[107] As the

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[104] Goldschmidt, 1982, *op. cit.*, pp. 129-130; *Letter from the Chancellor of the Federal German Republic to the Secretary of State for Foreign Affairs regarding Nuclear Fuels for Civil Purposes*, HMSO, London, Cmd. 9323, 16 November 1954.

[105] Harald Müller, "The Evolution of Verification" PRIF Working Paper in *Modalities for the Application of Safeguards Paper Presented at Future Nuclear Weapon Free Zone in the Middle East,* IAEA Workshop, 4-7 May 1993, pp. 2-3. Nuclear inspection was transferred to EURATOM.

[106] *Letter from the Chancellor of the Federal German Republic to the Secretary of State for Foreign Affairs regarding Nuclear Fuels for Civil Purposes*, 16 November 1954, Cmd. 9323, HMSO, London. The renunciation was superseded by the FRG's NPT agreements.

[107] Fursdon, *op. cit.*, pp. 326-327.

FRG was acting unilaterally, it had far less incentive for constraints then it had during EDC negotiations.

The ACA never became fully operational, because the political will for implementation was lacking. The Agency's legal instruments, empowering inspection without prior consent, were left unratified. Instead of regular inspection, it could only carry out limited control exercises. It was denied funding to recruit nuclear experts for inspections forcing it to accept government inventory reports as accurate. Lack of universal application limited any interest in participation. France viewed the absence of restrictions on the United Kingdom as discriminatory and ignored Treaty provisions on the production and stockpiling of nuclear weapons. It refused to allow inspections of its nuclear programme and made no notification when nuclear weapons production commenced.[108]

Although many non-nuclear factors contributed to the plan's failure, ignoring control principles assisted in the plan's demise. Since rivalry management among participants was central to stability while developing a regional nuclear force, programme structures and strategic operational decisions were controlled by the Authority. As so often before, sacrificing sovereignty, renouncing nuclear weapons, and accepting inequality presented insuperable obstacles.

III. European Nuclear Energy Agency (ENEA)

While the negotiations of EURATOM proceeded, some members of the OEEC negotiated an alternative nuclear energy organisation. The ENEA, like EURATOM and the IAEA, was established to promote nuclear energy and its control organ suffered from being coupled with promotional activities.

In December 1953, members of the OEEC began to consider Europe's future energy needs and resources. They established the Commission for Energy in 1955 to explore cooperation. On 18 July 1956, the OEEC Ministerial Council established a Steering Committee for Nuclear Energy. This Committee was assigned to explore cooperative efforts for the production and use of nuclear energy and to establish an international security control system to ensure that "the operation of joint undertakings

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[108] C. F. Barnaby, *Preventing the Spread of Nuclear Weapons*, Souvenir Press, London, Pugwash Monograph 1, 1969, pp. 39-41; Mason Willrich, "West Germany's Pledge Not to Manufacture Nuclear Weapons", *Virginia Journal of International Law*, Vol. 7, No. 1, December 1966, pp. 91-97; Colin Gordon, "The WEU and European Defence Cooperation", *Orbis*, Vol. 17, No. 1, Spring 1973, p. 250.

and the materials, equipment and services made available by the Agency or under its supervision, shall not further any military purpose." The result of the Committee's effort was the establishment of the ENEA on 1 January 1958.[109]

The ENEA offered its members a nuclear energy promotion plan containing a softer alternative to the supranationalistic control debated in EURATOM. The ENEA's primary objective was nuclear energy promotion in a manner according states "maximum flexibility".[110] Participation was non-compulsory. The ENEA catered to non-members of the Brussels group that were "not prepared to become dependent on a monopolistic atomic community for materials they consider to be, in the long run, essential to their economic viability."[111] ENEA supporters believed that pooling nuclear resources was not feasible.[112]

Following the establishment of the ENEA, a Security Control Convention, which delineated specific measures, entered into force on 22 July 1959. ENEA controls were modelled directly on the IAEA Statute and US bilateral agreements.[113] The technical measures were slightly more rigorous although limited to cooperative projects and Agency aid. Article 2 (a) set the scope of application to cover materials, equipment, services utilised and source and fissionable materials recovered or obtained in an enterprise.[114] The ENEA's objective for safeguards to prevent diversion was somewhat stronger than the IAEA's. The injunction that joint undertakings and use of associated

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[109] *Background Material for the Review of the International Atomic Policies, op. cit.*, pp. 790-791.

[110] *Decision of the Council of the Organisation for European Economic Co-Operation Establishing a European Nuclear Energy Agency and Convention on the Establishment of a Security Control in the Field of Nuclear Energy*, Article 1, Paris, 20 December 1957, HMSO, London, Cmnd. 357; Council of Europe, *Policy of the Council of Europe: European Integration*, No. 483, 6 April 1956, p. 5.

[111] CPNA USAEC, W. Shearer, *Memorandum on Compatibility of OEEC and EURATOM Proposals*, 13 February 1956.

[112] CPNA USAEC, Dillon, Paris to Secretary of State Department of State, Incoming Telegram, No. 3868, 27 February 1956.

[113] Similar measures included safeguards on transferred material; facility design examination; approval over chemical processing methods; accounting and reporting requirements; deposit of excess materials with the ENEA returnable on request; and unrestricted access to facilities, data, and safeguarded materials.

[114] For a discussion see Stephen Gorove, "The Inspection and Control System of the European Nuclear Energy Agency", *Virginia Journal of International Law*, Vol 7, No. 2, April 1967, p. 76.

material and equipment "shall not further any military purpose" went beyond the wording in the IAEA's Statute (Article III.A.5) being "not used in such a way to further any military purpose".[115] ENEA aid was not to further any military aims regardless of the purpose of use.[116] Measures providing for withdrawal from an agreement were stronger than those of the Statute promoting safeguards continuation.[117] The ENEA system contained greater flexibility regarding changes in technology. Inspection could be increased by the Steering Committee without the agreement of the parties' involved when technical features required an increase. Enforcement measures contained elements from both IAEA and EURATOM. In the event of non-compliance, the President of the ENEA Tribunal could issue an inspection warrant. Sanctions such as suspension or termination of aid and return of material and equipment required only the vote of two-thirds of the Steering Committee, exclusive of the infringing party.[118]

Although the resulting mechanism was similar to its IAEA and EURATOM counterparts in style, when one of the negotiating working groups examined control during ENEA negotiations they investigated a control system that went beyond non-diversion of aid to include national programme coverage. The participants acknowledged that "effective" control would likely require a significantly different structure than control over joint enterprises:

> If the aim [of the ENEA safeguards system] is to be an effective control comparable with that exercised over joint undertakings, it will undoubtedly be necessary to set up an extremely heavy international control "machinery" within each national plant under control.[119]

For assurance, nuclear operations needed to be separated from national direction. The United Kingdom saw its proposals to use only joint enrichment plants as the best

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[115] The definition of military in Article 17 does not include propulsion.

[116] Gorove, April 1967, *op. cit.*, p. 73.

[117] Withdrawal requires 12 months notice and is executed without prejudice to the control over materials previously supplied by the Agency or under its supervision. (*Ibid.*, pp. 75-76.)

[118] *Decision of the Council of the Organisation for European Economic Co-operation Establishing a European Nuclear Energy Agency, op. cit.*, Articles 5, 10.

[119] Special Committee for Nuclear Energy Working Party No. II *Technical Study on the Control of Security in Plant Handling Fissile Materials*, OEEC, Paris, NE/WP.2 (56)8, 8 May 1956, p. 11.

hope of "real security" in the nuclear field.[120] A multinational project like the Eurochemic reprocessing plant potentially provided not only political assurances through joint-control but also technical benefits because incoming fuel from different reactors could be analysed for anomalies.[121] The Working Group on Security Controls stated that it was desirable that all controlled joint operations to be managed by the international body itself.[122] Analysts for the OEEC echoed the Baruch Plan, noting that if a plant was not part of a joint undertaking, the ENEA must play a managerial role:

> [...] the control authority will have to allow for the possibility of bad faith on the part of management. If there is a chance of connivance on the part of management, the possibilities of misappropriation are greatly increased and detection becomes extremely doubtful, unless it be accepted that the control authority should be allowed to have a say in plant affairs to an extent much greater than in the former case [joint undertakings].[123]

The negotiations also reaffirmed the importance of broad control throughout the fuel cycle. Control over sensitive national operations was technically and politically complementary to ENEA assurances.

> Control would be even more complete if, in this case, countries with national chemical processing plants at their disposal agreed, for psychological reasons, to submit their civilian reactors to the proposed security control.[124]

In examining control, negotiators emphasised the need for inspector to have wide rights of access and to avoid turning control into a number-crunching exercise:

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[120] *MESSINA, op. cit.*; EG 1/86 27549, R. W. Munro, Foreign Office to E. J. W. Barnes, Esq, Bonn, 3 March 1956.

[121] Einar Saeland, "Existing Arrangements for International Control of Warlike Material - 4: The European Nuclear Energy Agency", *Disarmament and Arms Control*, Vol. 2, No. 3, Summer 1964, p. 256.
Such arrangements as Eurochemic, however, did not address that states gained technological experience which could be used to break-out of an agreement.

[122] OEEC Council, *Security Control Institutional Problems*, OEEC, Paris, C (56)46, 20 February 1956, p. 4.

[123] NE/WP.2 (56)8, *op. cit.*, p. 11.

[124] Special Committee for Nuclear Energy, *Draft Report of Working Party No. II on Security Control*, OEEC, Paris, NE/WP.2 (56)7, 8 May 1956, p. 6.

> To restrict the control to the verification of book-keeping figures would render it illusory. Control authority officers will probably have to be in possession of the plans of the plant, be empowered to check their accuracy, be authorised to go without notice to any point in the plant, and be empowered to carry out any technical check that they might consider necessary. It might even be necessary to have control authority staff permanently stationed at certain points where fissile materials pass through the plant, perhaps to the exclusion of personnel of the plant.[125]

The control body, to function, needed a role in physical protection. The duties included "checking the effectiveness of the police control applied by the management of the undertaking either inside the plant itself or at the exit gates."[126]

Although the discussions revealed that parties would consider a strong system and were receptive to effective control, they preferred a flexible arrangement which might attract wider participation. Like other control endeavours, the ENEA negotiations revealed the tensions associated with balancing control with promotion and preservation of sovereignty. During the negotiations of the ENEA control system, the United Kingdom, a leader in the nuclear industry, expressed its hope to use control to protect proprietary information:

> The aim of this control will doubtless be to prevent not only the diversion of fissile materials, but also the disclosure of the manufacturing secrets held by the joint undertakings or communicated by them to national undertakings[...].[127]

Initial ideas on controlling domestic programmes were rebuffed and limiting proposals were brought forth. Often negotiations parallelled those of the Baruch Plan. During the negotiation, Austria, echoing past Soviet arguments, led efforts to make controls compatible with sovereignty.[128] Similarly, Sweden rejected inspection and

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[125] NE/WP.2 (56)8, *op. cit.*, p. 11.

[126] Special Committee for Nuclear Energy, *Draft Report of Working Party No. II on the Technical Procedures of the Security Control*, OEEC, NE/WP.2 (56)10, 24 May 1956, p. 13.

[127] C (56)46, *op. cit.*, p. 1.

[128] CPNA USAEC, Perkins, Paris to USAEC, *Highlights Nuclear Energy Portion OEEC*, Ministerial Meeting, 18 July 1956, 23 July 1956.

argued that national project control should consist of national record keeping only.[129] Sweden's cool reception to control was not surprising as there were indications that the Swedish government was considering nuclear weapons acquisition.[130] France, seeking access to heavy water access for its weapons programme, argued that states forming a joint undertaking should retain the option either to control it themselves or have recourse to the ENEA. Only special fissionable materials would be subject to compulsory Agency control.[131]

Compliance issues mirrored the veto debate between the United States and the Soviet Union during the Baruch era. Sweden, supported by Italy, which was also considering the nuclear option, argued that voting on sanctions should be unanimous, and include the accused. The proposal was defeated as states recognised a ploy to nullify the compliance mechanism.[132]

The ENEA, which later became known as simply the Nuclear Energy Agency (NEA), witnessed promotional growth, but its control functions were eventually handed over to EURATOM or IAEA depending on which organisation had responsibility for the territory in question. The NEA experience is interesting because the early investigation into effective control yielded conclusions similar to the Baruch era. As with the other cases, features that would promote effective control demanded too many sacrifices.

IV. Conclusion

Attempts to establish regional control are relevant for two reasons. First, when analysts attempted to make control effective, their conclusions resembled that of the Baruch era. They tended to equate effectiveness with strong measures incorporating principles identified by Acheson and Lilienthal. Secondly, supporters of control

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[129] PRO EG 1/115 27549, M. I. Michaels to I. F. Porter, Esq., O. B. E., Foreign Office, 7 May 1956.

[130] Mitchel Reiss, *Without the Bomb*, Columbia University Press, New York, 1988, p. 40.

[131] Steering Committee for Nuclear Energy, *Proposals Concerning Security Control, Organisation for European Economic Co-operation*, OEEC, Paris, NE (57)18 Revised, 20 April 1957, p. 1.

[132] PRO EG 1/104 27590, F. C. How, Whitehall to R. C. L. Brayne, Esq, United Kingdom Permanent Delegation to the OEEC, 13 June 1957; NE (57)18 Revised, *op. cit.*

encountered difficulties in establishing control systems similar to the Baruch Plan and IAEA negotiations; states resisted intrusions upon their sovereignty and economic interests and thus undermined control efforts.

CHAPTER 5: THE IMPACT ON CONTROL OF LIMITING THE BARUCHIAN PRINCIPLES

The period from 1970 to 1990 was one of safeguards maturation. This chapter uses the principles identified in Chapter 1 to analyse developments during this period in the safeguards system devised to meet the IAEA's obligations under the NPT. It should be noted that during this time the Agency dealt with a number of challenges to the technicalities of implementing the system, which can be related to the principles of control. However, these problems did not necessarily affect judgements on whether the "Principles" were basic building blocks for an effective control system.

In analysing these challenges, the developments can be viewed from two very different perspectives. The first perspective views IAEA safeguards in the context of non-proliferation. This is the purpose for which the system was designed. When taking this view, the system appears to meet its objectives and has acquired a valuable and important role in promoting international stability despite its imperfections. The NPT and safeguards have been credited with preventing unrestrained horizontal proliferation, which was a concern at the advent of the nuclear age, and has set a goal of total disarmament for the NWSs.

The purpose of this chapter, however, is to examine the developments in the second perspective, which is in the context of disarmament. This approach renders a much harsher judgement on the events of the last quarter century. The higher level of criticism is a function of the difference in requirements for certain states to feel secure in establishing and maintaining a NWFW versus sustaining an international order that is based on nuclear deterrence and the promotion of non-proliferation. The judgement is not so much a condemnation of the system as a demonstration of the requirements for disarmament.

I. Feasibility

Analysts in 1946 believed that an international control system needed to be feasible. Feasibility under the current system became problematic on several levels. First, there were difficulties regarding the level of control that the IAEA could apply in view of the rapid developments in technology, the unchecked growth of nuclear industry and the restrictions placed on the IAEA's budgets. Second, there were problems regarding what states believed was economically or politically feasible.

Political feasibility demanded tight budget controls and limits on IAEA access. Both contributed to complicating IAEA efforts in resolving technical problems.

Growth in the nuclear industry by the mid 1970's was considerable as this contributed to an increasing stockpile of weapons grade material and the number of facilities in operation.[1] In 1985, 96 states with agreements had 486 facilities containing safeguarded material. In 1997, 135 states with agreements had 931 facilities. Between 1985 and 1999 nuclear facilities subject to inspection mushroomed from 486 to 1093.[2] Increases in facility numbers were not always an indication of safeguard needs. Some new facilities were larger and more complex, requiring more inspection resources.

The IAEA safeguards budget, however, was not designed to take industrial growth into account, leaving the Agency to struggle in meeting obligations. In 1985, the BOG imposed a zero-growth budget which provided for annual adjustments for inflation but made no allowance for increases in the number of safeguarded facilities when states acceded to the NPT or constructed new facilities.[3] At times, the IAEA was forced to absorb annual cost increases of up to millions of dollars depending on the facility types involved.[4] Relative to military budgets, contributions to safeguards were small, but politically they were viewed as excessive.[5] Rather than increase the budget to meet the rising costs, some states preferred that the IAEA reduce or

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[1] By 1999, the IAEA had under safeguards 609 tons of Pu in irradiated fuel, 75 tons of separated Pu outside reactor cores or recycled fuel elements in reactor cores, 21.2 tones of HEU, 62,984 tons of LEU and 88,087 tons of source material. *(IAEA Annual Report for 1999*, IAEA, Vienna, 2000, Table A18.)

[2] *IAEA Annual Report for 1999*, IAEA, Vienna, 2000, Table A19.

[3] Occasionally an increase was permitted. In 1992, the Board allowed a 4.6% increase which was nevertheless insufficient to cover new activities in South Africa, the DPRK and Latin America. (Eric Chauvistré, "The Agency's New Clothes: Nuclear Inspections after Iraq", Peace Research Centre, The Australian National University, Canberra, April 1993, p. 19; Benjamin Sanders, *PPNN Newsbrief*, No. 18, Summer 1992, p. 4.)

[4] The cost to apply safeguards under the new ABACC agreement was estimated at US$ 2,100,000. (GOV/OR.768, para. 120.)

[5] The US total contribution of $28.3 million was estimated to be one ten-thousandth of its national security and international relations budget. (Office of Technology Assessment, *Nuclear Safeguards and the International Atomic Energy Agency*, OTA-ISS-615, Washington, DC, June 1995, p. 52.)

suspend safeguards when the Agency identified no diversion risk.[6] Despite the shortfalls, the IAEA could not refuse new safeguards agreements without placing itself in a difficult political position and therefore operated on a narrow cash flow margin. By summer 2000, the US withholding of dues until the year end created a cash flow problem which led to an Agency announcement that it might be unable to meet its payroll.[7]

The impact of these events was that the comprehensive coverage of the system was curtailed. The Agency experienced equipment shortages and failures due to obsolescence or lack of maintenance.[8] Staff shortages were endemic. In the late 1970s and throughout the 1980s, inspection activities were rationalised. Inspection efforts were reduced on smaller or less-sensitive facilities with conclusions sometimes being based solely on reports.[9] In the 1990s, inspection duration and frequency were substantially reduced in NWSs and even at larger facilities in NNWSs.[10] Heavy workloads and financial constraints at times forced the Secretariat to concentrate on tracking significant quantities of nuclear material (SQs)[11] rather than timeliness or lengthen timeliness objectives. In providing assurances, the Agency takes qualitative factors were taken into account when drawing conclusions. The question arises, however, at what point were qualitative factors insufficient?

Since restraints on the size or type of plants were not politically feasible, some experts questioned whether it was technically feasible to safeguard certain facilities.

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[6] Statement by Brazil, GOV/OR.367, paras. 35-36.

[7] William Drozdiak, "UN Nuclear Agency in Financial Straits", *The Boston Globe*, 8 August 2000, p. A9.

[8] United States Senate, *Nuclear Nonproliferation and Safety*, GAO Report to the Chairman, Committee on Governmental Affairs, GAO/NSIAD/RCED-93-284, September 1993, p. 37; NPT/CONF.IV/12, para. 18(f).

[9] United States Congress, *IAEA Programs of Safeguards*, Hearing before the Committee on Foreign Relations, 97th Congress, 1st Session, 2 December 1981, Washington, DC, 1982, p. 60.

[10] NPT/CONF.IV/12, para. 18(g); NPT/CONF.1995/7, para. 110.

[11] An SQ is the amount of material required to build a crude nuclear weapon, production depending on the type of material under consideration. SQs for plutonium and HEU were set at 8kg and 25kg, respectively. Timeliness represents a period of time ranging from days to a year and represents the amount to time the IAEA aims to detect material diversion. The allotted time identified for each material is based on detection before it can be converted to metallic components for a nuclear explosive device. For a discussion of safeguards criteria see GOV/2107.

Large plants generating MUF levels exceeding the amount necessary to construct several nuclear weapons led experts to question the accounting accuracy, especially at bulk reprocessing plants.[12] By the 1990s, the specter of unsafeguardable plants loomed. Facility complexity presented a considerable control problem in generating and implementing comprehensive safeguards approaches.[13] Even under continuous inspection, verification of some facilities was problematic. Basic verification activities proved difficult or impossible without large-scale operational interference. For example, the IAEA failed to reach inspection goals at a German Alkem facility despite continuous inspector presence with near unlimited access to all relevant parts.[14]

II. Sufficient Warning of Non-Compliance

In 1946, analysts believed control systems should provide adequate warning of misdeeds. Warning levels were derived from the safeguards objective of the timely detection of a SQ of nuclear material diverted from peaceful nuclear activities to explosive device manufacture.[15] Warning can also be affected by the nature and size of a nuclear programme. Some Baruch era analysts believed that a peaceful nuclear programme can become inherently destabilising if states generate large nuclear material stockpiles or if the programme is structured so that it allows a state to easily convert from peaceful uses to nuclear weapons production.

The levels set by the IAEA were thought to leave little margin for error. Starting in the mid-1970s on, doubts surfaced regarding whether the IAEA's standards for

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[12] Marvin Miller, *Are IAEA Safeguards on Plutonium Bulk-Handling Facilities Effective*, Nuclear Control Institute, August 1990 in Eldon V. C. Greenberg, *The NPT and Plutonium: Application of NPT Prohibitions to "Civilian" Nuclear Equipment Technology and Materials Associated with Reprocessing and Plutonium Use*, Nuclear Control Institute, Washington, DC, 1993, pp. 4-5; *IAEA Programs of Safeguards, op. cit.*, p. 62; for NRC concerns see United States House of Representatives, *Technical Aspects of Nuclear Proliferation: Safeguards*, Hearings before the Subcommittee on Energy research and Production of the Committee on Science and Technology, 97th Congress, 2nd Session, Washington, DC, 3-4 August 1982, p. 92.

[13] Thomas Shea, Stein Deron, Fredy Franssen et Al., "Safeguarding Reprocessing Plants: Principles, Past Experience, Current Practice and Future Trends", *Journal of Nuclear Materials Management*, Vol. 21, No. 4, July 1993, p. 25.

[14] "Questions are Said to Still Remain about Efficacy of Safeguards at Alkem", *Nuclear Fuel*, Vo. 13, No. 5, 21 March 1988, pp. 9-10.

[15] INFCIRC/153, para. 28. Also see *IAEA Safeguards: An Introduction*, Vienna, International Atomic Energy Agency, IAEA/SG/INF/3, 1981, p. 12.

timely detection provided sufficient notice to enable complying states to apply political pressure on a non-compliant state before it could assemble a device.[16] To further heighten concerns, some experts asserted that less material than the identified detection levels were actually required for a weapon.[17]

III. Provision of Security in the Event of System Failure

The Acheson-Lilienthal Report advocated that states needed to feel secure in the event of system failure. Baruch went further by requiring a strong mechanism to address compliance. More recent analysts reached similar conclusions, noting that failure to provide for withdrawal or breakout by establishing an enforcement mechanism undermined the system.[18] The adopted control system was designed for a flexible response by offering limited sanctions and relying on the international community to take action. While the outcome of international enforcement attempts have been mixed, it has underscored the vulnerability of states in a NWFW in the event of non-compliance.

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[16] On the limitations of the objectives see David A. V. Fischer, "On IAEA Safeguards", *The Bulletin of the Atomic Scientist*, Vol. 38, No. 3, March 1982, pp. 39-41; United States House of Representatives, *Nuclear Safeguards: A Reader*, Report prepared by the Congressional Research Service for the Subcommittee on Energy Research and Production Transmitted to the Committee on Science and Technology, 98th Congress, 1st Session, December 1983, p. 41; *IAEA Programs of Safeguards*, *op. cit.*, p. 63; Myron Kratzer, *International Nuclear Safeguards: Promise & Performance*, Atlantic Council of the United States, Washington, DC, Occasional Paper, April 1994, *op. cit.*, p. 34.

[17] For more detail on SQs see *IAEA Safeguards Glossary*, IAEA/SG/INF/1, Vienna, Austria, 1980, pp. 21-22. The US Department of Energy gave indications in 1995 that 4 kilograms of plutonium are sufficient to make a nuclear weapon. (Office of Technology Assessment, 1995, *op. cit.*, p. 11.) However, the construction of weapons using lower amounts of nuclear material was thought to require higher expertise not always available in a nuclear weapons programme that has not matured.

[18] "Statement by Senator Stuart Symington", "Prepared Statement by Emanuel R. Morgan", "Written Statement of S. Jacob Scherr on Behalf of the Natural Resources Defense Council, 24 June 1981" and "Prepared Statement of Paul Leventhal" in *Nuclear Safeguards: A Reader*, *op. cit.*, pp. 353, 750, 764-765 and 896 respectively; Kratzer, April 1994, *op. cit.*, p. 34; Scheinman in Leachman and Althoff, *op. cit.*, p. 112; Christopher E. Paine, "Separated Plutonium and the Non-Proliferation Regime: Risks, Safeguards and Remedies" in William Clark Jr. and Ryukichi Imai (eds.), *Next Steps in Arms Control*, Carnegie Endowment for International Peace and International House of Japan, Washington, DC, 1996, pp. 163-164.

Iraq presented the most significant enforcement challenge for the system. After its defeat in the Persian Gulf War, the international community created the UN Special Commission on Iraq (UNSCOM) which was accorded a broad range powers to dismantle or neutralise Iraq's WMD programme. While UNSCOM was able to utilise broad rights, allowing it to uncover Iraq's clandestine nuclear weapons programme, the difficulty of enforcement became evident. Iraq executed a structured resistance campaign to UNSCOM dismantlement of its WMD programmes and establishment of an ongoing monitoring and verification regime (OMV).[19] As time passed and despite air strikes, resistance continued. Iraq suspended cooperation in October 1997 and again in August 1998. Eventually, the international community fragmented, and it lost its ability to extract full compliance from Iraq.[20] By mid-1999 UNSCOM was defunct, and states began searching for effective but less intrusive mechanisms, acceptable to Iraq, that could still prevent its acquisition of WMD.[21]

The case demonstrated the challenge of ensuring that states continue to feel secure when the system comes under threat. The lesson for states, which are most threatened by Iraq or rely on nuclear weapons deterrence, is discouraging. Under current arrangements, the international community has not effectively generated confidence regarding its ability to deal with states not complying with their nuclear commitments. It is conceivable that, if the events in Iraq had occurred in a NWFW, states may have maintained their resolve to ensure the complete dismantlement of Iraq's WMD programme. In actuality, however, the capability of the international community to respond to nuclear crises was inadequate. This is not only true for Iraq but in other cases as well. The community is still struggling to fully resolve non-compliance by the DPRK with its safeguards agreement.

If, in times of crises, a state perceives that the system cannot provide security during a system failure, the credibility of the control system is undermined. A fear of

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[19] For details see GOV/INF/688, para. 10; *Iraq Inspections: Lessons Learned*, JAYCOR, Vienna, Virginia, 11 September 1992; GC(42)/14, Annex 1, p. 3, para. 29; GOV/INF/688, p.2; GOV/INF/770; GOV/INF/776, paras. 14-15; Kathleen C. Bailey, *The UN Inspections in Iraq: Lessons for On-Site Verification*, Westview Press, Oxford, 1995, pp. 62-69; Benjamin Sanders, *PPNN Newsbrief*, No. 15, Autumn 1991, p. 10.

[20] Former UNSCOM Inspector Scott Ritter testified in 1997 that the United States would not support confrontational inspections while the Russians and French wanted to avoid a crisis. (Laurie Mulroie, "Scott Ritter's Congressional Testimony", *Iraq News*, 7 September 1998.)

[21] Benjamin Sanders, *PPNN Newsbrief*, No. 43, 4th Quarter, 1998, p. 20; John J. Goldman, "New Approach to Iraq gathers steam in UN", *Los Angeles Times*, 23 January 1999.

system failure and the belief that the international community could not act rapidly was a leading factor behind Israel's air attack on the Iraqi Osiraq reactor on 7 June 1981.[22] In justifying its action, Israel cited the absence of a mechanism triggered if IAEA safeguards becoming inoperative. Israel criticised the bilateral letter exchange on 11 September 1975 between Iraq and France for not providing solid "backup safeguards" should Agency safeguards cease and saw enforcement as impossible.[23] In the event of detection, Israel was convinced that "no one would intervene to alter Iraq's conduct, and establishing effective international sanctions against Iraq would be impossible since Iraq was a major oil exporter supported by other Arab States.[24]

IV. Incorporation of Positive Aspects in the Programme

The first nuclear control analysts concluded that to be effective an international system needed to contain some positive elements as an incentive to participate. Although the adopted framework contained such elements, the manner in which these incentives were incorporated did not contribute to effective control. They were used to compensate for flaws in the system that acted as strong disincentives. Originally, economic benefits were not intended to compete with controls. The benefit of control was security to enable development in a stable environment, not promoting development at any cost.

Two problems occurred regarding promotional aspects. First, promotional incentives were not properly designed. Economic incentives for joining the NPT were not always clear. NPT States Parties were slow to provide strong incentives by linking transfers and aid to acceptance of fullscope safeguards. Throughout the 1970s and 1980s, a number of countries were willing to sell their wares to states that did not

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[22] United States House of Representatives, *Problems in the Accounting for and Safeguarding of Special Nuclear Materials,* Hearings before the Subcommittee on Energy and Environment of the Committee on Small Business, 94th Congress, 2nd Session, Washington, DC, 27 February 1978, p. 84.

[23] United Nations General Assembly, Letter Dated 19 October 1981 from the Permanent Representative of Israel to the United Nations Addressed to the Secretary-General, Ministry of Foreign Affairs and Atomic Energy Commission, *The Iraqi Nuclear Threat - Why Israel Had to Act*, Jerusalem 1981, A/36/610, 20 October 1981, pp. 24-25; Lawrence Scheinman, *Assuring the Nuclear Non-Proliferation Safeguards System*, The Atlantic Council of the United States, Washington, DC, Occasional Paper, October 1992, p. 40, fn 11; also see Shai Feldman, "The Bombing of Osiraq - Revisited", *International Security*, Vol. 7, No. 2, Fall 1982, p. 114.

[24] A/36/610, *op. cit.*, pp. 27, 121.

accept NPT safeguards[25] despite calls for preferential treatment of parties over non-parties in access to, or transfer of, equipment, materials, service, and technology.[26] The same problem occurred with the Model Protocol which was adopted in 1997 to strengthen the safeguard system. Neither nuclear supplier states nor the IAEA have offered incentives or given preference to importing states that adopt the Model Protocol. As some states have little interest in the proliferation aspects of the IAEA safeguards system, they find few incentives to accept the Protocol's additional verification burdens in no economic benefits are apparent.[27]

The second problem is that the system, in providing benefits through promotional activities, has set promotion in competition with control. The need to compete with promotion has had a negative effect on safeguards. Since safeguards were established, the Agency has been barraged by constant reminders to meet promotional obligations while applying minimal safeguards. The Conference of Non-Nuclear Weapons States declaration in 1968 reveals the pressure on the Agency. Calls, all of which concerned standard Agency practices, were made for:

- safeguards simplification;
- the development of rules against industrial espionage, the duplication of safeguard procedures and commercial discrimination;
- the implementation of studies on promotional activities; and
- the establishment of a special fissionable materials funds to benefit NNWSs.[28]

As the Agency assumed responsibility for NPT safeguards, many states regarded the growth in safeguarding activities as competing with the promotional mandate. Comments such as by Spain that the Agency "should not become a mere inspection body, to the detriment of such other activities as technical assistance" were common.[29] Developing states expressed disinterest in safeguards. In 1975, Sudan noted at the NPT Review Conference:

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[25] This slowly changed as some states made a practice of attaching criteria for recipients who receive assistance from their contributions to the IAEA's development funds. (Scheinman, 1987, *op. cit.*, p. 253.)

[26] NPT/CONF.II/C.II/34; NPT/CONF/C.II/SR.2; NPT/CONF.2000/28.

[27] For a discussion see Oliver Meier, "Strengthened Nuclear Safeguards", *VERTIC Briefing Paper,* No. 00/2, April 2000, pp. 6-8.

[28] GOV/1318; Final Document of the Conference of Non-Nuclear-Weapon States, A/7277, pp. 8-16.

[29] Statement by Spain, GOV/OR.424, para. 24.

> As far as the developing countries were concerned, article III was of less importance than article IV, although the two articles were clearly interrelated.[30]

A number of states formed a voting bloc to promote giving precedence to technical assistance.[31] Conflict was aggravated because not all Agency members were party to the NPT. Non-parties, notably India, Argentina and Pakistan, resisted what they regarded as attempts to make the Agency an arm of the NPT.[32] In February 1979, they rejected the Board decision approving new criteria for technical assistance. This decision stated that projects should be based on peaceful atomic energy use and exclude "research on, development of, testing or manufacture of a nuclear explosive device".[33]

Continuing pressure on the IAEA to balance promotional and safeguards activities created political pressures on individual states to increase safeguards funding only with corresponding increases in contributing to promotional activities. As noted by the Office of Technology Assessment:

> Even if the United States were to increase its contribution, other IAEA member states may object to increasing their assessments or even to allowing the US increase to be spent on safeguards without a corresponding increase in the technical assistance program.[34]

In many respects promotion hindered control. Although there is considerable interest worldwide in achieving disarmament, the IAEA, which is the international organisation with the longest experience of implementing control, has not been able to expand its control role easily. While it safeguards some US and Russian excess nuclear materials from dismantled warheads, it was rejected as the control organ for the CTBT. In spite of the complementary nature of detecting clandestine nuclear activities and clandestine nuclear weapon tests, Russia and the United States cited a

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[30] NPT/CONF/C.II/SR.2.

[31] *Nuclear Proliferation Factbook, op. cit.*, p. 5.

[32] Lawrence Scheinman, *The Nonproliferation Role of the International Atomic Energy Agency*, Resources for the Future, Washington, DC, 1985, pp. 33, 242.

[33] Scheinman, 1985, *op. cit.*, pp. 49-50.

[34] Office of Technology Assessment, 1995, *op. cit.*, p. 8.

conflict of the Agency's mandate to promote peaceful nuclear energy with test ban verification.[35]

The right to develop peaceful nuclear energy enshrined under Article IV of the NPT inadvertently served as a platform to launch political arguments against attempts to support safeguards through national policies when safeguards could not be strengthened through international means. States' response to perceived reactionary non-proliferation policy developments was reflected in the draft review document of the 1980 NPT Review Conference which noted:

> The Conference agrees that concern for non-proliferation should not be used as a pretext to prevent States from acquiring and developing nuclear technology and to impose conditions which are incompatible with the sovereign rights and independence of countries.[36]

While a respectable number of states professed that safeguards did not hinder peaceful nuclear activities[37], a core group of states vociferously disputed the point. Some, such as Sweden, complained of inspection frequency to the IAEA privately[38] while others, like Belgium, found the measures necessary to enable the IAEA to meet its timeliness criteria untenable and called for amendments to INFCIRC/153.[39] By the 1970s, critics feared that industry had neutralised safeguards. US Senator Stuart Symington observed:

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[35] David Fischer, 1997, p. 81.

[36] NPT/CONF.II/C.II/34, p. 4.

[37] NPT/CONF/35/1, Review of Article III, p. 3; statement by Mexico, NPT/CONF/C.II/SR.3; statement by Switzerland, NPT/CONF/C.II/SR.2; statement by Thailand, NPT/CONF/C.II/SR.3; statement by Austria, NPT/CONF/C.II/SR.3; statement by New Zealand, NPT/CONF.II/C.II/5; statement by the Soviet Union, NPT/CONF.II/C.II/SR.2, para. 5 and NPT/CONF.III/C.II/SR.2, para. 18; NPT/CONF.III/64/I, Review of Article III, para. 9; statement by Australia, NPT/CONF.III/C.II/SR.3, para. 14; statement by Bulgaria, NPT/CONF.III/C.II/SR.3, para. 35; statement by the United States NPT/CONF.III/C.II/SR.2, para. 14; *Report of Main Committee 2*, NPT/CONF.IV/MC.II/1, para. 6; statement by Sweden, NPT/CONF.IV/MC.II/SR.2, para. 16.

[38] Lawrence Scheinman, "Political Implications of Safeguards", in Mason Willrich (ed.), *International Safeguards and Nuclear Industry*, American Society of International Law, London, 1973, p. 239.

[39] NPT/CONF.II/C.II/8, para. 1; statement by Belgium, NPT/CONF.II/C.II/8, para. 1; Howlett, *op. cit.*, p. 217; GOV/OR.515, para. 71.

> [I]t is becoming increasingly clear that commercial interests now prevail over consideration of nuclear weapons control [...] During our visit to the IAEA, we found that this Agency does little more than monitor roughly the flow of nuclear materials.[40]

As predicted in the Baruch era, safeguards became a bargaining chip until the establishment of a nuclear suppliers regime. Lower safeguards commanded a better market price. For example, in the pre-NPT era, Canada was unable to negotiate a safeguarded uranium transfer with France without reducing the price relative to available unsafeguarded material.[41] In the post-NPT period, Argentina judged a Canadian bid to construct its Atucha II reactor superior on both economic and technical grounds but preferred to negotiate with the FRG or Switzerland where it could strike a less restrictive deal.[42] Industrial competition not only lowered safeguards but increased sensitive technology transfers. Both the French and the Germans felt outmatched by the US General Electric and Westinghouse companies. To compete effectively, the Europeans offered to sell reactors plus sensitive fuel-cycle facilities.[43]

The struggle between economics and control could be seen in the case of the FRG and its dealings with Brazil. Brazil was interested in developing its fuel cycle, and turned to the United States to supply an enrichment plant. The United States refused because Brazil was not a NPT member and had no comprehensive safeguards agreement.[44] In addition, the United States could see no economic justification for the plant and speculated that Brazil wished to develop nuclear weapons.[45] Brazil

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[40] "Statement by Senator Stuart Symington, 15 July 1975" in *Nuclear Safeguards: A Reader, op. cit.*, p. 353.

[41] Goldschmidt, 1982, *op. cit.*, p. 284.

[42] GWU, *Current Foreign Relations,* Department of State Telegram, Issue No. 36, 12 September 1979, GWU Doc No. 1663, p. 10.

[43] Newhouse, 1989, *op. cit.*, pp. 271-272.

[44] US suspicions were well founded. In 1990, Brazil's Secretary of Science and Technology confirmed that Brazil's nuclear weapons programme started up in 1975. (Benjamin Sanders, *PPNN Newsbrief*, No. 11, Autumn 1990, p. 7.)

