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ABSTRACT

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THE PRINCIPLES OF NUCLEAR CONTROL

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This thesis develops the principles of nuclear control which are derived from control models initially developed in the 1940s, namely, *The Acheson-Lilienthal Report*, and the Baruch Plan. Authors of these works aspired to create a grand disarmament scheme establishing an international authority to manage nuclear energy and to prevent states from diverting nuclear energy production to nuclear weapon development. They identified principles, which they believed needed to be incorporated in any nuclear control plan, if the plan was to be effective in promoting international security and stability.

The thesis then examines control models that were actually established and explores how they diverged from the suggested principles identified previously. In protecting states' economic and political sovereignty, a series of compromises were made on meeting principles of control. Political realities forced states to settle on a national inspection system (the International Atomic Energy Agency Safeguards System) which sought to detect the diversion of nuclear materials from peaceful uses to nuclear weapons. This type system was initially considered by analysts of the Baruch era but was emphatically rejected as having weaknesses that would undermine the system's effectiveness. Although decision makers were aware of the damage that compromises on the principles could have on the control system's effectiveness, they believed some imperfect control system was better than none at all.

The thesis shows that departures of the established model from the earlier model weakened control system effectiveness as predicted by Baruch era analysts. This less rigourous adopted approach achieved broad international acceptability, but could not provide sufficient assurances to all parties. As a consequence, some governments took unilateral action to enhance their security in the face of inadequate controls and/or engaged in efforts to strengthen the system. The mechanisms they created incorporated some of the basic nuclear control principles originally identified a half-century earlier but were rejected on political grounds.

The thesis sheds light on the difficulties in implementing control and the relevance of these implementation problems for disarmament. It highlights the struggle between states' desires for more credible systems requiring greater sacrifices on national sovereignty and a need for broad adherence to international control demanding less intrusiveness and wider benefits. The thesis reveals a long-term trend that states appear more willing to accept international control measures as globalisation occurs and concludes that the control system is evolving towards incorporating the principles identified in the 1940s that were not included in the established system.

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Volume I:

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ABBREVIATIONS

ABACC	Brazilian - Argentine Agency for Accounting and Control of Nuclear Materials
ACA	Armaments Control Agency
ACDA	(United States) Arms Control and Disarmament Agency
ADA	Atomic Development Authority
ARIE	Actual Routine Inspection Effort
ASTEC	Australian Science and Technology Council
BOG	Board of Governors
BWR	Boiling Water Reactor
CANDU	Canada Deuterium Uranium Reactor
CAS	Committee on Assurances of Supply
CDT	Combined Development Trust
CMD	Command Paper (UK)
COCOM	Coordinating Committee on Multilateral Export Controls
CPNA	College Park National Archives, Maryland, United States
CRS	Congressional Research Service
DDG	Deputy Director General
DPRK	Democratic Peoples' Republican of Korea
DU	Depleted Uranium
EEC	European economic Community
ECSC	European Coal and Steel Community
EDC	European Defence Community
EMIS	Electromagnetic Isotope Separation
ENEA	European Nuclear Energy Agency
EURATOM	European Atomic Energy Agency
FRG	Federal Republic of Germany
GAO	General Accounting Office
GDR	German Democratic Republic
GWU	George Washington University National Security Archives
HEU	Highly Enriched Uranium
HMSO	Her Majesty's Stationary Office
HWR	Heavy Water Reactor
IAEA	International Atomic Energy Agency
ICC	International Control Commission
IDA	International Development Authority
INFCE	International Fuel Cycle Evaluation
INFCIRC	Information Circular
IPPNW	International Program for the Prevention of Nuclear War
IPS	International Plutonium Storage
LASCAR	Large Scale Reprocessing
LEU	Low Enriched Uranium
LOF	Location Off-Site
LWR	Light Water Reactor
MBA	Material Balance Area
MLF	Multilateral Force
MOX	Mixed-Oxide
MNFC	Multinational Fuel Cycle Facility

MRIE	Maximum Routine Inspection Effort
MTR	Materials Test Reactor
MUF	Material Unaccounted For
NAM	Non-Aligned Movement
NEA	Nuclear Energy Agency
NNPA	Nuclear Non-Proliferation Act
NNWS	Non-Nuclear Weapon States
NPT	Non Proliferation Treaty
NRC	Nuclear Regulatory Commission
NSG	Nuclear Suppliers Group
NWFW	Nuclear-Weapon-Free World
NWFZ	Nuclear-Weapon-Free Zone
NNWS	Non-Nuclear Weapon State
NWS	Nuclear Weapon States
OEEC	Organization for European Economic Cooperation
OLR	On-Load Refueled Reactor
OMV	Ongoing Monitoring and Verification
OPCW	Organisation for the Prohibition of Chemical Weapons
PLARIE	Planned Actual Routine Inspection Effort
PNE	Peaceful Nuclear Explosion
PPNN	Programme for Promoting Nuclear Non-Proliferation
PRO	Public Records Office, London, United Kingdom
PSP	Particular Safeguards Provisions
Pu	Plutonium
PWR	Pressurised Water Reactor
R&D	Research and Development
RRCA	Research Reactors and Critical Assemblies
ROK	Republican of Korea
SAGSI	Standing Advisory Group on Safeguards Implementation
SIPRI	Stockholm International Peace Research Institute
SIR	Safeguards Implementation Report
SQ	Significant Quantity
SSAC	State System of Accounting and Control
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
UNAEC	United Nations Atomic Energy Commission
UNGA	United Nations General Assembly
UNMOVIC	United Nations Monitoring, Verification and Inspection Commission
UNSC	United Nations Security Council
UNSCOM	United Nations Special Commission on Iraq
US	United States
USAEC	United States Atomic Energy Commission
USGPO	United States Government Printing Office
USSR	Union of the Soviet Socialist Republics
VVER	Russian Pressurized Water Reactor
WEU	Western European Union
WMD	Weapons of Mass Destruction

INTRODUCTION

Robert J. Oppenheimer once stated, "Control of atomic energy would either alter in a most profound way the present relations between powers, or it [control] would not be possible."[1] The creators of the atomic bomb recognised that there was an imperative to control the development, production and use of nuclear energy; otherwise nuclear weapons might eventually destroy life on earth. Establishing a broad control mechanism proved an elusive goal, however. Although some changes in relations between states did occur in respect of nuclear issues, motivation for the establishment of genuine international control was lacking. As a result, nuclear threats to security have remained a problem.

This study aims to identify, conceptually develop and analyse the principles of nuclear control and the framework necessary for their implementation in the context of a world free of nuclear weapons, and, in the interim, of policies to limit the proliferation of nuclear weapons. First, it will clarify what these principles were, why and how they were identified, and how they have been viewed over time. The study will address which principles were implemented and why. Second, it will identify the contexts and/or factors that influenced implementation transformations, and illuminate the dynamics of state interactions with nuclear control systems. Third, the study will demonstrate that *ad hoc* efforts to strengthen the safeguards system have re-introduced some principles previously identified as critical for providing effective control and security. Finally, it will identify which elements of a control system applicable to a nuclear-weapon-free world are already in place, and which would still need to be developed.

This discussion of the evolution of nuclear control, in the context of IAEA safeguards and the prospects for a NWFW, also has considerable resonance for the debate between neoliberalism and neorealism. Although this thesis does not specifically attempt a systematic theoretical analysis of these two positions, the principal assumptions that underlie them are relevant in providing a conceptual context for this study.[2]

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[1] College Park National Archives, United States Atomic Energy Commission, Records relating to Atomic Energy Matters 1944-1952 (hereafter referred to as CPNA USAEC, 1944-1952), Robert Oppenheimer to Professor Lincoln Gordon, Graduate School of Business Administration, Harvard University, 21 April 1947.

[2] For a useful overview of the assumptions see David A. Baldwin, *Neorealism and Neoliberalism: The Contemporary Debate*, Colombia University Press, New York, 1993.

David Baldwin has characterised the debate between neoliberalism and neorealism in terms of six focal points. The first concerns the nature and consequences of anarchy, and whether the absence of government at the international level leads states to seek their survival primarily through unilateral or multilateral means. Whereas neorealism assumes that the condition of international anarchy determines that states will seek their own means for security, neoliberalism, in contrast, places greater emphasis on international interdependence and the possibilities for mitigating anarchy by establishing international regimes.[3] This underscores one of the central aspects of this study concerning the measures states have pursued in the context of nuclear control.

The second point concerns the differences between the two positions on international cooperation. While both theories accept that international cooperation is possible, neoliberalism considers that the prospects for such cooperation are easier and more likely than does neorealism.[4]

A third point relates to the emphasis each position adopts on relative versus absolute gains. The implications of this for this thesis on the evolution of nuclear control are profound. Although the distinction between absolute and relative gains may not be as clear-cut as sometimes suggested, there is a potentially significant difference between neoliberalism and neorealism on the question of who gains the most where security matters are concerned. Stemming from the assumption about the possibilities for international cooperation, neoliberalism stresses the absolute gains to be made from engaging in multilateral institutions for the purposes of pursuing common interests. In contrast to the emphasis neoliberalism places on the mutual gains deriving from cooperation, neorealism asserts that states seeking security will be more concerned about relative gains: that is, whether one state will gain more from nuclear control than any plausible alternative.[5]

Neoliberalism and neorealism also differ on the priority they assign to state goals relating to economic and security matters. Baldwin observes that writers on neoliberalism tend to study political economy, where the assumption of cooperation and the ease with which it is established may be more pronounced. Neorealists such as Joseph M. Grieco, in contrast, tend to study security issues and consider that the

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[3] David A. Baldwin, "Neoliberalism, Neorealism, and World Politics", in Baldwin, *op. cit.*, pp. 4-5.