[45] United States House of Representatives, Testimony of Herbert Scoville, Former Assistant Director for Science and Technology at the ACDA, in *Oversight Hearings on Nuclear Energy - International Proliferation of Nuclear Technology*, Hearings before the Subcommittee on Energy and the Environment of the Committee on Interior and Insular Affairs, 94th Congress, 1st Session, Washington, DC July 1975, Part III, p. 85 (herein referred to as *Oversight Hearings on Nuclear Energy*).

turned to the FRG, which considered the deal a major breakthrough in the world market.[46] The two concluded a trade agreement in 1975 for the transfer of from two to eight power reactors, a fuel fabrication plant, a reprocessing plant and an enrichment facility.[47]

A trilateral safeguards agreement, concluded in February 1976, attempted to assuage US security concerns by inserting new safeguards provisions. The FRG placed safeguards on the use of transferred technology, requirements for physical protection measure reporting to the IAEA and obligated Brazil to accept BOG-approved Safeguard Document extensions.[48] The deal also proposed that the reprocessing plant be operated as a joint venture.[49]

There were limits to German flexibility on structuring transfers to provide assurances. The FRG rejected US pleas to defer transfer pending the availability of alternative technologies for reprocessing and breeder reactors. The FRG estimated that these technologies would require 10-15 years to develop, and it could afford neither the time nor the funds.[50] The arrangement also opposed the IAEA push for comprehensive safeguards agreements. The IAEA and several other states were no longer satisfied with the results of non-comprehensive safeguards arrangements, fearing that limited safeguards application to select facilities was insufficient to prevent the spread of nuclear weapons capability.[51]

By late 1984, parts of the German government began questioning the wisdom of the deal. Brazil's attempt to acquire French compressors to build an enrichment plant despite sharp cuts in its civil nuclear programme raised German concerns over

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[46] Helga Haftendorn, *The Nuclear Triangle: Washington, Bonn and Brasilia National Nuclear Policies and International Proliferation*, Georgetown University, Occasional Paper, June 1978, pp. 14-15.

[47] For a discussion on the deal see Haftendorn, *op. cit.*, pp. 14-15, 22-23; M. Zuberi, "Nuclear Safeguards and the Developing Countries: The Servitudes of Civilian Nuclear Technology", *International Studies*, Vol. 20, No. 1-2, February 1981, pp. 184-185.

[48] Benjamin N. Schiff, *International Nuclear Technology Transfer*, Croom Helm, London, 1984, p. 139; INFCIRC/237, Articles 3, 19 and 25; GOV/OR.484.

[49] Haftendorn, *op. cit.*, p. 17.

[50] *Ibid.*

[51] See a comments by Bangladesh, GOV/OR.484, paras. 50-59.

the commercial justification for uranium enrichment.[52] The Germans concluded that Brazil was employing German-supplied technology for a military programme and was merging its civilian and military programmes while shielding the programme from foreign inspection. Worse, leaked German government documents reported a secret IAEA complaint to the German Foreign Minister on 23 January 1987 concerning lax controls and insufficient reporting of German deliveries to Brazil.[53] Nevertheless, in 1990 the agreement was extended for five years after Bonn determined that fears of diversion to military use did not justify cancellation.[54]

Ultimately , the IAEA could not compete with private industry, which was less constrained and better equipped for international nuclear trade.[55] This ongoing commercial drive to weaken safeguards eventually caught the attention of states as they became aware of nuclear proliferation implications. At the fourth NPT Review Conference, the representative of Indonesia observed:

> The industrial countries were increasingly asking for a reduction of the safeguards on their nuclear facilities. However, any relaxation of the existing rules in that area would have serious implications for the effectiveness of the system and would jeopardize the implementation of article III [on safeguards].[56]

Nevertheless, states continue to insist that support for control should in no way detract from the IAEA's promotional activities.[57]

V. Adaptability to Environmental Change

In 1946, analysts believed that the control system had to adapt to environmental changes to function effectively. As the IAEA developed, it identified

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[52] David Marsh, "Brazil N-Plant Worrys France", *Financial Times*, No. 29219, 13 January 1984, p. 4.

[53] Roth, Terence, "Brazil Violating Nuclear Accord, Files Indicate", *Wall Street Journal*, Vol. 214, No. 15, 24 July 1989, p. A11.

[54] Benjamin Sanders, *PPNN Newsbrief*, No. 9, Spring 1990, p. 3.

[55] Joshi, *op. cit.*, p. 96.

[56] NPT/CONF.IV/MC.II/SR.2, para. 47.

[57] NPT/CONF.2000/28, Part I, Section II, para. 32

technical and political loopholes but could not gain the support of states to close them. Enthusiasm for new measures was evident only if other measures could be eliminated. Adapting to technological changes proved especially challenging as adjustments in safeguard procedures were not easily implemented for either technical or political reasons.

Political Willingness to Adapt to Change

In spite of pressures to tighten safeguards, a cadre of states successfully resisted change, especially where INFCIRC/66 type agreements were involved. Between 1976-1988, the Secretariat found that the older facility attachments or subsidiary arrangements needed improvement as procedures were discovered to be inadequate. While it was expected that old agreements would become obsolete, once facility attachments and subsidiary arrangements were set, alterations sometimes generated difficult negotiations. One acute case was in April 1981, when the Agency informed Pakistan that the safeguards at its Kanupp reactor facility needed improvement.[58] Unable to reach agreement, the Secretariat was forced to turn to the BOG in September 1981 and declare the Agency unable to verify that nuclear fuel was not being diverted.

The Secretariat's justifications for new measures was that changes would take into account recent progress in the development of safeguards approaches for on-load refueled reactors (OLRs) and the use of Pakistani-manufactured rather than imported, safeguarded fuel bundles.[59] The disagreement was over the location and use of a backup camera and additional TV recording systems to improve surveillance, use of underwater seals, use of a fuel bundle counter system initially agreed to in 1972 and a need to apply safeguards at an emergency air lock system in the reactor.[60] Although these measures were all commonly used by the IAEA, the issue was not resolved until June 1982.

Even when the Secretariat announced its technical inability to complete its tasking, support for correction proved difficult to obtain. A few states expressed

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[58] Statement by Pakistan, GOV/OR.598, para. 7.

[59] *Ibid.*, para. 2; GOV/INF/420, paras. 5-6; GOV/INF/432, para. 3; Fischer and Szasz, *op. cit.*, pp. 16-17.

[60] GOV/INF/420, paras. 5-6; GOV/INF/432, para. 4; *Technical Aspects of Nuclear Proliferation: Safeguards, op. cit.*, p. 80.

concern and some called for a resolution supporting the Secretariat.[61] However, several sympathised with Pakistan, fearing the Agency would take liberties in safeguards implementation. Iraq, Malaysia, and Nigeria rejected placing excessive pressure on Pakistan, including setting an early deadline for agreement, on grounds that Pakistan was negotiating in good faith and should not be alienated.[62]

The situation underscored the difficulties of the Secretariat when a change in procedures was necessary. The Secretariat assured the Board that it was "fully aware" its negotiations were with a sovereign state and there was no question of imposing measures on Pakistan unilaterally.[63] When accused of discrimination, the Director General defended the proposed amendments, noting that the Agency requested no measures not already applied in similar cases in other countries.[64] Proceeding delicately, the Secretariat did not imply that material had been diverted, although the weakness in safeguards allowed such an opportunity.[65] The lack of agreement however, was not considered a material breach of Pakistan's safeguards agreement.[66]

Pakistan refused to acknowledge that the Agency could not meet its safeguards objectives under current arrangements and held that the Agency had no authority to alter subsidiary arrangements without the consent of the inspected party.[67] Pakistan was not alone, as some of the developing States also endorsed a state's sovereign right to reject safeguards alterations. Pakistan argued that, if the Agency believed an agreement ought to be supplemented, legally it must consult the

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[61] Statement by Australia, para. 24; statement by Canada, para. 31, statement by Italy, para. 32; statement by Panama, para. 13; statement by Japan, GOV/OR.598, para. 18; statement by the Soviet Union, para. 25; statement by the United Kingdom, GOV/OR.598, para. 16.

[62] Statement by Iraq, GOV/OR.594, para. 143; statement by Malaysia, GOV/OR.594, para. 119; statements by Nigeria, GOV/OR.594, para. 142 and GOV/OR.598, para. 21.

[63] Statement by the Director General, GOV/OR.594, paras. 146-147.

[64] Statement by Director General, GOV/OR.593, para. 13.

[65] Fischer and Szasz, *op. cit.*, p. 17.

[66] David Fischer, 1997, *op. cit.*, pp. 270-271.

[67] Statements by Pakistan, GOV/OR.580, para. 40 and GOV/OR.594, para. 115.

Member State concerned.[68] Pakistan argued that the Board was not a suitable forum for resolving technical and legal matters and the issue should never have been raised.[69] However, direct negotiation without Board involvement would have weakened the Agency negotiating position further and the global community would have remained uninformed regarding potential diversion risks.

As awareness grew regarding technical shortcomings in safeguards agreements (especially in INFCIRC/66-type agreements), attempts were made by some suppliers to correct the shortfalls in safeguards when they negotiated new transfer agreements. Resistance erupted, often from non-NPT parties, who resented changes that appeared to make INFCIRC/66 resemble NPT safeguards. Although the trend for strengthening measures persisted, inconsistent progress resulted in varied agreements.[70]

Argentina led in criticising additional measures. For example, it complained about excessive effort devoted to non-nuclear material inspection in a Franco-Spanish agreement.[71] In an agreement between Spain and Germany, it attacked classifying heavy-water production plants as nuclear facilities[72] and rejected including an automatic *a posteriori* amendment which would allow changes to the agreement if alterations were made to the basic Agency safeguards document. It argued that this latter measure infringed on sovereign rights to agree to such amendments.[73]

Even when two parties agreed to strengthened measures, their efforts were criticised by states fearing new precedents. India complained about the technology controls in the agreement between France and the Republic of Korea (ROK), noting the "undesirability of introducing new concepts" without careful consideration.[74] As stronger measures appeared in bilateral agreements before the Board, states sought to prevent their permanent inclusion in future safeguards agreements. In reviewing Albania's NPT safeguards agreement, which contained no provision for withdrawal of safeguarded material for use in non-proscribed military activities, Board members

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[68] Statement by the Phillippines, GOV/OR.580, para. 52.

[69] Statement by Pakistan, GOV/OR.598, para. 5.

[70] See Rainer and Szasz, *op. cit.*, pp. 269-403.

[71] Statement by Argentina, GOV/OR.560, paras. 36-42.

[72] Statement by Argentina, GOV/OR.588, paras. 115-117.

[73] *Ibid.*, paras. 115-117.

[74] Statement by India, GOV/OR.482, paras. 8-9.

explicitly stated that the absence was not a model or precedent for future agreements.[75] Similarly, Argentina strove to prevent an agreement for a Soviet research reactor transfer to Cuba from establishing a precedent for containment and surveillance measures, advocating that they be addressed in subsidiary arrangements.[76]

Adapting to Technical Changes

In 1946, experts feared that a control system that was not designed to adapt to technical change would eventually become ineffective. In the 1970s that fear became a reality. Problems arose as the Agency lacked the support and authority to influence industrial practices or apply new measures. If a technical problem with safeguards application existed, the IAEA's main recourse was to inform the Board, but immediate and decisive action was taken only in crises.

In the post-NPT period, observers cited advances in nuclear technologies which outpaced safeguards development as major weaknesses in the safeguards system.[77] The demand for new approaches due to technical developments arose from time to time across the entire fuel cycle. However, developing methods for an effective approach or technique could require several years or even decades. Even if solutions were developed, field testing and integrating a measurement device or approach could take several years. Bundle counters, under development by 1978, were ready for installation in 1981, yet achieving their full deployment posed a challenge throughout the 1980s. Although the IAEA continually raised the standards by which it critiqued itself in its annual review, its continuing dissatisfaction with certain measures indicated that assurances were, in the Agency's view, not sufficient to meet its mandate.

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[75] NPT/CONF.IV/12, para. 17.

[76] Statement by Argentina, GOV/OR.555, para. 10.

[77] *Problems in the Accounting for and Safeguarding of Special Nuclear Materials, op. cit.*, p. 82; Prepared Statement of Harry R. Finley, Associate Director, International Division, US General Accounting Office, in *Nuclear Safeguards: A Reader, op. cit.*, p. 733; Prepared Statement of Hon. Nunzio J. Palladino, Chairman, US Nuclear Regulatory Commission, *Ibid.*, p. 901; Myron B. Kratzer, "Historical Overview of International Safeguards", International Conference on Nuclear Power Experience, Vienna, IAEA-CN-42, 13-17 September 1982, p. 16.

Often problems linked to poor facility design hampered safeguards or generated additional safeguards efforts. Industry built facilities for profit not for safeguards. The IAEA had no power to veto poor facility designs. Designing safeguards for complex plants took time, and they might not be ideally configured when operations commenced. For example, the Agency experienced problems in safeguarding CANDU reactors when they were introduced. While Canada provided the Agency with support in developing improved safeguards, it did not wait to export the reactors until safeguards were perfected. In addition, these reactors required more intensive safeguards, entailing higher Agency costs.[78]

Under pressure to implement safeguards effectively, the IAEA sometimes needed to rely on technical methods that were not yet perfected. Critics noted that periodically technology was used despite Agency doubts.[79] The difficulties in adapting to technical change reduced IAEA efficiency and effectiveness. Equipment failure and dealing with operator schedules increased Agency workload by forcing additional operations at Agency cost. Backup measures were not always successful, available or economically affordable. Ultimately states relying on the system lost confidence. By 1982, the United States doubted Agency ability to monitor bulk handling facilities and detect diversion.[80]

VI. Management of Nuclear Rivalry

The generation of 1946 advocated rivalry management as a key part of control. The control authority under the Baruch Plan performed rivalry management tasks in several ways which were relevant to the IAEA experience. First, with a control authority in charge of all critical nuclear activities, states would have fewer reasons to question the intentions of rivals with regards to developments in their peaceful nuclear programmes. Second, the authority would be in a reasonable position to investigate a concern and bring an issue to closure. Third, it would have some control over how states structured and operated their nuclear programmes so as to avoid generating suspicions.

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[78] David Fischer, 1997, *op. cit.*, p. 150.

[79] "Prepared Statement of Emanuel R. Morgan", in *Nuclear Safeguards: A Reader*, *op. cit.*, p. 751, Prepared Statement of Paul Leventhal, President, The Nuclear Club Inc., *Ibid.*, p. 896, Prepared Statement of Hon. Nunzio J. Palladino, Chairman, US Nuclear Regulatory Commission, *Ibid.*, p. 901.

[80] *Technical Aspects of Nuclear Nonproliferation: Safeguards*, *op. cit.*, p. 96; *IAEA Programs of Safeguards*, *op. cit.*, p. 6.

The case of Iran demonstrates the advantage of an authority-centric control system over a national inspection one. Iran, legally committed to using nuclear energy for peaceful purposes under safeguards, sees nuclear energy playing an important role in its development. In recent history, it has come into conflict with the United States. The United States claims that Iran is developing nuclear weapons, although it has not made its evidence public. IAEA safeguard activities have not revealed any diversion.[81] The Agency, without sufficient evidence which would allow it to take additional action to determine the matter, can do little to provide additional assurances to the United States, and the United States appears to distrust the Agency's capability to confirm the evidence it claims.

Iran's continued pursuit of nuclear energy development is considered threatening by the United States. The current control system cannot address US concerns, and it is highly unlikely that even a significantly strengthened Agency inspection system could do so. The United States does not trust the intentions of the Iranian government and no system short of external control of Iran's nuclear programme is likely to quell US suspicions.

Assurances by the IAEA regarding an accused state are limited in their ability to relieve nuclear threat perceptions when rivalries exist.[82] As noted by Richard Butler, the former Director of UNSCOM:

> The propensity of states to accept the assurance of other states that a given atomic programme is merely peaceful, is a direct function of their broader relationship and strategic importance to each other.[83]

By shifting control from the nation-state to the supranational authority, the Baruch Plan attempted to neutralise nuclear security issues which have a proclivity to escalate among rivals. The need for a stronger system when tensions are high led the IAEA to

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[81] As of the writing of this document, Iran has not signed up to the IAEA Additional Protocol designed to strengthen safeguards. The Additional Protocol will be discussed in Chapter 6.

[82] This situation may be ameliorated as States adopt the Model Protocol designed to strengthen safeguards effectiveness. The impact on confidence in the Agency inspection apparatus cannot be determined at this early date.

[83] Butler,1968, *op. cit.*, p. 91.

support the establishment of a nuclear-weapon-free zone (NWFZ) in the Middle East.[84] However, the US-Iranian case underscores the point that nuclear tensions are global as well as regional.

The case of Israel demonstrates the advantage of the Baruch Plan's recommendation that the control authority directly address all nuclear concerns. Nuclear suppliers, free to export as national policy dictated, rejected Israeli concerns about the Iraqi proliferation threat during the 1970s.[85] Although the United States was concerned, it cautiously concluded that Israel's fears were exaggerated, leaving Israel's security dilemma unresolved.[86] Israel dismissed the system as inadequate, noting its inability to resolve its nuclear security concerns because the safeguards system was not sufficiently comprehensive and means were lacking to resolve suspicions of other states.[87] Although Israel was not a party to the NPT, it clearly looked to the safeguards system as a factor contributing to their security. With unresolved questions and escalating concerns, Israel rejected the IAEA model:

> [...] it is nevertheless inconceivable that a country directly threatened would entrust its fundamental security to an inspection procedure which is contractually limited, is not unconditional and binding, and is substantially dependent in both character and duration on the discretion of the country posing that threat.[88]

After it dismissed the system, it attacked Osiraq. Ironically, even as other states including Iraq's neighbours later became concerned and despite increasing media reports on Iraqi activities, the IAEA lacked the ability under its mandate to launch a comprehensive inspection.[89]

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[84] See *Modalities for the Application of Safeguards in a Future Nuclear-Weapon-Free Zone in the Middle East*, Workshop Proceedings, International Atomic Energy Agency, Vienna, 4-7 May 1993.

[85] A/36/610, *op. cit.*, p. 34.

[86] *Problems in the Accounting for and Safeguarding of Special Nuclear Materials, op. cit.*, p. 77.

[87] Israel endorsed a US report that plutonium diversion was technically feasible. (A/36/610, *op. cit.*, p. 19.)

[88] A/36/610, *op. cit.*, p. 2.

[89] On Canadian and US concerns see Thomas O'Toole, "Carter Concerned over Iraqi Reactor Asked France to Tighten Safeguards", *Washington Post*, Vol. 104, No.

The third form of nuclear rivalry management is more preventative in nature. State rivalry does not need to be present for a peaceful nuclear programme to destabilise international relations. Some analysts have pointed out that France, India and Pakistan developed nuclear weapons from their peaceful programmes.[90]

Providing assurances of peaceful intentions under a national inspection system has been a challenge for the IAEA when states built large peaceful nuclear programmes. In the mid-1960s, the IAEA Secretariat began warning that nuclear materials produced in power reactors could add to the global stockpile available for nuclear weapons development.[91] By the mid-1970s, UN First Committee members began expressing concern over accelerating world plutonium production relative to present and expected civilian uses of nuclear energy.[92]

By the 1990s, stockpile issues became a matter of increasing concern particularly in the case of Japan. Japan, like Iran, is a party to the NPT. After 40 years of nuclear energy production, Japan has one of the world's leading programmes and has amassed large stockpiles of spent nuclear fuel. As of 31 December 1999, they possessed 5,200 kgs. of unirradiated separated plutonium or plutonium held in unirradiated MOX fuel and 73,000 kgs. of Pu in spent fuel.[93] These materials are held in Japan and also in the United Kingdom and France. Considering Japanese reprocessing capability and technology base, if Japan desires nuclear weapons, it can exit the NPT and build a credible nuclear force in a short period.

Japan has not engaged in serious conflicts regionally or globally since 1945, and although it is not without rivals, its recent international relations have been peaceful. Initially, Japan's safeguarded nuclear energy programme was considered benign. States began to take note as Japan accumulated very large plutonium stocks and opted to pursue reprocessing on a major scale. Since the early 1990s, suspicions have grown among Japan's neighbours and even its key ally, the United States, that

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205, 28 June 1981, p. A15. For comments of French experts see *Problems in the Accounting for and Safeguarding of Special Nuclear Materials, op. cit.*, p. 81; *Nuclear Nonproliferation and Safety, op. cit.*, pp. 23-24.

[90] Steve Weissman and Herbert Krosney, "The Islamic Bomb", Times Books, New York, 1981, p. 32.

[91] GOV/1060, Annex, p. 66.

[92] NPT/CONF/10, para. 50.

[93] INFCIRC/549/Add.1/3.

Japanese intentions may not be purely peaceful.[94] Rumours have circulated that Prime Minister Eisaku Sato asked an advisory group of key government official and scholars to examine whether it was desirable for Japan to develop an independent nuclear force.[95] The sheer size of Japan's operations complicates IAEA efforts to apply safeguards and enhances among some perceptions of questionable intentions.[96]

Japan's adoption of the plutonium cycle was questioned by the IAEA, which recognised that its plans to store large quantities of plutonium for civilian use could pose regional political and security problems. It quietly urged Tokyo to place its stockpiles under international custody.[97] Despite international concerns and IAEA warnings, Japan, with no indigenous source for its energy needs, continued with its plans. In spite of efforts to assure its peaceful intentions, Japan's neighbours remain aware that government policies can change overnight.

Under the current system, differing national structures of nuclear energy programmes pose problems in implementing control because there is no requirement for a state to demonstrate that a chosen approach is consistent with the peaceful utilisation of nuclear energy. The Second NPT Review Conference draft document which was echoed by the Third NPT Review Conference Final Document noted:

> [...] each country's choices and decisions in the field of peaceful uses of nuclear energy should be respected without jeopardizing their respective fuel cycle policies or international co-operation agreements and contracts for peaceful uses of nuclear energy.[98]

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[94] Benjamin Sanders, *PPNN Newsbrief*, No. 17, Spring 1992, p. 11; Kumao Kaneko "Confront Nuclear Suspicions", *The Japan Times*, Vol. 90, No. 34245, 21 June 1994, p. 16; David E. Sanger, Japan Edges Close to Nuclear World", *International Herald Tribune*, No. 33824, 26 November 1991, pp. 1, 7.

[95] Selig S. Harrison, *Japan's Nuclear Future: The Plutonium Debate and East Asian Security*, Carnegie Endowment for Peace, Washington, DC, 1996, p. 8.

[96] On the difficulties in tracking material in the Tokai Plutonium Fuel Production Facility see Shaun Burnie "The IAEA and the NPT Safeguards Regime: An Impossible Task", in Japsers, *op. cit.*, pp. 71-72.

[97] Benjamin Sanders, *PPNN Newsbrief*, No. 18, Summer 1992, p. 5; "Tokyo Cautioned on Nuclear Storage", *International Herald Tribune*, No. 33,824, 26 November 1991, p. 8.

[98] "Unofficial Paper Distributed at Final Session of 1980 NPT Review Conference", August 1985, para. 4, reprinted in *Nuclear Proliferation Factbook*, *op. cit.*, p. 572; "Review of Article IV and Preambular Paragraph, 6 & 7", NPT/CONF.III/64/I, para. 8.

Difficulties arise when states structure nuclear energy programmes in a manner that makes little economic sense. Although no concern was expressed publicly, India's completion of a reprocessing plant in 1964, years before it needed plutonium for a breeder reactor did not go unnoticed.[99] As nuclear energy programmes prospered, states became more sensitive to the need for others to follow peaceful development norms. In 1984, Libya's purchase of specialised uranium processing equipment for which there was no apparent commercial need raised alarm in the US Government.[100]

The need to control programme structure was demonstrated by Iraq. The country had been an NPT party since October 1969 and was engaged in an extensive nuclear energy programme. Speculation on the nature of its nuclear programme came to a head in the mid-1970s when Iraq attempted to purchase 500MW (th) and 1500MW (th) gas-graphite reactors from France which were well suited for plutonium production.[101] France declined, since it discontinued production of those reactor types in the late 1960s opting to manufacture other, more-efficient power production reactors. France's counteroffer of the more fuel efficient and less proliferant Pressurised Water Reactors (PWR) or Boiling Water Reactors (BWR) was rejected. Iraq opted for the less logical 70 MW Osiris which used 93% enriched HEU, was better suited for metallurgical research and normally built by countries planning to manufacture nuclear power reactors. Until that time, no Iraqi intentions towards manufacturing were evident, and an apparent gap existed between Iraq's facilities and nuclear ambitions given Iraq's small industrial base.[102] In addition, the reactor

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[99] Norman Moss, *The Politics of Uranium*, Andre Deutsch Ltd., London, 1981, p. 84.

[100] J. Falk, "Australia's Uranium Export Policy: A Critical Perspective", paper presented to the *Conference on The Future of Arms Control*, The Strategic & Defence Studies Center and Research School of Pacific Studies, Australian National University, 21-23 August 1985, p. 6.

[101] France's decision to adopt the gas-graphite fuel cycle rather than alternatives such as the light water reactor (LWR) enabled France to take the weapons route whenever it chose. (Bertrand Goldschmidt, *International Safeguards*, The Royal Institute of International Affairs, London 1979, p. 8.) Iraq also attempted to purchase a 350MW (th) Cirene type reactor from Italy which had the capacity to produce 100 kgs. of weapons grade plutonium per year. (A/36/610, *op. cit.*, p. 9.)

[102] *Ibid.*, p. 9; United States House of Representatives, *Problems in the Accounting for and Safeguarding of Special Nuclear Materials*, *op. cit.*, p. 81; United States Senate, Testimony by Dr. Herbert Konts, Chairman, Department of Nuclear Energy, Brookhaven Atomic Laboratory, in *The Israeli Air Strike*, Hearings before the Committee on Foreign Relations, 97th Congress, 1st Session, June 1981, p. 126; Testimony by John Boright Acting Deputy Assistant Secretary for Nuclear Affairs,

belonged to a class of reactors internationally recognised as a proliferation concern.[103] In 1979, France offered to replace the HEU needed for the reactor with caramel fuel - a more proliferation resistant type of fuel. Iraq declined, arguing that the change would cause delays in construction. France agreed to the sale according to the original terms.[104] The Iraqi arguments that enabled it to build its weapons programme were common throughout the history of nuclear control: states have the right to choose the structure of their national programmes and control should not hinder peaceful nuclear development.

VII. The Authority's Right to Have Comprehensive Knowledge of States' Nuclear Activities

In 1946, experts believed that the Authority had to understand states' entire nuclear activities to achieve effective control. The safeguards system was designed to limit the information to which the Agency was entitled and how that information was used. The Agency depended on states meeting their declaratory obligations. However, the scope of reporting was insufficient and states often failed to meet their responsibilities, complicating IAEA tasks. The resulting gaps were exploitable and undermined the system's credibility.

The safeguards framework engendered poor information management with the directive that state systems for accounting and control (SSACs) be designed around national, not Agency, needs. Many SSAC procedures were inadequate and implementation was insufficient for Agency purposes.[105] The Agency either based conclusions on insufficient critical data or conducted additional inspection activities at IAEA cost.

Bureau of Oceans and International Environmental and Scientific Affairs, *Ibid.*, p. 16.

[103] A/36/610, *op. cit.*, pp. 137-138. Materials test reactors were classified as such in the International Fuel Cycle Evaluation (INFCE) Report. INFCE was spearheaded by the United States and was officially billed an exercise to investigate if any particular fuel cycle was more resistant to proliferation than others.

[104] Pierre Lellouche, "The Dilemmas of Non-proliferation Policy: the Supplier Countries" in David Carlton and Carlo Schaerf (eds.), *The Arms Race in the 1980s*, Macmillan Press Ltd, New York, 1982, p. 189; *Problems in the Accounting for and Safeguarding of Special Nuclear Materials, op. cit.*, pp. 83-85.

[105] Schiff, *op. cit.*, p. 141.

By design, the system protected private industry by constraining IAEA information access. Critics found the MBA inspection approach technically ineffective in detecting clandestine activities.[106] Access to plant construction was difficult, since, under INFCIRC/153, the submission requirements for design information were interpreted as 180 days before initial receipt of nuclear materials.[107] Critics charged that, hidden features could be introduced into a facility. Regularised access for long-term plant analysis to perfect safeguards procedures was also difficult to secure.[108]

A major drawback in obtaining comprehensive knowledge was that safeguards were predicated on state-supplied information. Since NPT safeguards applied to materials, facilities without declared materials were not subject to inspection. If a reprocessing facility operator reported that no fuel was to be processed for a month, the Agency stopped sending inspectors for the duration.[109] Israel cited this loophole in defence of its actions against Osiraq. It complained that Iraq provided inventory for only declared fuel, was not required to give clarification on experiments and could utilise some of its unsafeguarded facilities for manufacturing weapons.[110]

Following the discovery of the Iraqi clandestine programme, the Agency conceded that the system had fatal flaws with regard to the scope of information to which the IAEA had access:

> [O]wing to limitations in information available to the Agency [...] non-compliance with safeguards agreements could occur without detection by the Agency in the case of undeclared activities.[111]

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[106] "Statement of Roger Richter", Former IAEA Inspector, in United States House of Representatives, *Israeli Attack on Iraqi Nuclear Facilities*, Hearings Before the Subcommittees on International Security and Scientific Affairs on Europe and the Middle East and on International Economic Policy and Trade of the Committee on Foreign Affairs, 97th Congress, 1st Session, Washington, DC, 1981, p. 57; "Statement of Roger Richter" in *Nuclear Safeguards: A Reader, op. cit.*, p. 710.

[107] David Fischer, 1993, p. 57.

[108] "Agency Responds to Morgan's Criticisms" *Nuclear Engineering International*, Vol. 27, May 1982, p. 16.

[109] *IAEA Programs of Safeguards, op. cit.*, p. 94.

[110] *The Israeli Air Strike, op. cit.*, p. 22; A/36/610, *op. cit.*, p. 21.

[111] D. Schriefer, D. Perricos, S. Thorstensen, "IAEA Safeguards Experience", in *International Nuclear Safeguards in 1994: Vision for the Future*, IAEA, Vienna, IAEA-SM-333/217, 1994, p. 39.

As industry grew, shortfalls in fuel cycle coverage became more evident. Experts raised questions about non-coverage of uranium, uranium processing facilities, yellowcake and unrecoverable materials transferred out of inventory.[112] The right to transfer material to non-proscribed, non-explosive but uninspected legitimate uses was also seen as problematic.[113]

VIII. The Authority's Right to Apply Controls Comprehensively to States' Nuclear Activities

When Baruch era analysts considered comprehensive control, they focussed on scope and effective implementation *by a regulating body*. In the adopted model, the IAEA had no such scope or authority initially. Both industrial operators and states ensured that the Agency knew its place and tested the limits on the manner in which control was applied.

Comprehensive Scope

Analysts from the 1940s believed that control had to be implemented by a central organisation which dealt with all aspects of nuclear energy. One important segment, physical protection, was left to domestic regulation. The shortcomings of a lack of standards eventually became evident. Events in the late 1960s and early 1970s including unexplained MUF at the US Apollo/NUMEC facility and theft of enrichment plant blueprints from Holland triggered concerns in the United States and eventually elsewhere.[114] However, it was not until after the collapse of the Soviet

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[112] "Prepared Statement of Emanuel R. Morgan", *op. cit.*, p. 749; *IAEA Programs of Safeguards, op. cit.*, p. 91; *Israeli Attack on Iraqi Nuclear Facilities, op. cit.*, p. 54.

[113] *SIPRI Yearbook of World Armaments and Disarmament 1968/69*, Almqvist & Wiksell International, Stockholm, 1969, p. 162. When Canada considered purchasing nuclear submarines, concerns arose on whether the IAEA could inspect submarine reactor fuel from the point that it was enriched beyond natural levels through its storage as spent fuel. Had Canada completed the acquisition, it could have legally denied inspection (Ben Sanders and John Simpson, *Nuclear Submarines & Non-Proliferation: Cause for Concern*, PPNN, Southampton, *Occasional Paper*, No. 2, July 1988, p. 3.)

[114] Steve Dolley, "Outside Assistance to the Indian and Pakistani Nuclear Programs", Briefing Paper, Nuclear Control Institute, Washington, DC, 5 June 1998.

Union when theft reports of nuclear materials rose at alarming rates that domestic physical protection standards came into the global spotlight.[115]

The logic behind Acheson and Lilienthal's demand for comprehensive scope of control was to prevent proliferation. Areas that were not covered would be the target from which proliferation could occur. As Eric Chauvistré noted:

> The more effective export controls and safeguards are in one field, the higher the incentives to go one step further back in the 'proliferation food chain'.[116]

For Baruch era analysts, that food chain also included non-nuclear materials, equipment and technology in addition to materials since such items could be misused if source materials were available.

Under the established system, controls centered on nuclear materials, enabling Iraq to acquire dual-use nuclear weapons technology and equipment by exploiting weak export control laws. Iraq launched its programme from fuel cycle areas not subject to control and its supplies came from heavy, rather than nuclear, industry which was subject to less restrictions. Such behaviour was characteristic of Iraq which, for example, purchased large supplies of natural uranium.[117]

There was considerable scepticism regarding the effectiveness of the Agency's key activity, inspection, due to legal limitations. Inspection schedules did not consider a state's entire nuclear programme. Visits were based on material on hand in a plant or MBA rather than the entire state. Routine and *ad-hoc* inspections were confined to MBAs. *Ad-hoc* inspections, designed to be conducted on short notice, were subject to visa processing delays. Inspection intensity was limited when INFCIRC/153 set up a

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[115] In 1992-1995, several major cases of diversion included seizures: 6 kg of 20% HEU in Kiev; 6.15 g. plutonium-239 in Tongan; 800mg. of 87.7% HEU in Landshut, 363 g. of plutonium 239 in Munich, and 145 g. of 90% HEU from Toms Polytechnical University; 1.5 kg. of 90% HEU from Podlosk; 1.8 kg. of 36% HEU from Andreeva Guba; 4.5 kg. of 20% HEU from Sevmorput and 2.7 kg. of 87.7% HEU in Prague. *(Nuclear Successor States of the Soviet Union*, Monterey Institute of International Studies, Monterey, and the Carnegie Endowment for International Peace, Washington, DC, No. 5 March, 1998, p. 106; For a discussion on more recent trends see Emily S. Ewell, "NIS Nuclear Smuggling since 1995: A Lull in Significant Cases?", *The Nonproliferation Review*, Vol. 5, No. 3, Spring-Summer, 1998, p. 122.)

[116] Eric Chauvistré, *op. cit.*, p. 16.

[117] A/36/610, *op. cit.*, pp. 8-9, 12-14, 20. Also see on Iraq, Feldman, *op. cit.*, pp. 114-142.

Maximum Routine Inspection Effort (MRIE).[118] During facility attachment and subsidiary arrangement negotiations the Actual Routine Inspection Effort (ARIE)[119] was typically set at 1/4 to 1/3 of the MRIE. The Agency then defined a Planned Actual Routine Inspection Effort (PLARIE), normally the anticipated inspection level, often lower than the ARIE.[120]

The implications for system credibility were noted by Scheinman as to be that the approach resulted "in less frequent inspections than might have been warranted by political concerns about the safeguarded state".[121] Low intensity inspections were questioned after Iraq invaded Kuwait. Commentators speculated whether inspection frequency was sufficient to prevent clandestine material diversion between visits.[122] Their fears were vindicated when UN Inspectors discovered that Iraq separated three grams of plutonium at the Tuwaitha research reactor and conducted non-continuous irradiation of fuel elements at the radiochemical lab between inspection visits.[123]

Special inspections were also seen as insufficient. Before discovering the Iraqi clandestine programme, the Agency advocated its right to use special inspections[124], but understood its limitations in detecting clandestine programmes. The framework under INFCIRC/153 provided no avenue for the Agency to search for undeclared

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[118] MRIE is the maximum number of person-days of inspection work per annum allowable for a given facility. *IAEA Safeguards Glossary*, Vienna, 1987 Edition, pp. 65-66.

[119] The ARIE is the estimated annual inspection effort under INFCIRC/153 based on plant operating fully according to its design. (*Ibid.*, pp. 65-66.)

[120] Scheinman, 1987, pp. 232-233. For example, the total MRIE in 1981 was 43,000 man-days per year. INFCIRC/153, para. 78 requires maintaining a minimum level consistent with effective implementation. Thus, the ARIE was set at 11,300 man days per year or 26% of the MRIE. However, only 45% of ARIE could be implemented in 1981. (GOV/2107, para. 39.)

[121] Lawrence Scheinman, "Lessons from Post-War Iraq for the International Full-Scope Safeguards Regime, *Arms Control Today*, Vol. 23, No. 3, April 1993, p. 4.

[122] Benjamin Sanders, *PPNN Newsbrief*, No. 12, Winter 1990/91, p. 8.

[123] Bailey, *op. cit.*, pp. 55-56; *Nuclear Nonproliferation and Safety*, pp. 23-24.

[124] For a discussion by the head of External Relations at the Agency that it could perform special inspections irrespective of accusation see Christopher Herzig, "IAEA Safeguards", *International Security*, Vol. 7, No. 4, Spring 1983, pp. 195-199.

facilities or activities, even if a state were obligated to place them under safeguards.[125] Special inspections were for verifying special reports or when information made available by states was not adequate for the Agency to fulfil its responsibilities.[126] The Agency had to demonstrate anomalies observed when conducting safeguards activities or an inability to draw a conclusion based on safeguards information.

The implications of the limited structure were evident. Israel felt the nature of IAEA special inspections precluded allaying suspicions of plutonium production in Osiraq.[127] It needed a stronger mechanism that fully addressed detecting clandestine production. For Israel, however, that required "a fundamental change in the scope of agency responsibility" and a "new dimension in safeguards policy.[128] The IAEA supported additional access, but saw little prospect for them at the time. Senator Cranston stated at a Congressional Hearing in 1981 that nine senior IAEA technical specialists held an internal extraordinary meeting to consider the dangers of certain plutonium diversion paths. They concluded that it was very unlikely that some IAEA member States would accept inspection activities necessary to detect such diversion.[129]

Comprehensive Implementation

Baruch era analysts assumed control would be implemented rigourously. There were two problems in achieving rigourous implementation. First, the states subject to safeguards had effectively discouraged the IAEA inspectorate from being aggressive. Second, states and operators were lax in cooperation.

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[125] Comptroller General of the United States, *Role of the International Atomic Energy Agency in Safeguarding Nuclear Material*, Report to the Committee on International Relations, House of Representatives, Department of State, Washington, DC, 3 July 1975, p. ii; Testimony of J. Kenneth Fasick, Director, International Division, US General Accounting Office, Statement of Hon. Gary Hart, US Senator from Colorado, and Prepared Statement of Paul Leventhal, President, The Nuclear Club, Inc., all in *Nuclear Safeguards: A Reader*, *op. cit.*, p. 389, 742 and 896. Kratzer, September 1982, *op. cit.*, p. 3. Lawrence Scheinman, "Political Aspects of NPT Safeguards", in Robert B. Leachman and Phillip Althoff, *Preventing Nuclear Theft: Guidelines for Industry and Government*, Praeger Publishers, London, 1972, p. 111.