[4] *Ibid.*, pp. 4-5.

[5] *Ibid.*, pp. 5-6.

condition of anarchy leads states to focus on relative power and the search for survival.[6]

Another potentially important difference is reflected in Baldwin's fifth focal point relating to intentions versus capabilities. Neorealism places greater emphasis on the capabilities possessed by states and their distribution within the international arena, as there are likely to be many uncertainties about future intentions.[7]

This focus on capabilities, while also important in many neoliberal institutionalist accounts, is tempered by the latter's view that the development of international regimes can provide a plausible means for adjudicating on the future intentions of states because of the common interests in pursuing absolute gains. This aspect also reflects on the final focal point of difference between the two positions. Whereas many neorealist accounts acknowledge the existence of international regimes, they differ over their significance and whether these regimes are capable of constraining the behaviour of states in the condition of anarchy, especially the most powerful ones. As Baldwin indicates, neorealists such as Grieco consider that the neoliberals, "exaggerate the extent to which institutions are able to 'mitigate anarchy's constraining effects on inter-state cooperation.'"[8]

Granted the relevance of these elements of international relations theory as a context for this study, the first chapter presents early thinking on the ramifications of the discovery of nuclear energy. Experts at the time agreed that the impact of nuclear weapons upon international relations was a unique phenomena with very serious security implications. They concluded, therefore, that nuclear energy needed to be controlled. They immediately set up interim control mechanisms employing secrecy and materials monopoly. Meanwhile, they investigated the modalities of control, paying special attention to those aspects of nuclear energy production requiring control. They also attempted to identify control requirements that would ensure that their security needs would be effectively met and postulated some crude models.

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[6] *Ibid.*, p. 7.

[7] *Idem.*

[8] *Ibid.*, p. 8.

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The chapter then investigates the debate triggered by the release of a US government report, *The Acheson-Lilienthal Report*. The analysts found that nuclear weapons created conditions requiring specific actions on the part of states to avoid an arms race. The approach was expressed as a set of principles and a framework for an international control plan that would be effective in meeting global nuclear threats. The chapter also reviews a model that was originally rejected, which was similar to the actual control system extant today. This model was rejected because it did not fully address nuclear threats. The chapter concludes with examining control plan negotiations and their failure. Finally, the historical assumptions underlying the proposed control model are evaluated.

The study then proceeds to an analysis of the global and regional control systems established a decade later. The thesis demonstrates that by failing to establish the original grand design, anticipated shortcomings in the alternative models slowly became evident. By comparing the structures, objectives, principles and functions of the adopted and rejected systems, the dynamics of how individual features sustain or undermine the control regime's ability to meet security needs and expectations are elucidated.

Chapters two and three track the development of a limited global control model known as the International Atomic Energy Agency (IAEA) safeguards system. Compromise on principles was necessary for implementation. Analysts were concerned about the damaging effects of such compromises on control capabilities. Even in its infancy, experts sought to strengthen the minimalist system because some critical security concerns were not being met. Those efforts espoused the re-introduction of some control principles and their associated framework.

Chapter four examines other attempts to establish nuclear control systems. The chapter notes how regional control negotiators identified concepts reflecting the principles of control as desirable for efficacy. However, they also encountered difficulties similar to the 1940s experience in implementing principles of control in regional agreements.

Chapter five examines the adopted control system, the IAEA safeguards system as applied under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), in its maturity (1970-1990). The chapter identifies 19 different problem types predicted by the Acheson-Lilienthal Commission that can be linked to compromises made on the principles.

Chapter six examines unilateral, multilateral, and international efforts to address the problems identified in Chapter five, detailing the attempts to re-incorporate those principles of control absent in the adopted model.

The thesis concludes that the 1940's principles and framework formed the basis for an effective nuclear control system in a disarmed world. It deduces that the minimalist adopted system is being incrementally reformulated to incorporate principles and structural features integral to the 1940's model. The greatest impediment to that reformulation is the unwillingness of states to place global interests in nuclear threat reduction above national sovereignty. However, a gradual trend indicates that as globalisation proceeds and nuclear energy use matures, states appear more willing to accept international control measures.

This dissertation draws on many previous safeguards studies. It builds upon the work of Mark Imber, whose Ph.D. Thesis[9] employs the IAEA safeguards system as a case study in the consideration of functionalism.[10] He equates the principles with a functionalist approach. While Imber demonstrated the validity of the functionalist approach by using IAEA safeguards as a case study, this study will demonstrate how and why a particular framework, which is fundamentalist in nature, is appropriate for effective nuclear control and why other alternatives may fail.

It also builds on the numerous works of Lawrence Scheinman[11], who has examined structural problems in the IAEA safeguards system, and some classic works

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[9] Mark F. Imber, *Mitrany's Functionalism, The International Atomic Energy Agency, and the Development of Safeguards against the Proliferation of Nuclear Weapons 1945 –1975*, Doctoral Thesis, University of Southampton, Southampton, 1981.

[10] Functionalism refers to breaking down systems by functions rather than structures. In applying it to governance, supporters of the approach argue that it is possible to identify responsibilities of the national government that can be more efficiently organised through inter-governmental cooperation. For a discussion see Imber, *op. cit.*, p. 34.

[11] For his most extensive work on safeguards see Lawrence Scheinman, *The International Atomic Energy Agency and World Nuclear Order*, Resources for the Future, Washington DC, 1987.

on the history of the IAEA safeguards system. Benjamin Sanders' *Safeguards Against Nuclear Proliferation*[12] and David Fischer and Paul Szasz's *Safeguarding the Atom: A Critical Appraisal*[13] provide legal interpretations of the IAEA safeguards systems. Allan McKnight's *Atomic Safeguards*[14] and Darryl Howlett's *EURATOM and Nuclear Safeguards*[15] provide insights into early negotiations on the IAEA and the EURATOM regional safeguards system, respectively. Finally, David Fischer's recent work *History of the International Atomic Energy Agency: The First Forty Years*[16] provides a wealth of historical material.

By understanding the dynamics of nuclear control, greater insights into a continuing international problem can be gained, especially regarding how the nuclear security concerns of states can be resolved. This problem is critical in the current environment since nuclear disarmament is predicated on such a solution. Identifying the principles behind effective nuclear control will reveal nuclear threat dynamics and the management thereof. The work therefore aims to elucidate the requirements for a control system to sustain a nuclear-weapon-free-world.

Throughout the work, the dilemmas regarding the control of nuclear energy are spotlighted. States struggle to balance nuclear security threats against economic development. The extent to which states should sacrifice political and economic sovereignty for the management of nuclear threats remains a continuing issue.

As the thesis tracks the historical debate, it will become evident how perceptions of the global nuclear security environment influence how nuclear threats are evaluated. Support for strong controls tends to be crisis driven. Minimalist approaches remain desirable for states unless circumstances force a more elaborate system. As nuclear threats arose, the system evolved towards a maximalist

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[12] Benjamin Sanders, *Safeguards Against Nuclear Proliferation*, Stockholm International Peace Research Institute (SIPRI) Monograph, The MIT Press, London, 1975.

[13] David Fischer and Paul Szasz, *Safeguarding the Atom: A Critical Appraisal*, Taylor & Francis, London, 1985.

[14] Allan McKnight, *Atomic Safeguards*, United Nations Institute for Training and Research, New York, 1971.

[15] Darryl Howlett, *EURATOM and Nuclear Safeguards*, The Macmillan Press, Ltd., London, 1990.

[16] David Fischer, *History of the International Atomic Energy Agency: The First Forty Years*, International Atomic Energy Agency, Vienna, 1997.

approach. Nevertheless, no fundamental conceptual shift in the view of control has occurred. Nuclear control history reveals resistance to a solution based on geo-governance in spite of the insufficient efficacy of current controls for a percentage of the international community.[17] Since states have been unable to "change the way they do things", Oppenheimer's observation that control would not be possible is vindicated.

At this point, a note on the early debates on nuclear control and resources used for this study is needed. Sources used for early discussions on nuclear control are primarily American and British. The United States led nuclear weapons development and was forced to confront nuclear management issues earlier than other countries. Having a superpower status, the United States played a leading role in control debates. International views have become more pronounced as other countries engaged in nuclear energy production and subsequently took an interest in global nuclear energy issues.

The author uses the term "control" to mean to rule, manage or have power over.[18] A control system can be viewed as measures comprising two elements -- observant supervision and corrective effectuation. On a practical level, this includes an independent organisation administering information collection based on data submission, data verification, enforcement measures and on-the-spot controls.[19] A "nuclear control" system refers to a situation where designated organisations are accorded such rights over national nuclear energy programs. The term "safeguards" refers to measures to verify that nuclear energy and materials are employed for peaceful purposes. A safeguards system can be categorised as a particular control system.

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[17] For more on geo-governance see Chris Brown, *Understanding International Relations*, Macmillan, London, 1997, p. 84.

[18] *Webster's New Collegiate Dictionary*, G. & C. Merriam Company, Springfield, p. 247.

[19] Hugo J. Hann, "Control Under the EURATOM Compact", *The American Journal of Comparative Law*, Vol. 7, No. 1, 1958, pp. 26-27.

CHAPTER I DEVELOPING PRINCIPLES FOR NUCLEAR CONTROL

This chapter will focus on the evolution of nuclear control thinking and the identification of a set of principles and framework for establishing effective nuclear control. The period between 1939 and 1950, which is addressed in this chapter, can be divided into three phases. Initially, scientists and policymakers grappled with the political implications of nuclear weapons and reached the conclusion that international control of nuclear energy was essential to global stability. Meanwhile they set up an *ad hoc* control system based on secrecy and a production monopoly. During the second phase, experts explored modalities for an international control system. The third phase witnessed the creation of a control structure thought to be the most viable threat management approach.

I. Phase I - Emergence of a Threat and Need for Control

The story of control began in 1938 with a scientific event: the discovery of fission. Physicists recognised that the energy release from fission could be harnessed for both peaceful and destructive applications. The devastating power of a nuclear weapon would dramatically alter international relations in favour of possessors. As the former IAEA official Allan McKnight noted, "The traditional concept of war in the international society was altered forever."[20] The scientists realised that such power accorded to a state, especially to an aggressive one, was extremely dangerous.[21]

Although the scientists were unsure whether nuclear weapons would actually work, their initial reaction was to avoid dissemination of nuclear technology. In the wartime environment, the only viable control approach was a policy of "complete secrecy". Leo Szilard, who became the chief physicist at the University of Chicago's Metallurgical Laboratory spearheaded the secrecy campaign in February 1939, and many fellow scientists declined to publish nuclear data of possible military interest.[22]

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[20] McKnight, *op. cit.*, 1971, p. xvii.

[21] Richard Rhodes, *The Making of the Atomic Bomb*, Simon & Schuster, New York, 1988, p. 312; also see Bertrand Goldschmidt, *The Atomic Complex*, American Nuclear Society, La Grange Park, IL, 1982, p. 9.

[22] Richard G. Hewlett and Oscar E. Anderson, Jr., *The New World 1939/1946*, The Pennsylvania State University Press, University Park, Vol. 1, 1962, p. 25; Arthur Holly Compton, *Atomic Quest: A Personal Narrative*, Oxford University Press, New York, 1956, p. 115.

The need for control was recognised as a *sine qua non* to sustain global stability and security.

Both British and American government officials agreed with the scientists' concerns. The US Advisory Committee on Uranium began implementing a secrecy policy in 1939-40.[23] Secrecy became official policy in the United States in the spring of 1940 when the Americans became interested in developing nuclear technology for military purposes. A Reference Committee within the National Research Council of the National Academy of Sciences established to control publication of militarily significant research began controlling articles on uranium.[24] Institutionalised secrecy was not limited to the United States. Great Britain adopted a policy of 'compartmentalisation' on the subject, albeit to a lesser extent than the United States.[25] Secrecy was to remain policy until a sufficient level of development and understanding could be achieved.

The primary objective of early nuclear control was to ensure wartime adversaries did not acquire nuclear capabilities. Secrecy, according to the future creator of the H-bomb, Edward Teller, would prevent the Nazis from acquiring nuclear weapons first.[26] Leading powers had learned the cardinal rule of the nuclear world: a situation where one state does not possess a weapon while its enemy does is unacceptable. Nuclear control became an imperative.

Secrecy was implemented through information control on nuclear energy and weapons development. Canada, the United Kingdom and the United States adopted broad patent control policies. All persons engaged in nuclear work were required to assign all patent rights to their respective governments.[27] Initially, the control of patents was considered to be a basis for global control. Sir John Anderson, the former Lord President of the Council and Chancellor of the Exchequer, suggested establishing control through patent machinery whereby the United States and United Kingdom

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[23] *Ibid.*, p. 116.

[24] *Ibid.*, pp. 115-116.

[25] Ronald W. Clark, *The Birth of the Bomb*, Phoenix House Ltd., London, 1961, p. 110.

[26] Rhodes, *op. cit.*, p. 294.

[27] US Department of State, *The International Control of Atomic Energy, Growth of a Policy*, United States Government Printing Office (USGPO), Washington DC , Department of State Publication No. 2702, 1946, p. 103 (hereafter referred to as *Growth of a Policy*).

would regulate their internal patents, already under government control, and acquire world rights for any patent submission by a foreign applicant.[28]

From whom information should be withheld was not always agreed. Keeping information from the Nazis was one issue – withholding it from the Soviet Union was another.[29] Disagreement over sharing nuclear technology with the Soviets revealed another aspect of the nuclear issue: while it was highly undesirable that enemies acquire nuclear capabilities, it was unclear whether all allies could be trusted equally.

The power that nuclear weapons accorded a state and the threats they generated made secrecy between allies common practice. A monopoly over nuclear energy by a single state, even a trusted ally, was unacceptable. Great Britain was the first to demonstrate reluctance in sharing information. In the summer of 1942, when Great Britain held the lead in atomic research, British policymakers were not enthusiastic about joint undertakings with the United States.[30] In 1943, British Prime Minister Winston Churchill asserted that, if the United States attempted to establish unilateral control over nuclear energy and would not engage in full interchange, Britain would immediately start a parallel development programme.[31]

As the United States research effort surpassed the British, they too demonstrated reluctance in sharing information in spite of existing cooperative agreements. On 28 December 1942, US President Roosevelt approved a policy of only limited interchange after the US government learned of an Anglo-Russian agreement for the exchange of new and future weapons development concluded in September 1942.[32]

In the summer of 1942, the United States also began to question British motives with regard to sharing nuclear technology. They were concerned that the

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[28] CPNA USAEC, Department of State Records, British Documents, Sir John Anderson, Privy Council Office to Dr. Bush, 5 August 1942.

[29] Compton, *op. cit.*, pp. 116-117.

[30] Goldschmidt, 1982, *op. cit.*, p. 40.

[31] "Memorandum by the Secretary of War's Special Assistant (Bundy)", 22 July 1943 in *The Conferences at Washington and Quebec 1943*, *op. cit.*, p. 635.

[32] Hewlett and Anderson, *op. cit.*, pp. 267-268.

British were primarily interested in acquiring a postwar market advantage.[33] This suspicion foreshadowed the uneasy relationship between the pursuit of nuclear security and the promotion of economic objectives.

In January 1943, the United States informed Great Britain and Canada that nuclear information would be exchanged on a need-to-know basis in furtherance of the war objectives.[34] The United States restricted information sharing on manufacturing and engineering technologies for bomb construction, enrichment of U-235 and reprocessing.[35] This policy indicated the complexities of nuclear energy relations with regard to the possession of nuclear weapons knowledge. The boundary on exchanging information was drawn at a relatively low scientific level with restrictions placed on engineering and manufacturing processes.

Limiting information exchange as a measure of control introduced a dilemma for those espousing democratic ideals. How does one balance secrecy measures with the ethics of denying the free flow of information? The compartmentalisation instituted by the Director of the Manhattan Project[36], General Leslie R. Groves, was found disturbing by some.[37] The scientific community argued against control via secrecy on the ground that it would subordinate science to politics and drive competition between nation-states.[38] Niels Bohr, particularly active in promoting international nuclear control, argued that secrecy would fuel Soviet suspicions and an arms race, and declared that to avoid an arms race universal openness of both industrial and military bases would be required. His concerns were justified. Convinced that a covert nuclear weapons project was underway in the West, the Soviets began nuclear studies from nuclear fission and stepped up censorship by 1943.[39]

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[33] "The Director of the Office of Scientific Research and Development (Bush) to the President's Special Assistant (Hopkins)", 31 March 1943, in *The Conferences at Washington and Quebec 1943*, *op. cit.*, p. 9.

[34] *Ibid.*, p. 7.

[35] Arnold Kramish, *The Peaceful Atom in Foreign Policy*, New York, Harper & Row, 1963, p. 49. Also see Joseph I. Lieberman, *The Scorpion and the Tarantula*, Houghton Mifflin Company, Boston, 1970, p. 21.

[36] The Manhattan Project was the US initiative to build the first nuclear weapon.

[37] Rhodes, *op. cit.*, pp. 502, 523.

[38] *Ibid.*, p. 294.

[39] Lieberman, *op. cit.*, pp. 193-194.

Interim Measures for Control

In an unstable political climate, secrecy initially appeared to offer more security than an open control system. Secrecy kept information away from enemies but an absence of transparency risked fuelling global instability. Appeals by leading nuclear physicists for international nuclear control were rejected, particularly by Prime Minister Winston Churchill.[40] While the American and British Governments both acknowledged a requirement for a modified post-war control system, they initially retained institutionalised secrecy.[41]

Secrecy was not sufficient, however, to meet their needs. A complementary mechanism - the utilisation of "denial" tactics - was required. Denial required identifying those elements of the nuclear weapons production process that would make weapons manufacturing physically impossible or very difficult. While knowledge on nuclear weapons would eventually diffuse, materials and key technologies were considered to be limited in supply. Thus, the key to denial was the control of source materials and key processes without which a weapon could not be manufactured.