[126] INFCIRC/153, para. 73.

[127] A/36/610, *op. cit.*, p. 120.

[128] A/36/610, *op. cit.*, p. 20.

[129] *The Israeli Air Strike*, *op. cit.*, p. 22.

Until the discovery of a clandestine programme in Iraq, the political climate discouraged Agency adoption of an aggressive safeguards approach. Numerous reports circulated about the Agency's reticence in implementing safeguards. Critics charged that in 1966 the Agency internally believed that safeguards were inadequate but they thought that expressing the opinion was "heresy".[130] Some complained that the Agency had become "extremely anxious" to avoid offending any member states.[131] They alleged that the IAEA negotiated insufficient time for inspections, numbers of inspectors and usage of surveillance equipment, knowing that a complete job could not be done.[132]

A more significant problem for the IAEA was that of operators not fulfilling obligations. Operators often did not or could not fulfill their responsibilities. Reports used to track transfers and production for many years were inadequate, unstandardised and often late or unsubmitted.[133] Occasionally, operators obstructed inspectors by acting in contravention to Subsidiary Arrangements and Facility Attachments. For example, they would deny access to verify design information in spite of agreed arrangements.[134] States were not always helpful in remedying the situation as they failed to enforce instructions or take corrective action promptly.

The requirement that the IAEA work around operations rather than operators making an effort to assist the Agency also had a negative effect. SSACs, originally arranged for industry benefit, were costly to the Agency. Some operators, notably the FRG, utilised record systems complicating simple audit procedures and causing considerable wastage of inspectors' time.[135] The absence of reporting standardisation incited the Agency to issue recommendations and guidelines on SSAC and shipper/receiver reporting, but it had to campaign for several years to obtain broad adherence.

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[130] Slobodan Nakicenovic, Retired Director of IAEA Safeguards Operations, *Comments on IAEA Safeguards*, United States Congressional Research Service, Washington, DC, August 1981, p. 2.

[131] *IAEA Programs of Safeguards, op. cit.*, p. 39.

[132] "Prepared Statement of Emanuel R. Morgan", *op. cit.*, p. 751; Peter Pringle, "On the Hill Nuclear Safeguards", *The New Republic*, 23 December 1982, p. 13.

[133] Remarks of Victor Gilinsky, Commissioner, US Nuclear Regulatory Commissioner, AIR Conference on Nuclear Safeguards, Orlando, Florida, 12 April 1976, US Nuclear Regulatory Commission Release in *Nuclear Safeguards: A Reader, op. cit.*, p. 395.

[134] *IAEA Programs of Safeguards, op. cit.*, p. 78.

[135] *IAEA Programs of Safeguards, op. cit.*, p. 91.

This lack of cooperation and effort by operators was not aimed at diverting materials but rather driven by technological inability to comply and by profit motivations. Dutch operators threatened to close plants with too many scheduled inspections, while France resisted near real-time accountancy because it might disrupt operations and required access to sensitive data.[136]

As single events, these problems may seem trivial. When taken collectively, they point to a real challenge for the control authority. States failing to meet their obligations such as by not taking measurements properly raised costs.[137] Delays in reporting risked preventing the Agency from applying safeguards. According to the IAEA, the failure to meet specific verification goals did not imply an inability to detect diversion[138], but it did indicate a weakening of their points of observation and reduced the chance of detecting diversion. While the Agency maintained that their conclusion of "no diversion" remained valid in the absence of contrary evidence[139], the question became at what point is the credibility of the conclusions undermined? At least for the United States, the impact of these implementation problems on the IAEA's ability to draw conclusions became a concern by the early 1980s.[140]

The high tolerance for small infractions opened the door for potential violators. Iraq used delays and denial of access as it was pursuing its clandestine programme. Inspections in January 1981 were conducted using flashlights in the dark and limited to visual inspection of fuel.[141] Several months passed before verification was complete.

Although states were purportedly concerned about keeping safeguards expenses down, their treatment of the IAEA complicated the application of safeguards which increased the safeguards costs and risked reducing safeguards credibility. By lingering in designating inspectors, states hampered the Agency's ability to effectively

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[136] Scheinman 1987, p. 131; "Agency Responds to Morgans Criticisms", *op. cit.*, p. 15; Ann MacLachlan, "Technology Holders Tackle Question of Big Reprocessing Plant Safeguards", *Nuclear Fuel*, 13 October 1988, p. 6.

[137] *IAEA Programs of Safeguards, op. cit.*, p. 77.

[138] David Fischer, "Safeguards Controversy, Continued", *Bulletin of the Atomic Scientists*, Vol. 45, No. 5, June 1989, p. 38.

[139] GOV/2863, para. 30.

[140] Statement by Victor Gilinsky, *Nuclear Safeguards: A Reader, op. cit.*, p. 395.

[141] A/36/610, *op. cit.*, p. 22; *The Israeli Air Strike, op. cit.*, p. 30.

use its manpower.[142] Negotiations of basic safeguards agreements, subsidiary arrangements and facility attachments that sometimes lasted years had the same effect.[143]

EURATOM negotiations over the Subsidiary Arrangements and Facility Attachments were extremely protracted. Soon after EURATOM's safeguards agreement, INFCIRC/193, entered into force in February 1977, negotiating problems arose. Delays could be attributed to inaccurate negotiating assumptions, on expected technical breakthroughs and on the viability of certain inspection methods[144], but the Director General also attributed difficulties to EURATOM member attitudes, constantly backtracking on previous agreements or repudiating proposals after acceptance.[145] By the late 1990s, EURATOM negotiations were still in progress, indicating some non-cooperation by EURATOM members.

EURATOM resistance had harmful effects, particularly during the Cold War. The dispute cast doubt on Agency safeguarding abilities and detracted from the security assurances it could provide.[146] The Soviet Union, for whom the safeguarding of EURATOM states was of critical necessity during the Cold War, threatened to bring EURATOM's intransigence to the UN Security Council.[147] Other states, including but not limited to Eastern European nations, also expressed concern regarding EURATOM Agency access denial.[148]

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[142] Remarks of Victor Gilinsky, Commissioner, US Nuclear Regulatory Commission, AIR Conference on Nuclear Safeguards, Orlando, Florida, 12 April 1976, *US Nuclear Regulatory Commission Release.*

[143] As of the 2000 NPT Review Conference, 51 States party to the Treaty had yet to bring basic safeguards agreements into force. Most are beyond the prescribed time for completion of safeguards agreements. (NPT/CONF.2000/28, Part. 1.)

[144] It was believed that seals could be place on fuel assemblies at fuel fabrication plant and could remain intact until they reached reprocessing. This was thought to reducing inspection effort but operators found safety problems with the approach. Also, certain tamper-proof techniques for sampling reprocessing and fabrications plants proved to be unfeasible. (GOV/OR.500, paras. 8-9.)

[145] GOV/OR.523, para. 22.

[146] Statement by Pakistan, GOV/OR.523, para. 41.

[147] Rainer and Szasz, *op. cit.*, p. 388.

[148] Statement by Australia, GOV/OR. 514, para. 52; statement by Bulgaria; GOV/OR. 514, para. 63; statement by Czechoslovakia, GOV/OR. 515, para. 69; statement by Hungary, GOV/OR.530; para. 37.

IX. Transparency of Nuclear Programmes and Control Authority Activities

In the 1940s, transparency of state and Agency activities was believed to be important in effective control. Transparency of states' programmes enabled others to confirm the control authority's conclusions, and transparency of the control authority allowed states to affirm that inspectorate was functioning effectively.

Under the established system, INFCIRC/153, Article 5 required the Agency to carefully protect commercial and industrial secrets acquired through safeguards implementation. Protection of commercial secrets extended to information relating to nuclear facility design, and nuclear material quantities, location, composition and movement, as well as the safeguards approach, facility inspection goals, and inspection results, including anomalies and incidents at nuclear facilities.[149] This framework constrained how the Agency communicated challenges in the application of safeguards. The IAEA reported functional problems, but it could not identify states whose cooperation was poor until it reached crisis level.[150] The rigid secrecy requirements shielded those who abused the system as states could not be shamed unless a question of diversion was at hand.

The lack of transparency in national programmes was identified as a problem in the early 1970s and remained so into the 1990s. States encountered difficulties in obtaining data to assess safeguards effectiveness and draw their own conclusions.[151] For this reason some states concluded that bilateral rather than trilateral safeguards arrangements were more effective. Gilinsky testified that substitution of a bilateral with a trilateral agreement to include the IAEA meant that the exporter state received no information of potential violations. It only received confirmed violation information indirectly and that only after a substantial delay.[152]

In some respects, the secrecy raised more questions than it answered. Without naming states, parties were not certain that the reports of non-cooperation or of Agency inability to meet goals were not in states that were economic or political rivals. Some states proposed both naming states and publicising the Safeguards

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[149] NPT/CONF.1995/7, para. 92.

[150] Scheinman, 1985, *op. cit.*, p. 49.

[151] David Dickson, "US Backs Nuclear Safeguards", *Nature*, Vol. 296, 25 March 1982, p. 279.

[152] *Nuclear Safeguards: A Reader*, *op. cit.*, pp. 404-405.

Implementation Report (SIR), but their proposals were rejected lest the Agency come under more pressure to be circumspect and the media misconstrue the reports. When the press leaked some SIR details in 1988, speculation surfaced that the Agency had been covering up that safeguards were not as reliable as claimed.[153] Consequently, the 4th NPT Review Conference draft document recommended improvements in presentation transparency of Agency safeguards activities so that the results could be made public to prevent possible misinformation and misunderstanding.[154]

This concern over the lack of transparency tended to increase apprehensions that warning was insufficient and to undermine its general credibility. There were numerous allegations that the Agency was not forthright in reporting difficulties.[155] Several reports stated that the Board was uninformed concerning events affecting safeguards conclusions. Among the allegations were occasions when:

- accounting information was incomplete because material balances could not be closed at a number of facilities;[156]
- an unauthorised fuel element removal was unreported;[157]
- small quantity diversions (under one SQ) were detected but an internal review determined the amount was insufficient to justify even notifying the supplier states.[158]

The challenge that the IAEA had in being transparent was that states had placed it in an a very difficult position. The Agency understood the limits of intrusiveness that states would accept and that states did not want to be told that a good deal more intrusiveness was needed to make the system work. When the

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[153] Brooks Tigner "Europe's Greens Say EURATOM, IAEA are Lying on Safeguards", *Nucleonics Week*, Vol. 29, No. 2, 2 June 1988, pp. 5-6; Paul Brown, "States Fail to Back Nuclear Watchdog", *The Guardian*, 31 May 1988, p. 2; Paul Brown, "Atom Bomb Safeguards `Don't Work'", *The Guardian*, 31 May 1988, p. 20; "Da hätte jemand die Bombe bauen können", *Der Spiegel*, Vol. 42, No. 3, 18 January 1988, pp. 22-23.

[154] NPT/CONF.1995/7, para. 104.

[155] Schiff, *op. cit.*, pp. 140-141.

[156] Nakicenovic, *op. cit.*, p. 22.

[157] *IAEA Programs of Safeguards*, *op. cit.*, p. 6; Nakicenovic, *op. cit.*, p. 20.

[158] B. Amory and L. Hunter Lovins, *Energy/War Breaking the Nuclear Link*, Friends of the Earth, San Francisco, 1980, p. 32.

system was criticised, for example because the system could be bypassed by not reporting nuclear materials subject to safeguards, the Agency had no choice but to go on the defense of the system.[159] They had to make the minimalist system work and look successful.

X. Non-Possession of Nuclear Explosives

Early control plan drafters recognised that non-possession of nuclear explosives, including PNEs was critical for control system success. If one state had nuclear weapons, others would be encouraged to pursue similar programmes. That projection was accurate. France's Minister of Defence, P.O. Lapie, once wrote:

> [...] so long as the period of simultaneous and controlled general disarmament will not open the era of solely peaceful construction of atomic energy, France must have her independence assured by inventions, tests, and development of military atomic devices.[160]

The Baruch era analysts asserted that nuclear arms races were considered a strong possibility when a state with a nuclear capability had a relationship of rivalry with another state. After China tested its first weapon, India, with a history of difficult Chinese relations, called for security guarantees to non-nuclear countries against nuclear attack and was soon hinting that nuclear weapons were the only response to the Chinese threat.[161] Similarly, experts have assumed that India's 1974 nuclear test prompted its rival Pakistan to pursue nuclear weapons.[162]

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[159] When critics asserted that states like Iraq bypassed the system by not reporting the introduction of nuclear materials to new facilities, the Agency responded that such suppositions of non-reporting by Iraq were conjecture. ("IAEA Comments on the Testimony of Roger Richter" on June 19, 1981, in *The Israeli Air Strike, op. cit.*, p. 298.)

[160] Quoted in Scheinman, 1965, *op. cit.*, p. 108.

[161] Government of Canada, *House of Commons Debates*, First Session, 30th Parliament Vol. VII, 1975, p. 6856; Government of Canada, *House of Commons Debates,* 1st session, 30th Parliament, Vol. XII, 1976, p. 12058.

[162] The Australian Science and Technology Council (ASTEC), *Australia's Role in the Nuclear Fuel Cycle*, Australian Government Publishing Services, Canberra, May 1984, p. 133.

As long as NWSs and *de facto* NWSs retained nuclear weapons, they reduced any control system security benefits and led other states to question whether the system was worthwhile. The NNWSs cited their vulnerability to the vertical nuclear arms race and the devastating consequences of a nuclear war.[163] Because nuclear weapons gave the NWSs an insuperable strategic advantage over the NNWSs, the NNWSs demanded formal positive and negative security assurances from the NWSs.[164] The NNWSs thus sought to compensate with new security mechanisms where the adopted model fell short.

Nuclear weapons also undermined regional NWFZ attempts to establish control systems that were stronger than the international standard. Under pressure from the NWSs, zones often made allowances for nuclear weapon transit through their respective zones.[165] For example, the South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga) neither interfered with a party's right to decide whether to allow foreign ship and aircraft visits to ports and airfields nor placed limitations on the duration of visit.[166] The Soviet Union argued that potential nuclear weapons transit contradicted Treaty aims.[167] This was hardly surprising; in 1983, ships of its Cold War rival, the United States, spent 251 days in Australian ports. As the United States neither confirms nor denies the presence of nuclear arms, it can be assumed that a substantial portion of those vessels carried nuclear weapons.[168]

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[163] Statement by Nauru, NPT/CONF.III/44.

[164] Georges Fischer, *op. cit.*, 155; John Simpson, "The 1990 Review Conference of the Nuclear Non-Proliferation Treaty", *The Round Table*, 1991, No. 318, p. 143.

[165] On transit see NPT/CONF/9, para. 11.B.

[166] For discussion see Nigel Fyfe and Christopher Beeby, "The South Pacific Nuclear Free Zone Treaty", *Victoria University of Wellington Law Review*, Vol. 17 No. 1, 1987, pp. 41-43.

[167] Josef Goldblat, "The Treaty of Rarotonga", *Disarmament Watch*, Vol. 13, No. 2. 1987, p. 26.

[168] Lippman, Matthew, "The South Pacific Nuclear Free Zone Treaty: Regional Autonomy Versus International Law and Politics", *International and Comparative Law Journal*, Vol. 10, No. 1, 1988, p. 128-129. For similar concerns regarding transit permitted under Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (the Treaty of Tlatelolco) see Félix Calderón, "Nuclear-Weapon-Free Zones: the Latin American Experiment", in David Carlton and Carlo Schaerf (eds.) *The Arms Race in the 1980s*, Macmillan Press, London, 1982, pp. 262-263.

Retention of PNEs was equally problematic. During the negotiations for the Treaty of Tlatelolco, states defending nuclear energy development inserted a clause in the Treaty to allow parties to carry out PNEs.[169] Argentina and Brazil interpreted the Treaty to mean that their rights to build PNEs were fully preserved.[170] The United States and United Kingdom, hardly eager to see new nuclear weapon states, rejected their interpretation, noting that PNEs were legal "only if and when future advances in technology permit the development of devices for peaceful explosions which are not susceptible of use for weapons purposes."[171] The clause came to be considered a major weakness of the zone and therefore strong control advocates tended to view the Latin American zone as not a true disarmament commitment.

XI. Universal and Permanent Participation in the Control Plan

In the 1940s, universality and permanent participation in the control plan played an important control role because, *inter alia*, it clarified state intentions. Those remaining outside the system risked having their nuclear activities viewed as suspect and a threat. Non-universality weakened control because participants were vulnerable to non-participants. The Arab League commenting on Israeli policy noted:

> Israel's refusals to join the NPT [...] represents a threat to regional security and brings into question the credibility and universality of the NPT.[172]

Especially where concerns existed that active nuclear weapons development was taking place, NPT members sought to apply pressure to non-parties to accede to the Treaty. Efforts included proposals to cut off nuclear supplies to Israel and South Africa[173],

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[169] Treaty of Tlatelolco, Article 18.

[170] NPT/CONF/9, p. 20.

[171] United States Arms Control and Disarmament Agency, *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons*, Washington, DC: USGPO, Publication 48, January 1969, p. 65; on the United Kingdom see NPT/CONF/9, p. 27.

[172] Joseph Cirincione, "The Non-Proliferation Treaty and the Nuclear Balance", *Current History*, Vol. 94, No. 492, May 1995, p. 205.

[173] NPT/CONF.II/C.II/34; for a brief discussion see, *SIPRI Yearbook 1981*: *World Armaments and Disarmament*, Taylor and Francis, Oxford, 1981, p. 299.

suspending South Africa's membership in the IAEA[174] and linking NPT Extension to Israeli accession.[175]

Concerns regarding non-adherents were justifiable. States' policy do not remain static. Both India and Pakistan, when they engaged in nuclear energy development, declared that they did not intend to build nuclear weapons. Yet, both eventually acquired nuclear weapons.[176]

In the 1940s, withdrawal equalled a declaration of nuclear weapons pursuit, and therefore was not to be accepted. That view did not change. When the DPRK decided to withdraw from the NPT in March 1993, states took the view that the announcement reflected an intention to build nuclear weapons.[177] Fear of withdrawal was as problematic as actual withdrawal. The United States opposed a deal where the FRG would transfer enrichment equipment and technology to Brazil fearing Brazilian withdrawal from the proposed INFCIRC/66-type agreement.[178] Israel's dramatic action against Osiraq was based on the assumption that Iraq would accumulate sufficient plutonium to manufacture nuclear weapons and then withdraw from NPT.[179]

XII. Equality

Since the Agency was established, the international community has struggled against discrimination in control arrangements. When considering inequity, the most common criticism is that the NWSs have the right to retain nuclear weapons. This two-tier status generated great dissatisfaction with the NPT and has detracted from the ability of the Treaty to achieve universality and provide security. In addition, the

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[174] For background see David Fischer, 1997, *op. cit.*, p. 110.

[175] Rebecca Johnson, "Israel's Nuclear Weapons: A Stumbling Block" *NPT Update*, No. 5, 21 April 1995; Rebecca Johnson, "The First Week in View" *NPT Update*, No. 6, 24 April 1995; see Rebecca Johnson, "Indefinite Extension not Indefinite Possession, Says Russia", *NPT Update*, No. 7, 25 April 1995.

[176] On Pakistan see Benjamin Sanders, *PPNN Newsbrief*, No. 7, October 1989, p. 8; NPT/CONF.IV/7, para. 34; A/S-15/PV.18, paras. 8, 11. On India see A/S-10/PV.24, para. 13; NPT/CONF.III/3, para. 9, GOV/OR.944, para. 74.

[177] NPT/CONF.1995/7, paras. 44-60.

[178] *Oversight Hearings on Nuclear Energy, op. cit.*, p. 85.

[179] A/36/610, *op. cit.*, p. 1.

difference between the two groups of states has also generated inequities in the application of civilian safeguards, which aggravates the situation.

Antagonisms have been aggravated by incomplete safeguarding of civilian activities in the NWSs. The NWS have concluded voluntary safeguards agreements through which they provide lists of facilities that they are willing to submit to safeguards.[180] These arrangements, however, contain some important deviations from regular safeguards agreements.[181] Under voluntary agreements, the Agency verifies that nuclear material is not withdrawn except as provided. This ability to withdraw material has been activated on numerous occasions.[182] While the United States and United Kingdom attempted to demonstrate that the NWSs were not asking the NNWSs to embrace safeguards that they were unwilling to accept by opening up all of their civilian facilities[183], other NWSs used narrower formulations, where only materials in specific facilities or portions thereof were designated for inspection.[184] These designations could be altered at state discretion and were quite limited; the Soviet list at one time restricted inspection to its 440 and 1000 MW VVERs.[185] The actual application of voluntary safeguards have been constrained as financial problems dictated that the IAEA curb voluntary safeguards activities in view of their limited contribution the NPT's non-proliferation objectives.

The differences discouraged support for a strong system. Weaknesses such as having rights to remove safeguarded facilities from the list of facilities subject to safeguards and to unilaterally withdraw material from safeguards were not looked upon favourably.[186] Some states attempted to equalise their safeguards treatment.

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[180] Rainer and Szasz, *op. cit.*, p. 311.

[181] GOV/1383, Annex 1.

[182] Richard Bolt "Plutonium for All: Leaks in Global Safeguards", *Bulletin of the Atomic Scientists*, Vol. 44, No. 10, December 1988, p. 15; Burnie, *op. cit.*, p. 75.

[183] The British formulation withheld materials for retained for national security purposes, while the US agreement eliminated nuclear activities with direct national security significance. (INFCIRC/263, para. 1.b; INFCIRC/288, para. 1.b.)

[184] INFCIRC/290, para. 1.a-b. INFCIRC/327, para. 1.a-b INFCIRC/369, para. 1.a-b.

[185] Melvyn B. Nathanson, "Soviet Reactors to Open for International Inspections" *Bulletin of the Atomic Scientists*, Vol. 41, No. 6, June/July 1985, p. 32.

[186] For a comments on the Soviet agreement see, statement by Argentina, GOV/OR.632, para. 75.

While Argentina remained outside of the NPT, it received sympathy in demanding flexible terms in negotiating its safeguards agreement, citing that it was making a unilateral submission.[187] It was, however, not successful in achieving measures that widely deviated from established safeguards standards.

At times, NWS commercial deals contained advantageous safeguard clauses. For example, a deal between Spain and France deviated from standard safeguards because fuel transferred from Spain's Vandellos power plant would not be safeguarded while being reprocessed in France.[188] The justification was that the spent fuel was stored for a relatively short period, but these arrangement still were viewed as discrimination.[189] These small differences fed fears of unfair economic competition. The effects on the system were summed up by Harald Müller:

> The minimal standards used in interpreting NPT commitments resulted primarily from the persistent efforts of some non-nuclear-weapon states, the FRG in particular, to ensure that they were not placed at a competitive disadvantage in the development of the commercial use of nuclear energy, including its export possibilities, compared with the nuclear-weapon states.[190]

While the inequities in the application of safeguards between the NWSs and the NNWSs has been the main focus of international attention, some NNWSs efforts to acquire special privileges also has had detrimental effects on the system. EURATOM members, a considerable collective political force, sought to retain for their organisation its safeguards activities during NPT negotiations by achieving the right to conclude a safeguards agreement as a group. While the IAEA upheld its right to draw its own conclusions from safeguards activities, the application of safeguards in EURATOM states differed from the norm since the two organisations cooperated to implement safeguards.

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[187] Statements by Argentina, GOV/OR.471, paras. 42-45 and GOV/OR.632, para. 76.

[188] GOV/2019, para 16 (b); INFCIRC/66/Rev.2, para. 28. Russia and Cuba concluded a similar agreement shortly thereafter. (INFCIRC/298).

[189] GOV/2019, para. 5; statement by Japan, GOV/OR.560, paras. 45-46.

[190] Harald Müller, "Reform of the System of Nuclear Export Controls", in Harald Müller and Lewis A. Dunn, *Nuclear Export Controls and Supply Side Restraints: Options for Reform*, PPNN, Southampton, PPNN Study, No. 4, October 1993, p. 2.

Opinions ranged on whether EURATOM states received better or worse treatment under the cooperative arrangement and whether EURATOM control was more effective.[191] What is relevant for control is that the different treatment for EURATOM States posed political problems. Japan, an industrial competitor, was particularly sensitive to the issue. It demanded equal treatment and insisted that its agreement be worded similar to INFCIRC/193. The difference in treatment became more pronounced as the IAEA increased reliance on certain EURATOM activities when the two organizations concluded the New Partnership Approach in 1992 to improve cooperation. The different treatment this involved exposed it to accusations of special treatment by non-EURATOM states.[192] It also complicates efforts to amend the safeguards system to meet environmental developments. Due to the special arrangements between EURATOM and the IAEA, the negotiation of the Model Protocol presented a set of complex issues regarding implementation for EURATOM states that had to be addressed.

XIII. CONCLUSION

The maturation period of safeguards in both the IAEA and EURATOM cases revealed that many problems associated with a national inspection system were anticipated in the 1940's.[193] The predictions made by the Baruch Plan architects were

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[191] EURATOM controls have at times been thought to be technically more comprehensive, but its regional nature limits the extent of the assurances the framework provides.

[192] Statement by India, GOV/OR.948, para. 42.

[193] While this chapter focussed on the experience of the IAEA, a remarkable number of similarities could be drawn about the experience of EURATOM. Among the problems are: difficulties arising from inadequate coverage of the entire fuel cycle and promotion competing with control (European Parliament, *Session Documents*, Document A 2-120/88/Part A, 24 June 1988, pp. 12-15); inadequate provision of warning (European Community, "Written Question No. 1357/90", *Official Journals*, No. C 79, 1991, Item 21 (91/C 79/21), 11 June 1990); credibility problems due to lack of transparency of the control authority (European Community, "Debates of the European Parliament", *Official Journals*, 9-13 May 1977, Vol. 217, pp. 44-45; Richard Leaver, "Australian Safeguards: Can We Trust EURATOM?", *Pacific Research*, Vol. 1, No. 1, August 1988, p. 7; David Albright, "French Military Plans for Superphénix?", Vol. 40, No. 9, November 1984, pp. 30-34); problems generated by the lack of disarmament (R. J. S. Harry, "Superphenix and US-EURATOM Agreements", *Bulletin of the Atomic Scientists*, Vol. 41, No. 3 March 1985, p. 63); resistance to control ("Negotiation of a Safeguards Agreement", *Nuclear News*, October 1979, p. 87; Elaine Davenport, Paul Eddy and Peter Gillman, *The Plumbat Affair*, André Deutsch Ltd.,

consistently accurate where the adopted model failed to incorporate their principles. By continuing to protect economic and political sovereignty over nuclear energy, states could fully cultivate the inherent limitations of the national inspection mechanism that they created.

The events resulting from the shortcomings in the system revealed the great extent to which control principles are synergistic. Failure to incorporate one principle can reverberate throughout the system in such a manner as to create a dynamic working against a properly functioning effective system. This dynamic tends to take on a life of its own. For example, a failure to create an equitable system encourages states to resist the application of comprehensive controls; oppose allowing the IAEA to create a comprehensive knowledge base; place heavy emphasis on promotion; resist adjusting the system to meet environmental demands; and dismiss calls to participate in the system, etc. These tendencies in turn contribute to creating other problems and the ripple effect continues.

If one evaluates the effectiveness of a established control model based on the litmus test of whether the assurances provided meet the needs of states in uncertain security situations caused by regional tensions or international rivalry then the answer is no.[194] Obstacles built into the system or erected by states and operators impede the control authorities' ability to implement control in a way that inspires confidence in system ability to provide security assurance. The obvious shortcomings make national supplemental mechanisms vital. The period witnessed the concomitant development of compensation mechanisms in the form of export controls, unilateral military action, horizontal and vertical proliferation and payoffs in aid by the NWSs to developing states.

London, 1978, pp. 166-168; Goldschmidt, *op. cit.*, pp. 295, 385-386, 428; and challenges in responding to industrial growth (W. Gmelin, "The Role of EURATOM in International Safeguards" in *International Nuclear Safeguards in 1994: Vision for the Future*, Vienna: IAEA, IAEA-SM-333/208, 1994, pp. 50-52, pp. 50-52; European Community, *Twenty-first General Report on the Activities of the European Community in 1987*, Brussels, 1988, p. 273; European Community, *Report on the Operation of the EURATOM Inspectorate*, European Parliament Working Documents 1979-1980, Luxembourg, Doc. 3/79, 30 March 1979, p. 13).

[194] Because EURATOM operated in a regional context with a much smaller membership than the IAEA, the levels of internal rivalry that it needed to manage was limited. The main source of regional rivalry, which came from Germany and France, lost its acuteness when placed in the larger context of the Cold War. More threats came from preventing sub-national diversion promoted by ex-regional actors.

If one places the range of problems in the context of the political environment of the time, the evaluation becomes more positive. If one were to ask whether the system's problems were significant enough for states to abandon it, the answer is no. The system managed to function despite states limited cooperation. As the first truly global nuclear control system, no state or international organization could totally predict the practicalities associated with implementation. Despite states' best efforts to weaken the system through legal means and limited cooperation, the system did not fall apart. There were questions of failure regarding certain aspects of the system, but only the extreme critics condemned it as a total failure.

CHAPTER 6: BACK TO THE FUTURE

This final chapter reviews how states have reacted to shortcomings in the IAEA control system and the motivations behind their corrective recommendations. Improving the system was fraught with difficulty as states still insisted that control should pose minimal interference in economic and political sovereignty. Initially, concerned states took unilateral action outside of the IAEA framework. More recent changes to the system were driven by new threats perceived by an increasing percentage of the global community. This chapter reveals the ongoing struggle between states' needs to strengthen control while resisting the necessary relinquishment of sovereignty to achieve this goal. Strengthening takes place when a sufficient number of states find rising threats need new control approaches. States began to appreciate that international control was in their national interests and thus became more willing to support the IAEA and relinquish sovereignty to make the system more effective. This chapter examines how measures to correct unsatisfactory aspects of the control system incorporated ideas from the principles and framework proposed in 1946. In many respects, the system has slowly been evolving back towards the Baruch Plan as what was originally unacceptable started to become acceptable.

I. Unilateral Measures

Between 1970-1995 nuclear threat concerns erupted sporadically. India's 1974 nuclear test galvanised leading suppliers into taking unilateral measures to arrest proliferation. Increasingly, nuclear activities became viewed as sensitive despite their dual-use nature. Since there was insufficient support to make any major changes to the newly established system, Some suppliers instituted export controls and formed the Nuclear Suppliers Group (NSG) which raised control levels over the negotiated international norm.

The United States led the effort to strengthen controls over "dangerous" activities and materials. It discontinued its practice of using as a basis for approval over reprocessing the safeguardability of materials and equipment in February 1976, when the Ford Administration issued Executive Order 11902. This Order replaced economic with security priorities, stating that non-proliferation considerations would prevail over commercial ones when evaluating an export request.[1] Ford declared that plutonium reprocessing should not proceed without sound reasons and called for

[1] Brenner, *op. cit.*, p. 87

maximum restraint in reprocessing and enrichment for three years while steps were taken to create a reliable nuclear fuel supply regime. He also sought discussions to establish a new regime for international plutonium storage (IPS) and drew attention to enforcement, calling for material violations of safeguards agreements to be recognised as unacceptable and to automatically result in the immediate imposition of sanctions.[2]

Many US initiatives at the time reflected a concern that certain activities and facilities were threatening, regardless whether they were implemented or utilised for peaceful purposes. The 1976 Symington Amendment to the 1961 Foreign Assistance Act cut off economic and military assistance to NNWSs that imported or exported reprocessing or enrichment materials, equipment or technology unless the state agreed to place all items under multilateral auspices and accepted fullscope safeguards. The 1977 Glenn Amendment followed by terminating aid to any country that delivered or received reprocessing equipment material or technology regardless of fullscope safeguards or placement under multilateral auspices. President Jimmy Carter also acted in April 1977 to end US engagement in the plutonium cycle by deferring commercial breeder programmes and exploring the establishment of alternative fuel cycles that would avoid plutonium separation. Then, in 1981, the US Senate decided to suspend all foreign aid to any new state testing a nuclear device.[3]

The most significant development, however, was the adoption of the Nuclear Nonproliferation Act (NNPA) of 1978. This required, *inter alia*, that existing nuclear cooperation agreements be renegotiated and that sensitive nuclear technology information become a new export control category. In addition, importing states had to:

- renounce pursuit of nuclear weapons including research into PNEs; and
- meet certain physical protection standards;
- accept full-scope safeguards; and
- seek prior US approval on retransfer and reprocessing of fuel.[4]

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[2] President Gerald Ford, "Statement on Nuclear Policy, Presidential Statements and Orders, 28 October 1976" in *Nuclear Proliferation Factbook, op. cit.*, pp. 212-213, 217; Brenner, *op. cit.*, p. 115.

[3] Goldschmidt, *op. cit.*, p. 206; Scheinman, 1987, *op. cit.*, pp. 184-185.

[4] "Fact Sheet on the Proposed Nuclear Non-Proliferation Policy Act of 1977", 27 April 1977, in *Nuclear Non-Proliferation Factbook, op. cit.*, pp. 230-231; Also see Charles N. Van Doren, *Nuclear Supply and Non-Proliferation: The IAEA Committee on Assurances of Supply*, Congressional Research Service, Washington, DC, October 1983, pp. 235-237.

The Act required the President to obtain approval from the Senate for HEU supply greater than 15 kgs. and to seek international agreement on conducting enrichment, reprocessing and fuel fabrication only at facilities under international auspices where strict limits on NNWS access to sensitive nuclear technology and on fuel allocation were enforced.[5] The US government also committed itself to:

- avoid new commitments to export significant amounts of separated plutonium and HEU;
- identify facilities that might be converted to LEU consumption;
- take steps to minimize weapons-useable uranium inventories abroad; and
- apply stiff sanctions if transfers were used as explosives or if safeguards were terminated.

These unilateral initiatives sought to compensate for shortcomings which could not be negotiated internationally. Safeguards were seen to be falling short because they did not verify whether facilities operated as agreed between supplier and recipient.[6] The initiatives reflected US perceived needs for a control system which addressed the problem that certain fuel cycle activities were more "dangerous" or posed a higher proliferation threat than others. In the US opinion, materials needed not only tracking but quantitative and qualitative management for security to prevail. By creating a greater gap between national governments and sensitive capabilities, the United States encouraged the prevention rather than detection of proliferation.

The United States was not unique in this, as Australia moved in similar directions. In October 1976 and May 1977, the Fraser Government set up the Ranger Inquiry to examine the IAEA safeguards system. The Ranger Inquiry identified numerous safeguards problems, underscoring the non-universality which allowed states like India to acquire nuclear weapons.[7] It also focussed on managing security during system collapse. The Inquiry identified several problems with Agency safeguards including:

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[5] GWU, *Report of the President to the Congress Pursuant to Section 601 of the Nuclear Non-Proliferation Act of 1978*, January 1980, GWU Document No. 1663, p. 11; Brenner, *op. cit.*, p. 191.

[6] Rainer and Szasz, *op. cit.*, p. 352.

[7] *Ranger Uranium Environmental Inquiry*, 28 October 1976, Acting Commonwealth Government Printer, Canberra, pp. 125, 127.

- the lack of effective sanctions for system enforcement;
- easy withdrawal from safeguards or the NPT;
- no means of control over materials use once withdrawn from control;
- inadequate warning procedures; and
- the failure of the UN to effectively settle disputes.[8]

Like the United States, Australia took the view that control needed to go beyond material accountancy to include technology transfer and the supply of "sensitive" equipment supply in light of the linkage, between civil and military nuclear energy uses.[9] The Inquiry cited the difficulties in preventing technology transfer from the former to the latter and identified loopholes in some Australian transfer agreements with regards to PNEs.[10]

The Inquiry found the comprehensiveness of control inadequate. It cited shortcomings in physical protection requirements and in non-coverage of yellowcake, other source materials and materials used in non-explosive military use. It criticised the ignoring of clandestine activities and deficiencies in dealing with diversion.[11] Finally, it identified problems with system adaptability, noting states' resistance to surveillance measures.[12]

The exercise led to a strengthened Australian safeguards policy which, like that of the United States, attempted to introduce additional control principle elements through unilateral measures. Its future natural uranium transfer policy required fullscope and perpetual safeguards and set physical protection requirements. It embraced a managerial style by:

- seeking recipient assurances on nuclear material uses;
- setting additional selection criteria for uranium recipients;
- establishing fallback safeguards in the event of an Agency safeguards collapse;

- requiring prior consent on the re-export of Australian origin material;

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[8] *Ibid.*, pp. 125, 127-128, 139-141, 147.

[9] However, it stopped short of the US position, noting that there were legitimate reasons for reprocessing (*Ibid.*, pp. 135, 144.)

[10] *Ibid.*, p. 147.

[11] *Ibid.*, pp. 131, 134-135, 141, 147, 151.

[12] *Ibid.*, p. 120.

- requiring recipients to demonstrate need and seek consent for reprocessing or enrichment beyond 20%; and
- declaring that consent was not guaranteed for all peaceful purposes.[13]

Finally, Australia took the lead in establishing a nuclear-weapon-free zone (NWFZ) in the South Pacific, which, according to the former Australian Permanent Representative to the IAEA Ron Walker, was an "attempt to convert its unilateral policy into a multilateral one."[14]

Canada underwent a similar process. Shocked by India's abuse of its nuclear assistance, it implemented a unilateral policy of increased control. Canada suspended cooperation with India and, in December 1974, announced stricter export controls on nuclear material, equipment, technology and heavy water to be applied to all states and under all agreements. Requirements for nuclear cooperation were upgraded and retroactively applied including assurances of non-explosive use, fallback safeguards, physical protection, prior nuclear reprocessing and retransfer consent for nuclear equipment and derived materials, including heavy water produced with Canadian aid. In 1976, it added a requirement for an NPT or similar non-proliferation commitment by making full-scope safeguards a condition of supply.[15]

The new measures were not always easy to sustain. Importing states criticised them as unrealistic, an NPT violation and protectionist.[16] Renegotiation of agreements proved difficult and contracts came under threat. All three suppliers softened positions one way or another. For example, retransfer consent requirements

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[13] On Australian Policy see "Extract from Speech by Australian Prime Minister Fraser on Government Policy on Nuclear Safeguards, 24 May 1977 in Van Doren, October 1983, *op. cit.*, pp. 199-205; Russell B. Trood, "Australian Uranium Exports: Nuclear Issues and the Policy Process", in Robert Boardman and James F. Keeley, (eds.), *Nuclear Exports and World Politics*, MacMillan, New York, 1983, pp. 133-134.

[14] Interview with Australian Ambassador Ron Walker, October 1996.

[15] Extract from Canada's Nuclear Non-Proliferation Policy, Department of External Affairs, May 1982 in Charles N. Van Doren, October 1983, *op. cit.*, pp. 193-196; author correspondence with Mark Gwozdecky, Depart of Foreign Affairs and International Trade, Ottawa, Southampton, 2 December 1996.

[16] Statement by Mexico, NPT/CONF.II/C.II/SR.7, para. 33; "Unofficial Paper Distributed at Final Session of 1980 NPT Review Conference" in *Nuclear Proliferation Factbook*, *op. cit.*, p. 573; Brenner, *op. cit.*, p. 155.

for transfers within the EU were eventually relaxed.[17] Additionally, other exporting states attempted to exploit the situation. Australia attempted to require that recipients accede to the NPT but was forced to back down when its supply agreement with France was threatened by a German proposal to become France's supplier.[18]

II. Export Control Regimes

The use of export controls served to address technology and equipment not covered by the material-oriented IAEA system. While states saw export controls as important control elements, they realised that unilateral efforts were limited. Leading suppliers therefore attempted to promote a more universal approach resulting in the formation of international transfer standards.

After the conclusion of NPT negotiations, the Zangger Committee, named after Swiss Chairman Claude Zangger, met from 1970-1974 to agree upon those materials, equipment and technologies whose transfer would trigger application of safeguards under Article III.2. Consensus on the first was reached in 1972, but its publication was delayed until 1974 in order to secure Soviet participation. Its adherence was assisted by India's nuclear test.[19] Guidelines called for importers to provide assurance of non-explosive use, accept information and technology safeguards relevant to the transfer and consent to perpetual safeguards.[20] These conditions extended beyond NPT requirements under Article III.2 in covering source material produced from, processed by, or used in exported items. The Committee further agreed to exchange information about granted or rejected licenses.[21] The Zangger List was amended six times to clarify or extend coverage between 1977 and 1994. Over time, the Zangger

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[17] In Canada's case see John J. Noble "Canada's Continuing search for Acceptable Nuclear Safeguards, *International Perspectives*, July/August 1978, pp. 45-46; in Australia's case see Richard Leaver, *The NUKEM Scandal and Australian Safeguards*, Working Paper, No. 49, September 1988, p. 18.

[18] Trood, *op. cit.*, p. 135; For additional reports on the softening of Australian policy see Dr. J. Falk, *Australia's Uranium Export Policy: A Critical Perspective*, paper presented to the Conference on the Future of Arms Control, Strategic & Defence Studies Centre and Research School of Pacific Studies, Australian National University, 21-23 August 1985, fn. 55 and p. 16.

[19] Ebinger, *op. cit.*, p. 52.

[20] INFCIRC/209. For a discussion see Rainer and Szasz, *op. cit.*, p. 347.

[21] Müller, *op. cit.*, p. 3; Forland, *op. cit.*, p. 362.

list gained credibility as part of the NPT framework.[22] States saw that it caused little commercial interference and believed it was being equitably applied.

Slower to gain acceptance was the practice of requiring fullscope safeguards as a condition of supply. Fullscope safeguards required all nuclear activities be placed under safeguards and their acceptance symbolised acknowledgment that all civil nuclear activities required control. The first NPT Review Conference in 1975 managed to recommend only strengthening export requirements to require fullscope safeguards as a condition of supply to non-Parties.[23] Non-universal participation offered commercial grounds for resisting fullscope safeguards. Industrial competitors such as Belgium and Switzerland were reluctant to make an unqualified recommendation favouring fullscope safeguards lest France, which did not require them from non-NPT customers, be competitively strengthened.[24] By the 1990 NPT Review Conference attitudes changed, as an increasing number of states lent support, including second-tier suppliers and the developing world.[25] More recently, some states have sought to expand the definition of fullscope safeguards. At the 2000 NPT Review Conference, Australia, Canada and New Zealand suggested that the newly adopted Model Protocol was part of fullscope safeguards required by Article III of the NPT and should be a condition of supply.[26]

Supplier control did not stop at the NPT framework boundaries established by the Zangger Committee. In the wake of India's test, Canada approached the United States for support on stronger controls noting that NPT restrictions were insufficient. In 1975, seven states, Canada, Japan, France, the FRG, Switzerland, the United Kingdom and the United States, joined by eight others in 1977, formed the Nuclear

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[22] In 1990, the Zangger list received a formal endorsement from the 4th NPT Review Conference (*SIPRI Yearbook 1991: World Armaments and Disarmament*, Oxford University Press, Oxford, 1991, p. 573.)

[23] NPT/CONF/35/I.

[24] *SIPRI Yearbook 1991: World Armaments and Disarmament, op. cit.*, pp. 572-573.

[25] Carlton E. Thorne, "The Nuclear Suppliers Group: A Major Success Story Gone Unnoticed", *Director Series on Proliferation*, No. 3, Lawrence Livermore National Laboratories, Livermore, July 1993, p. 31; John Simpson, "The 1990 Review Conference of the Nuclear Non-Proliferation Treaty", *The Round Table*, 1991, No. 318, p. 142; *SIPRI Yearbook 1991: World Armaments and Disarmament, op. cit.*, p. 564.

[26] Rebecca Johnson, "Safeguards, Export Controls and Nuclear Energy", *NPT Briefing*, No. 7, 3 May 2000.

Suppliers Group (NSG). In 1978, they released a set of Guidelines and a Trigger List that went beyond the Zangger Committee.

The Guidelines were an extension of the tighter control policies developing on national levels. Features included requirements for guarantees of non-explosive use, adequate physical protection and safeguards on transferred replicas and re-exports of imported technology. Under the NSG Guidelines, suppliers took partial managerial responsibility by attempting to control access to "dangerous" technology. The Guidelines requested, *inter alia*, that suppliers exercise restraint over exports of sensitive facilities, technologies (i.e. for enrichment and reprocessing), and materials (i.e. supplied or derived weapons useable material); and required prior supplier consent for material enrichment above 20%.

While the NSG expanded multilateral controls, some national policies went further. However, progress was hamstrung by commercial interests. During the NSG negotiations, France and the FRG defeated proposals prohibiting the transfer of enrichment and reprocessing facilities and making a commitment to multinational reprocessing. A majority of states also rejected fullscope safeguards as a condition of supply.[27] Between 1978 and 1991, the NSG was dormant. The inactivity was attributed to the unwillingness of some suppliers to expand the export controls established in 1977 due to commercial interests.[28] Disagreements on the extent of controls and fullscope safeguards lingered. Even when the NSG revived, commercial interests played an important role in subsequent times.[29] Proliferation concerns at the end of the Persian Gulf and Cold Wars revived the NSG, and membership reached 35 by 1999. Members adopted changes touching on the control principles. Comprehensiveness was the objective of many alterations. In May 1992, the NSG adopted a policy of fullscope safeguards as a condition of supply.[30] The control list expanded to include, *inter alia*, items on the Zangger list but not previously covered by the NSG, dual-use technology, and items deemed relevant based on Iraq's clandestine programme.

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[27] Office of Technology Assessment, United States Congress, *Nuclear Proliferation and Safeguards*, Praeger Publishers, New York, 1977, pp. 43, 220-221.

[28] Tedeusz Strulak "The Nuclear Suppliers Group", *The Nonproliferation Review*, Vol. 1 No. 1, Fall 1993, p. 3.

[29] See for a discussion Müller, *op. cit.*, p. 6.

[30] INFCIRC/405.

Under new Guidelines issued in April 1992 NSG participants agreed not to export dual-use nuclear technologies (1) if they were intended for explosive activities or unsafeguarded nuclear fuel cycles; (2) if there was unacceptable risk of diversion to such; or (3) if transfer was contrary to non-proliferation objectives.[31] Thus, suppliers were called upon to make judgements on recipient intentions and whether certain behaviour fell within accepted international norms.[32] The NSG framework provided guidance for such decisions. By requiring these judgements, NSG members strengthened their policy on what they believed to be their NPT obligations. The arrangements resulted in a more restrictive interpretation of Article IV.[33] For this group, promotion was not obligatory when state security concerns existed. As the United States and France noted during the 1995 NPT Review Conference, there was no requirement to actively support the fuel choices of another party.[34]

Seeking equality, Japan successfully proposed during NSG negotiations an initiative that exporters should refuse transfer licences to NWSs if there was "unacceptable risk" of diversion to nuclear explosive activities.[35] Participants emphasised the importance of comprehensive knowledge and transparency when they agreed to notify each other of a license rejection (which was binding on all members for three years) and exchange information on threshold state nuclear programmes and purchasing activities.[36] They also agreed that enhanced reporting of nuclear material, relevant equipment and certain non-nuclear material transfers should be actively pursued within the IAEA as a means to strengthen the safeguards system.[37] Finally, to improve security during system collapse, they committed themselves to coordinated action in the event of illegal safeguards termination or violation by recipients.[38]

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[31] INFCIRC/254/Rev.1/Part.2.

[32] Müller, *op. cit.*, pp. 3-7.

[33] *Ibid.*

[34] Rebecca Johnson, "Building Consensus", *NPT Update*, No. 9, 25 April 1995.

[35] Müller, *op. cit.*, p. 5.

[36] "NSG Completes Regime", *Export Control News*, 29 April 1992, Vol. 6, No. 4, p. 4.

[37] Nuclear Suppliers Group, *Press Statement of Nuclear Suppliers Meeting - Meeting of States Adhering to the Nuclear Suppliers Guidelines*, 1992.

[38] Rainer and Szasz, *op. cit.*, p. 351.

NSG efforts were rejected by states with strong commercial development interests. Developing states interpreted the NSG's denial policies, particularly on technology, as economic and development impediments to economic development[39] and a violation of NPT promotional obligations.[40] NSG opponents argued that its Guidelines falsely assumed that nuclear power spread correlated to nuclear weapons proliferation.[41] These states saw a wide conceptual divide between civil and military nuclear energy uses. In the 1980s, this group, led by the threshold states, attempted to make nuclear trade independent of non-proliferation assurances in fora such as the Committee on Assurances of Supply (CAS) and United Nations Co-operation in Peaceful Use of Nuclear Energy, (UNCPICPUNE).[42] The developing states' problem with exporter suspicion and the exporting states diminishing ability to trust importers under a limited system increasingly clashed.

III. Strengthening the System

Although concerned states attempted to buttress safeguards with external mechanisms, they also tried to strengthen the system itself. In the late 1970s and 1980s, an increasing number of national governments began quietly reviewing nuclear control. Some analysts even reviewed the Acheson-Lilienthal Report and found the analysis of effective control dynamics to hold true, while others rated the Baruch Plan as "unquestionably the most effective system ever proposed."[43] Even before the discovery of Iraq's clandestine nuclear programme, some developing states concluded that IAEA safeguards significantly enhanced their security, and that they should support the system rather than consider it an imposition by developed states.[44]

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[39] "Unofficial Paper Distributed at Final Session of 1980 NPT Review Conference", *op. cit.*, p. 572.

[40] "Unofficial Paper Distributed at Final Session of 1980 NPT Review Conference" *op. cit.*, p. 573; NPT/CONF.II/C.II/34; proposal by Yugoslavia, NPT/CONF.II/C.II/12/Rev.1.

[41] This was the British position in the NSG negotiations. (Moss, *op. cit.*, p. 120.)

[42] Müller, *op. cit.*, pp. 3-4.

[43] "Report of the Advisory Committee on US Policy Toward the International Atomic Energy Agency, Department of State", Washington, DC, 19 May 1962, p. 12; on the Acheson's and Lilienthal's rejection of a superimposed inspection system see "Statement by Stuart Symington", in *Nuclear Safeguards: A Reader, op. cit.*, p. 354.

[44] Simpson, 1991, *op. cit.*, pp. 139-140, 152.

In reviewing safeguards, analyst control assumptions had not changed since the 1940s. Safeguards depended on stable international relations and government willingness to cooperate with the control authority.[45] Relinquishing sovereignty was the key. The Office of Technology Assessment noted:

> The most fundamental limit to improving the International Atomic Energy Agency's ability to detect nuclear proliferation is the extent to which the states that subscribe to nuclear safeguards are willing to cede additional sovereignty to the IAEA.[46]

Effective safeguards were not a matter of introducing stronger technological measures but rather of changing the approach. In 1992, Zaire's Representative to the IAEA questioned whether a new safeguards structure was needed.[47] Concerned states looked to the IAEA to find solutions to international nuclear security issues. For example, Egypt, long threatened by Israel's nuclear weapons programme, called on the Agency to more actively pursue disarming non-NPT states and conduct an independent inquiry into nuclear weapons development by Israel or any other state, citing Agency objectives to promote international peace and disarmament.[48]

International attitudes towards nuclear weapons were turning full circle. Shock and horror at nuclear weapon implications in the late 1940s made the Baruch Plan worthy of consideration despite the sacrifices involved. After the shock wore off, nuclear weapons were accepted as a fact of life over the next two decades. With rising nuclear threats, attitudes began to shift. As noted by Scheinman in 1972, "the conviction has grown that a world of nuclear weapon powers is neither safe nor desirable."[49] This change created an environment for strengthening the system.

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[45] See for example Fischer and Szasz, *op. cit.*, p. 6; Comptroller General of the United States, *Role of the International Atomic Energy Agency in Safeguarding Nuclear Material*, Report to the Committee on International Relations House of Representatives, Department of State, Washington, DC, 3 July 1975, p. iii.

[46] Office of Technology Assessment, 1995, *op. cit.*, p. 40.

[47] Statement by Zaire, GOV/OR.781, para. 21.

[48] Statement by Egypt, GOV/OR.698, paras. 3-7.

[49] Scheinman, in Leachman and Althoff, *op. cit.*, p. 107.

Discontent with Control Objectives

The aim of safeguards to detect and deter nuclear materials diversion became a source of misunderstanding and debate. Tensions mounted due to the gap between what was desired or needed and actual system performance. Observers pointed to excessive expectations regarding safeguards capabilities.[50] Former IAEA Director General Hans Blix once noted he was "struck by the fact" that many people thought that the IAEA was a "guarantee against nonproliferation". Fending off criticism, Blix clarified that safeguards were an "important but not a sufficient barrier" to proliferation and that the IAEA was not a police force able to intervene against nuclear diversion or misuse.[51]

The idea that control should function as a prevention rather than a detection and deterrence mechanism gained credibility.[52] By the 1970s, the United States embraced the national objective that nuclear proliferation needed prevention not simply detection.[53] Other states slowly moved in the same direction. At the 1985 NPT Review Conference, some parties felt it necessary to emphasise that the primary NPT purpose had always been proliferation prevention and peaceful uses could develop only within an effective non-proliferation regime.[54]

Where NPT prevention fell short, the NWFZs were able to provide additional regional support. The Treaty of Tlatelolco negotiators were aware that the IAEA system was not a preventative approach.[55] A draft treaty noted that control as

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[50] Scheinman, 1987, p. 226; *Technical Aspects of Nuclear Nonproliferation Safeguards, op. cit.*, p. 1; "Blix and Grumm Stump Washington with Call for Better Understanding of Safeguards", *Nuclear Fuel*, Vol. 7, No. 7, 29 March 1982, p. 14.

[51] "Blix and Grumm Stump Washington with Call for Better Understanding of Safeguards", *op. cit.*, p. 14; "Lessons for IAEA Safeguards Experience", *IAEA Bulletin*, Vol. 30, No. 2, 1988, p. 59.

[52] Scheinman, 1987, *op. cit.*, p. 227; Office of Technology Assessment, 1977, *op. cit.*, pp. 80-81; M. Zuberi, *op. cit.*, pp. 184-185.

[53] See for example United States House of Representative, *Salient Points of Hearings on Nuclear Policy Review*, A Summary Prepared for the Committee on Interior and Insular Affairs, 96th Congress, 1st Session, Washington, DC, December 1979, Annex, p. CRS-88.

[54] NPT/CONF.III/4, para. 7.

[55] R. Rainer, "The Treaty for the Prohibition of Nuclear Weapons in Latin America (Tlatelolco Treaty), *Nuclear Law for a Developing World*, IAEA, Vienna, Legal Series

outlined in draft articles was designed to be "as effective as possible in preventing any violation or evasion of the obligations of the Treaty" and supplemented the IAEA Safeguards System by providing appropriate procedures prohibiting nuclear weapons throughout the territories covered rather then just preventing nuclear materials diversion.[56]

Nuclear Energy as a Normal Industry

By the mid-1980s, attitudes about nuclear energy's dual nature were re-evaluated. The belief that the civil and military aspects could not be separated resurfaced. As noted by the Programme Director of PPNN, John Simpson:

> Nuclear technology [thus] possesses few inherent technical qualities which enable its civil applications to be distinguished from its military ones. Any attempt to do so inevitably leads to anomalies and exceptions.[57]

Nuclear energy production was not the normal industry that it was thought to be in the 1960s. NRC Commissioner Gilinsky testified:

> What I have tried to say here today is that nuclear explosive materials cannot be handled within the normal rules of commerce - their control is beyond the present capacities of our international institutions[...].[58]

Commerce needed to be conducted so as not to undermine safeguards. In addition to accepting restraints on trade, states started to acknowledge that industry must consider safeguards requirements when planning, designing and developing

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No. 5, STI/PUB/215, 1969, pp. 318-319.

[56] COPREDAL/19, reproduced in Alfonso García Robles, *The Denuclearization of Latin America*, Carnegie Endowment for International Peace, Washington, DC, 1967, pp. 97, 103; also for commentary see Alfonso, García Robles, *The Latin American Nuclear-Weapon-Free Zone*, The Stanley Foundation, Muscatine, Occasional Paper, No. 19, May 1979, p. 17.

[57] Simpson, 1986, *op. cit.*, p. 5.

[58] United States House of Representatives, *Nuclear Safeguards: An Updated Analysis of the Concept of Safeguards as a National and International Institution*, Report Prepared for the Subcommittee on Energy Research and Production of the Committee on Science and Technology, 96th Congress, 2nd Session, Washington, DC, June 1980, p. 5.

nuclear facilities.[59] Attitudes shifted regarding Agency-Operator relations. At one time, the Agency was required to adapt to state and facility needs, but increasingly states and their facility operators needed to adjust their procedures to assist the IAEA. Otherwise safeguards effectiveness was at risk. On 26 February 1992, the BOG approved early provision of design information to the Agency of new and modified nuclear facilities with a view to facilitating IAEA efforts to develop safeguards approaches.[60] It allowed consultation between the Agency, the state, and the facility operator during project conception and design, especially important for complex, higher throughput facilities.[61]

Positive Benefits Not Equating to Promotion

The 1940s concept that states should benefit from participating in a control programme remained valid. Aid was an important incentive for participation in any control scheme. For that reason, the Office of Technology Assessment recommended that improved technical assistance be given to civilian nuclear programmes.[62] Some states realised that promotion was not the control *raison d'etre*. Critics observed that promotion should be a secondary concern. Analyst Joseph Pattison noted that control had "taken on a life of its own" and did not need extrinsic support.[63] Appropriate rewards for control system participation needed development. Among suggestions were offering preferential or sole nuclear trading rights to NPT NNWSs or states with fullscope safeguards.[64] While this did not become universal, some states channeled aid through the Agency to reward those accepting controls. Technical assistance requests tended to go unfunded if from a non-NPT party.[65]

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[59] "Unofficial Paper Distributed at Final Session of 1980 NPT Review Conference", *op. cit.*, p. 570, para. 12; NPT/CONF.III/64/I, para. 16; NPT/CONF.1995/MC.II/1. para. 31.

[60] NPT/CONF.1995/7, para. 34.

[61] GOV/INF/613/Add.1, C.2-4, para. 12.

[62] Office of Technology Assessment, 1977, *op. cit.*, p. 81.

[63] Joseph E. Pattison, "The Transnational Control of Atomic Energy: A Nuclear Ecology", *International Lawyer*, Vol. 11, No. 3, Summer 1977, p. 513.

[64] Statement by the GDR, NPT/CONF.II/C.II/SR.7, para. 3; statement by Norway, NPT/CONF.II/C.II/SR.2, para. 11; statement by Canada, NPT/CONF.III/C.II/SR.3, para. 44.

[65] For details, see Scheinman 1987, p. 245.

This trend was aided by states re-evaluating the role of nuclear energy in the global economy. Sweden and the FRG took decisions in 1988 and 1999 respectively to gradually phase out their nuclear programmes.[66] In conducting re-evaluations, a few states have reconsidered the nature of their peaceful co-operation obligations under the NPT. Austria rejected the concept that nuclear energy was a developmental precondition when it declared at the 2000 Review Conference that nuclear energy did not contribute to sustainable development and therefore could not play a role in future energy policies.[67]

Structuring a Nuclear Programme

Some advocates believed that benefitting from nuclear energy use implied doing so in a non-destabilising manner. Support emerged for facilities and national programmes that were consistent with the main non-proliferation objectives.[68] Restraint on the export of sensitive technologies because there was no economic justification for increased enrichment capacity was advised by former IAEA officials Fischer and Szasz.[69] Some analysts proposed expanding Agency authority to identify normal patterns of peaceful nuclear development and to determine whether indigenous projects and international transfers were consistent with those patterns and appropriate for the state at a particular time.[70]

In the mid-1970s, attention turned to establishing multinational fuel cycle facilities (MNFCs) for enrichment, fuel fabrication and reprocessing.[71] Proposals had

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[66] "Nuclear Energy in Sweden", Uranium Information Center, Melbourne, *Nuclear Energy Briefing Paper*, No. 39, December 1999; "Germany Prepares for Abandoning Nuclear Energy", BBC World Service, 14 January 1999.

[67] Johnson, 3 May 2000, *op. cit.*

[68] Fischer and Szasz, *op. cit.*, p. 31; Frederick Brown, "Safeguards in the United Kingdom", American Nuclear Society, paper presented at an *Executive Conference on Safeguards*, Cape Cod, 16-19 October 1977, p. 257.

[69] Fischer and Szasz, *op. cit.*, p. 158.

[70] Testimony of Dr. Thomas E. Shea, *Nuclear Safeguards: A Reader*, *op. cit.*, p. 756.

[71] Statement by Thailand, NPT/CONF/C.II/SR.3; proposal by Denmark, NPT/CONF.II/C.II/3/Rev.1; statement by Switzerland, NPT/CONF.II/C.II/SR.3, para. 42; statement by South Korea, NPT/CONF.II/C.II/SR.6, para. 28; statement by Finland, NPT/CONF.II/C.II/SR.6, para. 48; statement by the GDR,

surfaced in the 1950s and mid-1960s without result.[72] MNFCs aimed to limit enrichment and reprocessing facilities to global, not national, needs and would function as an international materials management and storage regime. MNFCs would reprocess materials on an "as needed" basis and store them in proliferation-resistant forms.[73] Turning MNFCs into international islands to keep stockpiled materials outside national control was also reviewed.[74]

Echoing Baruchian concepts, MNFCs tried to create international interdependence in nuclear fuel cycles. By removing facilities associated with direct-use materials from state control a destabilising element was removed from state programmes. The scheme benefitted states, assisting them in dealing with supply issues and making supplier prior consent requirements obsolete.[75] In view of the interest in MNFCs, the IAEA conducted a study on MNFC viability from 1974 to 1977. It reported that the concept offered advantages in cost-savings, improved safety and reductions in weapon-usable material factories, but risked hastening the spread of technology.[76]

By 1977, a major MNFC proponent, the United States, withdrew its support. It was anxious about technology diffusion, fearing diversion to clandestine programmes.[77] The rejection was unsurprising since the approach was unsuited to be a standalone measure. While addressing the management of national programmes, verification of clandestine activities was non-existent. Sharing highly sensitive activities was possible only under strict, rather than partial, control. Arguments against MNFCs

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NPT/CONF.II/C.II/SR.7, para. 8; statement by Austria, NPT/CONF.II/C.II/SR.8, para. 22; NPT/CONF.III/64/I, Review of Article III, para. 19.

[72] Schiff, *op. cit.*, p. 149; GWU, Spurgeon Keeny, "Peaceful Uses: The Problem of Non-Compliance, Internal Paper", Draft Internal Paper, Office of the White House, GWU Doc No. 1088, 30 December 1964, p. 2.

[73] Thomas R. Pickering, Assistant Secretary, Department of State, in *Salient Points of Hearing on Nuclear Policy Review, op. cit.*, p. CRS-91; also see, *Internationalization to Prevent the Spread of Nuclear Weapons*, Taylor & Francis, London, 1980.

[74] Scheinman in Leachman and Althoff, *op. cit.*, p. 116.

[75] *Oversight Hearings on Nuclear Energy - International Proliferation of Nuclear Technology, op. cit.*, p. 77; A. J. Meerburg "A New International Consensus in the Field of Nuclear Energy for Peaceful Purposes" in *Internationalization to Prevent the Spread of Nuclear Weapons, op. cit.*, p. 79.

[76] Fischer and Szasz, *op. cit.*, p. 112.

[77] Office of Technology Assessment, 1977, *op. cit.*, p. 43; Schiff, *op. cit.*, p. 149.

also arose because the plan required massive institutional change, which was likely to be resisted.[78] Previous operations like the pilot EUROCHEMIC operation succeeded due to political will and national scientific interest.[79] Without similar political will, scientific interest, or economic incentives, interest dissipated.

While no further action was taken on MNFCs, the idea of discouraging "dangerous facilities" continued to be pursued. The 1995 NPT Review Conference discussed recommendations that no new civilian reactors requiring HEU be constructed – a move directed at, and opposed by, the FRG.[80] The 2000 NPT Review Conference succeeded in officially recognising the non-proliferation benefits from converting civilian research reactors from HEU to LEU.[81]

Attempts to restructure the DPRK nuclear programmes made important contributions to stability in Asia. To avoid aggravating relations, the DPRK and the ROK agreed on 31 December 1991 to ban uranium enrichment and plutonium reprocessing.[82] When a crisis arose regarding the nature of the DPRK nuclear programme, the DPRK and the United States concluded the "Agreed Framework" in 1994 under which the DPRK assented, *inter alia*, to disposal and storage of fuel from its 5 MW reactor without reprocessing in the DPRK and replacement of its graphite reactor with two proliferation-resistant 1000 MW LWRs.

International Fuel Cycle Evaluation (INFCE)

"Dangerous facilities" became the subject of intense scrutiny under the exercise known as the International Fuel Cycle Evaluation (INFCE). INFCE was initiated by US President Jimmy Carter to demonstrate that the once-through fuel cycle was more proliferation-resistant than alternatives. Goldschmidt described INFCE as resembling work undertaken 30 years earlier at an international meeting of scientists under UN auspices aimed at making an initial attempt to control atomic energy.[83]

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[78] Office of Technology Assessment, 1995, *op. cit.*, p. 22.

[79] Fischer, 1997, *op. cit.*, p. 264.

[80] Rebecca Johnson, "Week Two: Spotlight on Review", *NPT Update*, No. 11, 1 May 1995.

[81] NPT/CONF.2000/28, Part 1; also see NPT/CONF.1995/MC.II/1, para. 36.

[82] Benjamin Sanders, *PPNN Newsbrief*, No. 17, Spring 1992, p. 11.

[83] Goldschmidt, *op. cit.*, p. 414.

INFCE was launched in October 1977 and concluded in February 1980. Sixty-six states participated. Although the United States advocated INFCE as an international cooperative effort to evaluate, *inter alia,* nuclear energy technological and institutional roles in non-proliferation, developing states viewed it as an attempt by suppliers to divert negotiations from the IAEA to forums where suppliers could enforce nuclear trade controls.[84]

INFCE refrained from identifying any particular fuel cycle as more proliferation prone than others but recommended adapting a series of non-proliferation measures incorporating a range of 1940s concepts. This included safeguards agreement adaptability, physical protection as an element of control, positive incentives, programme structure management, enforcement and total disarmament. Specifically, INFCE advocated:

- creating an international plutonium and spent fuel storage regime (IPS);
- establishing MNFCs;
- utilising techniques of uranium denaturing, irradiation spiking and partial material processing to strengthen safeguards;
- designing reactors to minimise proliferation risk;
- conducting transfers based on non-proliferation agreements;
- requiring adequate physical protection including transport and storage of materials as mixed oxide;
- ensuring the permanency of safeguard commitments;
- conducting periodic reviews of non-proliferation undertakings and provisions for modifying existing requirements in response to international developments;
- ensuring assurances of supply;
- utilising sanctions; and
- working towards the renunciation of nuclear weapons and PNEs.[85]

These findings, as Goldschmidt noted, were "recognized long ago".[86] They were repackaged and diluted but the underlying concepts remained the same.

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[84] Schiff, *op. cit.*, p. 146; Brenner, *op. cit.*, p. 173.

[85] *INFCE Summary Volume*, INFCE/PC/2/9, IAEA, Vienna, January 1980, pp. 36-39; also see Brenner, *op. cit.*, pp. 205-207.

[86] Goldschmidt, *op. cit.*, 416.

Not Just a Technical Exercise

From the mid-1970s into the 1990s, experts appraised the nature of safeguards, finding them more than a simple technical exercise. Howlett observed safeguards:

> involve far-reaching political and security considerations which in many ways go right to the heart of the nuclear energy control questions.[87]

Similarly, INFCE declared that proliferation was primarily a political issue and that technical measures alone had a limited ability to restrain proliferation.[88] Experts cautioned against reliance on mathematical criteria rather than value judgements. Conventional material accountancy could not provide assurances, especially with large sensitive facilities, and could not evaluate the operations of the national fuel cycle system as a whole.[89] By 1990, states began questioning rigid application of the MBA approach indicating a reversion to appreciating control as a complex political security mechanism rather than just a set of specified technical operations.[90]

Meeting Individual State Concerns

To resolve proliferation concerns and strengthen non-proliferation efforts, regions created NWFZs. Many NWFZs strengthened existing crisis mechanisms by adding enhanced complaint procedures, consultations and inspection requests by suspicious parties. Under the Treaty of Tlatelolco, state parties agreed that they could request special IAEA inspections. A state should not wait for control authority

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[87] Howlett, *op. cit.*, p. 4; also see *Nuclear Safeguards: An Updated Analysis of the Concept of Safeguards as a National and International Institution*, *op. cit.*, pp. 1-2, 25.

[88] *United States Post-International Nuclear Fuel Cycle Evaluation (INFCE) Policy*, ANS Document PPS-40, September 1981, American Nuclear Society, La Grange Park; *Technical Aspects of Nuclear Nonproliferation: Safeguards*, *op. cit.*, p. 308.

[89] Frank Morgan, "Judgement in Safeguards Activities", in Leachman and Althoff, *op. cit.*, p. 205; David B. Sinden and John G. McManus, "A New Safeguards Approach", in Tariq Rauf, *Strengthening Safeguards and Regional Non-Proliferation Strategies, Canadian Centre for Global Security*, Aurora Papers, No. 23, 1994, p. 36; Office of Technology Assessment, 1995, *op. cit.*, p. 3; Ryukichi Imai, "Safeguards - A New Approach", *Nuclear Engineering International*, Vol. 21, April 1979, p. 55.

[90] Statement by Czechoslovakia, NPT/CONF.IV/MC.II/SR.2, para. 6.

action if it felt its security was in jeopardy.[91] Similarly, the Treaty of Rarotonga and the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba) set up complaint procedures under which inspectors were granted full and free access to information and sites in accused state territory.[92] For rivals Argentina and Brazil, stronger arrangements under the Brazilian-Argentine Agency for the Accounting and Control of Nuclear Materials (ABACC) were the key to building confidence when they agreed to mutual nuclear inspections independent of the IAEA in March 1986. When they subsequently negotiated the Quadripartite Agreement to establish an NPT-type agreement between the Agency, ABACC and themselves, Argentine and Brazilian officials feared that if the IAEA system took over ABACC responsibilities, ABACC risked losing its inspection function, something which would be detrimental to regional stability.[93] Thus, under the Quadripartite Agreement, cooperative arrangements between the IAEA and ABACC modelled upon the IAEA's agreement with EURATOM was established to ensure that Argentina and Brazil would remain fully engaged in the verification process.

Managing the Materials Threat

National and sub-national threats from growing stockpiles of fissile materials directed attention towards negotiating an IPS regime. The United States briefly revisited the idea that the IAEA or supplier states retain title to transferred materials in 1964, but serious interest surfaced in the mid-1970s.[94] The IAEA Statute's dormant Article XIV.B.2 giving the Agency storage rights to excess materials was a possible means to effectively safeguard stockpiles. The 1975 NPT Review Conference tasked the IAEA with examining an IPS structure.[95]

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[91] For background on the Treaty see Rainer, 1969, *op. cit.*, p. 320; John R. Redick, "Nuclear Confidence-Building in Latin America", in J. B. Poole & R. Guthrie, *Verification 1993*, Verification Technology Information Centre, London, 1993, pp. 99.

[92] The Treaty of Rarotonga, Annex 4, para. 6; The Treaty of Pelindaba, Annex IV, para. 4 (c); For discussion see Nigel Fyfe and Christopher Beeby, "The South Pacific Nuclear Free Zone Treaty", *Victoria University of Wellington Law Review*, Vol. 17, No. 1, 1987, pp. 41-43.

[93] Carlos Feu Alvim, "Common System for Accounting and Control of Nuclear Material between Brazil and Argentina and Role of ABACC for Peaceful Uses of Nuclear Material", Paper Presented at the Cairo Workshop on the Verification of Arms Control Agreements and Confidence Building Measures, Cairo, 11-13 July 1993, p. 9.

[94] Keeny, *op. cit.*, p. 1.

[95] NPT/CONF.III/64/I, para. 14.

The IAEA began its investigation in 1976 and assembled an Expert group in 1978 which met through the early 1980s. Initial proposals incorporated considerable controls. Experts identified three alternatives. The first, supported by Argentina, Yugoslavia and India, required States to provide an inventory of plutonium use and deposit their excess. Materials would be returned on submission of a statement of need and the conclusion of an agreement for verification of use. States could hold limited amounts of excess material depending on the nature of their national facilities. Material would be returned if the Agency was satisfied that peaceful safeguarded use would not lead to stockpiling.[96]

Under the second alternative, states themselves determined their own excess for deposit and also selected their own storage sites. Materials would be returned on request and sent to the location of use where they would be placed under safeguards. Verification of declared use was not necessary. Limits on buffer stock size at fuel fabrication plants were determined consensually by the owner, the state and the Agency. Limits were subject to change by mutual agreement. If unforeseen stocks accumulated, the owner and the state were to consider deposit.[97]

Under alternative three, supported by Australia, the Netherlands and Sweden, all civil plutonium was registered. Deposited materials were returned after the Agency assessed operator statements of use/need for accuracy and consistency. Deregistration occurred when materials were no longer subject to safeguards and usage was verified. Limited excess could be kept by states under seal or returned after procedure completion. This alternative permitted withdrawal for non-explosive uses only.[98]

While the proposals varied, conceptually their aims reflected 1940s ideas. The schemes incorporated some principles of control by aiming to increase Agency knowledge of, and control over, nuclear materials and uses while providing positive incentives to accept the measures by reducing obstacles to plutonium fuel cycles and supply.

Two of the three packages aimed to promote norms of non-provocative, non-threatening use and to prevent nuclear misuse. These proposals recognised that the intentions behind certain programs structures, although peaceful in nature, could be

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[96] GOV/INF/445 annex; IAEA-IPS/EG/140 Rev.2.

[97] *Ibid.*

[98] *Ibid.*

misconstrued, especially in times of international tension. In addition, with critical materials under international control, there was greater inherent security if rivalry between states rose or in the event that a state attempted to withdraw from its safeguards commitment.[99]

The proposals, however, floundered on the traditional issues of ceding political and economic sovereignty to an international authority. Experts disagreed on:

- the extent to which the control authority should assess proposed use during the return procedure;
- return conditions including restrictions on use or change of use and requirement for fullscope safeguards or physical protection;
- whether, how many, and what suitability criteria for extraterritorial storage on islands were reasonable;
- controls over transfers between storage units; and
- whether actual Agency presence rather than surveillance was necessary during storage.[100]

Pervading the discussions was state interests to protecting and promoting national industry. Some negotiators insisted that IPS should not interfere with national energy programmes[101], while others expressed concern that commercial secrets or research discoveries might be compromised by requiring great specificity about proposed material uses.[102] Equality was also an issue as Japan raised discrimination concerns regarding how the scheme would relate to bilateral control and EURATOM.[103]

Discussions stalemated, with states only willing to pledge transparency to demonstrate that supplied or produced plutonium was employed for peaceful uses.[104]

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[99] GOV/INF/391, para. 2.

[100] Charles N. Van Doren, *Toward and Effective International Plutonium Storage System*, Congressional Research Service, Washington, DC, 1 November 1981, pp. 9-10, 20-29, 38-39, 52-54, 58-59, 64-65; IAEA-IPS/EG/62/Rev.1; IAEA-IPS/EG/63/Rev.1; statements by Brazil, Argentina and India, GOV/OR.601, paras. 45, 54, 63 respectively.

[101] GOV/INF/391, para. 2.

[102] Van Doren, November 1981, *op. cit.*, p. 15.

[103] *Ibid.*, p. 107.

[104] M. L. James "International Plutonium Storage" in *Internationalization to Prevent the Spread of Nuclear Weapons, op. cit.*, pp. 147-148.

Although negotiations failed, IPS continued to be viewed favourably with calls at the 1990 and 1995 NPT Review Conferences for Agency arrangements on IPS and for states producing large stockpiles not to accumulate special fissile materials, respectively.[105]

Between 1992 and 1994, the IAEA Director General convened informal discussions among leading material producers. A 1993 Dutch paper attempted to resurrect material and facility management concepts, suggesting options including:

- joint supplier and user materials management;
- joint management under an IAEA umbrella where the Agency would consult and provide non-binding advice on the desirability of particular plutonium cycle activities;
- IAEA veto over national plutonium cycle activities;
- direct IAEA plutonium management; and
- IAEA material custodianship.

The Dutch believed that the second option was achievable.[106]

Discussions moved towards a transparency mechanism. Japan recommended that materials remain under national control but withdrawals be reported. Materials loaded in reactors or blended in MOX were not subject to transparency. Economics again became an obstacle as fears of increased costs and retrieval delays grew. Japan sought allowances for a large plutonium surplus without planned use for five years.[107] Likewise, efforts to include HEU were shunned since it was a high value commodity and its inventory data was considered proprietary or confidential.[108]

In 1997, the group effort yielded a limited transparency regime that left countries to decide their own national fuel cycle strategy but provided Guidelines for

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[105] NPT/CONF.IV/MC.II/1, para. 6.A.27; Johnson, *op. cit.*, 1 May 1995.