Although the US government identified the control of source materials as relevant in 1941, it did not act until 1943. In May of that year, Groves hired a contractor to survey global uranium resources and, in June, he proposed to the Military Policy Committee that the United States should take control over the world's supply of uranium ore.[42]

Driving the interest in source materials was the desire to accumulate material stocks in the event they were needed to create a nuclear force. Groves estimated that North American uranium supplies would soon be depleted in the post-war world. When the owner of the largest known uranium mine, Union Minière de Haut Katanga, refused to cooperate with American efforts to secure material, the United States turned to the British.[43] The British who owned a 30 percent stake in Union Minière,

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[40] Rhodes, *op. cit.*, p. 528.

[41] "The President's Special Assistant (Hopkins) to Prime Minister Churchill", 24 February 1943, in *The Conferences at Washington and Quebec 1943*, *op. cit.*, pp. 1-2.

[42] Rhodes, *op. cit.*, pp. 379, 500; John Simpson, *The Independent Nuclear State*, second edition, Macmillan, London, 1986, pp. 26, 79.

[43] The mine was located in the then Belgian Congo (Katanga province).

were also concerned about supply, and were eager to collaborate on a nuclear weapons project to design nuclear weapons.[44]

Discussions between the United States and the United Kingdom on managing nuclear threats yielded the first institutionalised international control system, based on secrecy and denial. The secrecy segment of the system was established on 19 August 1943 with the signing of the Quebec Agreement on Tube Alloys.[45] Under the arrangement, both parties promised, *inter alia*, never to use Tube Alloys against each other; not to use them against third parties without prior consent; and not to communicate any information about Tube Alloys to third parties except by mutual consent.[46]

Some observations can be made on the security architecture of the agreement. First, the system was based on states applying global control. Second, it attempted to monopolise knowledge of nuclear energy globally and to place controls on a wide range of nuclear activities. A notable feature was its comprehensive scope in starting control at unmined raw materials and in building a knowledge base on the world sources of material supply. In addition, participants in the arrangements provided each other with security assurances on the non-use of nuclear weapons. Finally, future peaceful aspects of nuclear energy were only a secondary consideration. The Quebec agreement was a military cooperation agreement in time of war and its extensive security precautions were motivated by the wartime environment. It was not intended to be permanent.

The denial aspect of the wartime control system was institutionalised on 13 June 1944 under the Combined Development Trust (CDT). Although the CDT primarily aimed to ensure an adequate supply of source materials for American and British nuclear programmes, it was also a control mechanism. The CDT's objectives were to negotiate agreements providing *complete* control over uranium supplies and limited control over thorium ores within areas under American and British jurisdiction, and to gain control over uranium and thorium supplies in other areas.[47] Control measures included exploration and surveying of uranium and thorium supplies, acquisition and

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[44] Hewlett and Anderson, *op. cit.*, p. 285.

[45] Tube Alloys was the British code for nuclear energy.

[46] "The Quebec Agreement" in Robert C. Williams and Philip L. Cantelon (eds.) *The American Atom*, University of Pennsylvania Press, Philadelphia, 1984, pp. 40-42.

[47] "Anglo-American Declaration of Trust" 13 June 1944 in Williams and Cantelon, *op. cit.*, pp. 43-45.

ownership of deposits, development of material production, and provision for storage.[48]

Experience of the CDT

When attempting to extend the regime's controls into peacetime, the CDT's creators encountered mixed reactions. Reaction to the CDT's efforts revealed an international acceptance that control was necessary for global stability and national security. While the CDT did successfully conclude agreements providing broad control over what were considered key material deposits, its monopolistic approach limited international acceptance of the CDT's proposals. The imbalanced approach to control opened the door for states to negotiate incentive packages in return for acquiescence.

In Belgium's agreement to supply the CDT with source materials, it agreed that "all uranium and thorium ores wherever located should be subject to effective control for the protection of civilization" and would "insure effective control" thereof.[49] If Belgium contemplated using its ores for energy, it would do so only "after consultation and in agreement" with the United States and the United Kingdom. In return, Belgium insisted that it participate with the United Kingdom and United States in the commercial utilisation of its ores.[50]

In negotiations with Brazil, the United States with British backing proposed that Brazil not sell its materials to third parties without the consent of the United States and sell to the United States and United Kingdom on favourable terms.[51] Brazil, however, balked at US attempts to limit Brazil's internal material use, noting that "it was politically impossible to insert any provision indicating that Brazil must first ask the

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[48] *Ibid.*, pp. 44.

[49] "The Belgian Minister for Foreign Affairs (Spaak) to the American Ambassador in the United Kingdom (Winant)", 26 September 1944, in *Foreign Relations of the United States: Diplomatic Papers 1944*, Vol. 2, Economic and Social Matters, Washington, DC, Department of State Publication No. 8211, 1967, p. 1029 (hereafter publication referred to as *Foreign Relations of the United States: Diplomatic Papers 1944*).

[50] *Ibid.*, pp. 1029-1030.

[51] "Memorandum by the Commanding General, Manhattan Engineer District (Groves)", 23 February1945, in *Foreign Relations of the United States 1945*, Vol. 2, Washington, DC, Department of State Publication No. 8314, 1967, p. 6 (hereafter referred to as *Foreign Relations of the United States 1945*).

United States before using within Brazil their own product".[52] Under the final agreement, Brazil agreed, *inter alia*, to apply export controls on all grades of monazite sands, thorium and thorium compounds, and limit export of such materials to the United States or to US-approved consignees.[53] Brazil also agreed to share all information regarding the existence and working of thorium deposits. In return, the United States agreed to supply technical experts on all inspection and control measures.[54]

The United States and the United Kingdom also sought to bind Sweden into instituting domestic uranium controls, prevent Sweden from exporting uranium without their prior consent, and provide them the first right of refusal on Swedish uranium exports.[55] Sweden readily accepted domestic and export controls,[56] but rejected placing its uranium production "in the hands exclusively of two of the great powers of the world."[57] It would, however, participate in an international arrangement for uranium material control.[58]

The CDT sought a similar agreement with the Netherlands, establishing export controls over monazite and thorium and providing for prior consent from the United States and United Kingdom before third party transfers. In July 1945, the Dutch agreed to restrict exports and establish a reserve for American and British purchases,

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[52] "Memorandum by Mr. S. Maurice McAshan, Jr., and Colonel John Lansdale, on the Staff of the Commanding General, Manhattan Engineer District (Groves)", 10 July 1945, in *Foreign Relations of the United States 1945, op. cit.*, pp. 16-17.

[53] "Memorandum of Agreement Between the United States of Brazil and the United States of America", 10 July 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 21.

[54] *Ibid.*, pp. 22-23.

[55] "Draft Memorandum of Instruction from the United States and United Kingdom Governments to the Minister in Sweden (Johnson)", 20 July 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 24.

[56] "The Minister in Sweden (Johnson) to the Commanding General, Manhattan Engineer District (Groves)", 22 September 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 45.

[57] "The Swedish Minister for Foreign Affairs (Undén) to the American Minister (Johnson) to the Commanding General, Manhattan Engineer District (Groves)", 11 September 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 47.

[58] "Memorandum by Major John E. Vance to the Staff of the Commanding General, Manhattan Engineer District (Groves)", 25 September 1945, in *Foreign Relations of the United States 1945, op. cit.*, pp. 52-53.

but demanded retention of a material stockpile for domestic use, including "the right to use thorium for defence purposes and not solely for industry."[59] The CDT attempted to limit the Dutch monazite reserve to a specified amount such as 20-30 tons. The Dutch rejected the restriction, denoting them as unnecessary since the Netherlands agreed to keep the material "out of the hands of the enemy."[60]

To support CDT efforts, the United Kingdom sought acquisition of source materials throughout the Commonwealth. In India, it orchestrated a hiatus in monazite sand mining and established export controls by December 1945. The Indian government, however, insisted on retaining control over uranium mining and refining operations and rejected British attempts to preempt monazite control from the Government of India.[61]

By December 1945, the Trust estimated that its members controlled 97% of the world uranium output and 65% of the global reserve. By mid-1946, the Trust controlled over 75% of the thorium stockpile on which commercial production was based.[62] Groves believed that the only states outside of the Trust's controlled areas which could realistically have sufficient materials to pursue a significant nuclear programme was the Soviet Union and possibly Sweden. However, Soviet resources were regarded as far inferior to those of the Trust.[63]

Attempts to survey and control special nuclear material was not strictly a Western phenomenon. In the Soviet Union, the Academy of Sciences established a

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[59] "Memorandum by Major Harry S. Traynor to the Staff of the Commanding General, Manhattan Engineer District (Groves)", 3 August 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 34.

[60] *Ibid.*, pp. 35-36.

[61] "Minutes of a Meeting of the Combined Policy Committee", 4 December 1945, *Foreign Relations of the United States 1945, op. cit.*, p. 85; Public Records Office, Foreign Office, (PRO) FO 371/67493 29551, Roger Makins to Major General Groves, 19 December 1946; PRO FO 371/59646 29551, Travancore Thorium, Memorandum, 1946.