[106] Jean-François Rioux, *The International Safeguarding and Management of Plutonium*, Centre for International Relations, Queen's University, Martello Papers, No. 10, Kingston, 1995, p. 45.

[107] *Ibid.*, pp. 46-47.

[108] *Guidelines for the Responsible Management of Plutonium*, Non-Proliferation Department of Trade and Industry, London, United Kingdom. Also see Mark Hibbs, "States to Disclose Via IAEA Plutonium Inventories Soon" *Nuclear Fuel*, Vol. 22, No. 13, 30 June 1997, pp. 6-7.

responsible management of non-military plutonium.[109] The Guidelines featured strategic management commitments encouraging states to take proliferation risks into account, to limit storage site numbers and to publish national nuclear power strategies, plutonium management plans, and international transfer control provisions. They encouraged participants to seek non-explosive use assurances from trading partners importing over 50 grams of Pu per annum, require export safeguards until Agency termination, and accept prior consent on re-transfers.[110]

The outcome of promoting transparency and increasing public confidence was a far cry from the original proposals to strengthen control. However, the establishment of the regime represented another incremental step in strengthening controls. Additional transparency, vital to promote confidence under the Baruch plan, was introduced. The Guidelines also established a limited basis for judging acceptable approaches to plutonium management. It fostered the idea that active plutonium management and physical protection were necessary elements of security and confidence, and it effectively forced governments participating in the scheme to become more active in instituting controls. For example, China's initial report under the Guidelines reported zero kilos of unirradiated plutonium and provided no report on spent fuel, since the government was unable to produce figures.[111]

Universality

As safeguards matured, universality became increasingly identified as a necessary element of control if safeguards objectives were to be fully achieved.[112] States learned that a rival outside of the system reduced significantly the effectiveness of the control architecture. The importance of participation was underscored by Arab-Israeli relations. The Arab World, finding Israel's undeclared nuclear force a threat, coalesced to suspend Israel's IAEA membership unless Dimona was placed under safeguards.[113] While the Arabs targeted Israel due to its weapons ambitions, states

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[109] The Guidelines were issued as INFCIRC/549.

[110] INFCIRC/549.

[111] INFCIRC/549/Add.7.

[112] For comments see Myron Kratzer, "Systems Against Nuclear Proliferation", presented at George Washington University, American Assembly, Airlie House, Warrenton, VA, 11 May 1967.

[113] Goldschmidt, *op. cit.*, pp. 207-209.

remaining out of the system for other reasons generated doubts about their intentions. One US study noted:

> [..] the most effective - possibly the only effective - means by which a nation can demonstrate the validity of its commitment to peaceful uses of nuclear energy is to place its program under effective international safeguards.[114]

While the international community welcomed Brazil's and Argentina's bilateral arrangements to eliminate their nuclear weapons programmes and open their peaceful programmes to inspection, their commitment was doubted until they concluded an agreement with the IAEA for international inspection.[115]

Universality's importance was also seen in the context of nations accepting equal burdens, especially in the commercial sphere. Belgium, a state which strongly protected its commercial operations from safeguards intrusions noted that it "would be more willing to subject exports of nuclear material and equipment to full-scope safeguards if all exporter States decided to adopt the same policy."[116]

Equality

Rectifying the adopted control system's inequalities became a long-term endeavour. Due to incremental evolution and state resistance to certain measures, INFCIRC/66-type agreements varied in structure. This made the system cumbersome, complex and costly, generating proposals like South Africa's 1966 call for streamlining.[117] INFCIRC/153 addressed the situation by establishing a model agreement rather than a set of guidelines and by 1972 efforts to draft a model Subsidiary Arrangements text.[118] However, concerns remained regarding standardised facility attachments.[119]

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[114] Kratzer, May 1967, *op. cit.*

[115] Benjamin Sanders, *PPNN Newsbrief*, No. 1, March 1988, p. 2.

[116] Statement by Belgium, NPT/CONF.IV/MC.II/SR.3, para. 29.

[117] Statement by South Africa, GOV/OR.376, paras. 19-21; proposal by South Africa, GOV/1173, para. 3.

[118] GOV/1528, para. 117; File A, 6.1.

[119] Office of Technology Assessment, 1977, *op. cit.*, pp. 80-81; Statement by L. Manning Muntzing, in *Technical Aspects of Nuclear Nonproliferation: Safeguards, op.*

More contentious inequalities existed between NNWSs and NWSs under the NPT. The division undermined support for the NPT and limited tolerance for its control measures. For example, India rejected remodeling nuclear on-site verification activities to resemble the Chemical Weapons Convention's (CWC) inspection and access rights on the grounds that the CWC did not have permanent "chemical weapon states".[120] Those declaring chemical weapons had a ten year time frame to dismantle their arsenals. Attempts to equalise the disparity came partly through pressure at NPT Review Conferences. NWS failure to disarm contributed to the inability of the 1980, 1990 and 1995 NPT Review Conferences to reach consensus on a Final Declaration and fed the NNWSs' demands in 1995 to establish greater accountability through the adoption of the Principles and Objectives document. NNWSs also made various proposals, including gradually extending safeguards to cover the NWSs' entire civilian and military nuclear activities;[121] require that NWS materials subject to safeguards remain safeguarded;[122] and require that all exports to NWSs be safeguarded.[123] Although no action was taken on these proposals, the United States and Russia established a Trilateral Initiative with the IAEA to permanently safeguard materials derived from nuclear disarmament.[124]

The NNWSs also demonstrated a decreasing tolerance of nuclear weapons transit activities in the NWFZs. The Treaty of Pelindaba sought to close transit loopholes in previously established NWFZs. By allowing visits or transits only "without prejudice to the purposes and objectives to the Treaty" the Treaty sought to prevent transit from becoming tacit acceptance of nuclear weapons stationing by the NWSs.[125]

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cit., p. 313.

[120] Statement by India, GOV/OR.795, para. 109.

[121] Proposed by Sweden, *SIPRI Yearbook 1991: World Armaments and Disarmament*, pp. 562-563.

[122] NPT/CONF.IV/18, para. 8.

[123] Johnson, *op. cit.*, 1 May 1995.

[124] GOV/INF/1999/8.

[125] Sola Ogunbanwo, "The Treaty of Pelindaba: Africa is Nuclear-Weapon-Free", *Security Dialogue*, Vol. 27, No. 2, June 1996, p. 191.

Peaceful Nuclear Explosions (PNEs)

In the 1940s, PNEs were considered as dangerous as nuclear weapons. The NPT took a conservative view of PNEs by allowing NNWSs to have made available to them the potential benefits from PNEs under appropriate international observation and procedures. However, the establishment of arrangements of conducting PNEs did not proceeded quickly. Within several years of the NPT's conclusion, a hastening of attitudes against PNEs was triggered by India's PNE test. By the close of 1974, states, including Canada, Japan and Sweden, advocated that PNEs be under international control with projects examined and licensed by an international authority.[126] In 1975, the UN Secretary General stressed the link between peaceful and military nuclear explosives uses:

> Available science evidence shows that there is little essential difference between explosive devices for peaceful purposes and those for nuclear weapons.[127]

Excluding Argentine and Indian reservations, this view was expounded by an Ad Hoc Advisory Group on PNEs meeting between September 1975 and August 1977, which cautioned that international PNE arrangements must take into account that PNEs could also be employed as weapons.[128] In February 1975, the Board of Governors formally interpreted peaceful use to mean that all subsequent non-NPT Safeguards Agreements contain explicit prohibitions on transfers supporting explosive purposes, including technical assistance.[129] In February 1979, the Board approved new technical assistance Guidelines which stated that peaceful atomic energy uses excluded R&D, testing or manufacture of PNEs.[130]

Environmental and public acceptance problems increased pressure for global renunciation of PNEs. PNE programmes collapsed in the United States and Soviet

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[126] NPT/CONF/10, paras. 32-33.

[127] *Ibid.*, para. 47.

[128] GOV/1854, Annex, para. 5.

[129] This declaration was made in connection with a USSR-Spanish agreement (INFCIRC/267). See also GOV/OR.474; GOV/1723, para. 2; GOV/OR.475, para. 11; Rainer and Szasz, *op. cit.*, p. 318.

[130] *Revised Guiding Principles and General Operating Rules to Govern the Provisional Technical Assistance by the Agency*, IAEA Doc. GEN/PUB/12/REV.2a, 21 Feb 1979, Principle A.1(i).

Union in the late 1970s and in 1988, respectively. The 1985 NPT Review Conference acknowledged that the potential benefits of peaceful nuclear explosions had not been demonstrated.[131] All NWFZs since the 1985 establishment of the Treaty of Rarotonga, have required state cession of rights to conduct PNEs. By 1990, hard-core supporters of PNEs began changing their stance. In February, President Fernando Collor de Mello of Brazil called for banning nuclear weapons including PNEs.[132] By the 1995 NPT Review Conference, only China upheld Article V PNE rights.[133]

Physical Protection

Although physical protection was not integrated into safeguards, it gained credence as vital to achieving safeguards objectives. As noted by Sanders in 1975:

> The protection of nuclear material and facilities against illegal acts is an essential supplement to any safeguards system based on accountancy. Such safeguards can *detect* the disappearance of nuclear material; physical security measures have to be taken to *prevent* such disappearance and to recover material that has gone astray.[...] Evidently, the international community has become aware that international safeguards are closely connected with national and, indeed, international measures of physical security.[134]

The EURATOM Commission agreed, seeing physical protection issues as connected to some extent with safeguarding techniques.[135] The connection was not accepted by all members, however, and EURATOM required a 1978 European Court of Justice decision that physical protection was within EURATOM purview before effectively regulating physical protection activities.[136]

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[131] NPT/CONF.III/64/I, Review of Article V, para. 3.

[132] Tom Zamora Collina and Fernando de Souza Barros, "Transplanting Brazil and Argentina's Success", *ISIS Report*, February 1995, p. 3.

[133] Johnson, 1 May 1995; Rebecca Johnson, "Security Assurances", *NPT Updates*, No. 1, 4 May 1995.

[134] Sanders, 1975, *op. cit.*, pp. 31-32.

[135] EURATOM Commission, *Ninth General Report on the Activities of the Community in 1975*, Brussels, No. 9, February 1976, p. 202.

[136] Court of Justice of the European Community, "Ruling Delivered Pursuant to the Third Paragraph of Article 103 of the EAEC Treaty", *Report of Cases*, 1978, pp. 2152-2153.

Acceptance of global physical protection measures was slow but steady. US interest in physical protection emerged in 1967 when the USAEC began requiring that nuclear power plant operating licenses include plans for security against sabotage. Over the next decade, academics and government officials highlighted the dangers of terrorism and an April 1974 report to the USAEC found US safeguards against nuclear theft or blackmail by terrorists "entirely inadequately to meet the threat."[137] During this time, domestic measures were adopted including strengthened special nuclear material transit and fixed storage site controls.[138]

During NPT negotiations, the United States pressed for physical security measures, but the majority felt that the problem was a policing issue needing separate treatment.[139] A consultant group convened in November 1971 and established a panel in 1972 under IAEA auspices to draw up physical protection guidelines. INFCIRC/225 was issued in June 1972 and updated in 1975, 1977, 1989, 1993 and 1999. These guidelines became the recommended baseline for national physical protection systems.[140]

Efforts to codify physical protection as a legal instrument continued. In October 1979, 58 states negotiated The Convention on Physical Protection on Nuclear Material which was opened for signature in March 1980. The Convention obligated states not to export, import, or authorise the export or import of nuclear material used for peaceful purposes without receiving assurances that materials would be protected during international transport as prescribed in the Convention's Annexes. However, the Convention was less detailed than INFCIRC/225/Rev.1 and addressed international transport not domestic facility security.

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[137] *Peaceful Nuclear Exports and Weapons Proliferation: A Compendium*, prepared by the Committee on Government Operations, United States Senate, April 1975, p. 487. The Compendium also contains discussions of reports on the inadequacies of physical protection practices.

[138] For details on measures see "Remarks by Robert T. McWhinney Jr., U.S. Atomic Energy Commission Before the Atomic Industrial Forum Public Affairs Workshop on Plutonium, Safeguards, and the Breeder", Knoxville, Tennessee, 9 October 1974, pp. 406-418, in *Peaceful Nuclear Exports and Weapons Proliferation: A Compendium*; Ralph G. Page, "Development and Status of U.S. Nuclear Regulator Commission Safeguards", American Nuclear Society, presented at an *Executive Conference on Safeguards*, *op. cit.*, pp. 100-101.

[139] Howlett, *op. cit.*, p. 203.

[140] Bonnie D. Jenkins, "Establishing International Standards for Physical Protection of Nuclear Material", *The Nonproliferation Review*, Vol. 5, No. 3, Spring-Summer 1998, p. 101.

Negotiations of the Convention foundered on sovereignty and economic issues. Although some states were open to an IAEA role in implementing the Convention or to linking the Convention to the NPT, it remained a separate, unregulated agreement.[141] States divided into those who supported coverage of:

- transport only[142];
- transport and domestic civilian uses; and[143]
- transport, civilian and military uses.[144]

Some also advocated controls on source materials.[145]

Some developing states argued that the physical protection obligations were costly burdens and infringed the NPT.[146] More developed states welcomed the broader scope but were reticent on military coverage. Physical protection remained a national matter because such controls needed to take into account different perceived threats, culture, and legal systems.[147]

Despite the conservative approach that prevailed over the Convention negotiations, the need for responsible physical protection continued to grow as an international norm. As illicit transfers rose in the 1990s following the Soviet Union's collapse, governments were prodded into taking additional action. Government experts met in November 1994 to discuss developments but still placed primary prevention responsibility on national governments. In December 1994, the IAEA Secretariat responded to a request of the General Conference by submitting proposals

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[141] Statement by Mexico, *Convention on the Physical Protection of Nuclear Material*, p. 263; statement by the Netherlands, NPT/CONF/C.II/SR.1; statement by Senegal, NPT/CONF.II/C.II/SR.4, para. 18.

[142] Statements by Belgium, Brazil, France, India, Panama, Romania, Yugoslavia in *Convention on the Physical Protection of Nuclear Material, op. cit.*, pp. 231, 259, 279, 305, 308, 322, 327, 355.

[143] Statements by Czechoslovakia, Finland, Italy, Mexico, Netherlands, Russia, South Africa, Sweden, United States, *Ibid.*, pp. 229, 239, 263, 266, 309, 319-320, 331.

[144] Statements by Argentina, Egypt, GDR, *Ibid.*, pp. 261, 328, 342.

[145] Statements by FRG, Japan, Netherlands, *Ibid.*, pp. 253, 259, 340-341.

[146] Statements by Egypt and Philippines, *Ibid.*, pp. 34, 80.

[147] Jenkins, *op. cit.*, p. 101.

to the BOG for assisting states in improving physical protection and SSACs, and by developing a database on illicit trafficking.[148] In June 1996, an IAEA meeting considered providing additional guidance and a handbook on designing physical protection systems.[149] Peer reviews were conducted in Romania, Bulgaria and Hungary in 1996 and in Poland and Hungary a year later.[150] Thus, states started recognising the contribution of physical protection to control and a norm started forming on international accountability in managing physical protection systems.

More recent moves attempted to extend the scope of institutionalised physical protection. Physical protection requirements were integrated into the Treaty of Pelindaba[151] and the Guidelines for Plutonium Storage.[152] Initiatives have included:

- a US proposal to extend the Convention's scope to incorporate specific standards for physical protection of nuclear material during domestic peaceful use, transport and storage;
- an Australian, Canadian and Turkish effort for a review of the Convention to determine whether it should be expanded; and
- support by the Netherlands and Syria for negotiating a Convention protocol.[153]

In addition, Russia proposed a sweeping initiative in 1998 requiring adoption of physical protection laws for nuclear materials, non-nuclear materials in nuclear programmes and all transport regardless of military or civilian use.[154] This is notable for applying measures across the entire fuel cycle and acknowledging the inseparability of civilian and military nuclear energy applications.

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[148] GOV/2804, para. 168; NPT/CONF.1995/7, para. 78.

[149] Jenkins, *op. cit.*, p. 100.

[150] *Ibid.*, p. 105.

[151] Treaty of Pelindaba, Article 10.

[152] INFCIRC/549, paras. 7-8 and Annex A.

[153] Jenkins, *op. cit.*, pp. 106, 110 (fn. 69).

[154] *Ibid.*, p. 104.

Enforcement and Withdrawal

Although no formal efforts to bolster options for enforcing compliance have been made, government and academic experts have repeatedly acknowledged the importance of compliance. In the United States, calls for stronger penalties and limitations on the right of non-cooperation emerged because any such refusal might represent a first step in diversion.[155] The enforcement challenge was underscored by the non-compliance of Iraq and the DPRK with safeguards agreements but solutions remained distant.

Withdrawal was as problematic as enforcement due to the implications regarding state intentions. NPT withdrawal provisions, noted in the Ranger inquiry as exceptionally easy, were tightened in the NWFZs. Under the Treaties of Rarotonga and Pelindaba and the Treaty on the Southeast Asia Nuclear Weapon-Free Zone (Treaty of Bangkok), withdrawal notification increased to 12 months.[156] In addition, under the Treaties of Rarotonga and Bangkok, withdrawal was only permitted in the event of a violation by a Treaty Member. A willingness to take collective action was noted in a 1992 UNSC declaration stating that members of the UNSC will take "appropriate measures" in the case of agreement violations reported by the IAEA.[157] In 1995, the Office of Technology Assessment approached the Baruch Plan framework when it recommended that the UNSC declare that withdrawal by a state from safeguards without surrendering all direct-use materials and facilities provided by NPT states would be considered a threat to international peace and that coercive means including military force could be employed to eliminate its weapons potential.[158]

Flexibility

As stated in Chapter Five, the IAEA had a limited ability to adapt safeguards to environmental changes. As proliferation threats emerged in the 1980s, some states

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[155] *The Israeli Air Strike, op. cit.*, p. 136; *Role of the International Atomic Energy Agency in Safeguarding Nuclear Material, op. cit.*, p. iii; *Nuclear Power Issues and Choices*, Report of the Nuclear Energy Policy Study Group, The Ford Foundation, Ballinger Publishing Co., Cambridge, MA, 1977, p. 293; Office of Technology Assessment, 1977, *op. cit.*, pp. 80-81; Nakicenovic, *op. cit.*, p. CRS-19.

[156] Articles 13, 22 and 20, respectively.

[157] S/PV.3046, 31 January 1992.

[158] Office of Technology Assessment, 1995, *op. cit.*, p. 19; also see Keeny, *op. cit.*, p. 3.

began supporting the Baruchian idea that the control authority should ensure that measures evolved to keep pace with technical developments and stockpile growth.[159] Specific suggestions included that the Agency:

- amend INFCIRC/66/Rev.2 type agreements which did not adequately define safeguards procedures or omitted important measures;[160]
- determine the level of inspection dynamically in the course of safeguards operations rather than limit itself to the ARIE; and[161]
- develop new principles for verifying operations in larger and more complex installations.[162]

New control mechanisms also incorporated such procedures. During negotiations on the Treaty of Tlatelolco, states considered requiring that IAEA safeguards system revisions be binding on zone members.[163] While negotiating the Convention on Physical Protection, Finland advocated inserting a mechanism for amending security measures through more flexible procedures than those necessary to modify the Convention.[164] These measures were rejected because they infringed on sovereignty.

Control Framework Changes - INFCIRC/66[165]

Although the basic safeguards framework was not designed to be flexible, some changes were made to incorporate control principles. The Agency, aware of the system's technical flaws, laboured to incrementally close the loopholes prevalent in

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[159] Statement by New Zealand, NPT/CONF.II/C.II/5; Review of Article III NPT/CONF.III/64/I, para. 13; statement by Egypt, NPT/CONF.IV/MC.II/SR.2, para. 55; statement by Norway, NPT/CONF.IV/MC.II/SR.3, para. 37.

[160] Statement by Australia, GOV/OR.505, para. 129.

[161] Nakicenovic, *op. cit.*, pp. CRS-11.

[162] Statement by Bangladesh, NPT/CONF.IV/MC.II/SR.3, para. 35.

[163] COPREDAL/19, *op. cit.*, p. 101.

[164] *Convention on the Physical Protection of Nuclear Material, op. cit.*, p. 229.

[165] The following discussion draws from the analysis of INFCIRC/66 development in Lawrence Scheinman (Principal Author), *Review of Negotiating History of International Atomic Energy Agency [IAEA] Document INFCIRC/66/Rev.2: The Agency's Safeguards System*, prepared for the Arms Control and Disarmament Agency, International Energy Associates Limited, Washington, DC, 30 July 1984, pp. 110-127.

INFCIRC/66-type agreements by setting bilateral negotiation precedents. If improvements were perceived as technical, they had a better chance of acceptance by states because they would be associated with cost-effectiveness.[166] On occasion, some states refused to recognise as precedents new measures accepted by other states in their safeguards agreements. These minor changes altered nuances in the safeguards framework: they increased Agency knowledge of, and control over, states' activities as well as strengthening the Agency's position as a control agent.

Improvements can be grouped into several categories. The first genus increased system technical rigour. For example, containment and surveillance became a regular feature in agreements after the mid-1970s.[167] Such changes eased Agency burdens in applying safeguards. An early change to INFCIRC/66-type agreements required recipients of material transfers to give the Agency two weeks advance notice of transfers.[168] The Agreement between the United States and Argentina altered the obligation for recipients to provide notice of transfers sufficiently in advance to enable the Agency to make the required arrangements before the transfers were effected.[169] The safeguards agreement on Argentina's heavy water production plant extended notification to a minimum of three months in advance.[170]

To improve control under INFCIRC/66-type agreements, changes were made to strengthen nuclear materials coverage or extend it over less sensitive items and facilities in the nuclear fuel cycle. Small increases in scope were achieved, for example, by making previously unsafeguarded material, processed or used in a safeguarded facility, subject to safeguards both when in, and after its removal.[171] The first application point for safeguards was set earlier in the fuel cycle in the German-Argentine fuel fabrication facility agreement whereby transfers made under the agreement from the FRG to Argentina would be safeguarded even if not immediately used.[172] Principal facilities subject to safeguards came to include heavy water plants

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[166] GOV/COM.22/14; GOV/COM.22/32.

[167] GOV/1282; for sample agreements see INFCIRC/237, Article 15.2; INFCIRC/239, Article 17.

[168] INFCIRC/92; INFCIRC/98; and INFCIRC/110.

[169] INFCIRC/130 Part III, Section 17.

[170] INFCIRC/296, para. 17.

[171] INFCIRC/251, Article 9.a.iv.

[172] INFCIRC/250, Section 8.

and specialized equipment.[173] By the 1990s, arrangements for safeguarding heavy-water production plants were made based on deuterium balances.[174]

Improvements were made regarding state information acquisition and use. Safeguards were applied to specified or relevant technological information transferred[175] and to information derived or obtained from transferred knowledge.[176] Thus, facilities and major components designed, constructed or operated based on transferred technology were treated as supplied hardware. Finally, physical protection requirements appeared in a 1976 agreement between the FRG and Argentina requiring the recipient to take into consideration IAEA recommendations.[177]

A second avenue of improvement bolstered Agency information access. Increases in reporting requirements on facilities containing transferred, equipment were made.[178] The Argentine-German agreement required that recipients inform the Agency of measures taken for physical protection.[179] A Canadian-Indian agreement encouraged flexible reporting by allowing more specific information to be supplied to the Agency as necessary.[180]

The third group of changes accorded the Agency some managerial powers, thus increasing its discretion over the conditions under which it would apply safeguards. An early improvement to INFCIRC/66-type agreements permitted transfers of equipment, facilities and materials only after the IAEA approved the receiving facility for listing in the safeguards agreement inventory.[181] Under the Canadian-Indian agreement, the specifics of system records and reports required

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[173] INFCIRC/247, Annex A, paras. 9, 12; on heavy water see INFCIRC/260, Section 5. The United States took a lead in this area as its agreements tended to cover equipment at an early stage while others did not. (e.g. compare INFCIRC/85, para. 5 with INFCIRC/98, Part II section 3.)

[174] "Heavy-water Production Plants", *IAEA Bulletin*, 1/1990, p. 13.

[175] INFCIRC/233, Sections. 2.b-c.

[176] INFCIRC/239, Article 2 (c) and 5 (c); INFCIRC/237, Article 2.2.

[177] INFCIRC/250, Section 18.

[178] INFCIRC/92; INFCIRC/130.

[179] INFCIRC/250, Section 18.

[180] INFCIRC/211, Article 9 (a-b).

[181] INFCIRC/92, Section 15.

mutual agreement between the state and the Agency.[182] Agency discretion further increased under an Agency-Argentine safeguards agreement requiring Argentina to supply sufficient information to enable the Agency to determine whether and under which conditions it could apply safeguards on internal transfers from the controlled facility to unsafeguarded ones.[183] A Franco-ROK agreement went further in providing that internal transfers could be prohibited by the Agency if it was unable to apply safeguards.[184] That same agreement also increased Agency discretion regarding conditions for non-application of safeguards and required that the Agency agree with the other two parties before safeguards could be suspended.[185] INFCIRC/153-type agreements continued the trend of the Agency not suspending safeguards until it approved the suspension arrangements.[186]

A fourth change strengthened the Agency's ability to react to environmental developments. Early changes in safeguards agreements, where a government could request amendments if there were changes to the Agency's Inspector's document or safeguard Guidelines, evolved in some cases into a formulation where the BOG could take their changes into account when amending agreements.[187]

Finally, legal structures evolved to suggest that the application of safeguards was a permanent nuclear energy feature. This extended the pursuit and perpetuity of safeguards. Pursuit referred to covering multiple generations of produced material or lifetime coverage of non-material entities while perpetuity pertained to the application of safeguards past agreement expiration dates.

Various formulations emerged about pursuit which required that safeguards:

- remain in force until safeguards on all inventoried nuclear materials listed in inventory were terminated[188];

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[182] INFCIRC/211, Article 9 (a-b).

[183] INFCIRC/202, Annex, para. B.9.

[184] INFCIRC/233, Section 13.

[185] INFCIRC/233, Sections 15-16.

[186] INFCIRC/294, Section 14.

[187] INFCIRC/168, Section. 25; INFCIRC/247, Section 33.

[188] INFCIRC/202, Article 10.

- partially continue on produced nuclear material; and[189]
- explicitly cover subsequent generations of special fissionable material.[190]

The formulation became standard policy in 1973 when the IAEA decided that, in future agreements, safeguards on materials, facilities or specified equipment should remain in force until the Agency determined that safeguarded material was consumed, unusable or irrecoverable.[191]

Regarding perpetuity, early INFCIRC/66-type agreement termination provisions covered only nuclear material. Later agreements contained provisions for safeguards termination on items other than nuclear materials.[192] Eventually, regulations were designed for the termination of safeguards over replicated safeguarded equipment and facilities. Under an agreement between Canada and Spain, the duration of safeguards for transferred technology was set at twenty years.[193] The NSG boosted support for duration, replication and technology controls when they required that items on the trigger list could only be transferred when the duration and coverage of provisions conformed to Agency guidelines under GOV/1621 and that, at all times an agreement safeguarding the use of transferred technology use must exist.[194]

IV. A New Approach in Iraq

Only in 1991, when they discovered that Iraq had violated its NPT safeguards agreement, did the international community genuinely re-evaluate its approach to nuclear control. The community redressed the situation by instituting preventative style control systems with teeth. Following Iraq's defeat, the United Nations Security Council adopted Resolution 687 which required that Iraq agree to:

- neither acquire nor develop nuclear weapons or nuclear-weapons-useable material or any subsystems or components or any research, development, support or manufacturing facilities;

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[189] INFCIRC/211, Article 27.

[190] INFCIRC/221, Article 24.

[191] GOV/1621.

[192] GOV/1282; INFCIRC/119, Section. 20.

[193] INFCIRC/247, Section 14.

[194] INFCIRC/254, Part A, para. 6(b).

- accept on-site inspection and the destruction of its nuclear programme;
- place all nuclear-weapons-useable materials under exclusive IAEA control for custody and removal; and
- accept the plan for ongoing monitoring and verification of compliance.[195]

Resolution 707 further required full transparency by demanding that Iraq:

> [...] provide full, final and complete disclosure, as required by resolution 687 (1991) of all aspects of its programme to develop weapons of mass destruction...[and]...allow the special Commission, the IAEA and their Inspections teams immediate, unconditional and unrestricted access to any and all areas, facilities, equipment, records and means of transportation which they wish to inspect.[196]

The crisis mechanism functioned as a broad control system according the United Nations Special Commission on Iraq (UNSCOM), total access and control. The IAEA with the assistance of the Commission was to dismantle Iraq's entire nuclear energy programme including all research and development facilities, leaving only isotopes for medical, agricultural and industrial purposes.[197] By early 1994, the IAEA removed or dismantled all the facilities deemed "dangerous" in view of Iraq's untrustworthiness including the Electromagnetic Isotope Separation (EMIS) Centrifuge enrichment programme, installations at Al Atheer, Tarmiya and Ash Sharqat, and fresh and irradiated nuclear materials. Initially, IAEA inspectors, had unprecedented power to access information and sites and apply other controls. Plans for ongoing monitoring and verification included:

- different environmental sampling and monitoring techniques;
- installation of equipment;
- use of site photography and video taping;
- aerial photography;
- electronic reporting;
- surveillance of dual-use equipment with on-site inspection anywhere, anyplace, and anytime without visa requirements;
- use of any information from member states; and
- ability to restrict movement of material and equipment

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[195] UN, S/RES/0687 (1991), para. 12.

[196] UN, S/RES/0707 (1991), paras. 3.i-ii.

[197] For a discussion see GOV/INF/622.

as deemed necessary.[198] The IAEA could "make use of any other verification technology that could facilitate the fulfilment of its mandate."[199] Sanctions were also established until Iraq was in full compliance with the ceasefire agreement.

Despite continued Iraqi resistance to controls, inspectors made commendable progress on uncovering Iraq's WMD programme. The controls applied by the IAEA functioned as a security management mechanism for a time. The system began malfunctioning after continued Iraqi resistance successfully eroded the international coalition. After a large proportion of its WMD programme was dismantled and its economy devastated by sanctions, Iraq no longer posed the same threat as when the IAEA uncovered a clandestine programme. Iraq resisted access and enforcement failed. Iraq's 1998 refusal to cooperate any further led to the collapse of the enforcement mechanism. The Security Council then scrambled to establish a new mechanism, the United Nations Monitoring, Verification and Inspection Commission (UNMOVIC) which suffered similar problems as UNSCOM even before it became operational.

V. Cold War Proposals Becoming Post-Persian Gulf War Actions

Before the Iraqi discovery, interest in strengthening control remained confined to control advocates. NPT safeguards, based on the INFCIRC/153 model agreement, were harder to change than INFCIRC/66-type agreements. As time passed, it became apparent that technical adjustments were needed to the basic framework. One observer noted it necessary to develop containment and surveillance devices beyond those originally envisaged in INFCIRC/153 to ensure safeguards objectives.[200] The IAEA, aware of its shortcomings, sowed the seeds for change.

Those seeds did not germinate until the post-invasion period, however. Nuclear security concerns triggered by Iraqi events were magnified by the DPRK crisis and the general Post-Cold War instability. The inflexible limited framework of

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[198] GOV/INF/753, para. 37-43; GOV/INF/770, paras. 22-40.

[199] GOV/INF/1998/16, para. 23.

[200] Frederick Brown, "Safeguards in the United Kingdom" in *Executive Conference on Safeguards*, *op. cit.*, p. 257.

safeguards became viewed as obsolete.[201] Assisting change, unlike the Osiraq case, the Agency did not defend the existing system. The IAEA was willing to acknowledge problems and states were willing to listen.

Cooperation with the Agency

Before the invasion, the IAEA launched a quiet campaign to increase state cooperation on safeguards implementation. Underlying calls for cooperation was the reality that safeguards, due to their complexity, could be implemented only with state agreement. Practicalities demanded state cease to insist on certain sovereignty issues and conveniences, rather than states leaving the IAEA to work around the practices and schedule of hundreds of operators. The IAEA's plight was periodically recognised by states. The 1985 NPT Review Conference called for states to comply with *all* safeguards notification requirements.[202] In February 1988, the Director General followed up with a proposal asking States to waive their rights to individual inspector designations. Facing hesitation, he gained acceptance in the post-invasion period of a voluntary scheme where states had two months to reject a designation before automatic acceptance.[203] Other proposals that the IAEA had been advocating attracted support including increased cooperation on processing or waiving visas[204] and improved interfaces between the IAEA and SSACs.[205]

Comprehensive Knowledge

In the pre-invasion period, advocates' calls for a centralised control authority and making the Agency the clearinghouse for nuclear energy and safeguards data

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[201] See, for example, comments by Dr. Jozef Goldblat "Verification, Safeguards and Action in the Event of Non-Compliance Implementation of Article II of the NPT", Seminar on Non-Proliferation: Points of View of Latin America and the Caribbean, Mexico, 11-13 January 1995, pp. 13-14.

[202] NPT/CONF.III/64/I, para. 17.

[203] GOV/INF/654, paras. 27-29.

[204] NPT/CONF.1995/MC.II/1, p. 24; Davis and Donnelly, *op. cit.*, 15 June 1994, p. 8.

[205] Office of Technology Assessment, 1977, *op. cit.*, pp. 80-81; Report of Main Committee II in *SIPRI Yearbook 1991: World Armaments and Disarmament, op. cit.*, p. 573; proposal by New Zealand, NPT/CONF.II/C.II/5.

went unheeded.[206] After the Iraq crisis, the Agency promulgated the idea that comprehensive knowledge of a state's nuclear programme was fundamental for effective and credible safeguards.[207] According to Director General Hans Blix, the positive impact from according the control authority access to broad information could be seen in dealing with Iraq:

> There was no doubt that the extended rights of entry, freedom of movement and so on, which the Agency enjoyed in Iraq thanks to the measures taken by the Security Council, had facilitated the inspection.[208]

In his view,

> [...] the decisive factor for the findings made had been the information supplied to the Agency about sites and installations that should be inspected.[209]

Several initiatives were taken by the Agency to increase the scope and timeliness of access to information. The state practice of providing design information from 30-180 days in advance despite minimums set in Subsidiary Arrangements was deemed by the IAEA to be "not sufficient and that much earlier notification to the Agency is needed both to enhance knowledge and reinforce confidence."[210] In February 1992, the Board recommended that design information should be provided as early as possible before nuclear material was introduced into a new facility - as soon as the decision to authorize construction or modification of a facility is taken and iteratively as designs developed. The recommendation aimed to reduce the likelihood of states obtaining new nuclear facilities without Agency knowledge and removing ambiguities regarding intentions to place new facilities under safeguards. It also attempted to give the Agency an opportunity to incorporate features reducing the complexity of safeguards implementation and give them time to plan and execute necessary safeguards research and development and deployment of staff and equipment in a timely manner.[211] The early provision of design information , especially

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[206] Office of Technology Assessment, 1977, *op. cit.*, p. 81.

[207] GOV/2554/Attachment 2/Rev.2, para. 1.

[208] GOV/INF/646, Attachment 1, para. 129.

[209] *Ibid.*

[210] GOV/2554/Attachment 2/Rev.2, para. 1.

[211] NPT/CONF.1995/7, para. 34; GOV/INF/613/Add.1, C.1-4.

for complex installations, was endorsed by an international safeguards study on large scale reprocessing called LASCAR, which analysed the safeguarding of large-scale plutonium reprocessing plants.[212]

Open Source Information

To strengthen safeguards, the Director General asked that the Agency to be entitled to use additional information from public sources and member states, noting that "[i]f the State itself concealed a nuclear activity, the inspectorate must - as in the case of Iraq - have some other information as to where it should look".[213] The BOG affirmed in February 1992 the IAEA's right to use information derived from non-safeguards activities and non-IAEA or political sources, despite some state objections that this would violate national sovereignty.[214] The decision increased the IAEA's ability to build its knowledge base by allowing systematic collection and analysis of information available from member states, the media and other open sources.[215] The BOG did, however, reject establishing a formal unit to process intelligence and dropped explicit references to use of foreign intelligence.[216]

Transparency

By the mid-1990s, decision-makers, echoing the experts of a half century earlier, came to appreciate the vital role that transparency of state and Agency operations played in nuclear control. From the early 1970s, calls were made for transparency in national activities and Agency findings, especially considering that no

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[212] Office of Technology Assessment, 1995, *op. cit.*, p. 42.

[213] GOV/INF/646, paras. 131-132, 136.

[214] Statement by China, GOV/OR.770, para. 52; statement by Cuba, GOV/OR.769, paras. 55, 59; statement by India, GOV/OR.769, para. 35; statement by Iran, GOV/OR.769, para. 119; statement by Malaysia, GOV/OR.770, para. 11; statement by Pakistan, GOV/OR.769, para. 98; statement by the Philippines, GOV/OR.770, para. 16.

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

[216] Office of Technology Assessment, 1995, *op. cit.*, pp. 41-42.

proprietary information remained in LWRs and research reactors.[217] Pre-invasion calls for lifting restrictions on the use of containment and surveillance equipment[218] were followed post-invasion by the employment of new environmental monitoring techniques.[219] Broad access became a regional practice as demonstrated by ABACC, which allowed Brazil and Argentina direct access to inspection information.[220] In 1995, Committee II of the NPT Review and Extension Conference linked transparency to effectiveness:

> [...] transparency with respect to national nuclear policies and programmes is an essential ingredient in the effectiveness of safeguards under the Treaty.[221]

The Agency took pains to become more transparent. In 1994, the Agency started providing an executive summary of its SIR to the public and, in June 1995, the Board declassified Board Documents over two years old, subject to exclusions and the Secretariat became more open about its difficulties.[222] In a report to the Board, it named states which were extremely slow in negotiating facility attachments and it also became been frank about its disastrous financial situation.[223]

Increased Reporting

To increase transparency and IAEA knowledge of states' activities, the Board adopted the Universal Reporting Scheme. In some respects, the Scheme was the culmination of 30 years of advocacy, that the utility of reporting transfers was

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[217] Text of Prepared Opening Statement by Senator John Glenn, Hearings before the Committee on Foreign Relations, 2 December 1981, in *Nuclear Safeguards: A Reader*, *op. cit.*, p. 739; *SIPRI Yearbook 1991: World Armaments and Disarmament*, *op. cit.*, p. 573; Scheinman, October 1992, *op. cit.*, p. 25; Scheinman, 1987, *op. cit.*, pp. 284-285; statement by Australia, GOV/OR.768, para. 168.

[218] Office of Technology Assessment, 1977, *op. cit.*, pp. 80-81.

[219] Sinden and McManus, *op. cit.*, p. 38.

[220] Collina and de Souza Barros, *op. cit.*, p. 6.

[221] NPT/CONF.1995/MC.II/1, para. 20.