[62] PRO AB 16/530, C. K. Leith and G. C. Bateman, *Control of Uranium and Thorium Resources, Memorandum to the Combined Development Trust*, 7 May 1946; PRO AB 16/530, C. K. Leith, G. C. Bateman and A. D. Storke, *Control of Uranium and Thorium Resources*, Memorandum to the Combined Development Trust, 2 October 1947.

[63] "The Chairman of the Combined Development Trust (Groves) to the Chairman of the Combined Policy Committee (Patterson)", 3 December 1945, in *Foreign Relations of the United States 1945, op. cit.*, pp. 84-85.

State Fund for Uranium Metal to study uranium deposits in Central Asia.[64] Acquiring uranium for an experimental reactor received support in 1942 from the Uranium Commission founder V. I. Vernadsky and other Soviet geologists. In 1945, large scale uranium exploration began as the Soviet Nuclear Weapons programme gained momentum.[65] Since Soviet mine production was only half of that needed for experimental reactor F-1, the Soviets seized the German uranium stockpile and concluded supply agreements with Germany and Czechoslovakia in 1945 and 1946 respectively.[66] The Soviets also approached Canada to purchase fifty tons of uranium claiming it was to be used for advanced steel alloy manufacture. Canadian metallurgists rejected the explanation and refused to go through with the deal when the Soviets refused to supply further details.[67]

The problems of establishing a control system were foreshadowed by the CDT experience elucidated above. Efforts to use the CDT as a control system were undermined by the advocates of the CDT and target nations of control having different goals for the system. The United States and the United Kingdom were focussed on meeting very high security concerns. Their proposals reflected a wartime solution. Other nations reacted on economic grounds. The difficulties in establishing bilateral controls illuminated that sovereignty would not be sacrificed blindly. Equality and significant benefit were required for state participation in the system. Domination by a subgroup of states was unacceptable. While restraint on international transfers was negotiable, limitations on domestic activities was not. While control over others was viewed as prudent, similar sacrifices by one's government were to be avoided.

Physical Protection as Part of International Control

Physical protection was established in tandem with the rest of the system for control. Generally, national governments implemented this element of control. The US Federal Bureau of Investigation formulated security measures including background investigations for employees of research institutions such as the Chicago Metallurgical

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[64] Thomas B. Cochran, Robert S. Norris and Oleg A. Bukharin, *Making the Russian Bomb*, Westview Press, Oxford, 1995, p. 5.

[65] *Ibid.*, p. 175.

[66] *Ibid.*, p. 176.

[67] PRO AB 1/683 29465, Inward Telegram, Canada (High Commissioner) to Sir John Anderson, 27 August 1945.

Laboratory.[68] In Britain, physical security including using double envelopes and wire fences on locations such as at the isotope separation pilot plant at Rhydymwyn.[69] However, arrangements for the state storage of major uranium purchases was coordinated through the CDT.[70] As the prospects for successful development of a fission weapon increased, physical protection measures became more rigid. After World War II, accounting systems were revamped.[71]

Several observations can be drawn from the first control system. The utilisation of several very strong interim measures to achieve a high level of assurance was a function of wartime instability. Control was not based on a single measure but rather on combinations thereof. While materials control was important to a control system, it was not sufficient to generate credibility. Attempts to create comprehensive control included applying supervision from mining through production to all aspects of the reactor fuel cycle. The system also required a knowledge management element consisting of supervision over scientific research and *all* nuclear energy related activities.

States also began the process which continues today of determining acceptable nuclear technology users and nonthreatening nuclear uses. Their inability to reach agreement generated discontentment. The activities that a state could engage in without engendering security concerns depended on how it was viewed by the state making that security evaluation.

II. Phase 2 - Approaches to Developing Long Term Solutions

The above control trends continued in the second phase, characterised by conceptual thinking about the nature and structure of control mechanisms. Decision

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[68] Compton, *op. cit.*, pp. 118-121.

[69] Ronald W. Clark, *op. cit.*, p. 110.

[70] Hewlett and Anderson, *op. cit.*, p. 288.

[71] On specific measures see United States Atomic Energy Commission, *Letter from the Chairman and Members of the United States Atomic Energy Commission Transmitting Pursuant to Law the Second Semiannual Report of the United States Atomic Energy Commission*, 80th Congress, 1st Session, Doc. No. 96, 1947, p. 19; United States Atomic Energy Commission, *Letter from the Chairman and Members of the United States Atomic Energy Commission Transmitting Pursuant to Law the Third Semiannual Report of the United States Atomic Energy Commission*, 80th Congress, 2nd Session, Doc. No. 118, 1948, pp. 29-31.

makers acknowledged that the secrecy-monopoly approach was a temporary solution since weapon technology would eventually diffuse. Efforts to find permanent solutions commenced, but it was clear that any successful solution would have to be an international approach since national nuclear weapons possession would generate only instability. Civilian applications continued to take a secondary position to military ones. This was understandable. Scientists were sure that the technology and economic benefits of peaceful nuclear energy use would be extensive, but the threats from the military applications appeared to be increasing.

The first governmental discussion regarding post-war international control occurred between Vannevar Bush, Director of the Office of Scientific Research and Development and President Franklin Roosevelt in October 1941.[72] Real work on formulating a plan did not begin until 1944. Retaining secrecy and denial as a control policy lost support as the scientific community became increasingly active in policy development.[73] The Jeffries Committee named after the General Electric metallurgist Zays Jeffries released the *Prospectus on Nucleonics* report in November 1944. The report noted that a stable security environment was not tenable with the United States as sole nuclear weapons possessor and called for an international control organisation. The Committee advocated that the United States should maintain its lead in nuclear research and industry after establishment, but with significant attention to the possibility of clandestine activities, the risk of diversion and the threat of seizure by subnational groups.[74] These concerns mark the perception of danger from a breakout, and consequently a need for reliable back-up security measures.

Despite the risks posed by international control, by Autumn 1945 Dean Acheson, US Assistant Secretary of State, James B. Conant, President of Harvard University, and Bush were strongly advocating that US policy move away from denial and secrecy. Their arguments included that America's secret was not a permanent one; that nuclear technology was inherently dual-use, revolutionary and could destroy civilization; that secrecy risked generating an arms race; and that an unannounced

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[72] Vannevar Bush to J. B. Conant, Oct. 9, 1941, Memorandum, in Rhodes, *op. cit.*, p. 379.

[73] For an example of an influential study from the Chicago atomic project scientific community see James Franck, Donald J. Hughes, J. J. Nickson et al., *The Franck Report*, "A Report to the Secretary of War", in Morton Grodzins and Eugene Rabinowitch (eds.), *The Atomic Age*, Basic Books Inc., London, 1963, pp. 21-27 (hereafter referred to as *The Franck Report)*.

[74] *Prospectus on Nucleonics* is reprinted in Alice Kimball Smith, *A Peril and a Hope*, University of Chicago Press, London, 1965, pp. 539-559.

attack with a nuclear weapon was not a practical option due to the moral implications of using such weapons. Particularly, there were concerns in the US government that the Soviet Union perceived the Anglo-American relationship as a threat and would react negatively.[75]

By September 1944, Bush and Conant, began looking at international control frameworks, emphasising transparency. They advocated simple measures including the release of basic scientific information, enacting national nuclear energy control legislation, negotiating an Anglo-Canadian-American treaty instituting equivalent domestic controls, and establishing a permanent information interchange. They proposed the eventual creation of an international authority, whose legal basis derived from an association of nations, that could guarantee the free exchange of all scientific information on nuclear physics. This authority would receive all disclosures on nuclear activities except munition manufacturing and military details and have access to all scientific and military nuclear laboratories and plants.[76]

The United States and United Kingdom also discussed the subject. The British considered the formation of a joint nuclear energy commission and the coordination of a common patent policy for the short-term.[77] The interim wartime infrastructure would serve as the basis for a postwar plan that would be supplemented by other mechanisms, including controls over raw material, supervision over research and operations, and the creation of a legal international instrument.[78] The British tended to be more conservative in embracing control. They were less forthcoming on transparency as they felt that the greater the information disclosure, the less inducement for agreement on international control.[79] Non-nuclear states would be more amenable to control based on their military disadvantage.

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[75] "Memorandum by the Acting Secretary of State [Dean Acheson] to President Truman", 25 September 1945, in *Foreign Relations of the United States 1945, op. cit.*, pp. 48-50; Vannevar Bush and James Bryant Conant to Henry L. Stimson, 30 September 1944, in Rhodes, *op. cit.*, p. 562.

[76] Hewlett and Anderson, *op. cit.*, pp. 326, 329 -330; Rhodes, *op. cit.*, pp. 561-62; Lieberman, *op. cit.*, pp. 50-51.

[77] Sir John Anderson, *op. cit.*

[78] Hewlett and Anderson, *op. cit.*, p. 262.

[79] "Minutes of a Meeting of the Combined Policy Committee", 4 July 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 13.