[222] GOV/2843, para. 8; IAEA Secretariat, *Activities of the International Atomic Energy Agency Relevant to Article III of the Treaty on the Non-Proliferation of Nuclear Weapons*, Background Paper, February 2000.

[223] GOV/2897, para. 3; File A, 6.3.

endorsed early in the Agency's history. At the 9th General Conference, NNWSs noted that safeguards would be ineffective unless the Agency knew about international transfers, receipts, and exports. The United States agreed in April 1965 to register all nuclear material transfers. Canada and Norway followed suit in 1966 and 1967, respectively.[224] At that time, the Director General unsuccessfully sought to establish a system for reporting and registering international transfers. Although both INFCIRC/66 and INFCIRC/153 type agreements contained reporting requirements for material transfers, gaps existed, particularly regarding those from NWSs. To assist the Agency in making safeguards more effective and efficient, in July 1974, the Soviet Union, the United Kingdom, and the United States agreed to notify the Agency of nuclear material exports above one effective kilogram.[225] France followed suit in 1984 and China in 1991.[226]

In 1989, the Director General proposed to the Board that NWSs fully report on civilian activities including transfers between peaceful and military programmes. He advocated the move because it would create better awareness of nuclear material accountancy and internal nuclear material flows, improve control in NWSs, and increase Agency ability to track international nuclear material transfers involving NWSs. The idea failed because the estimated cost to the IAEA of its implementation was US$ 20,000,000.[227] Some NNWSs, to ensure equal burden, moved to fill reporting gaps regarding transfers to NWSs. In 1992, a comprehensive safeguards agreement was concluded with two NNWSs providing for reporting exports to NWSs and NNWSs.[228]

Movement on reporting occurred again in February 1991. The Director General sought more complete reporting of exported items and Belgium proposed joint state notifications to the Agency to clarify understandings between suppliers and recipients on transfers of items subject to safeguards.[229] In 1992, the Secretariat submitted proposals to the Board of Governors for universal reporting of exports and imports of equipment and non-nuclear materials, arguing that such data on Iraq would have

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[224] GOV/1275, para. 84.

[225] NPT/CONF/6/Rev.1, para. 15.

[226] INFCIRC/207; INFCIRC/207/Add.1-2.

[227] Sum in 1991 US dollars. (GOV/INF/613, Section V. Recommendations, Annex. II.)

[228] GOV/2568, Annex.

[229] GOV/2523, para. 5.

triggered the IAEA to seek special explanations and inspections.[230] The proposals focussed on transparency in their nuclear activities which would enable the Agency to judge whether nuclear material, sensitive equipment, and non-nuclear material inventories were consistent with declared nuclear activities.[231]

The first proposal was to report all exports of nuclear material to NNWSs and for NNWSs to report all imports and exports of such material regardless of use. The threshold for reporting uranium and thorium would be lowered to 100 kgs. per shipment/1000 kgs. per year, with no threshold exemption for plutonium and HEU. Proposal two was for NNWSs to report by location domestic production and ore concentrate inventories. The third proposal called for IAEA verification of NNWS material not of a composition and purity suitable for fuel fabrication. The fourth proposal required that state initial inventories include all nuclear material designated for peaceful nuclear and non-nuclear use, including ore concentrates and the location of inventories containing over 100 kgs. of source materials.[232] Regarding equipment, the Agency suggested that states report initial inventories, exports, imports, and production by NNWSs of a list of sensitive equipment and non-nuclear material.[233]

Despite interest in strengthening safeguards, the proposals were greeted with hesitancy. Fears were expressed over:

- their cost effectiveness;[234]
- the reporting burden from including coverage of domestic production of sensitive equipment, the reporting of ores and the low reporting thresholds; and[235]

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[230] "Blix's Statement to the U.N. General Assembly", *IAEA Press Release*, 21 October 1992.

[231] GOV/2568, Attachment 2, paras. 1-2.

[232] GOV/2568, Attachment 1.

[233] *Ibid.*, Attachment 2.

[234] Statement by China GOV/OR.778, para. 7; statement by Cuba, GOV/OR.777, para. 126; statement by Egypt, GOV/OR.777, para. 103; statement by India, GOV/OR.781, para. 29; statement by Japan, GOV/OR.777, para. 92; statement by Switzerland, GOV/OR.778, para. 35; statement by Thailand, GOV/OR.781, para. 1; statement by the United States, GOV/OR.777, paras. 161-162.

[235] Statement by Malaysia, GOV/OR.802, para. 155; statement by Switzerland, GOV/OR.778, para. 35; statement by Thailand, GOV/OR.781, para. 1. On domestic production see statement by Belgium, GOV/OR.778, para. 16; statement by Japan,

- the inequality created by the limited application of the arrangement on the NWSs and their non-application to non-NPT states.[236]

There were also concerns that proposals for reporting on equipment and non-nuclear materials involved a *de facto* extension of the system beyond the traditional materials-based safeguards structure.[237]

The proposals had to be revised and the scheme ultimately agreed upon was not authorised until February 1993.[238] The new approach did not require reports on either domestic nuclear material or equipment production and did not include routine verification of reported transfers. Regarding nuclear material, all nuclear material imports and exports for peaceful use were to be reported within 30 days of the end of the month in which the transfer occurred. Reporting thresholds were to be set as originally proposed. Reports on inventories of ore concentrate and material not of a purity and composition suitable for fuel fabrication or enrichment were to be provided semi-annually. All initial material inventories, whether for nuclear or non-nuclear use, from ore concentrate to waste were to be reported although once the material was placed in inventory, it could then be exempted from safeguards. NWSs, states with an INFCIRC/66-type agreement and non-NPT parties were encouraged to report on nuclear material inventories, including ore concentrates. Verification would occur only with an INFCIRC/153-type agreement and only to clarify inconsistencies.[239]

On equipment, the new proposal asked states to report exports and imports, but not production. Verification would occur on the same basis as for materials.[240] A debate ensued as to what equipment should be reported. A proposal to use the

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GOV/OR.777, para. 92; statement by the United Kingdom, GOV/OR.777; para. 116. On ores and thresholds see statement by China, GOV/OR.778, paras. 3-4; statement by India, GOV/OR.781, para. 28; statement by Mexico, GOV/OR.777, para. 120.

[238] Statement by India, GOV/OR.781, paras. 28-30.

[237] Statement by Canada, GOV/OR.780, para. 62; statement by China GOV/OR.778, para. 7; statement by India, GOV/OR.781, para. 27; statement by Mexico, GOV/OR.777, para. 120; statement by Pakistan, GOV/OR.781 para. 39; statement by the United States, GOV/OR.777, para. 161.

[238] For a full explanation of the impact of the scheme on the different groupings of states (e.g. NWSs, NNWSs etc.) see GOV/INF/613/Add.1, paras. 15 a-e.

[239] GOV/2588, paras. 1-6.

[240] GOV/2589.

current NSG list was not acceptable as non-members felt excluded from the process of updating the NSG's list.[241] The compromise adopted was to assume states accepted updated NSG lists unless they indicated otherwise within six months of the adoption of any NSG amendment.[242]

The debate foreshadowed future safeguards development. The Agency's original proposals for voluntary schemes attempted to extend safeguards beyond material tracking to nuclear operations and the broader nuclear energy picture within a state. These ideas represented a conceptual shift from providing assurances of non-diversion or the non-existence of forbidden activities to a tighter set of control parameters involving verifying activities that fell within an acceptable behaviour range or simply consistent activities. Although initial proposals were too radical to be acceptable. The idea of basing control on the entire nuclear programme and seeking internal consistency persisted. However, in spite of events in Iraq, there were significant constraints on the further evolution of safeguards. Traditional arguments against safeguards still carried weight, resulting in change but not revolution.

Increased Access

Starting in the 1970s but gaining momentum in the post-Cold War, support for grew fo improving inspection procedures. Suggestions over two decades included increasing inspection quality and quantity, employing resident inspectors, fully utilising inspection rights, and implementing no-notice, full access inspections.[243] Some innovative but limited inspection developments pre-Gulf War arose from the Hexapartite project launched in 1980. Motivated by unsatisfactory attempts to safeguard centrifuge technology, developed nations worked with the IAEA on the

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[241] Statement by Algeria, GOV/OR.802, para. 133; statement by Chile, GOV/OR.803 para. 24; statement by India, GOV/OR.803, para. 9; statement by Japan, GOV/OR.802, para. 112; statement by Pakistan, GOV/OR.802, para. 144.

[242] Statement by the Chair, GOV/OR.803, para. 6.

[243] *The Israeli Air Strike, op. cit.*, p. 136; Text of Prepared Opening Statement by Senator John Glenn in *Nuclear Safeguards: A Reader*, p. 739; Office of Technology Assessment, 1995, *op. cit.*, pp. 9, 41-42; Office of Technology Assessment, 1977, *op. cit.*, pp. 80-81; David Fischer "Innovations in IAEA Safeguards to Meet the Challenges of the 1990's" in David Fischer, Ben Sanders, Lawrence Scheinman and George Bunn, *The New Nuclear Triad: The Non-Proliferation of Nuclear Weapons, International Verification and the International Atomic Energy Agency*, PPNN, University of Southampton, Southampton, September 1992, pp. 32-33; Sinden and McManus, *op. cit.*, p. 38.

Limited Frequency Unannounced Access Model.[244] Under the approach, operators provided limited access to sensitive plant areas - the cascade halls - on very short notice. The innovation was possible because states were interested in addressing enrichment control[245] and willing to show flexibility in dealing with safeguards challenges.

Pre-invasion, the IAEA was not encouraged to investigate clandestine activities. As Iraq's behaviour became suspicious in 1981, the Secretariat informed the Board of its need to improve analyses for assessing the potential for undeclared plutonium production through clandestine fuel element irradiation. This continued to attract attention through 1991.[246] After the Iraqi revelation of clandestine activities, the new verification approach under UN Resolution 687 targeted clandestine activities "to detect the presence of prohibited equipment, materials and activities" while OMV was "designed to provide assurance of the absence of prohibited equipment, materials and activities."[247] The concept of detecting clandestine activities not only in Iraq but throughout the global community resonated, and states accepted that such detection needed incorporation into regular safeguards activities.[248] As noted by the IAEA Secretariat, safeguards were:

> [...] looked to not only for assurance of non-diversion of declared nuclear material and non-misuse of declared nuclear facilities but also for assurance about the absence of undeclared nuclear activities.[249]

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[244] F. Brown, *The Hexapartite Safeguards Project*, Proceedings of the Nuclear Safeguards Technology International Symposium, Vienna, IAEA-SM-260/57, 1981, Vol. 2. pp. 491-503; Howlett, p. 227.

[245] The United States started investigating enrichment models in 1965.(Division of International Affairs, USAEC, "Materials on Safeguards Inspections", *International Agreements for Cooperation, Hearings before the Subcommittee on Agreements for Cooperation on the Joint Committee on Atomic Energy Congress of the United States*, 89th Congress, 1st Session, USGPO 1965, p. 115). The Soviets formally proposed to the Board the extension of INFCIRC/66 to cover enrichment (Statement by the Soviet Union, GOV/1231, para. 3; GOV/1239). The UN General Assembly invited the IAEA in 1970 to new safeguards techniques for uranium enrichment. (NPT/CONF/7, para. 49).

[246] File A, 6.2.

[247] GOV/INF/1999/4, para. 23.

[248] Statement by Switzerland, GOV/OR.870, para. 69; statement by France, GOV/OR.856, para. 28; also see statement by the Soviet Union, GOV/OR.768, para. 179.

[249] NPT/CONF.1995/7, para. 2.

Support increased for inspecting for clandestine activities. The draft final declaration of the 4th NPT Review Conference, urging the Agency not to hesitate to take full advantage of its rights, including special inspection rights,[250] foreshadowing the Board's February 1992 decision to strengthen the special inspections mechanism by explicitly reaffirming the IAEA's "right to obtain and to have access to additional information and locations in accordance with the IAEA Statute and all comprehensive safeguards agreements."[251] Finally, the original crafters of NPT Article III issued a study through a non-governmental organisation interpreting the Treaty and negotiations to utilise special inspections as a tool to detect clandestine activities.[252]

Increased Coverage

Since the 1970s, extension has been advocated of traditional safeguards coverage to other fuel cycle areas including yellowcake or waste.[253] In 1982, the Director General advocated that the SAGSI study the problems associated with safeguarding yellowcake.[254] Choosing an earlier starting point (at uranium concentrate) which would lengthen the diversion path and increase detection probability was estimated in 1983 as requiring an increase of 5% in inspection effort. Considering the low safeguards benefit of the effort, the Board rejected the proposal.[255] The issue was resurrected after the Iraqi crisis with scientists arguing for an earlier starting point of inspections to uranyl nitrate, because technological advances rendered the current coverage obsolete.[256]

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[250] GOV/INF/613, Part 1.A.I.

[251] Office of Technology Assessment, 1995, *op. cit.*, pp. 41-42.

[252] George Bunn and Roland Timerbaev, *Nuclear Verification under the NPT: What Should It Cover - How Far May It Go*, PPNN, Southampton, PPNN Study, No. 5, April 1994.

[253] On yellowcake see Statement of Roger Richter, Former Inspector, IAEA, *Nuclear Safeguards: A Reader, op. cit.*, p. 707. On waste see Office of Technology Assessment, 1977, *op. cit.*, p. 81.

[254] GOV/OR.594, para. 103.

[255] GOV/2107, para. 49; statement by the Netherlands, GOV/OR.603, para. 25; statement by the Soviet Union, GOV/OR.603, para. 41.

[256] Jörn Harry and Piet de Klerk, *Improving NPT Safeguards*, Netherlands Energy Research Foundation, Petten, ECN-RX-96-008, March 1996, pp. 6-12.

Although adjusting the safeguards starting point was difficult, the definition of special nuclear materials was extended to Neptunium and Americium.[257] Waste containing plutonium was also been re-evaluated. With new waste recovery technologies, large waste stocks, once thought of as irrelevant for diversion, risked becoming a threat.[258]

Regulation of research also started to play a role in safeguards. In 1990, Argentina and Brazil agreed, under the Foz do Iguacu agreement, to end all secret nuclear research while the Iraq Ongoing Monitoring and Verification programme also covered research on enrichment, reprocessing and weaponisation.[259] More recently, the Treaty of Pelindaba, opened for signature in early 1996, explicitly included, under Article III, that Parties would not conduct research on any nuclear explosive device by any means anywhere.[260]

Tightening Criteria

After the discovery of Iraqi clandestine activities, the Secretariat investigated tightening inspection criteria. In 1991, the Director General suggested the IAEA reduce the SQ by a factor of two. This suggestion was rejected because the IAEA would need to increase inspection at 40 facilities to 12 times a year.[261] The Board rejected the change as the IAEA financial crisis was already debilitated its ability to meet its timeliness goals and it had no desire to significantly increase spending.[262] The Board wanted to improve safeguards but was also looking for structural reform to minimise expenses.

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[257] Neptunium had been under watched for some time but movement on the issue did not occur until the later part of 1990s. (Office of Technology Assessment, 1977, *op. cit.*, pp. 143-144; "Neptunium, Americium May Require IAEA Monitoring", *Kyodo News*, 13 March 1999; *IAEA Annual Report for 1998*, IAEA, Vienna, 1999, p. 13.)

[258] See for example A. Fattah and N. Khlebnikov, "International Safeguards Aspects of Spent-Fuel Disposal in Permanent Geological Respositories", *IAEA Bulletin*, Vol. 32, No. 1, 1990, pp. 16-20.

[259] GOV/INF/1999/4, Attachment, p. 18.

[260] The text of the Treaty is reproduced in Benjamin Sanders, *PPNN Newsbrief*, No. 32, January 1995, pp. 19-24.

[261] GOV/INF/613/Add.1, para. 23.

[262] Office of Technology Assessment, 1995, *op. cit.*, pp. 11-12.

VI. Programme 93+2

In 1993, the IAEA Board of Governors requested that SAGSI make proposals to increase safeguards effectiveness and efficiency. The results of SAGSI's work was "Programme 93+2". It epitomised the more recent safeguards developments going "back to the future" by incorporating 1940s concepts. The measures aimed to extend Agency knowledge of state nuclear activities by broadening safeguards scope and increasing transparency by requesting states to supply additional information. They also sought to strengthen the IAEA's ability to apply control through timely access, including additional sites. The Programme advocated additional inspectorate training, increased data analysis and maximisation of measures in place.[263] From this effort emerged the latest major safeguards development, the Model Protocol. However, by the time the exercise was completed, the situation could be characterised as moving "forward to the past". Commercial protective behaviour re-emerged in the late 1990s as the memory of the Iraqi and DPRK crises faded.

Crisis Driving Change

Environmental factors were a major influence. The early 1990s were a wake-up call to sleeping governments. Old arguments became new concerns. Director General Hans Blix echoed Scheinman's observations 20 years earlier, who had echoed those from 25 years before:

> [...] the safeguards system had to be either completely satisfactory or it should not exist at all. If it was not completely satisfactory, there was the danger that it might lull States into a false sense of security.[264]

For the first time since the bomb's advent, states were receptive to implementing control measures *genuinely* addressing nuclear insecurities.

Initially, negotiation dynamics did not replicate previous negotiations. Traditional arguments against tight measures garnered less sympathy. The DPRK and

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[263] For background on the different tasks and on the Programme in general see GOV/INF/737; GOV/INF/759; GOV/2784.

[264] GOV/OR.871/Rev.1, para. 113; Scheinman in Leachman and Althoff, *op. cit.*, p. 108; also see Chapter 1, Footnote 119.

Iraq gave proponents of tight measures stronger grounds for improvements.[265] In addition, the IAEA Secretariat, with almost 40 years experience, played a more constructive negotiating role to ensure an outcome which would contribute to its ability to apply safeguards effectively.

The impetus for change caused states to consider introducing new measures and concepts to achieve higher levels of control, but was insufficient to introduce full international control as envisaged under the Baruch Plan. States made their views clear at the outset of Protocol negotiations that the Agency was not an "international police".[266] By the time Model Protocol negotiations commenced, states had already adjusted to the post-Cold War environment and ongoing Iraq and DPRK difficulties no longer took centre stage. Negotiations once again reflected the attempts of states to protect political sovereignty and economic interests. States employed tactics and mechanisms to restrain control seen in earlier negotiations.

Positioning and Initial Proposals

Immediately following the Gulf War, the Agency's Secretariat started promoting intrusiveness as necessary for effective safeguards in regions of tension. The Secretariat noted that in the Middle East:

> A more intrusive version of the existing Agency system of safeguards may prove necessary in order to establish the required confidence and co-operation between States in the area.[267]

Attempting to take advantage of a "safeguards-friendly" window of opportunity, the Agency began advocating various inspection and reporting measures that had been discussed previously. Its leadership contended that to provide confidence in such a volatile region, the Agency needed to:

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[265] For example, the Agency argued that the system applied broader coverage was more complete, the IAEA may have uncovered the collocated clandestine activities in Iraq. (GOV/2784. paras. 5, 71). The United States charged that stronger measures on reporting of the descriptions of facilities could have checked the abuse of the system by Iraq. (GOV/COM.24/OR.8, para. 115). Also see the rejection of 24 hours notice for special access to locations on sites (statement by the United States, GOV/COM.24/OR.14, para. 67) and the exploitation of constitutional issues see (statement by New Zealand, GOV/COM.24/OR.6, para. 33) as part of lessons learned.

[266] Statement by the FRG, GOV/OR.829, para. 147.

[267] GOV/2511, para. 3b.

- apply safeguards not only to nuclear material but to relevant non-nuclear materials;
- exercise its right to initiate special inspections anywhere either on request or by mutual agreement; and
- focus attention on fuel cycle activity rather than just tracking material through reporting and other transparency measures.[268]

The Secretariat presented the argument that the control authority needed to exercise some autonomy in its methods for applying controls: it believed that it should be the prerogative of the inspecting organisation's prerogative to decide on measures for conducting inspections and that the inspected party should have only limited veto powers.[269] The underlying ideas behind Programme 93+2 were reminiscent of concepts on comprehensive knowledge and fuel cycle control activities much more broadly developed in the Baruch Plan. As noted by Richard Hooper,

> [the] conceptual development of 93+2 had been based on the view that the level of assurance provided by a safeguards system depends on two fundamentally important attributes of the system. The first of these is coverage - the extent to which safeguards-relevant materials and events are effectively subject to verification. The second is continuity -- the extent to which the status of the whole continuum of relevant materials and events can be inferred at any given moment from verification of single parts, carried out at points of time or space selected according to random sampling procedures.[270]

The assurances provided by "classical" safeguards pertained to information correctness not to completeness.[271] Access barriers and maneuverability straightjackets during inspections under the strategic points approach needed replacing with timely data transmission, increased verification unpredictability, high transparency, confidence building through Agency results, and human surveillance.[272]

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[268] *Ibid.*, paras. 3a-d.

[269] Statement by Mohamed ElBaradei, GOV/COM.24/OR.13, para. 42.

[270] Richard Hooper, *IAEA Safeguards - 93+2 and Peaceful Uses*, Paper presented at Seminar The 1997 Preparatory Committee for the 2000 NPT Review Conference: Issues and Options, 7-9 March 1997, PPNN, Southampton, CG21/7, p. 5.

[271] Hooper, *op. cit.*, p. 2.

[272] GOV/2657, Annex, para. 14.

The battle to strengthen safeguards was intense. Traditional fears and arguments resulted in a conflict between two sets of objectives. One objective aimed at minimum measures while the other wanted a solid foundation for nuclear security. Some proposals went beyond the scope of current safeguards, leading the Secretariat to split the Programme into two parts. In June 1995, the Board approved implementation of Part I measures consisting of:

- an expanded declaration requiring reporting on all activities involving significant nuclear material amounts, SSAC aspects, nuclear activities predating entry-into-force of safeguards agreements, decommissioned facilities, facilities operations in general and design information and facility modifications;
- complementary access beyond strategic points at sites containing nuclear, closed or decommissioned facilities or locations off-site (LOFs);
- no notice inspections[273] at strategic points and other areas on nuclear sites where material is located to verify nuclear material accountancy, design information, initial and change reports or to check containment and surveillance measures;
- environmental sampling during inspections;
- optimisation of available technologies and systems including containment and surveillance equipment; and
- deeper cooperation with states such as by using modern communications, streamlining long-term visa issuance and conducting joint operations with SSACs.[274]

Part II measures, which require additional authority beyond what could be derived from INFCIRC/153 agreements, needed negotiating and involved allowing the IAEA increased information and access to areas previously denied. Initially, proposals included expanded declarations to provide information on:

- nuclear R&D involving non-nuclear material at nuclear facilities, at LOFs, at nuclear training institutes and other R&D centres;
- the nature of each building at nuclear facilities, LOFs or where nuclear activities was R&D taking place;

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[273] No notice inspection meant that the inspector arrives at the entrance to the site in question requiring no visas or multiple entry visas (GOV/INF/759, para. 48).

[274] GOV/2807, pp. 3-7. Also see its later version GOV/2863 which tends to be more specific, pp. 2-7. For example, GOV/2863 specified what states are to report such as location, present annual production, and approximate production capacity.

- the nature of other locations directly related to the operation of nuclear facilities, LOFs or nuclear R&D activities (e.g. heavy water plants, waste facilities, equipment stores, domestic equipment manufacturers, known uranium and thorium ore deposits and mines);
- the import and export of equipment; and
- plans for further R&D on the nuclear fuel cycle.[275]

Complementary access under Part II included locations identified in the Expanded Declaration from either Part I or II and locations which could be of interest to the Agency under voluntary arrangements.[276] Part II also provided for environmental sampling where complementary access was given and simplified procedures for inspector designation.[277]

Moving from materials-tracking to activity tracking was reminiscent of the Baruch Plan. As former IAEA Official Richard Hooper noted:

> The overall rationale for the expanded declaration is directly related to greater nuclear transparency and the need to establish a basis for a wider range of verifications, a range that includes nuclear fuel cycle, nuclear R&D and related activities in addition to nuclear material.[278]

The plan incorporated a normative approach by examining programme consistency. National operations had to "make sense". The programme had to link structure and state needs. This concept allowed the Agency to ask questions regarding activity that would be disconcerting from a security standpoint. In other words, "the concept of strategic points would largely disappear with new protocol."[279]

The Programme also redefined the Agency-state relationship. SAGSI emphasised that full cooperation between the Agency and SSACs was necessary to

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[275] GOV/2807, pp. 3-7.

[276] *Ibid.*, p. 6; The later formulation for requested access contained a number of constraints including the obligation of the Agency to take into account constitutional obligations and proprietary rights. (GOV/2863, p. 6.)

[277] GOV/2807., pp. 6-7.

[278] Hooper, *op. cit.*, p. 13; also see GOV/2807, Annex.

[279] GOV/COM.24/OR.3, para. 49.

permit cost-effective inspection operations.[280] Practically, cooperation entailed sharing laboratories and equipment, and using co-developed safeguards approaches including standardised material declaration formats.[281] Conceptually, the move symbolised the need for states to work with the Agency to institute practices that were designed for efficient and effective safeguards rather than forcing the Agency to harmonise over 100 different state accounting systems.

VII. Limiting the Model Protocol

The Model Protocol was adopted on 16 May 1997, but only after Programme 93+2 was watered down.[282] Throughout the negotiations, states feared control creep. Some governments felt that trust in a state's word still had a role in international control and atomic energy use.[283] A few questioned the need for a Protocol beyond the NPT framework.[284] This attitude was behind arguments that, since uranium and thorium were beyond the scope of safeguards, only the minimum information on those materials should be reported to provide an overview of a state's nuclear activities.[285]

While the stated aim of Programme 93+2 was to strengthen safeguards through improvements in effectiveness and efficiency, a key IAEA objective to meet effectiveness requirements was to implement measures to give credible assurance of the absence of undeclared nuclear activity.[286] In spite of sympathy with Agency negotiating positions[287], there were limits on state flexibility. According to safeguards

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[280] GOV/2657, para. 8.

[281] GOV/2698, paras. 8. i-ii.

[282] For a summary of the negotiations see Reinhard Loosch, "From 'Program 93+2' to Model Protocol INFCIRC/540: Negotiating for a Multilateral Agreement in the International Atomic Energy Agency", in Erwin Häckel and Gotthard Stein (eds.), *Tightening the Reins*, Springer Verlag, London, 2000. pp. 23-66.

[283] Statement by Brazil, GOV/OR.860, para. 105; statement by Cuba, GOV/OR.870, para. 54; statement by Libya, GOV/OR.892, para. 80 in GC(40)/17.

[284] Statement by India, GOV/COM.24/OR.5, para. 44; statement by Brazil, GOV/OR.860, para. 104.

[285] Statement by Japan, GOV/OR.889, para. 73.

[286] GOV/2863, Annex 2, para. G.

[287] Statement by Belgium, GOV/COM.24/OR.21, para. 57; proposal by the FRG, GOV/COM.24/WP.10; statement by Greece, GOV/COM.24/OR.21, paras. 80-81;

analyst James Keeley, the adopted text appeared more suited to increase safeguarding effectiveness of undeclared co-located activities than at undeclared separated sites.[288] States resisted adopting language on conducting verification activities that suggested its aim might be to seek out undeclared activities.[289] Many believed that complementary access should be limited to resolving inconsistencies in the information collected by the Agency.[290] States drew a distinction between sites with and without material when considering complementary access.[291] Under INFCIRC/540, inspector access to ensure the absence of undeclared nuclear materials and activities was permitted anywhere at declared sites, reported uranium mines, ore concentration plants, fuel storage locations exceeding designated quantities, areas where safeguard-exempt materials are located, and sites for holding or further processing intermediate or high-level waste containing plutonium or HEU on which safeguards had been terminated.[292] Complementary access, with the limited objective of ascertaining the completeness, correctness, or consistency of the expanded declaration, was designated for locations containing:

- reported imported nuclear equipment and non-nuclear material;
- fuel cycle research and development activities not involving nuclear materials;
- off-site location materials or activities for which the Agency requested information and believed to be functionally related to safeguards.[293]

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[288] For an analysis see James F. Keeley, "Undeclared Nuclear Activities and the IAEA's "93+2" Programme", in J. Marshall Beier and Steven Mataija, *Verification, Compliance and Confidence-Building: The Global and Regional Interface*, Centre for International and Security Studies, Toronto, 1996.

[289] Under draft article 6, the Agency was to "determine the absence of undeclared nuclear material and activities at the location in question or otherwise resolve an inconsistency". For views on limiting objectives see statement by Brazil, GOV/COM.24/OR.14, para. 9; statement by Mexico, GOV/OR.769, paras. 3, 9.

[290] Proposal by Argentina, GOV/COM.24/3, p. 4; statement by Belgium, GOV/COM.24/3, p. 4; statements by Brazil, GOV/COM.24/OR.14, para. 9 and GOV/OR.889, para. 84; statements by Japan, GOV/OR.884, para. 89, GOV/COM.24/OR.1, para. 33 and GOV/OR.889, para. 76; statement by the ROK, GOV/COM.24/OR.5, para. 51; statement by Slovakia, GOV/COM.24/OR.12, para. 43.

[291] Statement by Belgium, GOV/COM.24/OR.30, para. 70.

[292] INFCIRC/540, para. 4.a.1.

[293] *Ibid.*, para. 4.a.ii.

Moves to enshrine requirements that the Agency take account of state sovereignty legally arose as they had previously.[294] The strongest measures in the proposal, including no-notice inspections, were rejected by some states as an infringement on sovereignty.[295] Increased access was seen as conflicting with domestic laws. Proposals were made for the IAEA to give consideration to existing constitutional obligations.[296] Concerns arose that states could use constitutional claims to block controls and qualify state commitments to the Protocol, leading to non-uniform application of measures.[297] Negotiators therefore rejected the measure.

A number of states aspired to increase influence in shaping their Protocol agreements by making some measures subject to negotiation. Hoping that one-on-one negotiations could result in formulations more to state preferences, attempts were made to subject the details of certain measures to "mutual agreement" or state consultations including:

- additional access to sites where nuclear material was used, decommissioned facilities, or non-nuclear activities;
- environmental sampling procedures;

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[294] Statement by Algeria, GOV/COM.24/OR.42, para. 34; statement by Chile, GOV/COM.24/OR.42, para. 31; statement by China, GOV/OR.861, para. 56; statement by Egypt, GOV/COM.24/OR.42, para. 32; statement by India, GOV/OR.816, para. 74; statements by Iran, GOV/OR.769, para. 115 and GOV/COM.24/OR.42, para. 32; statement by Libya, GOV/OR.892, para. 80 in GC(40)/17; statement by Mexico, GOV/OR.769, para. 9; statement by Saudi Arabia, GOV/COM.24/OR.42, para. 32.

[295] Statement by Pakistan, GOV/OR.861, para. 37; statement by Belgium, GOV/OR.856, para. 62.

[296] Proposal by Algeria, GOV/COM.24/3, p. 6; proposal by Argentina, GOV/COM.24/4, p. 21; statement by Belgium, GOV/OR.856, para. 62; statement by Chile, GOV/COM.24/OR.41, para. 42; statement by Cuba, GOV/OR.870, para. 65; statement by Egypt, GOV/COM.24/OR.1, para. 56; proposal by Egypt, GOV/COM.24/3, p. 7; statements by the FRG, GOV/COM.24/OR.30, para. 49 and GOV/COM.24/OR.2, para. 54. statement by the ROK, G0V/COM.24/OR. 20, para. 74; statement by Spain, GOV/COM.24/OR.20, para. 66; proposal by Spain, GOV/COM.24/3, p. 24; statement by Syria GOV/COM.24/OR.20, para. 62; proposal by the United States, GOV/COM.24/3, p. 25.

[297] Statement by Australia, GOV/COM.24/OR.20 para.33; statement by the United States, GOV/COM.24/OR.32, para. 118; statement by Mohamed ElBaradei, GOV/COM.24/OR.30, para. 85.

- provision for certain types of additional information;
- the notification time before additional access is granted; and
- using new measures.[298]

States recognised risks in applying different techniques in different countries.[299] Thus, the use of consultations was adopted for only one scenario type. That scenario was Agency use of new or "other objective measures".[300]

The exception is notable because it impacts the Agency's ability to apply new measures in a changing environment. There was some interest in allowing Agency flexibility to employ "other objective measures" to make the safeguards system "forward looking".[301] The Governor of Australia commented:

> Safeguards development was a dynamic process[...]It was important that States accept the scope for innovation inherent in document INFCIRC/153 and that the Board develop proposals sufficiently flexible to accommodate further refinements which might include - for example - the use of wide-area environmental monitoring.[302]

States agreed to increase adaptability so that other objective measures demonstrated to be technically feasible and agreed to by the Board of Governors could be applied in complementary access.[303] The Protocol also implied wide-area sampling acceptability after use and procedural arrangements were approved by the Board.[304] Although the Board's motion could accord legitimacy and strengthen the Agency's bargaining

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[298] Proposals by Algeria, GOV/COM.24/OR.33, para. 9 and GOV/COM.24/3, pp. 26, 28-29; statement by Argentina GOV/COM.24/OR.13, para. 8; proposal by Argentina, GOV/COM.24/3, pp. 26, 28-29; statement by Belgium, GOV/COM.24/OR.12, para. 63; proposal by Egypt, GOV/COM.24/3, pp. 27-29; statement by India, GOV/OR.870, para. 40; statement by Japan, GOV/OR.889, para. 69; statement by Saudi Arabia, GOV/COM.24/OR.14, para. 83; Slovakia, GOV/COM.24/3, p. 27; statement by Spain, GOV/COM.24/OR.3, para. 2; proposal by Spain, GOV/COM.24/3, p. 20.

[299] Statement by Mohamed ElBaradei, GOV/COM.24/OR.13, p. 52.

[300] INFCIRC/540, Articles 6.a-d.

[301] Statement by Austria, GOV/COM.24/OR.3, para. 9.

[302] Statement by Australia, GOV/OR.870, para. 90.

[303] INFCIRC/540, Article 6. a-d.

[304] *Ibid.*, Article 9.

position in negotiating implementation, the power of a consultation clause should not be underestimated. As noted by Belgium, "not all saw the Board as setting a norm".[305]

Fearing Transparency

As in the past, states were unable to embrace transparency levels advocated by control supporters. Programme 93+2's call for states to declare accessible industrial, commercial and military installations in the vicinity of nuclear installations was eliminated.[306] Less successful were attempts to remove other reporting requirements including:

- past activities in cooperation and historical accountancy[307];
- research and development activities related to waste-containing nuclear materials or the nuclear fuel cycle not involving nuclear materials[308];
- the location and status of deposits and mines[309];
- planned nuclear-related activities[310];
- locations of nuclear material waste including those where safeguards had been terminated and waste processing[311]; and

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[305] Statement by Belgium, GOV/COM.24/OR.19, para. 18.

[306] Compare GOV/INF/759, para. 45; GOV/2807 Annex.

[307] Statement by Brazil, GOV/OR.870, para. 20.

[308] Statement by Algeria, GOV/OR.870, para. 101; statement by Cuba, GOV/OR.870, para. 56; proposal by Egypt, GOV/COM.24/3, p. 7; proposal by Spain, GOV/COM.24/3, p. 8; on privately owned research and development activities not involving nuclear material see proposal by Argentina, the FRG, Japan and Slovakia, GOV/COM.24/3, p. 7.

[309] Statement by Algeria, GOV/OR.870, para. 101; statement by Cuba, GOV/OR.870, para. 56.

[310] Statement by the FRG, GOV/COM.24/OR.2, para. 22; statement by Brazil, GOV/COM.24/OR.9, para. 58.

[311] Statement by Brazil, GOV/COM.24/OR.8, para. 104; proposals by Belgium and the FRG, GOV/COM.24/3, p. 14; statement by the FRG, GOV/COM.24/OR.1, para. 87.

- exports and imports of equipment and material in the universal reporting scheme.[312]

States also proposed constraints on how information could be used. These included limiting the information sources used to trigger environmental sampling requests or allow the Agency to request complementary access.[313] A number of states also sought to deny IAEA rights to examine records during complementary access to areas where there were no nuclear materials, equipment production or nuclear research and development not involving nuclear materials.[314]

States were not ready for the anywhere, any place, any time approach, especially at non-nuclear sites. The Secretariat's original proposal for access within two hours was diluted. Demands for advanced notice ranged from 24-48 hours.[315] Justification for notice included visa processing and constitutional reasons. The resulting formulation required 24 hours notice except to any place on a *site* sought in connection with normal inspections. Then they needed to give two hours but in exceptional circumstances under two hours was possible.[316]

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[312] Proposals by Egypt, the FRG and Spain, GOV/COM.24/3, p. 16; statement by the FRG, GOV/COM.24/OR.9, para. 3; statement by Belgium, GOV/COM.24/OR.9, para. 12; statement by the ROK, GOV/COM.24/OR.9, para. 30; statement by Spain, GOV/COM.24/OR.9, para. 6. On just reporting exports only see proposal by Switzerland, GOV/COM.24/3, p. 16; statement by Switzerland. GOV/COM.24/OR.9, para. 9.

[313] Proposal by the ROK, GOV/COM.24/3, pp. 23, 24; also see proposal by Egypt, GOV/COM.24/3, p. 22; on interpreting the problems with the ROK proposal see statements by Mohamed ElBaradei, GOV/COM.24/OR.11, para. 31 and GOV/COM.24/OR.12, para. 3.

[314] Proposals by Argentina and Brazil, GOV/COM.24/3, p. 29.

[315] Japan, 24 hours, GOV/COM.24/OR.6, para. 6; Algeria, 36 hours, GOV/COM.24/OR.14, para. 60; Egypt, 48 hours, GOV/COM.24/OR.14, para. 61; Syria, 48 hours, GOV/COM.24/OR.14, para. 78; Spain, 24 hours, GOV/COM.24/OR.14, para. 80; Nigeria, 24 hours, GOV/COM.24/OR.14, para. 84; FRG, 24 hours for complementary access that did not involve nuclear material or activities GOV/COM.24/OR.14, para. 64.

[316] INFCIRC/540, para. 4.b.(i-ii).

Competing Interests

As in past negotiations, some states insisted on equal funding for safeguards and technical cooperation, and complained of the detrimental effect of the former on the latter.[317] They argued that strengthening safeguards, they contended, should not have adverse financial affects on the Agency or on technical cooperation.[318] A number of states felt the primary Agency function was technical cooperation[319], and strengthening safeguards remained complementary to peaceful promotion of nuclear energy.[320]

Financially, the Agency was pressured to stress safeguards efficiency. New measures had to be long-term cost-neutral if not cost-cutting.[321] Trade-offs were demanded.[322] One European Governor asserted that the list of facilities subject to inspection was long and growing and it was advisable to shorten it wherever possible.[323] Initially, a safeguards financing bulge was to be permissible, but after Model Protocol adoption, state willingness to support increases quickly dissipated. At the 2000 NPT Review Conference, its final document again stated that safeguards strengthening should not negatively affect resources available for technical assistance and cooperation.[324] Trade-offs were also sought between control and promotion. Seeking to strengthen state positioning for technology access, Iran made an

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[317] See for example statement by Uruguay, GOV/OR.769, para. 124.