Through 1945, international control appeared to gain acceptance. The British agreed on the impossibility of sustaining an Anglo-American nuclear monopoly.[80] By October, Acheson had convinced the Canadians of the merits of an international solution.[81] The Soviets also appeared to view international control in a positive light for short time. An analyst on Soviet Affairs, Joseph Nogee, cites a comment by the *New Times*[82] rejecting large-scale nuclear energy development, approving international control "by representatives of the Five Great Powers over the production and employment of atomic bombs" and disarmament under the auspices of the United Nations (UN).[83]

The Dynamics of Control

The scientific community and government personnel investigating control modalities recognised that traditional measures for military equipment control would not be sufficient for nuclear technology. Sir John Anderson noted that something beyond patents would be needed in the post-war period:

> By reason of its peculiar importance [sic] and urgency, ... it is not safe to allow the problem of the international control of nuclear energy to be left to be dealt with by any general solution covering other fields in which American and British inventions have been temporarily pooled for war-time use.[84]

Szilard advocated tight control and called for global coverage of nuclear materials production. His proposals contained preventative undertones and focussed

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[80] PRO AB 1/606 29465 From A.M.S.S.O to J.S.M., 30th August 1945; PRO AB 1/606 29465, *International Treatment of the T.A. Project*, Draft Memorandum, undated; PRO AB 1/606 29465 *T.A. Project, International Control*, 22 May 1945.

[81] Joseph Levitt, *Pearson and Canada's Role in Nuclear Disarmament and Arms Control Negotiations, 1945 -1957*, McGill-Queen's University Press, London, 1993, p. 79.

[82] *The New Times* was believed to be a mouthpiece for Soviet government policies at the time.

[83] Joseph Lippman Nogee, *Soviet Policy Towards International Control of Atomic Energy*, University of Notre Dame Press, Indiana, ND, 1961, pp. 12-13; also see Lieberman, *op. cit.*, p. 199. The attitude changed by March 1946 as the Soviets announced that nuclear energy would figure prominently in its new five year plan. (*Ibid.*, p. 31.)

[84] Sir John Anderson, *op. cit.*

on materials management and transparency. The Soviet Union, the United Kingdom and the United States could set up joint control over the manufacture of active materials on a global basis. He objected to highly enriched uranium production which could be used for manufacturing nuclear weapons, but this did not imply either suppression of nuclear power development or prevention of the special nuclear materials manufacture.[85] If states built nuclear power installations on their territory, they would grant inspection access under any conditions whereby "agents would roam freely" and "spies would be secretly employed." He was not alone in thinking that system's ability to provide security rested on transparency. Secretary of State James F. Byrnes later noted that the US commitments to control and transparency relied on reciprocal inspections. Without inspections, it could not share information on nuclear energy production.[86] Thus, programmes had to be transparent to member states as well as to the inspecting authority.

Szilard anticipated little or no peaceful development in an alternative option. Uranium ore would be mined under control and transported to some "neutral" territory. This management mechanism potentially yielded a system that was "much easier, safer, and would require much less tight control".[87] This option was not pursued as a primary approach.

Similar to Szilard's first proposal, *The Franck Report* foresaw the need to control raw materials. The authors considered allowing unlimited production as long as the fate of each pound of uranium mined was tracked and recorded.[88] However, the question remained of preventing accumulation of large quantities of materials in the hands of one or several nations.[89] They therefore proposed a stockpile management approach to *prevent* such a situation from occurring. This approach entailed complete management over material in any state's possession:

> The amounts of ore taken out of the ground at different locations could be controlled by resident agents of the international control board, and each

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[85] Leo Szilard, "Atomic Bombs and the Postwar Position of the United States in the World, a memorandum to President Roosevelt", reprinted in Grodzins and Rabinowitch, *op. cit.*, pp. 15-17.

[86] "Minutes of a Meeting of the Secretaries of State, War, and Navy", 16 October 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 60.

[87] Szilard, 1963, *op. cit.*, p. 16.

[88] *The Franck Report, op. cit.*, p. 26.

[89] *Ibid.*, p. 26.

> nation could be allotted only an amount which would make large scale separation of fissionable isotopes impossible.[90]

This approach limited mining and fissionable materials production and also required compulsory material denaturation.[91]

The scientists were aware that any proposed system would contain inherent weaknesses including non-cooperation. Szilard concluded that a "successful" control system must provide adequate warning of a breakout to enable preparation of a nuclear defence. Non-compliance had very serious ramifications. Szilard noted:

> [...]any difficulties which any nation may place in the way of the established controls would have to be considered as tantamount to a "declaration of war".[92]

Governments tended to focus more on the practicalities of control. Bush advocated an incremental approach whereby the Soviet Union, the United Kingdom and the United States would establish a UN scientific body charged with information dissemination. Transparency was the initial focus. Participants would offer foreign scientists unimpeded access to laboratories, encourage student exchanges and openly publish research. Step two entailed giving an inspection commission unimpeded access to any nuclear laboratory or plant to determine operational magnitude without exercise of control. The inspection scope would eventually extend until the conduct of clandestine activities would be deterred. Enactment of strong legal controls would allow for commercial nuclear energy development. Finally, nations would limit nuclear material stockpiles by agreement to that necessary for commercial needs.[93]

In drawing up potential plans, the analysts were aware that certain political conditions must exist for a plan to function properly. *The Franck Report* cites as necessary conditions: good relations, political will and sacrifice of political and

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[90] *Ibid.*, p. 26.

[91] At the time, scientists were under the false impression that isotopes could be added to fissionable materials to make them permanently unsuitable for nuclear weapons but still allow for their use in civilian applications.

[92] Szilard, 1963, *op. cit.*, p. 17; *The Franck Report, op. cit.*, pp. 21-27.

[93] "Memorandum by the Director of the Office of Scientific Research and Development (Bush) to the Secretary of State", 5 November 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 72.

economic sovereignty.[94] For control to work, national sacrifices on an equal basis were needed, including by the United States.[95] Such unprecedented transparency, was not possible without solid security assurances. For Bohr, openness would hardly be conceivable unless all partners were assured common security against nuclear threats.[96]

Government Initiatives and Their Political Context

Early governmental thinking on control was heavily influenced by the deteriorating relationship between the Soviet Union and the West. The looming threat of a nuclear Soviet Union made policymakers amenable to the idea of a tight and intrusive control system. The threat also made Western officials reluctant to relinquish secrecy and denial policy, since verification, being untested, was perceived as unable to provide similar levels of assurance.

In 1945, on the advice of the US Secretary of War, Henry Stimson, President Roosevelt assembled an "Interim Committee" to develop post-war policies including the control of nuclear energy. The Interim Committee made little headway on a plan. Members agreed that nuclear energy cooperation between democratic powers was necessary but that practical implementation of an international control plan was problematic. The reliability of a system using inspection as the control basis was disputed.[97] Transparency presented a larger problem. Sharing information with allies was consistent with national security and militarily necessary, but sharing critical information such as production blueprints with the Soviet Union was a nonstarter.[98] Although concerned about isolating the Soviet Union and insuring Soviet involvement in

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[94] *The Franck Report, op. cit.*, pp. 25-26.

[95] Vannevar Bush and James Bryant Conant to Henry L. Stimson, 30 September 1944 in Rhodes, *op. cit.*, p. 562.

[96] Niels Bohr, *A World Destroyed*, Memorandum 3 July 1944 in Rhodes, *op. cit.*, p. 534. His sentiments were also shared by the Sir John Anderson. (Margaret M. Gowing, *Britain and Atomic Energy, 1939-1945*, St. Martin's Press, Inc., London, 1964, p. 352.)

[97] On the British side, Attlee believed that inspection was impractical since thousands of top scientific inspectors would be needed. (Nogee, *op. cit.*, p. 8.)

[98] Eventually, the Senate Atomic Energy Committee was insistent that no exchange of information be made until arrangements for inspections and safeguards were made. ("The Acting Secretary of State to the Secretary of State, at Moscow", 15 November 1945 in *Foreign Relations of the United States 1945, op. cit.*, p. 609.)

international controls[99], US officials preferred to continue with weapons and materials production while attempting to improve Soviet relations and establishing control mechanisms.[100]

Continued deterioration in US-Soviet relations undermined the establishment of an effective control system. As international tensions rose, states became reluctant to rely on an international organization to perform critical activities such as inspection. In July 1945, Stimson questioned whether the Soviet Union could realistically participate in an effective international control system because the US and Soviet political systems were entirely different.[101] US Secretary of State Byrnes concurred and further believed that, based on past experience with the Soviets, inspection could not be entrusted to the United Nations.[102] The British were also uncomfortable with relying on international organisations. Prime Minister Attlee abandoned the idea of entrusting the United Nations Security Council (UNSC) with the scientific development of nuclear energy.[103] One can conclude that states must take an active role in control organisation activities, particularly when tense relations *vis-a-vis* potential nuclear capable states existed.

Caution subsequently filtered through American policies. US President Truman's public speeches following the bombing of Japan projected a sense of wariness rather than good will. While Truman called for renunciation of the development and use of nuclear weapons and encouraged peaceful nuclear development, he made it clear that US nuclear weapons trusteeship would not be one of "generosity" and "openness" but rather remain protective pending analysis of international control.[104] US policy was to sustain information non-disclosure and

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[99] Lieberman, *op. cit.*, pp. 31-32.

[100] For more detail on the policy see "Memorandum by the Director of the Office of Scientific Research and Development (Bush) and the Commanding General, Manhattan Engineer District (Groves), to the Secretary of State", 9 November 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 74.

[101] Robert L. Beckman, *Nuclear Non-Proliferation Congress and the Control of Peaceful Nuclear Activities*, Westview Press, London, 1985, p. 22.