[318] Statement by Brazil, GOV/OR.889, para. 93; statement by China, GOV/OR.889, para. 15; statement by Libya, GOV/OR.892, para. 80 in GC(40)/17; statements by Morocco, GOV/OR.861, para. 96 and GOV/OR 870, para. 111; statement by Niger, GOV/OR.888 para. 187; statement by Uruguay, GOV/OR.889, para. 95; statement by Venezuela, GOV/OR.889, para. 115.

[319] Statement by Brazil, GOV/OR.889, para. 93.

[320] Statement by China, GOV/OR.871/Rev.1, para. 57.

[321] Statement by India, GOV/OR.829, para. 26; statement by Japan, GOV/OR.840, para. 125; statement by Mexico, GOV/OR.855, para. 117; statement by Pakistan, para. 35, GOV/OR.861; statement by Poland, GOV/OR.870, para. 115; statement by Romania, GOV/OR.856, para. 67; statement by Venezuela, GOV/OR. 855, para. 114.

[322] Statement by Japan, GOV/OR.889, para. 64.

[323] Statement by Spain, GOV/COM.24/OR.2, para. 43.

[324] NPT/CONF.2000/28, Part 1.

unsuccessful attempt to introduce text on the commitment to promotion into the Model Protocol by paraphrasing NPT Article 4.[325]

Concern remained that strengthening safeguards might hamper technological or industrial development.[326] Systematic and comprehensive reporting, which could cover obscure items such as airplane ballast, was argued to be burdensome.[327] Thus, some states sought to curtail:

- reporting on research and development not involving nuclear material such as enrichment and waste treatment especially in the private sector[328];
- participation in the voluntary reporting scheme, especially regarding dual-use equipment or the import thereof[329];
- reporting on buildings on inspection sites and other locations outside facilities where nuclear material was customarily used[330]; and
- reporting on mine deposits, production and reserves.[331]

States also emphasised retaining confidentiality and protecting commercial secrets in both industrial and developing states.[332] Industrial states tended to seek

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[325] Statement by Iran, GOV/COM.24/OR.20, para. 1.

[326] Statement by Argentina, GOV/OR.889 para. 4; statement by China, GOV/OR.889, para. 10; statement by India, GOV/OR.829, para. 26; statement by Libya GOV/OR.892, para. 80 in GC(40)/17; statement by Morocco, GOV/OR.889, para. 49; statement by Pakistan, GOV/OR.861, para. 39; statement by Tunisia, GOV/OR.904, para. 109.

[327] Statement by the FRG, GOV/COM.24/OR.8, para. 72.

[328] Statement by Brazil, GOV/OR.870, para. 31; statement by Egypt, GOV/COM.24/OR.1, para. 56; statement by Japan, GOV/COM.24/OR.1, para. 32; statement by Spain, GOV/COM.24/OR.1, para. 43.

[329] Statement by Switzerland, GOV/OR.892, para. 87 in GC(40)/17; statement by Thailand, GOV/OR.888, para. 147.

[330] Statement by Spain, GOV/COM.24/OR.1, para. 43.

[331] Statement by Brazil, GOV/OR.884, para. 74; statement by South Africa, GOV/OR.889, para. 113.

[332] Statement by Belgium, GOV/COM.24/OR.6, para. 18; statement by Brazil, GOV/OR.889, para. 86; statement by Denmark, GOV/COM.24/OR.3, para. 82; statements by Japan, GOV/COM.24/OR.1, para. 31 and GOV/COM.24/OR.3, para. 77; statement by Mexico, GOV/OR.889, para. 22; statement by Morocco, GOV/OR.889, para. 49; statement by Nigeria, GOV/OR.904, para. 115; statement by

protection of commercial data and questioned such measures as reporting technical advances in research and development.[333] NWSs and non-Party states aimed at the same for military- or security- related information. For example, India and Pakistan voiced fears that samples could contain "politically sensitive" information or yield knowledge on capabilities and activities unrelated to "nuclear programmes".[334] Some went so far as to support a blanket restriction on providing information to protect sensitive commercial or security data[335], but the Board had learned its lessons. It recognised the proposed right to deny supply information as a serious loophole and rejected the initiative.[336]

Similar, proposals were tabled to limit state responsibilities to meet IAEA requirements. Proposals included supplying information on imports and exports only "where available"[337] and obligating states to provide information in response to Agency enquiries about locations external to facilities where materials were customarily used "as soon as possible" rather than "promptly".[338] It was proposed that Agency initiatives for SSAC cooperation take into account differing degrees of nuclear development to avoid unwarranted state costs.[339] In addition, despite the trend recognising that states must cooperate with the IAEA, a minority remained convinced that the Agency still needed to accommodate them. As noted by Cuba, "States were not obliged to adapt themselves to the Secretariat's requirements but rather the reverse.[340]

New in this era was caution in utilising new technology associated with high levels of intrusiveness. Problematic activities included:

Spain, GOV/COM.24/OR.3, para. 6.

[333] Statement by India, GOV/OR.870, para. 40.

[334] Statement by Pakistan, GOV/OR.871/Rev.1, para. 40; statement by India, GOV/OR.870, para. 41.

[335] Proposal by the FRG, GOV/COM.24/3, para. 31; statement by Morocco, GOV/OR.889, para. 49.

[336] On exploiting national security concerns see statement by Netherlands, GOV/COM.24/OR.14, para. 14.

[337] Statement by the FRG, GOV/COM.24/OR.9 para. 3.

[338] Proposals by Algeria, Belgium, and Egypt, GOV/COM.24/3, p. 20.

[339] Statement by Cuba, GOV/OR.870, para. 49.

[340] Statement by Mexico, GOV/OR.781, para. 76.

- collection of environmental samples in general[341] or unrestricted sampling anywhere[342];
- use of wide area monitoring[343];
- use of national technical means[344]; and
- use of communication satellites except where it was demonstrated that safeguard confidentiality could be maintained.[345]

States, especially industrialised ones, still feared the Agency as a potential abuser and called for protectionist language regarding inspection.[346] They questioned the proposed role of inspectors.[347] Some supported full justification orally or in writing for complementary access requests.[348] States also successfully argued that verification of expanded declarations should not take place regularly or mechanistically.[349] The text of the Preamble recalled the Agency's need to avoid hampering economic and technological development, to take every precaution to protect information and to keep the intensity of activities to a minimum.[350]

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[341] Statement by Algeria, GOV/COM.24/OR.3, para. 3.

[342] Statement by Brazil, GOV/COM.24/OR.1, para. 4.

[343] Mark Hibbs, "Language Curbing IAEA Access Unlocks Progress on 93-Plus-2", *Nuclear Fuel*, 10 March 1997.

[344] Statement by China, GOV/OR.892, para. 29 in GC(40)/17.

[345] Statement by Cuba, GOV/OR.870, para. 50.

[346] Statement by the ROK, GOV/COM.24/OR.11, para. 19; statement by Spain, GOV/COM.24/OR.10, para. 74; *Statement by the Utilities Employing Nuclear Energy and the Nuclear Industry in Germany on the IAEA Programme 93+2*, 3 June 1996, p. 8; statement by the FRG, GOV/COM.24/OR.3, para. 79 and GOV/COM.24/3, p. 5; statement by Greece, GOV/COM.24/OR.3, para. 81; statement by South Africa, GOV/OR.889, para. 113.

[347] Statement by the European Union, GOV/OR.888, paras. 133-134.

[348] Statement by Belgium, GOV/COM.24/OR.6, para. 25; statement by FRG, GOV/COM.24/3, p. 21; statement by Japan GOV/COM.24/OR.6, para. 6; statement by Mexico, GOV/OR.884, para. 112.

[349] INFCIRC/540, Article 4. Also see statement by Mexico, GOV/OR.884, para. 112; proposal by Japan, GOV/COM.24/3, p. 26; proposal by the FRG, GOV/COM.24/OR.29, Attachment, Article 3a.

[350] Also see INFCIRC/540, Article 15.

Equality and Universality

Near the end of the negotiations, Baruchian themes of equality and universality also permeated discussions. NNWSs called for the Protocol to apply to NWSs and non-Party states.[351] Their justification was that universal participation was important to system effectiveness and promotion of non-proliferation[352] and was necessary to promote industrial acceptance and avoid creating a distorted or discriminating system.[353] The NWSs demanded a voluntary protocol for NWSs because the Protocol's *raison d'etre* was to identify clandestine activities, a debatable in NWSs.[354] The non-NPT parties also rejected universality on grounds of non-relevancy to them,[355] the Protocol's inability to deal with vertical proliferation,[356] and the different terms given NWSs.[357]

The pattern established under voluntary NPT agreements on safeguards implementation endured under the Model Protocol. France, the United Kingdom, and the United States sought to apply the Protocol's measures to promote consistency and to meet commitments in Article I of the NPT -- that is to prevent horizontal proliferation.

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[351] Statement by Argentina, GOV/COM.24/OR.21, para. 53; statement by Belgium, GOV/COM.24/OR 1, para. 47; statement by Egypt, GOV/COM.24/OR.1, para. 56; statement by the FRG, GOV/COM.24/OR.1, para. 64; statement by Iran, GOV/COM.24/OR.40, para. 70; statement by Japan, GOV/COM.24/OR.1 para. 30; statement by Libya GOV/OR.892, para. 80 in GC(40)/17; statement by New Zealand, GOV/COM.24/OR.40, para. 78; statement by the Philippines, GOV/OR.861, para. 22; statement by the ROK, GOV/COM.24/OR.40, para. 53; statement by Spain, GOV/COM.24/OR.1, para. 40; statement by Turkey GOV/COM.24/OR.40, para. 66.

[352] Statement by ROK, GOV/OR.871/Rev.1, para. 103 and GOV/COM.24/OR.40. para. 53; statement by Spain, GOV/COM.24/OR.40, para. 63.

[353] Statement by Mexico, GOV/OR.889, para. 21; statement by Switzerland, GOV/COM.24/OR.24, para. 42; "ROK Weighs in on 93+2 Safeguards Terms", *Nuclear Fuel*, 2 December 1996.

[354] Statement by Russia, GOV/COM.24/OR.21, para. 69; statement by the United States, GOV/COM.24/OR.40, para. 14.

[355] Statement by Cuba, GOV/COM.24/OR.22, para. 51; statement by India, GOV/COM.24/OR.41, para. 106; statement by Pakistan, GOV/COM.24/OR.40, para. 59.

[356] Statement by India, GOV/COM.24/OR.40, para. 34.

[357] Statement by Brazil, GOV/OR.860, para. 106.

As with its NPT agreement, the United States committed itself to all Protocol provisions, but the commitment contained a broad exemption due to its retention of its nuclear weapons. It excluded instances where its application would provide IAEA access to activities, information or locations with direct national security significance. It also maintained managed access rights in connection thereof. While the exemption aims to prevent proliferation by ensuring that sensitive weapons technology is not inadvertently transferred through inspection, it has the effect of reducing the application of extended declarations and inspections.[358] The United Kingdom and France used a different formulation. The agreement for the United Kingdom required that it declare activities conducted in cooperation or otherwise relevant to NNWSs.[359] France made a similar commitment. Neither agreement obligated these states to provide information and full access to nuclear sites where peaceful and military operations were collocated. The United Kingdom, however, permitted access where it committed to supplying data, while France was more cautious. Both Protocols provided additional information and access not required under the Model Protocol regarding R&D where cooperation existed with NNWSs.[360]

With no model NWS protocol, these states can easily exercise their rights to be less than generous in subjecting themselves to control. China offered broad information on links to NNWSs, but reportedly has not shown any inclination to allow complementary access to verify it. Early indications are that Russia's offer will also be limited.[361]

VIII. Nuclear -Weapon- Free-World (NWFW)

One final development testifies to the continuing relevance of Baruchian control ideas since the adoption of the Model Protocol. Since the 1995 NPT Extension Conference, renewed interest has emerged in total nuclear disarmament. This interest has been accompanied by work on strategies for achieving and sustaining a

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[358] Suzanna Van Moyland "The IAEA's Additional Protocol: Some Connections between Arms Control and Disarmament", *INESAP 1997 Conference Challenges and Opportunities for a Nuclear-Weapon-Free World*, Shanghai, China, 1997, Conference Proceedings No. 3, 1998; Suzanna Van Moyland, "Progress on Protocols: The IAEA's Strengthened Safeguards Programme", *Disarmament Diplomacy*, No. 27, June 1998, pp. 9-10.

[359] Meier, *op. cit.*, p. 9.

[360] Van Moyland, 1997, *op. cit.*; Van Moyland, 1998, *op. cit.*, pp. 9-10.

[361] Van Moyland, 1998, *op. cit.*, pp. 9-10.

nuclear-weapons-free world (NWFW) conducted by academic and NGO communities. Common threads among this has been a "Baruch-style" approach to nuclear security and acceptance that the control regime for such a world must be restructured and considerably strengthened.

Their incorporation of comprehensive measures reflects an observation by Scheinman that echoes the early experts on nuclear control dynamics. He notes that the confidence required will determine the stringency of verification, which in turn will correspond to the effects of cheating on the strategic balance. Since cheating in a NWFW would significantly disturb the strategic balance, stringency in verification will be high.[362] The confidence derived from a nuclear deterrent must be replaced with equivalent confidence under controls. Thus, controls in a NWFW would require higher verification requirements than that of IAEA safeguards.

The new ideas regarding the application of control, transparency, scope, enforcement, establishing a *control* authority, and positive benefits vary in their construction, but their basic approach remains the same. For example, Jürgen Scheffran and Merav Datan identify the following elements as part of a nuclear weapons convention:

- an international body similar to the OPCW not promoting nuclear energy;
- containment and surveillance of *all* materials, equipment or facilities contributing to nuclear weapons development, production, or maintenance;
- treatment, storage, and disposition of materials and special nuclear materials under strict, effective, and "exclusive international control";
- challenge and on-site inspections;
- anytime, any place inspection of declared and undeclared facilities;
- use of information from other agencies, including NGOs, national technical means, and public sources;
- stronger physical protection controls;
- procedures for transport;
- energy assistance for states not developing nuclear energy;
- possible elimination of exclusive national access to weapons-useable materials;
- transparency;

[362] For a discussion see Lawrence Scheinman, "Safeguards and Arms Control: Is There an IAEA Role?", American Nuclear Society, Vienna, 17 November 1987, p. 4.

- reciprocal monitoring to identify warning signs; and
- compliance and enforcement provisions.[363]

A second plan by the Lawyers Committee on Nuclear Policy and International Physicians for the Prevention of Nuclear War (IPPNW) used a slightly different mixture of measures, but nevertheless a similar approach, including:

- a data sharing registry of nuclear materials;
- transparency of all data and broad access to information;
- an international monitoring system;
- national technical means, remote sensing, and satellites;
- consultation and clarification mechanisms;
- challenge and on-site inspection;
- use of verification measures deemed necessary by the Agency;
- safeguards on special nuclear material, fissionable material, other facilities and materials as determined by the technical secretariat;
- a 20% enrichment restriction;
- no use of HEU and strict controls on reprocessing;
- prohibition of breeder reactors;
- universal physical protection;
- controls on nuclear weapons R&D; and
- Agency licensing of nuclear material not prohibited for civilian use.[364]

Old ideas, previously dismissed as radical, are resurfacing, including the need to modify global power structures. Analysts Eddie Gonçalves and Martin Jones noted that the global governance required for a NWFW cannot be underestimated or avoided.[365] Banning dangerous activities such as enrichment and reprocessing or placing them under international auspices still finds favour in the academic community.[366] In another disarmament proposal, Martin Kalinowski argued that an

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[363] Jürgen Scheffran and Merav Datan, "Nuclear Weapon Convention - The Treaty is Out of the Bottle", *INESAP 1997: Conference Challenges and Opportunities for a Nuclear-Weapon-Free World*, Shanghai, 1997, Conference Proceedings No. 3, 1998.

[364] *Model Nuclear Weapons Convention*, Lawyers' Committee on Nuclear Policy, New York, April 1997, pp. 19, 35, 36, 37, 39, 41.

[365] Eddie Gonçalves and Martin Jones, *Blueprint for a Nuclear Weapon-Free World*, Campaign for Nuclear Disarmament, London, August 1996, p. 27.

[366] Christopher E. Paine, "Separated Plutonium and the Non-Proliferation Regime: Risks, Safeguards and Remedies in William Clark Jr. and Ryukichi Imai, *Next Steps in Arms Control, op.cit.*, pp. 163-164; Jonathan B. Tucker, "Verifying a Multilateral Ban

international control organ should have "full physical control" over all special nuclear materials to the point where state access to materials required inspector cooperation.[367]

The disarmament experts of the 1990s have also acknowledged the necessity of dealing with collapse in a NWFW framework. Kalinowski proposes "provisions that allow efficient international reaction after it has been detected that a state has diverted weapon-useable material and before it succeeds to build a nuclear weapon".[368] Under the Lawyers' Committee plan, withdrawal, a form of collapse, was disallowed in a NWFW.[369]

This community also recognised the importance of adaptability. Suzanne van Moyland underscored the need for the disarmament framework to respond dynamically to environmental changes. She called for frequent review mechanisms to deal with verification system flaws before they corrode the system.[370]

The importance that disarmament conventions must operate in a prevention not detection mode also has re-emerged. A revised Model Convention from the Lawyers Committee and IPPNW employed language describing the verification activities as preventative controls.[371]

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on Nuclear Weapons", *INESAP Information Bulletin*, No. 14, November 1997, p. 16.

[367] Martin B. Kalinowski, "Beyond Technical Verification, Integrated Prevention and Detection of Diversion of Special Nuclear Material in the Nuclear Weapons Convention", *INESAP 1997 Conference Challenges and Opportunities for a Nuclear-Weapon-Free World*, Shanghai, China, 1997, Conference Proceedings No. 3, 1998.

[368] Kalinowski, *op. cit.*; also on enforcement see, James Leonard, Martin Kaplan & Benjamin Sanders, "Verification and Enforcement in a NWFW", in Joseph Rotblat, Jack Steinberger and Bhalchandra Udgaonkar, (eds.), A *Nuclear-Weapon Free World Desirable? Feasible*, Oxford: Westview Press, 1993, pp. 132-144.

[369] "Model Nuclear Weapons Convention", *Disarmament Times*, Vol. 20, No. 2, 28 April 1997, p. 2.

[370] Suzanne Van Moyland "Sustaining a Verification Regime in a Nuclear Weapon-Free World", *Research Report*, No. 4, VERTIC, June 1999, p. 3.

[371] This Convention which is a revised version is reprinted in *Security and Survival, The Case for a Nuclear Weapons Convention*, International Association of Lawyers against Nuclear Arms, INESAP, and IPPNW, Cambridge, MA., 1999, para. I.A.2.c and g.

Finally, views on treating military and peaceful aspects of nuclear energy have changed. Nuclear energy use has been identified as having direct implications for security and the effectiveness of control. Martin Kalinowski noted:

> In theory the highest barrier would be realised in a world without nuclear energy. However, it should be pointed out that the abolition of nuclear weapons can be accomplished, though less easily, even without abolishing nuclear energy.[372]

Therefore, some analysts proposed options for eliminating nuclear energy and exploring opportunities for receiving assistance in developing other energy resources.[373]

Although the academic community has taken the lead on disarmament, some governments have taken cues from them. The most notable development has been the formation of the New Agenda Coalition which consists of Brazil, Egypt, Ireland, Mexico, New Zealand, South Africa and Sweden. These states united because they believe that NWSs are not adhering to their NPT commitments, and therefore they are within their rights to become involved in the NPT Article VI disarmament process.

IX. Conclusion

To the Agency's and system's credit, the safeguards system has withstood a significant amount of abuse and managed to partially address if not sometimes overcome a range of challenges. In spite of efforts by a number of states to keep the system limited, the system has been strengthened and has gained wide acceptance. The system's imperfections have not discouraged an increasing number of states appreciating the IAEA's contribution in promoting international security. The growth in nuclear development had the effect of re-enforcing the belief that nuclear energy presented risks of nuclear weapons proliferation. The ongoing process of integrating the principles into the established control system increased the attractiveness of the IAEA safeguards system as a method to address the nuclear question. While the developments relating to the established control system continue to support the preference for external control over national monitoring, the current

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[372] Kalinowski, *op. cit.*

[373] The option has been advocated by Merav Datan and Jürgen Scheffran "Principles and Means for Verification of a Nuclear Weapons Convention", *INESAP Information Bulletin*, No. 14, November 1997, p. 24.

system has indeed been effective in its role in non-proliferation and as the a next best solution when external control is not politically feasible.

As environmental changes occurred and state-to-state relations cycled through crests and troughs, the trend has been to look towards stronger international control mechanisms to address increased threats. Large crises, such as the events in Iraq and the DPRK, have served as effective agents of international change. Technology diffusion in a multipolar post-Cold War world has made states aware of the ease with which adversaries can achieve nuclear potentiality. Strengthening the system has entailed introducing bonafide control. When the international control system needed improvement, expert analysis often paralleled and endorsed discussions of the Baruch era. Sacrifices in sovereignty became acceptable once a sufficient nuclear threat that could be addressed on a unilateral level was perceived.

In times of lower tensions, however, controls often return to being viewed as a burden rather than performing a service. In such lulls, the IAEA becomes vulnerable to assault by states. New measures proposed under 93+2 were groundbreaking but over time, traditional interests in national sovereignty and economics returned to the forefront. Although states show a greater appreciation for the safeguards system in post-crisis periods, the decline in interest can be very damaging. In spite of the progress made with the adoption of the Model Protocol, one need only to look at the financial deprivation that the Agency is currently experiencing to understand the vulnerability of the IAEA to the whims of states. The Agency is in the unfortunate position of having to please 187 masters. It receives little sympathy when it struggles to perform its mission as often it conflicts with national interests. Pre-Gulf War, the IAEA was accused of being both weak and intrusive. States, having revamped the IAEA in the Post-Gulf War period, do not want to hear that the IAEA still require attention in meeting new challenges to its safeguards mission generated by political and technical environmental change.

While the system is functioning reasonably well in meeting non-proliferation objectives, the implications for disarmament are not quite as bright. The struggle between more credible systems requiring greater sacrifices of national sovereignty and a broad adherence to international control demanding less intrusiveness and wider benefits remains a challenging one.[374] The period covered in this chapter indicates a lack of confidence in the system which may undermine future disarmament efforts if left unattended. While some problems have been addressed, confidence in

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[374] For a further discussion see Scheinman in Leachman and Althoff, *op. cit.*, p. 108.

international control to enable disarmament still is lacking, and this will complicates efforts to implement further cuts.

CONCLUSION

I. The Principles of Control

This work set out to identify the principles of nuclear control and examine their operation. The basis for the answer could be found in the analysis conducted at the advent of the nuclear age. At that time, principles were identified and set in a framework for promoting international nuclear security and stability, based on a nuclear-weapon-free environment. It was considered that compromises in the control principles would lead to predictable sub-optimal consequences. Proponents of control in subsequent generations found strict measures desirable but often politically unacceptable. Therefore, they established a national inspection system, similar to the one rejected in the 1940s. The developments associated with the implementation of control revealed that the initial analysis on the elements of control was accurate as the performance of the established national inspection system fulfilled predictions. Moreover, when policy makers decided to strengthen the control system, adjustments to the existing framework incorporated aspects of the principles that were lacking in the adopted framework.

Feasibility

The analysts of the Baruch era identified feasibility as a first principle of control. While the early analysts focussed primarily on technical feasibility, political feasibility was to play an equally important role in promoting a stable system. Technical feasibility implies a control system designed in such a manner to provide high assurances in meeting its stated objectives. When some technical aspect of control cannot be fully addressed by available means, those aspects of control are not technically feasible and assurances are reduced. The problems of measures being too cumbersome, too intrusive or an unacceptable infringement on sovereignty are issues of political feasibility. While a scientific basis contributes to the determination of technical feasibility, political feasibility is determined by perceptions and national interests.

The feasibility of control has changed since the advent of nuclear weapons. There have been environmental developments that have made control technically more difficult or less feasible because science has been limited in the answers it can provide. At the same time, there has been a slow trend towards control being more politically, although not more economically, feasible. The system has faced numerous crises, such as the events in Iraq, which have spotlighted the risks associated with a

weak system. These, in turn, have generated proliferation concerns and triggered actions to improve the international control system. While highlighting the limitations of control, in some respects these events were the best thing that could have occurred for control development as they have forced states to re-evaluate how they view international control.

Baruch era analysts determined that control was technically feasible. However, their original concept for controls was based on two false assumptions: uranium existed only in small quantities and denaturing of plutonium was a possible control method. The true nature of plutonium implied that certain control measures could not provide the assurances originally believed. The assumption about uranium was more significant. Assurances needed to be high to keep states adhering to the plan. Tight uranium control was viewed as a solid mechanism to *prevent* clandestine programmes. As uranium output grew, the prospects for effective control worsened. Assurances based on new assumptions could not easily be grafted onto a system built to meet old assumptions. Coverage of source materials became much more costly and intrusive. This was detrimental to the willingness of states to extend safeguards scope to source materials and reduced assurances. Both contributed to a lack of support for the control plan.

Over time, new conditions emerged in the technical environment that further affected the feasibility of control and influenced the potential effectiveness of a nuclear control system based on the 1946 framework. One change was developments with regard to WMD and conventional weaponry. When the experts examined the security threats driving a nuclear arms race in the 1940s, they assumed that those drivers would predominantly be derived from suspicions about the nuclear intentions of other states. No other class of weapon could pose a credible response to nuclear weapons. With technology diffusion, access to WMD increased. Although chemical weapons do not pose the same threat as a nuclear weapon, states have shown a willingness to use them. Developments in nuclear weapons technology have made smaller nuclear weapons useful as a deterrent to chemical weapons. Biological weapons are in the process of becoming a threat that can equal nuclear weapons. The concept of using nuclear weapons to deter against biological weapons is now a realistic national military strategy. As the proliferation and technological advancement of other WMDs continues, initiatives for nuclear control may need to consider these threats as well. The problem is that the Baruchian approach does not address this potential driver of nuclear weapons proliferation and therefore it may undermine the assurances that a Baruchian Plan could provide.

This factor does not undermine the validity of the principles for effective control. It does, however, imply a dependency between control of nuclear weapons and any new weapon capable of a level or type of destruction that can significantly impact on strategic military power. If new strategic weapons emerge with the same effects on international relations as nuclear weapons, they must also be effectively controlled.

The planners also did not design their system to deal with utilising nuclear weapons to counter threats by large conventional forces. The link was not dismissed but it was underestimated. Analysts from the Baruch era place priority on ensuring that the plan was manageable. The relationship between the two clearly impacts the establishment of control as a number of cases in history have shown. Careful management of conventional balances will be required to ensure the stability of the nuclear control system, especially as conventional weaponry increases in sophistication. This aspect of control is an area for future research.

Another environmental factor that is relevant to feasibility when disarmament is achieved is the technical question of accounting for past production in nuclear programmes. While a strong verification regime could be set up, the experience in South Africa has shown that, even with full cooperation, a perfect accounting of all material is not possible. The exercise for this small country, which operated a programme for only a few years, was a challenge for the Agency.[1] Verification of past activities in the NWSs, some of which have had active programmes for over 50 years, raises the question of whether assurances of the non-existence of clandestine materials can be provided even with the full cooperation of the states concerned. The technical difficulties may be sufficient for states to retain serious doubts during crises or the disarmament process.

Another technical environmental factor affecting control is the high level of technology diffusion. The revolution in information technology poses the possibility that nuclear know-how can be acquired despite the most stringent controls. This factor is detrimental to control system effectiveness. However, the purpose of the rather strong approach envisioned in the Baruch era was to give the control authority

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[1] Verification of South Africa's initial report was considered a technical challenge by the Agency since the country engaged in significant unsafeguarded nuclear activities. South African cooperation was unprecedented. While assurances could never be 100%, the IAEA and the international community were satisfied with their investigation. (NPT/CONF.1995/7, paras. 66-67; GOV/2609, paras. 4, 9, 24; N. Von Wielligh, N. E. Whiting, "Experience of an Ex (De Facto) Nuclear Weapon State With the Application of Post-Iraq Safeguards", in *International Nuclear Safeguards 1994: Vision for the Future, op. cit.*, p. 227.)

every opportunity to identify at the earliest point a move towards developing nuclear weapons. The object was to identify as early as possible the point when the "intangible" element of acquiring knowledge or know-how, which cannot be covered by a control system, becomes tangible like equipment or material that can be detected and controlled. It is the opinion of this author that technology may in the future reach a level where the conversion time of the intangible to the tangible will be such that even strong control plans may not detect the event rapidly enough to provide warning.

Technical, political and economic feasibility of control were also challenged by the establishment of nuclear industry. Baruch era analysts saw an unregulated nuclear industry as one of the greatest threats to feasibility. When nuclear energy became viewed as a potentially profitable industry, strict controls, perceived as cumbersome and costly, were no longer politically or economically feasible. As industry grew the technical feasibility of safeguarding programmes of a certain structure or size came became a concern.

Political feasibility played a critical role in shaping the nuclear control system. Effective control was based on the premise that states would relinquish sovereignty with regards to nuclear matters. The level of sacrifice necessary for control has not been considered to be politically feasible. Throughout the history of control, states efforts to minimise incursions on national sovereignty limited the system's capability. Historically, most problems associated with achieving satisfactory control had little to do with technical issues. Only a limited range of technical questions have arisen regarding whether a reasonably effective system could or could not be established. The real difficulties rest with finding the political will, ceding sovereignty and paying the bill, without which the chances of establishing a NWFW are exceedingly thin.

While states did not reject the "total control" approach as an effective solution, it was not an option under the prevailing political conditions. A minimalist plan was favoured as the environment was coloured by expectations of nuclear energy benefits and states acceptance of the existence of nuclear weapons. Political feasibility was influenced by a new paradigm where the civilian and military aspects of nuclear energy could be separated. When that paradigm started to decay, the thinking on control design reverted to acknowledgment of the relevance of the control principles.

Provision of Sufficient Warning of Non-Compliance

Analysts of the 1940s sought a strict control plan that it could provide "sufficient" warning of nuclear energy misuse to enable states to take appropriate measures. If states did not perceive that the plan could provide sufficient warning, they would reject reliance on the plan and would withdraw, engage in diversion to protect their own security or not join the plan at all. In designing a plan to provide warning, Baruch era analysts set their control objective as prevention not detection. The reason behind prevention was that no plan was perfect. A prevention goal was believed to make proliferation more difficult and costly, and it would lengthen the amount of time states would have to react.

The IAEA's purpose was not to control nuclear energy but promote its peaceful uses by providing assistance and facilitating cooperation while applying safeguards to detect diversion. Experts believed that the measures would be sufficient to promote some nuclear stability. The plan opened the door to industrial development but did little for security. The technical standards to detect diversion were questioned by experts as leaving the IAEA with little room for error. In view of continued industrial growth and a lack of Agency funding, credibility of the system became a problem for states whose threat perceptions were higher than the norm. Where warning was perceived as insufficient, states took unilateral and multilateral action, often seeking measures to strengthen the international control framework that would prevent proliferation as opposed to strictly increasing detection capabilities.

Provision of Security in the Event of System Failure

According to Baruch era analysts, if the system failed, whether by breakout, withdrawal or some other means, states needed to feel secure. Addressing this issue was problematic in the UNAEC negotiations and remains a major problem today. The cases of Iraq and the DPRK have thrown a very harsh light on the unresolved question of compliance. The international community has uniformly embraced the concept that states must retain freedom in dealing with non-compliance. The problem emerges when the international community, unable to reach a consensus, becomes unable to act. Consensus for penal action can be difficult to achieve and can be lethargic. Lack of resolve opens the door to protracted hide and seek games.

While the situations in Iraq and the DPRK have not completely eroded, they are far from ideal. Past difficulties in handling non-compliance problems through collective action places some doubts relying on the international community to provide

"security in collapse". National fears of abusive bureaucracies have kept the organisations weak, but these weaknesses have fostered independent action and go-it-alone proclivities, of the United States in particular. While NGOs and other observers do not like to discuss it, the transgression response regarding proliferation issues has to be strengthened and may not be able to exclude a potential military response, as sanctions simply make trade harder and, as illustrated by Iraq, have a limited lifespan. This is not to say that enforcement requires military action, but strong, prompt and reliable responses, backed by the international community, are necessary for assurance. Non-compliance or even fear of it left unattended can fester and, as seen in the case of Israel's bombing of Osiraq, lead to unilateral actions. An open policy on enforcement may be workable, but the international community must show that it is a credible, collective and durable force when faced with a nuclear threat.

The failure to resolve the compliance issue has clear implications for disarmament. For many states, the possession of nuclear weapons by Iraq may be a threat, but not an immediate one. However, for a small few, possession of nuclear weapons by Iraq is a significant and immediate problem. In a NWFW, the international community would take strong action, as the implications of any breakout might be considerably different in that situation. However, without a demonstration by the international community that it has the will to bring to complete resolution problems of compliance as well as proliferation, there is no incentive for states possessing nuclear weapons to disarm.

The history of control shows that there is one other type of system failure which does not receive great attention due to its latent nature. The IAEA system has suffered from nominal non-cooperation. When this occurs in excess, as it did in the late 1970s and 1980s, credibility is affected. Iraq's non- cooperation with the inspectorate was a real problem for Israel, but not out of the ordinary when compared to other states. The international community consistently stumbles when dealing with these type of non-compliance issues, because much of it relates to economic interests or administrative problems. Petty or not, the scale of the problem fed the lack of faith that vulnerable states had in the system and was exploited by Iraq. The IAEA is limited in dealing with these states, and the current system does not penalise poor cooperation considered to be caused by reasons other than non-proliferation.

Incorporation of Positive Aspects in the Control Plan

While the Baruch plan incorporated the benefits of peaceful nuclear energy as an incentive to join the plan, their conception of incentive was very different from that

under the established system. Peaceful benefits were secondary to addressing security issues. Security assurances from a nuclear attack was the primary benefit. As a secondary benefit, analysts believed that the trust that the plan would generate was trust which would enable interstate cooperation. This was the assumption also of EURATOM negotiators who, in seeking to gain assistance from the United States for nuclear energy development, initially sought to incorporate additional features into their regional system that were not then acceptable in an international system.

The current system sets up promotion in competition with control. The arrangement has inflicted considerable damage on efforts to establish and maintain effective control. It has also established a bad precedent. For some, safeguards were not operated to promote security but were viewed as an inconvenience in the conduct of trade. States together with their nuclear industries have rigidly held that safeguards should not hamper operations, new measures can only be implemented if and when others are reduced and financing for promotion and control should be equal. By the 1980s, the inflexibility of these demands undermined assurances. States finding their security environment unsatisfactory felt forced to adopt unilateral measures to enhance control including export controls. Hence, when promotion is developed at the expense of control, ultimately promotion is hurt.

Adaptability to Environmental Change

Adaptability to environmental change was considered necessary to prevent the effectiveness of the control plan from being eroded over time. Creators of the Baruch plan originally conceived that adaptability to environmental change could be implemented by according the authority sufficient flexibility in the application of measures to ensure that the system remained effective. History has shown that the term "flexible international control agreement" is an oxymoron. Because inspection takes place in very sensitive national or industrial facilities, states negotiate every conceivable detail and are not amenable to change.

Making controls stronger is extraordinarily difficult once standards are set. The major breakthroughs in control development have been driven by fear and crises. Only when a sufficient number of states find that unilateral measures are not effective does the system undergo a revision. Often, when revisions are adopted, considerable time is required before they acquire broad political acceptance. The situation risks becoming more problematic as the pace of technology development continues to speed.

Management of Nuclear Rivalry

Management of nuclear rivalry was for Baruch era analysts perhaps the most emphasised of the principles. They did not view the Plan as a verification system but as a political mechanism to address security issues generated by the discovery of nuclear energy. By making the control authority a regulator, it would be in a position to prevent states or operators from engaging in activities that would be desirable on a national or economic level but destabilising internationally.

Absence of the regulation abilities to allow the control authority to address underlying causes of nuclear rivalry had several consequences. Without the ability to "manage" the growth of civilian nuclear programmes, industry expanded at a rate with which it was difficult for the IAEA to keep pace. At times, national programmes were structured in manners that were perceived to be threatening by rival states or difficult for the IAEA to safeguard. Massive programmes structured for profit created large material stockpiles promoting mistrust among states. With so much investment at stake, states with large nuclear industries and developing states seeking to exploit nuclear technology feared that their endeavours would be crippled and lobbied against strong safeguards whenever attempts were made to strengthen controls. Operators, dealing with a national inspectorate rather than a regulator, could be lax in meeting obligations, complicating the situation for the IAEA.

The Iraqi case demonstrated the problems of the absence of rivalry management. Long before the clandestine programme was revealed, states and some officials within the IAEA questioned the peaceful nature of Iraqi activities. The design of the control system, however, was not conducive to the IAEA fully addressing the suspicions of individual states. Not only did the legal structure make it difficult to investigate suspicions but the political environment encouraged the Agency to minimise intrusive interference and avoid making a fuss over small problems.

Where rivalry management lacked in the initial system, states sought to either strengthen the system or seek alternative means to address concerns. When technology had progressed and diffused as predicted, proposals arose to avoid creating direct-use materials in order to increase the conversion time between civilian production activities and bomb fabrication. More recent trends indicate an interest to allow for some rivalry management in nuclear control. The NWFZs addressed rivalry management by strengthening the right of parties to raise questions. Solutions to the proliferation threats stemming from large nuclear material stockpiles are becoming perennial issues. Although management structures are proving difficult to build, the

Model Protocol represents a move toward rivalry management by enabling the IAEA to ensure that programmes are internally consistent and address inconsistencies.

The Authority's Right to Have Comprehensive Knowledge of States' Nuclear Activities

Baruch era analysts believed that, due to a nuclear weapon's unique ability to inflict mass destruction and undermine state security, control would have to be comprehensive. To be comprehensive, the scope of the system must include all conceivable aspects of nuclear weapons development, including those aspects only indirectly related to nuclear production such as deposits of source materials and production of heavy equipment.

Initially, the adopted system worked on a completely different premise. As little information as possible was to be revealed to the control authority. The consequences were a reduced Agency understanding of state nuclear programmes, which has been exploited on several occasions. While that premise is still upheld, states have adjusted the amount of information that they have been willing to reveal considerably, recognizing that the IAEA needs a substantial information base if it is to meet its responsibilities effectively. While they realise that the control authority must have a full understanding of national programmes to identify inconsistencies, finding an acceptable formula that can build confidence between rivals that no clandestine programme exists has not yet been possible.

The Authority's Right to Apply Comprehensive Controls to States' Nuclear Activities

According to analysis in the 1940s, control had to be comprehensive, rigourous and intrusive. The framework empowered the authority to apply control, including physical protection, across the fuel cycle spectrum, enabling it to provide warning and security. This empowerment implied that the authority was given a regulatory if not monopolistic control over international nuclear energy development. This decision was taken on the basis that military and civil nuclear energy uses could not be separated. If control was not comprehensive, states would either develop a false sense of security or not trust the system.

States wanted a weak control authority and created it. A primary mandate of promotion, a constant barrage of reminders to keep control unintrusive and extreme financial constraints ensured that the Agency authority would be limited. Without sufficient backing of members or greater authority, the Agency had little bargaining

power *vis-a-vis* states when standards were negotiable. The Agency was often placed in a difficult position when disagreements arose, having neither the resources nor the political maneuverability of a state. Turning to member states has provoked responses in major crises but less critical issues tend to elicit expressions of concern by only a few states. The community response has often been lacklustre.

Instead of setting parameters on state actions, the system established checks on whether states engaged in non-agreed behaviour. The former sought a comprehensive solution to all nuclear threats, the latter limited to providing confidence that civilian activities were not a threat. The new approach was riddled with difficulties from the beginning. Confidence was difficult when many potential threats were left unattended.

The partial system, however, survived and has steadily evolved. In spite of ongoing concerns that the IAEA safeguards system was not sufficiently rigourous, it has remained remarkably viable. The limited assurances provided by a lack of comprehensiveness were not desirable, but a limited approach was the only acceptable path. The implications of a minimalist system were understood but not really appreciated until the Iraq and DPRK crises. Over time, the approach to control became more holistic. Control was not just about dealing with the acquisition of material necessary for nuclear weapons. Rather, control dealt with non-nuclear materials, equipment and facilities associated with the fuel cycle.

A holistic approach to nuclear control could also be seen in the developing relationship between control and physical protection. States increasingly appreciated that physical protection, separated from safeguards early on, played an important control role and had an impact on international security and stability. Although it remains nationally regulated, it is increasingly recognised as a control aspect needing more international attention.

In parallel to greater acceptance that control must be comprehensive, peaceful and miliary aspects of nuclear energy are once again seen as strongly related. Support for PNEs may have initially been eroded primarily due to environmental concerns, but PNEs are now internationally considered nuclear weapons. Likewise, states are increasingly appreciating the military implications of a highly developed civil nuclear programme under IAEA safeguards. Large civilian programmes risk functioning as virtual nuclear arsenals. The move by a few states to dismantle their nuclear energy programmes and reject the promotion of nuclear energy production signals an important change in views on nuclear energy promotion. While one cannot

say these developments form a trend, a continuation in this direction may hold some relevance for the future of control.

The evolution of comprehensive control has been crisis driven. Although the process was evident in the 1960s, safeguards evolution did not pick up speed until the 1990s when Iraq and the DPRK provided strong stimuli for change. The system has evolved considerably from its starting point. States may reject strong nuclear control, but they are reacquainting themselves with the desirability of the security provided by a strong system and appear to be increasingly willing to move toward one. Some sacrifice of sovereignty became an acceptable price for increased system rigour.

States' willingness to sacrifice sovereignty for security benefits derived from control indicates some but not a high level of learning. As globalisation proceeds, states appear more willing to accept international control measures. This learning process has been slow and arduous. When threats fade, so does states' interest in control. The problem in achieving comprehensive control is that it is predicated on the cooperation of states, which is often inconsistent. The Agency may win rights on paper, but it requires continued support through funding and cooperation in safeguards implementation.

Transparency of Nuclear Programmes and Control Authority Activities

Not only did Baruch era analysts believe that the control authority needed comprehensive knowledge of a state's activity, but states needed a general degree of transparency in national programmes and the control authority as well. Without them suspicions would arise. This form of transparency reassures states that the control mechanism is functioning properly.

In the adopted international system, states and the IAEA were unable to exercise a great deal of transparency due to the competitive nature of the nuclear market. The development of transparency has been slow and arduous. The limits on transparency during the late 1970s and early 1980s led some states to question the IAEA's credibility. Although the nuclear industry has matured, it is still competitive because it is very weak. While states have increased their transparency since the developments in Iraq and the DPRK, the restrictions they continue to place on the Agency are extreme and not always generated by the need to protect a patent or pending deal. Change has been more successful in regional NWFZs which is not surprising since fewer players are involved in those transparency arrangements.

Non-possession of Nuclear Explosives

Baruch era analysts believed that a stable control system could only be sustained over the long term if all states renounced their rights to nuclear weapons and to PNEs. Due to the political environment, the established system permitted five states to temporarily retain their nuclear weapons while allowing the NNWSs to benefit from PNEs. The discrimination between states regarding the right to possess nuclear weapons and the differentiation in implementation of safeguards acted as a disincentive for states to join the regime, to cooperate with the Agency and to accept increases in safeguards burden when demanded by changes in the environment. By allowing EURATOM members a nuclear weapons option, states undermined the value of EURATOM control for its rivals and trade partners who were concerned that their exports were not misused.

While non-possession of nuclear weapons and PNEs is an accepted international norm, one can question whether some or all of the NWSs believe total disarmament is really possible. The frustration of the NNWSs on the slow progress of disarmament indicates that the two-tiered structure is unlikely to be indefinitely sustainable. Likewise, China's threats to build up its nuclear forces if the US proceeds with missile defence plan indicate how changes in international power balance can quickly trigger arms races so long as nuclear weapons remain in existence.

Universal and Permanent Participation in the Control Plan

The Baruch Plan was conceived as requiring that participation be universal and permanent. Those outside of a plan would alway pose a threat whether or not they had nuclear weapons. A withdrawal would signal intentions of nuclear weapons pursuit. These assumptions have never been questioned. The adopted system has been considerably strengthened as it has reached near universal membership. Common reasons that have been provided by states declining to join the international control system are that the system is discriminatory and has been ineffective in achieving disarmament.

The importance of permanent participation has been demonstrated by the DPRK's withdrawal which triggered an international crisis. In addition, although the NPT is seen as flawed, its indefinite extension has signalled that states view the system as integral to international stability.

This research underscores the "fear of withdrawal" problem. Such fears can create an international crisis and need to be addressed either before withdrawal occurs or before a concerned state take unilateral action. If a situation occurs where a state fears that another party to the control regime is planning to withdraw and this causes the commencement of high-profile unilateral activity to address the situation, a rivalry management problem in the system is indicated.

Equality

The initial studies of control in the early 1940s required that the system be applied equitably to all states. The great irony of this principle is that when the Baruch Plan was subsequently negotiated, the specifics of the Plan violated the principle of non-discrimination, which eroded the Baruch Plan's ability to provide warning and rivalry management. In the adopted system, the inequality between the NWSs and the NNWSs became one of the greatest factors undermining the system. Regional control arrangements have corrected the divide with EURATOM allowing all states to opt for a weapons programme while the NWFZs have chosen to ban them.

The NNWSs faced a difficult choice. They could accept belonging to an arrangement which has become the international norm, seems to provide some important services with regards to national security but which is also perceived as grossly unfair and places them in a vulnerable position *vis-a-vis* the NWSs. Otherwise, they faced economical and political isolation by staying out of the regime. All but four states, three of which have nuclear weapons, chose the former. While the attraction of access to technology played an important role in that decision, their endorsement of complete disarmament cannot be discounted. Inequality is unlikely to be sustained indefinitely.

The impact of inequity has often been given insufficient attention. The division between the NWSs and NNWSs not only affected rights to retain nuclear weapons, but the application and implementation of safeguards to the NWSs further emphasized the difference between the two groups. First, some NWSs are not willing to subject all of their civilian facilities to safeguards. Second, although some NWSs are fully subject to safeguards, they are not always fully applied. These situations continue to exist because states perceive that the costs to fully apply safeguards to the NWSs yields a benefit that may make the system somewhat more equitable, but does not contribute to non-proliferation or disarmament.

A lack of willingness to fund full coverage of civilian facilities in the NWSs exacerbates economic inequity and erodes support for the system. The NWSs fail to recognise that when all civilian facilities are fully safeguarded arguments against strengthening safeguards based on complaints of inequitable application are no longer tenable. The industrialised NNWSs fail to recognise that full application of safeguards to the NWSs will ensure that the NWSs understand the full impact of safeguards and consequently far less likely to propose strengthening the system unless they genuinely feel the new measures are a necessity.

II. Issues Outside of the Scope of the "Principles of Control"

The IAEA vs. States

While this study appears rather harsh on the IAEA, it is critical of the established system's structure and states' behaviour, not the Agency *per se.* It does not in any way dismiss the contribution safeguards has made to nuclear non-proliferation. The study attempted to identify the differences between the current system and one necessary for a NWFW. It also attempted to demonstrate the merits of a total control system. In all fairness to the Agency's safeguards system, it was never designed to implement control for a NWFW. Rather, its aim was to promote nuclear energy development so that peaceful energy production would take place in a framework that did not create highly destabilising situations. The long-term objectives under Atoms-for-Peace were for the control methods to serve as a model for disarmament, since at that time the proposers of the plan recognised that such an approach could not serve as an arrangement for total disarmament. This implies that the step-by-step disarmament approach may be stunted unless the standards of the basic control structure are increased.

The heart of the Agency's problem regarding safeguards lies not so much in its internal operations as many states believe but in the abuse it has received from Member States. Much of the dissatisfaction with the Agency has resulted from excessive expectations and demands from multitudes of masters. Although the criticisms of safeguards during the 1970s and 1980s were valid, the basis for those criticisms was the premise that the system should either prevent nuclear weapons acquisition or detect clandestine programmes. This could not be done with the tools allocated to the IAEA.

States desired a weak Agency, but for different reasons. In contemplating the future of nuclear control, it is necessary to consider the purpose behind control and

the likelihood of a commonality of interest among states in advancing control. Three primary purposes are often cited for control—non-proliferation, disarmament, and nuclear energy development. Non-proliferation, the prevention of additional nuclear weapons states, was the original motivation behind NWS promotion of control; disarmament of the NWSs and the prevention of NNWS neighbours from acquiring nuclear weapons was the motivation for industrialized NNWSs; and nuclear energy development motivated the rest. While these motivations are an over-simplification of the situation, they already indicate the difficulty in finding common ground. Extrapolating further, one can identify three classes of states possessing nuclear weapons, each with a unity of attitudes towards disarmament, proliferation, and nuclear energy and four classes of NNWSs, mainly differentiated by industrialization, but with much less unity in attitude, probably due to shifting nuclear aspirations. Each class has objectives regarding control and needs to be considered separately. These are not hard and fast subcategories as state evolution often brings transition.

The first subclass of states possessing nuclear weapons is the United States, the Soviet Union and to a lesser extent the United Kingdom. The United States and the United Kingdom developed the bomb to defeat the Axis Powers in World War II. The nascent Cold War led the United States to maintain a nuclear weapons capability 'to protect the free world' while the Soviet Union worked towards nuclear weapons with the avowed purpose of 'defending the global peace' against American hegemony. The key factor here is that these states were leading global military powers in 1945 and the United States and United Kingdom remain so in 2000. The Russian Federation is at risk of falling out of this category due to its continuing economic decline. These states developed nuclear weapon to project extra-territorial power in the context of NATO, the Commonwealth, the Warsaw Pact, and other defence treaties. They tended to view nuclear weapons as a necessary evil to carry out their 'national security' goals which included 'international obligations'. This implied that any disarmament plan would have to address those obligations and obviate their perceived need for nuclear weapons. These leading powers were worried about nuclear weapons in the hands of hostile states in the event of disarmament. Their defence to retain nuclear weapons carried overtones of xenophobia which is a hindrance to control and disarmament, but also reflected their lack of faith in international control. These states demonise challengers to the nuclear order as a way to eliminate perceived threats without appearing as bullies that are generated by those who do not cooperate with the established regime. It is difficult to imagine a control authority with the teeth to enforce compliance will not fulfill a similar function.

The second category of NWSs, France, China, and India, seek to ensure their world power status. As elucidated in Chapters 2-6, these countries had a markedly

different rationale for developing nuclear weapons than the superpowers. None were involved with winning a war, saddled with international responsibilities or had a compelling military reason for acquiring nuclear weapons. The acquisition circumstances indicated a need to prove that they were still great powers. France built nuclear weapons after suffering a series of military setbacks in the 1950s including the humiliation at Suez in 1956. Similarly, China built nuclear weapons after its split with the Soviet Union and war with India. After India's test of a nuclear weapon Prime Minister Shri Atal Bihari Vajpayee paid tribute in Parliament to Indian scientists, engineers and defence personnel "whose singular achievements have given us a renewed sense of national pride and self-confidence [...]"[2]. The leading powers have nuclear weapons because they are military powers; the second-tier nuclear powers are military powers because they have nuclear weapons.[3]

Consequences for disarmament are significant. The economic and technological capability of the second tier NWSs is limited in comparison with the superpowers, leading to a reliance on nuclear weapons as a cheaper (short-term) military capability. These states lead the group who made possession of nuclear weapons the be-all of international status. These second tier NWSs have demonstrated a similar attitude towards safeguards, with modifications for the different times and circumstances. An ongoing demand that the superpowers be subject to similar restrictions and a claimed economic disability are hallmarks of the group. Anti-nuclear activism in the second tier states is aimed primarily at the superpowers, as are disarmament discussions. The second tier states hold their positions with extreme tenacity. The general stance is that they will disarm when the superpowers do or maybe the day after. Superpower disarmament is a constant cause for the second tier states, but support of both safeguards and proliferation is muted.

Both of the above groups pose a challenge in that they like the benefits of having disarmed neighbours but also want to retain their nuclear weapons. The NWSs and India either saw other states' proliferation as a serious threat or turned to nuclear weapons to enhance their military capabilities. They enjoy the benefits of nuclear weapon possession but also enjoy having the rest of the world committed to remain disarmed. However, while doing so they fail to fully comprehend the effects of their

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[2] 'Suo Motu Statement by Prime Minister Shri Atal Bihari Vajpayee in Parliament,' 27 May 1998.

[3] For this reason, the Russian Federation appears to be transitioning to this group.

weapons ownership and vertical proliferation on the security and attitude of others.[4] As time passes, sustaining the divide will become increasingly difficult, and the stability of the NPT may be put at risk.

The remaining states with nuclear weapons follow a different pattern. This group represents those states who use nuclear weapons to address non-nuclear security threats. Israel uses nuclear deterrence to ensure state survival.[5] Pakistan also retains its weapons out of fear. They are more likely to use nuclear weapons than any other state. If a means to allay their fears is found, these are also liable to disarm faster, since they have smaller and less healthy economies than the other NWSs, and status is not really an issue. In the historical debate, their role has been small. While rejecting controls on themselves, they have been strong supporters of nuclear controls. To some extent, this use of nuclear weapons to meet general security threats contributed to the defeat of the Baruch Plan as the United States moved to nuclear deterrence against a reputedly superior Soviet conventional force. Russia also moved towards this strategy when its conventional forces fell apart. This defect will remain a hazard if a stringent control plan is established under a NWFW. The plan can only contribute to creating a norm against possessing nuclear weapons and once implemented, make possession more difficult, but none of its measures directly deal with this particular security driver to acquire a nuclear capability.

In the NNWS class, a group of non-nuclear-weapon industrial states with the military, economic, and technological capability to build nuclear weapons exist, including but not limited to Argentina, Australia, Belgium, Brazil, Canada, Germany, Japan, the Netherlands, South Africa and Sweden. These nuclear-weapons-capable states could build nuclear weapons but either chose not to or started and then stopped. NPT, NATO, Warsaw Pact, and UN agreements have limited NWS membership by mitigating the fear factor, but the end of the Cold War and resultant uncertainties could, as elucidated in the preceding chapters, cause one or more of these states to revisit their decision. Support for nuclear weapons in this group was based on fear. They paid lip service to disarmament during the Cold War as they benefitted from a superpower's protective shield at limited expense to themselves. The rising political costs of nuclear weapon deployment then led them towards support

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[4] Although India is not a NWS under the NPT, it too fails to acknowledge the impact of its vertical proliferation on Pakistan.

[5] This issue has been neglected and may need to be addressed under any serious attempts to establish a NWFW. For a discussion, see Richard Guthrie, "The Transition to a Nuclear-Weapon-Free World: A New Model for the Verification Framework", Preliminary Report prepared for the VERTIC Seminar, 15 May 1998.

of disarmament. These states have varied in their attitudes towards safeguards and control but, in general, they support strong controls to restrain proliferation but have not allocated the necessary money to the IAEA and the promotional fees to the third world or do not presently wish to. Often, they are colonial powers rather than post-colonial states and hence are more receptive to stronger controls, sovereignty infringements, and internationalism.

A second sub-class of the NNWSs is the "developing capability" states. These states are somewhat lacking in the military, technological, or economic sphere. The group includes states such as Egypt, Indonesia, Iran, Mexico, South Korea and pre-Gulf War Iraq. A number of these states are in Asia or are post-colonial. Government stability and border integrity are often issues for these states. Before developing nuclear weapons, China, India, and Pakistan fell into this category. These states may be rapidly advancing or declining economically. A key characteristic is that their political and social structures are in flux. This is the most proliferation prone group. They are likely to have an interest in a nuclear industry and national pride may lead to interest in a bomb. They could probably build a bomb under the current regime, although it would be a challenge economically.

These nations represent a significant challenge to any control regime. As former colonial or client states now enjoying their first real national success, they reject being pressured about what they cannot or should not do. Their status in the world is shifting and they are very sensitive to perceived slights. Historically, this group has often resisted safeguards, been in favour of superpower disarmament, and quite protective of their domestic industry. Control presents a large political problem for these states. The control concept and safeguards system were developed by Europeans and North Americans, their former colonial masters. This structure is currently perceived by post-colonial states as imposed on them from outside. From the developing capability state perspective, the internationalist safeguards system looks like colonial exploitation on an economic level. Sovereignty infringements are resented. If these states have any interest in control it is often because a regional rival has become a concern. Often new control measures are acceptable when they levelled the playing field. With their interests in nuclear energy development, these states are responsible for ensuring that promotion successfully competes with nuclear security derived from control. The ramifications for future control are that a situation must be structured where nations feel that they join the regime of their own free will and have an active voice in defining the regime. A change in their attitude that control is not an oppressive instrument of the west must also be attained before a stronger control system can be established.

The third group of NNWSs is usually lumped in with the second group or ignored. These are states that lack a great deal of the military, economic, and technological infrastructure for nuclear weapons but have sufficient remaining to have nuclear dreams. These nations are more likely to be non-democracies and more hostile to global economic powers. Since only a dictatorship can force such a pursuit without a strong external impetus, leading countries in this category are Libya, the DPRK, and Iraq. Most states in this category want to be bribed to accept safeguards with as big a bribe and as small a safeguards requirement as possible. These limited capability states are the horror stories of proliferation but the developing capability states actually present a higher risk.

The last group of NNWSs is worthy of consideration on historical and special status grounds. These are the non-nuclear weapons capable states, without the military, economic, or technological base to pursue nuclear weapons. This category includes numerous signatories of, or nations behind, establishing the NWFZs. Many islands are in this category and many countries with a far better view of the colonial powers than previous categories. They support safeguards and disarmament and provide a fundamentally moral voice in the debate.

In addition to the groups listed above, there exists a cross-section of states drawn from these groups that have a large stake in nuclear energy development and the protection thereof. Often, their nuclear industry is large, domestic lobbies for protecting nuclear energy industries are strong and/or economic development is a more immediate, if not critical issue, for state stability. In setting up the safeguards cost-benefit equation, these states frequently value nuclear industry development over nuclear security issues. They generally resist strengthening measures. If changes to the system are made, the safeguards price tag must remain the same or be reduced. For these states, controls increase in stature when a direct threat arises but fall by the wayside quickly when the threat recedes or an economic issue emerges to take precedence. The challenge posed by these states is that their economic motivations blind them to appreciating latent nuclear security threats and the level of concerns that other states may have regarding nuclear threats. They fail to realise that strengthening the technical aspects of the safeguards system from this point on will carry a higher price tag for a lower return as the remaining shortcomings of technical control are far more complex to deal with than establishing measures for the base features of the system.

For states in this group that are less well off, control often serves as a tool to extract development funds from the NWSs, which are aware of the discrimination in the current regime and need to provide compensation for political reasons, and from

advanced NNWSs that have higher sensitivities to proliferation threats. In addition, they exploit the NPT promotional commitments to keep control at bay by making safeguards costlier, by demanding that increases in safeguards spending must be matched by support for technical cooperation. In addition, an effective way to reduce safeguards is to under-fund the operations. Inspectors can't inspect if there are insufficient funds. If the NWSs or advanced proliferation-sensitive states want more control, they have to pay for it dearly. The approach reduces the flexibility of a control system to meet new threats and has no place in a disarming world.

States with strong industries also tend to weaken the effectiveness of the control system by abusing their right to protect commercial secrets. In the past, they preferred technological measures over human inspection as it formed part of a protection scheme against industrial espionage. These states failed to appreciate that inspectors play an important role in identifying indicators of evasion that would not be detected by technological means. These demands help keep outsiders in the dark regarding national activities.

The demands of the states for secrecy have complicated the Agency's ability to be transparent in safeguards operations, thus making it difficult for members to evaluate actual implementation procedures. Under the current system a state is left to rely solely on Agency judgement as specific information cannot be revealed. The nature of a rival's nuclear programme and the assessment of control authority effectiveness impact upon the perceived warning that the system can supply and affect the confidence that a government has in the system. When an operator or state official refuses to cooperate with inspectors, even on a nominal level, the members should be informed in which state the event occurred. No confidential information is being released when the IAEA names state X as missing its reporting requirements by an excessive period of time. States can then decide for themselves if there is a problem rather than have to completely second guess the control authority. The change would also reenforce the norm that states need to cooperate fully with the control authority. The implications for control are that better guidelines on what can be held secret and why are needed in place of the current "because I said so" approach. If the Agency abuses its authority, states need to be more proactive. For a state to claim the existence of spies while producing no evidence does not resolve the issue. Increasing individual, as well as state, liability may help ease the situation. Investment and increased cooperation with the Agency would be a better approach to dealing with confidentiality than just saying "no".

The broad range of motivations of states indicate that global nuclear control will require a highly stable international system to gain acceptance. With so many

states having different objectives and reacting to different faults within the system, their collective behaviour is prone to combine synergistically to block the support necessary for the general health of the system. An example of that synergy can be seen in the NNWSs sensitization to their different burdens from the NWSs. The divide discourages universality and support for strengthening measures. This reduces the ability of states to rely on the system and complicates efforts to disarm. This situation creates spin-off problems.

Trends in Control Development

The evidence suggests that the general trend in control development has been to move "back to the future". Baruch Plan supporters and today's NGOs deem that a maximalist system is needed to establish a NWFW. Although a minimalist system was adopted, the system has only very slowly been moving from this position. Yet rising numbers of states have found value in increased nuclear control. This has occurred in spite of the safeguards system not being intended as a global nuclear control system.

Although this trend has been consistently resisted by governments, states over the past three decades have tinkered with the system to accord the IAEA more authority and increase its ability to apply controls. As control plans were investigated, the belief remained that under an authority with sufficient scope, transparency and power, control was possible. The analysts, particularly the academic analysts, consistently identified the same framework elements or features as needed for effective control. The basic principles still hold and can be seen as objectives for implementation whenever windows of opportunity arise for strengthening the existing system.

As states have accepted some infringements on sovereignty, the door has been slightly opened to Agency Secretariat implementation of some changes. The increased value placed on safeguards has elevated Agency influence compared to its initial status. The need for stronger assurances has given the Agency more legitimacy. In the negotiations of the Model Protocol, the IAEA became notably more vocal in advocating items necessary to meet IAEA obligations than ever before in the history of safeguards negotiations. There are a several possible explanations for this change. The IAEA was a more mature organisation. It could not afford to argue that the system did not have serious problems. Also, the more outspoken approach may have been a function of Agency leadership and of the circumstances that opened the

discussion on strengthened safeguards which made it apparent to all that a significant change was needed.

How long and how far this supportive trend will continue is difficult to predict. The environment is far from allowing the creation of a strong control organ. The current window of opportunity opened by the events in Iraq and the DPRK appears to have closed. During the Model Protocol's negotiation, there were certainly moments of "forward to the past" when protectionist shadows rose again.

Review of the Current Situation

In spite of 50 years of evolution in the safeguards system, state insistence on a minimalist rather than maximalist approach has left a minority of states with unfulfilled needs. The current system based on the NPT is tenuous, with NNWS patience running thin. It is difficult to conceive of a 50th anniversary of the NPT without significant progress in fulfilling Article VI. An absence of significant progress the system risks collapse in the form of withdrawal.

Despite recent strengthening of the safeguards system, assurances that would inspire confidence are absent. Accusations are still rife regarding the existence of clandestine programmes, yet they are not being formally submitted to the IAEA, indicating a lack of trust in the Agency's ability to resolve the problem. In addition, states have been very slow to adopt the Additional Protocol and it is unclear whether it is sufficient to address state suspicions. Early academic evaluations suggest that while the new measures are important improvements, they fall short of fully addressing clandestine threats. It appears that no state is willing to make the sacrifices needed to establish global non-nuclear security. The NWSs, industrial states and developing states all resist controls for individual reasons and it would appear that further development in the control necessary for disarmament is blocked for the foreseeable future.

The system is condemned by the lack of financial support. Safeguards may have been designed for strategic threats, but states do not considered them worthy of the support given to most other mechanisms that make up national defence budgets. At present, the system is being sapped by state stinginess. Safeguards for many states are no longer a top priority since the Iraqi and DPRK crises have muted. No public entity can annually absorb new responsibilities that cost thousands if not millions of dollars without a corresponding increase in funding. When an organisation reaches the point that meeting payrolls are at risk, common sense indicates that corners are

being cut. Additional benefit from newly adopted measures is watered down by the ongoing financial crisis in the IAEA. There is no support for significantly increased safeguards funding despite efforts by the Director General to point out to the IAEA's members that funding is insufficient especially in view of expectations that the Agency should take on new duties under a trilateral agreement to safeguard excess fissile material from dismantled nuclear weapons.

In defence of Member States, however, the nuclear non-proliferation regime contains a significant number of elements that discourage support. *Inter alia*, it is inequitable, has not managed critical nuclear rivalries, has not yielded nuclear disarmament and suffers from the inability to resolve enforcement issues. An improved system that addresses the above has a better chance to garner support than the present system.

An Example of Governance

Conceptually, this report has been a story about geo-governance. States began the process of establishing geo-governance by setting up the IAEA and NPT. However as noted by Sir Shridath Ramphal, "[...] reforming the global order is only partly a matter of institutional reform; more fundamentally, it involves learning to live by neighbourhood values - not just changing structures of governance but changing ourselves".[6]

As peoples and institutions are increasingly active in advancing various political economic, social, cultural and environmental objectives, some of their agendas are not mutually compatible.[7] In the case of nuclear energy, promoting and controlling nuclear energy are not well suited to cohabitation. While the proponents of governance note that nation-states must adjust to the appearance of such institutions and take advantage of their capabilities[8], in the case of nuclear energy, the willingness to change has been forced out of fear, instability, necessity and conflict. The views on the system have a broad range. On one extreme, parties dealing with nuclear insecurity think like Acheson and Lilienthal, while on the other, parties not feeling

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[6] Sir Shridath Ramphal, *Global Governance*, Global Security Programme, Cambridge, 5 June 1995.

[7] *Our Global Neighbourhood*, Report of the Commission on Global Governance, United Nations, New York, 1995, p. 4.

[8] *Ibid.*, p. 4.

threatened see control as non-essential or a necessary evil. States have sought to identify the lowest level of control possible that they felt they can live with. Often, the levels they set were too low and had to be adjusted. The understanding of the mechanics to create and sustain a stable NWFW exists, but the courage, willingness to make the sacrifices and vision by the world's leadership does not.

Implications of the Research

The implications of the thesis are relevant for the current efforts to work towards the establishment of a NWFW. Parties advocating the establishment of a NWFW need to recognise that nuclear disarmament requires the cooperation of more than just those states with nuclear weapons. Each state has a different set of security requirements with regards to nuclear weapon issues. If the NWSs are to disarm, they need to perceive that the mechanism to replace their nuclear forces will be as effective in resolving nuclear threats as the one they give up.[9] In this context, nuclear rivalry management aspects will be central.

Those states which have signed up to the NPT as NNWSs may not find their nuclear security situation ideal and thus have sought nuclear security assurances from the NWSs. However, many have signed on because the NPT approach is preferable to living in a world where all states are free to acquire nuclear weapons. Those NWSs which have a low threshold in tolerating security threats may use nuclear weapons not only as deterrence against threats from other nuclear powers, but also against states which they believe may be pursuing clandestine programmes. If for any reason a NWS genuinely believes that a rival subject to control can or is pursuing a clandestine programme, then that state will not disarm. If the system cannot resolve the concern, the international community needs to become more active in the problem and ultimately amend the system so that such a situation does not reoccur. If this situation persists, then one can draw the conclusion that the control system in place will be ineffective in achieving total disarmament.

Reductions may take place among nuclear powers, but getting to zero will involve commitments beyond existing safeguards from the NNWSs for the application of additional controls. In a NWFW, the nuclear control system would become the primary defence against a nuclear weapons breakout. The needs of those who feel vulnerable must be addressed to keep the system stable. Verification for them must

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[9] This is a basic concept of arms control theory. See for example Donald G. Brennen, "Setting and Goals of Arms Control", in *Arms Control, Disarmament, and National Security*, Donald G. Brennan, ed., George Braziller, New York, 1961, p. 37.

be highly effective and must meet the principles of control. Thus, setting up a NWFW will require a different structure than that which is administered under the IAEA.

States need to reevaluate what is politically feasible. In all likelihood a new structure will need to supercede the current non-proliferation framework. It may resemble the current system in many aspects but changes will be required. Flexibility will be key to establishing a framework that is successful. While accommodating the views of many states will naturally promote a system that suits the norm as opposed to those most threatened, the system's stability will be a function of the weakest link. In the case of control, the weakest link is the state which has the least amount of faith that the system is credible. A lack of faith can yield a breakout, pre-emptive action against a perceived violator or a failure to join.

In order to sustain a NWFW, the control system cannot be held hostage to development or be based on a minimalist approach. Aid, promotion and avoidance of inconvenience need to be placed in a proper perspective. The regime as it currently stands promotes a dynamic that global arms control must be sold through aid and technology transfers, if universality is to be achieved. As the Baruch Plan was conceived with the idea that economic benefits could only be derived from nuclear development after security questions were addressed, the economic factors challenging control would have been regulated so that the "tail wagging the dog" situation did not arise. As disarmament proceeds, states need to relinquish this mentality. When the system functions properly, it can open doors for cooperation to flow freely.

Control for a NWFW requires a strong organisation, not one torn by competition. No state bases their defence system on the premise of a penny for defence – a penny for foreign aid. Rather, the budget is based on national need. If a control system is to provide a first line of defence against nuclear weapons, it must be accorded the necessary resources to function as such. Funding will be critical as to enable the control authority to keep up with technical developments. When a defence assessment indicates that a problem lies on the horizon, the state takes action often in the form of a defence budget increase and the institution of new control approaches or methods. So must it be with a control system, and it explains why flexibility was seen as necessary by the generation of 1946. The challenge however, is that nuclear controls by nature are highly structured and not particularly flexible. Responses need to be programmed into the system. This required rigidity means that an economic free-fall such as that suffered by Russia in the 1990s will necessarily damage control. System stresses, such as border and ethnic wars, must be resolved before a system is self-supporting. This requires a level of national maturity that exists among only a

minority of states. Time and effort will be needed for practical solutions, which are far more complex and far-reaching than simple nuclear control.

As with all arms control agreements, the system must be made sufficiently strong for those states with the greatest insecurities to view the plan as a better option than nuclear weapons deterrence. While fears that such international organisations can be exploited by rivals are legitimate, systems where control is weak are less likely to be accepted or trusted. The rigour of the system must correspond to the threat. In the nuclear case, weak systems which implement control when states disarm are inherently less stable, are more likely to have difficulties in providing assurances which inspire trust and are more prone to collapse when tensions arise. The question states need to ask is – which risk is less acceptable, loss of an industrial edge or the prospect of forever facing nuclear armed states? Making states more accountable if their inspectors are caught abusing their inspection rights may be worth investigating.

States may need to also be held more accountable with regards to their cooperation with the control authority. One can imagine a version of a safeguards implementation report that evaluates state implementation as opposed to Agency implementation. No industrial secrets need to be revealed. Rather, basic statistic showing, for example, to what extent states report on time can provide additional assurances as well as establish norms on the expected level of state cooperation with the control authority.

Nuclear activities need to be conducted according to norms. However, bringing industry under a plan that increases not only access but a control authority or international community voice in issues associated with the design and operation of sensitive production plants, stockpile management and national programme structures will be an obstacle to establishing any system suitable for disarmament. A question also remains regarding states with very large programmes already in place that may operate production lines for nuclear weapons material or possess significant material stockpiles.

If serious attempts are made to establish a NWFW, negotiators will likely need to revisit the principle of "security in collapse". Of all the principles, it is perhaps the most shunned when proposing measures, but it is nevertheless recognised as playing a very important role in a NWFW control scheme. Without more effective procedures or mechanisms to handle a potential Iraq or DPRK. World reaction to critical nuclear events does not inspire confidence. One needs to look to the international community's overall reaction to the PNE test of India, the subsequent weapons tests

by India and Pakistan 20 years later, and the unresolved compliance situations in Iraq and the DPRK to appreciate why it does not inspire confidence.

The study also underscores the paradoxical nature of control. Low restraints are needed for universality but high ones are needed to effectuate disarmament and to stabilise the system. The challenge faced in moving towards a NWFW will be to change state attitudes towards international organisations. The quote by Robert Oppenheimer in Chapter One still rings true. If states do not change their behaviour, they will suffer the consequences of living in a world overshadowed by nuclear war. The very sound structure that was deemed necessary to sustain a disarmed world requires that states do things differently. It demands the establishment of a different international structure to that currently existing and implies the need for states to accept a globalist approach. Control also requires an acceptance by states that nuclear energy is not like other commodities, but has high security costs attached. Finally, it demands economic sacrifice on nuclear energy operations and political sacrifices of sovereignty beyond what has been achieved at this time.

While the requirements for the international environment and political will to implement control seemingly relegate the possibilities of setting up a strong control system to a utopian dream, the eventuality of control should not be dismissed as a long-term possibility. The initial UNAEC negotiations may have failed, but the plan was not so far fetched that a respectable number of states were unwilling to seriously consider the approach as a viable approach to the nuclear question. While the plan was not adopted as a whole, elements of it have crept in over time. Attitudes do and have changed.

Are their alternatives to international control? No nuclear power may be one, but it will still require some time of framework. Although nuclear energy losing its popularity, this is unlikely without new development in energy resources. Another option is to continue as we are. Frustration is growing and NPT with it two-tier state relations looks unlikely to hold in the long-term. A world with nuclear weapons is normatively unpopular and there exists the ever present risk of that the weapons will be used.

Implications for the Present Situation

Unfortunately, the globalist approach is a non-starter in the current environment. A troubled United Nations has not served as an inspirational model that would lend states to engage in further experimentation with large supranational

organisations. The outlook for the near or medium future is dim. There is little to suggest that there will be significant changes in the organisation of nuclear control in the near future. Most changes have been slow and evolutionary except when the occasional major crisis occurs.

History has demonstrated that states learn to relinquish sovereignty for control benefits the hard way. Although some would correctly argue that there are some initiatives for establishing control measures that were motivated by economic interests, there is little doubt that the driving force behind many major developments in the safeguards system has been security. Updating early safeguards guidelines, extending the scope of safeguards to all nuclear activities and empowering the Agency to confirm the absence of undeclared programmes under the Additional Protocol were all driven at least partly by security concerns. However, sensitivity runs in peaks and troughs. The Iraqi and DPRK crises are classic examples of how initiatives are damped when the necessary measures are translated into legal text.

Significant future changes are likely to be even more difficult. Previously, alterations have involved technical change to address major system gaps rather than small nuances. Further strengthening of control requires conceptual shifts. They could take the form of the integrating physical protection into the safeguards system, extending rights of inspection for clandestine programmes beyond what is permitted under the Model Protocol, establishing international plutonium management under the auspices of the IAEA, etc. These types of measures would entail further infringements upon sovereignty and are unlikely to be embraced without a change in the way governments view controls. The requirements to achieve effective control, as set out in the Acheson-Baruch era and validated in this study, are not what states want to hear. It is a problem that will not find a final solution at the national level. It is a global problem requiring an unprecedented level of global cooperation.

Since the possibilities of a strong control system seem highly remote, one may ask if the principles of control have any relevance in today's circumstances. It is the opinion of this author that the principles are highly relevant. The logic of the analysts of the Acheson-Baruch era for choosing the approach that they did was sound. In formulating the principles, these experts asked what encourages a state to join and remain in a nuclear control system and what drives it out. They have provided a set of questions that can be asked when today's analysts seek to improve the control system. These questions may not lead to answers that are fully achievable, but they do point to root problems that destabilise control systems. By understanding the dynamics of control, one can comprehend the very intricate relationship among the elements that form a control plan functioning as a security mechanism.

The work underscores the very strong interdependency of all of the identified elements of control. For example, a lack of disarmament discourages universality and support for strong controls. A lack of strong controls and universality discourages disarmament. In many respects, they present a black and white world with very limited shades of grey. Baruchian analysts never viewed nuclear control as just a technical exercise as a subsequent generation viewed the safeguards system. The control functioned like a chain. The system is only as strong as its weakest element. The state most highly driven to acquire a nuclear capability, whether it is through by-passing control, not joining control or responding to the fear that a rival is by-passing control, can break the system.

As the NWSs take small steps towards disarmament, each step further down the road will become increasingly difficult without a proper international framework. The step-by-step process can successfully lead to disarmament providing states start to consider that control will need to be strengthened as the NWSs start relying more on control and less on nuclear deterrence. With each reduction and other arms control agreement, progress will become increasingly difficult. The current non-proliferation regime is not structured to address some of the more complex issues that arise as one approaches a NWFW. The implications are that step-by-step muddling will only go so far before the process will break down.

The results of this research are not likely to find support among governments or by the IAEA. States are too focussed on other priorities to make the necessary sacrifices to achieve control, and the IAEA , in its very tenuous political position, must tread delicately when criticising state behaviour. As states appear to significantly increase their level of cooperation only when crises are imminent, one is left to ponder the level of crisis necessary for states to change their ways so that the nuclear issue can be finally resolved.

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