[102] "Minutes of a Meeting of the Secretaries of State, War, and Navy, October 16, 1945, 10:30 a.m." in *Foreign Relations of the United States 1945, op. cit.*, p. 60.

[103] Nogee, *op. cit.*, p. 8.

[104] For a statement on US trusteeship policy also see "An Address by Secretary of State Byrnes at Charleston, South Carolina, November 16, 1945 (Excerpts)" in *Growth of a Policy, op. cit.*, p. 122.

maintain a nuclear weaponry advantage, while seeking to establish a control regime. Only when control was fully established would the United States make full disclosure on weapons production and dismantle its nuclear arsenal.[105] Even if control were established, there was support for the United States to accumulate sufficient fissionable material and retain the right to rearm as insurance against the collapse of any agreement.[106]

Intentions for close cooperation with the Soviet Union fell by the wayside. Truman called for discussions with the United Kingdom and Canada, subsequently with other nations, to work out arrangements under which international collaboration and exchange of scientific information might safely proceed.[107] The lack of transparency gave Moscow the wrong impression. The Soviets had assumed that they would share in bomb information. As feared by some analysts, they became suspicious of Western intentions when they continued to receive no information on nuclear weapons. The British Ambassador to the Soviet Union noted in November 1945:

> But their [the Soviets] disappointment was tempered by the belief inspired by such echoes of the foreign press as were allowed and to reach them that their Western comrades in arms would surely share the bomb with them. That some such expectation as this was shared by the Kremlin became evident in due course. But as time went on and no move came from the West, disappointment turned into irritation and, when the bomb seemed to them to become an instrument of policy, into spleen. It was clear that the West did not trust them. This seemed to justify and it quickened all their old suspicions[...].[108]

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[105] "Memorandum by the Director of the Office of Scientific Research and Development (Bush) to the Secretary of State", 5 November 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 73.

[106] Hewlett and Anderson, *op. cit.*, pp. 355-361.

[107] "A Message from the President of the United States to Congress Transmitting a Request for the Enactment of Legislation to Fix a Policy Covering the Use and Development of the Atomic Bomb, October 3, 1945" in *Growth of a Policy, op. cit.*, pp. 109-112.

[108] "The British Ambassador in the Soviet Union (Kerr) to the British Secretary of State of Foreign Affairs (Bevin), 3 December 1945 in *Foreign Relations of the United States* 1945, *op. cit.*, pp. 83-84. On the inauspiciousness of inspections in the USSR see "Minutes of a Meeting of the Secretaries of State, War, and Navy, October 23, 1945, 10:30 a.m." in *Foreign Relations of the United States 1945, op. cit.*, p. 62.

Stimson was aware of the problem and warned Truman that the existing Anglo-American alliance and US acquisition of the bomb would fuel distrust and stimulate Soviet efforts to acquire nuclear weapons unless swift and decisive action to bring the Soviet Union into partnership with the United States and United Kingdom was undertaken. In September 1945, evidence already indicated that Soviet Union was seeking a nuclear capability.[109] By November 1945, the Soviets were issuing public statements that a major technical secret could not remain the exclusive possession of one country and that they would acquire nuclear capabilities.[110] By December of 1945, they indicated to US officials their conclusion that the United States had no intention of sharing nuclear power, and therefore they would push vigorously ahead with their nuclear programme.[111]

The issue of how states could participate in control started to generate increased interest. It appeared to US officials that the Soviets would not forgo nuclear armament even if a control system existed.[112] The United States recognised that inclusion of states that could pose a nuclear threat was crucial for an effective control system.[113] Incentives were therefore sought for Soviet participation.

While participation of key players was central, universality was preferred. Incentives were needed not only for the Soviets, but for other states as well. Under-Secretary of War Robert P. Patterson advocated that effective completion of nuclear disarmament was a strong incentive. He proposed that the Soviet Union, the United Kingdom and the United States cease work on manufacturing and further development of nuclear weapons and that the United States agree to impound its current arsenal.[114] Others believed that the scheme needed to include economic development to be palatable to states less concerned with nuclear weapons and more focussed on

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[109] "Memorandum by the Secretary of War (Stimson) to President Truman", 11 September 1945, in *Foreign Relations of the United States 1945, op. cit.*, pp. 42-43.

[110] Bernhard G. Bechhoefer, *Postwar Negotiations for Arms Control*, Greenwood Press, Westport, Ct., 1961, p. 47.

[111] Lieberman, *op. cit.*, p. 203.

[112] Dean Acheson, *Present at the Creation*, Hamish Hamilton, London, 1969, p. 125.

[113] "The Secretary of State to the Canadian Ambassador", 5 December 1945, in *Foreign Relations of the United States 1945, op. cit.*, p. 91.

[114] "Memorandum by the Acting Secretary of War (Patterson) to President Truman", 26 September 1945 in *Foreign Relations of the United States 1945, op. cit.*, p. 54.

economic viability. In a proposal resembling the NPT, Canadian Ambassador Lester Pearson suggested that Canada, the United Kingdom and the United States use their temporary monopoly to establish international control by offering to trade nuclear technology for nuclear weapons renunciation.[115]

Moving Towards an Open International Control System

On 15 November 1945, US President Truman, British Prime Minister Attlee and Canadian Prime Minister King issued the Truman-Attlee-King Communiqué to develop an open international control system. The objectives of the proposal were:

- to prevent the use of atomic energy for destructive purposes; and
- to promote the use of recent and future advances in scientific knowledge, particularly in the utilisation of atomic energy, for peaceful and humanitarian ends.[116]

In this initiative, the objective of prevention reflected the level of assurance deemed necessary for the system to be effective. The objective of promotion reflected the requirement for the provision of participation incentives.

Although the purpose was a transparent system, the three states justified continued secrecy including commercially-relevant information until control was established on the basis that trust required control.

> We are not convinced that the spreading of the specialised information regarding the practical application of atomic energy, before it is possible to devise effective, reciprocal, and enforceable safeguards acceptable to all nations, would contribute to a constructive solution of the problem of the atomic bomb...We are, however, prepared to share, on a reciprocal basis with others of the United Nations, detailed information concerning the practical

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[115] Levitt, *op. cit.*, p. 79.

[116] United States Department of State, "Joint Declaration by that Heads of Government of the United States, the United Kingdom, and Canada, November 15, 1945", in *Documents on Disarmament 1945-1959*, Vol. 1, Historical Office, Bureau of Public Affairs, Washington DC, Department of State Publication 7008, August 1960, pp. 1-3 (hereafter publication is referred to as *Documents on Disarmament 1945-1959*).

industrial application of atomic energy just as soon as effective enforceable safeguards against its use for destructive purposes can be devised.[117]

The communiqué was also the first official international instrument to refer to "safeguards". While the idea of restricting how nuclear energy should be used became referred to as "control", the individual measures collectively making up the control system became known as "safeguards".

Following consultation by the Western powers with the Soviet Union, the Communiqué was converted into a United Nations General Assembly (UNGA) resolution.[118] The mandate, adopted on 24 January 1946, established the United Nations Atomic Energy Commission (UNAEC). This Commission was to inquire into all phases of the nuclear energy problem and make proposals on exchange of information, establishment of control to ensure peaceful use, establishment of effective safeguards and disarmament of nuclear and other weapons of mass destruction (WMD).

By then, it was clear that the invention of nuclear weapons created unique security problems requiring unique political solutions. The nature of nuclear weapons created an all-or-nothing situation regarding control. The nuclear question required a globalist solution that was broad in scope, universal, transparent and included a functional threat management mechanism.

For control to work, states with nuclear capabilities had to open up and trust that the control system was effective enough that they would not be vulnerable to nuclear attack. Trust implied a mechanism to provide security in the event of system failure. At the same time, states would not expose themselves to the risks to disarmament of the dissemination of information without an effective control and mitigation system. An ineffective system was viewed as creating a worse situation than if no control existed at all, since complying states would be disadvantaged while their fears and suspicions would be engendered.[119] Leading decision-makers struggled

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[117] *Ibid.*, p. 2.

[118] UN General Assembly Resolution 1(I) of 24 January 1946 is reprinted in *Documents on Disarmament 1945-1959*, Vol. 1, *op. cit.*, pp. 6-7.

[119] UNAEC, AEC/C.2/W.20, Appendix IV, pp. 14-15. Also see, CPNA, United States Atomic Energy Records 1944-1952, Dean Rusk, Director of Office of Special Political Affairs, to Warren R. Austin, US Representative to the United Nations, 23 June 1947; David E. Lilienthal, "How Can Atomic Energy Be Controlled?" *British Atomic Scientists*, Vol. 2, Part 7-8, 1 October 1946, p. 15.

because they were unsure that a control system could match nuclear deterrence while recognising denial-secrecy-deterrence system drawbacks.[120] These factors therefore made movement away from the denial-monopoly approach extremely difficult.

III. Phase 3 - Crystallisation of Control Concepts

The principles of control crystallised and were subsequently elucidated as decision-makers identified basic control principles and constructed a nuclear control plan accordingly. This discussion will review both identified principles of control and the framework for their implementation. While much of the work draws directly from *The Acheson-Lilienthal Report* and The Baruch Plan, which was based on *The Acheson-Lilienthal Report*, it also examines other works contributing to the debate. This section will also investigate plan assumptions and the rationale for rejecting the Baruch Plan.

In early 1946, Secretary of State Byrnes established a committee to design a plan for controlling the atom and retaining the United State's "secret".[121] The Committee, known as the Secretary of State's Committee was chaired by Dean Acheson. It produced a work known as the *Acheson-Lilienthal Report*.[122] The report was the culmination of many previous ideas. It proposed a framework for international control that removed nuclear energy regulation from national governments and placed it under the purview of an international authority. The report was generally well received in the West and became a standard for further work in the field. Although some of its assumptions were questioned, subsequent studies often incorporated substantial portions of the framework advocated in the Report.[123]

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[120] A standard requirement of any arms control agreement is that the arms control system had to be perceived as being sufficiently effective and providing greater security over the one that was already in place. Donald G. Brennen, "Setting and Goals of Arms Control" in Donald G. Brennen (ed.), *Arms Control, Disarmament, and National Security*, George Braziller, New York, 1961, p. 37.

[121] Lilienthal, (1946), *op. cit.*, p. 10. Also see John Newhouse, *The Nuclear Age*, Michael Joseph Ltd., London, 1989, p. 62.

[122] The Secretary of State's Committee on Atomic Energy, *A Report on the International Control of Atomic Energy*, Department of State, Washington, DC, Publication No. 2498, 16 March 1946 (hereafter referred to as *The Acheson-Lilienthal Report*).

[123] See for example CPNA USAEC, 1944-1952, University of Chicago Committee, *Draft for a Convention on Development and Control of Atomic Energy*, 1 May 1946; CPNA USAEC, 1944-1952, The Technical Committee on Inspection and Control, *Technical Aspects of Control and Inspection of the Utilization of Atomic Energy*, 8

Rejection of an International Inspection System

The Committee and other analysts, while evaluating nuclear control dynamics, investigated the possible establishment of a national inspection system. This approach was akin to the systems proposed by the Carnegie Foundation and the Soviet Union to the UNAEC in 1947, both of which followed early British thinking on control.[124] These approaches sought to preserve states' economic and political sovereignty, respectively. They minimised control authority activities, placing the responsibility for the regulation of nuclear energy squarely in national hands.

A national inspection system such as proposed under the Soviet Plan called for "strict international control" over nuclear material mining and production. Control would be implemented via periodic inspection by an International Control Commission (ICC) to confirm accounting, reports and stocks; observe the "fulfilment of rules" on technical exploration; assist in information exchange; collect and analyse data on mining and production; and conduct research on nuclear energy. The ICC could pursue anomalies, carry out special investigations in suspicious cases, recommend production, inventory and use nuclear materials, and advise the UN Security Council on actions to deal with violations. States could conduct unrestricted research and nuclear energy control remained in national hands.[125]

March 1946; CPNA, General Records of the Office of Research & Development, World Government Committee, Oak Ridge Engineers and Scientists, *A Memorandum Discussing the State Department Report on the International Control of Atomic Energy*, 25 May 1946; Council of the British Atomic Scientists' Association "British Atomic Scientists' Proposals for International Control of Atomic Energy", *British Atomic Scientists*, Vol. 3, No. 2, February 1947, pp. 42-43, 49; The Atomic Scientists Committee of Great Britain, "Memo to the UN Atomic Energy Commission", *Bulletin of the Atomic Scientists*, 1 June 1946; CPNA USAEC, 1944-1952, Curtis Martin, Dion J. J. Archon, Robert B. Black et al., *A Plan for the Administration of an International Atomic Development Authority*, Harvard University, Cambridge, MA, April 1947; CPNA USAEC, 1944-1952, M. Benedict, S.G. English, C. Starr, et al., *Informal Statement on International Control of Atomic Energy*, 27 May 1946 (hereafter referred to as *Informal Statement on International Control of Atomic Energy*).

[124] Committee on Atomic Energy of Carnegie Endowment for International Peace, *Utilization and Control of Atomic Energy, A Draft Convention*, Carnegie Endowment for International Peace, Washington DC, June 1946; "Soviet Proposals Introduced in the United Nations Atomic Energy Commission, June 11, 1947", *Documents on Disarmament 1945-1959*, Vol. 1, *op. cit.*, pp. 85-98; PRO CAB 134/6 29465, Cabinet Advisory Committee on Atomic Energy, A.E.A.E. (45) 3rd Meeting, 27 September 1945.

[125] UNAEC, AEC/C.1/68.

The Committee members rejected the national inspection approach outright.[126] The members felt that due to the highly destructive nature of nuclear weapons, the lack of defence against them, the inevitable diffusion of technology and the interchangeability of peaceful and military uses, the system must go beyond verification.[127] The Committee argued that a national inspection system was fatally flawed and could not alone protect complying states against violations if national governments or private organisations were permitted to produce fissionable materials.

Implementation of safeguards could be seriously hindered if governments interfered with inspectors. Inspectors would be subject to bribery or duress while making intimate inquiries into industrial activities. Industrial development was a concern because industrial secrets were vulnerable during the application of safeguards. In addition, staff requirements for inspection would become unmanageable as the nuclear industry grew. It was estimated that a team of 300 inspectors would be required for a single diffusion plant.[128] These inspectors would have a range of tasks including to check the accounting and measuring instruments as well as the employment records and travel activities of individuals including students. The Committee also anticipated conflict between the implementation of control measures and developing nuclear energy as a profit making industry regulated and promoted by governments.

Control by nature was "dependent on [the] confidence of [the] whole field of international relations".[129] A pledge to forego development of nuclear weapons in this type of system placed "an enormous pressure upon national good faith".[130] Faith would increasingly be tested with growth of industrial capacity which would provide a reserve for military potentialities through what today might be referred to as "virtual

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[126] *The Acheson-Lilienthal Report, op. cit.*, p. 4.

[127] *Ibid.*, pp. 4-5.

[128] *The Acheson-Lilienthal Report, op. cit.*, pp. 6-8; for additional estimates see The Technical Committee on Inspection and Control, *op. cit.*, p. 29.

[129] PRO FO 371/59635 29490, British Foreign Office to Paris, Telegramme No. 619, 10 July 1946.

[130] *The Acheson-Lilienthal Report, op. cit.*, p. 4. Also see *Informal Statement on International Control of Atomic Energy, op. cit.*, p. 9.

arsenals".[131] If peaceful activities were left unmonitored, any security provided would inevitably collapse. The report noted:

> So long as intrinsically dangerous activities may be carried on by nations, rivalries are inevitable and fears are engendered that place so great a pressure upon a system of international enforcement by police methods [...].[132]

Ironically, a system designed to place "reasonable reliance upon inspection" and to allow the national exploitation of atomic energy would become the basis for the nuclear control system that ultimately was adopted.

Principles of an Effective System

In making their recommendations, *The Acheson-Lilienthal Report* identified six basic principles necessary for an effective control system. First, the plan, if it were established, "must reduce to manageable proportions the problem of enforcement of an international policy against atomic warfare."[133] In other words, the plan had to be feasible. The system needed to consist of some realistic combination of practical measures. The UNAEC concluded that it was scientifically, technologically and practically feasible to ensure nuclear energy use for only peaceful purposes; to eliminate nuclear weapons; and to provide effective safeguards against violations and evasions via inspections and other measures.[134]

Second, a control plan must provide "unambiguous and reliable danger signals if a nation takes steps that do or may indicate the beginning of atomic warfare" and these signals must provide sufficient warning to "leave time adequate to permit other

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[131] *The Acheson-Lilienthal Report, op. cit.*, p. 8. On virtual arsenals see Michael J. Mazarr (ed.), *Nuclear Weapons in a Transformed World: The Challenge of Virtual Nuclear Arsenals*, St. Martin's Press, New York, 1997.

[132] *The Acheson-Lilienthal Report, op. cit.*, p. 5.

[133] *Ibid.*, p. 9.

[134] For full UNAEC findings see "First Report of the United Nations Atomic Energy Commission to the Security Council", 31 December 1946, UNAEC, AEC/18/Rev.1 in, *Official Records: Special Supplement, Report to the Security Council*, United Nations, Lake Success, New York, 1946, pp. 13-22.

nations - alone or in concert- to take appropriate action."[135] This principle functions as a threat management mechanism, giving states an opportunity to re-establish the balance of power should a participant cease compliance. Warning time was assumed substantial. The objective was "to make the control system so effective that plans for violation or evasion - whether of a major or minor character - may be detected at the earliest stages and prompt measure taken for effective prevention."[136]

Third, *The Acheson-Lilienthal Report* advocated that if the plan "fails or the whole international situation collapses, any state such as the United States will still be in a relatively secure position, compared to any other nation."[137] While the manner in which this principle was presented is coloured by the US national objective of ensuring global supremacy in system failure, the underlying concept is critical. A system failure should not leave a participant in a severely disadvantaged security situation. Experts at the time believed that a plan could fail in several ways. First, a state could withdraw from a control agreement or seize nuclear facilities that the control authority managed. Second, it could divert material or pursue a clandestine nuclear programme. Finally, states could collectively decide to terminate the agreement. These situations were all viewed as critical because of enormous strategic implications of a single nuclear weapon in a nuclear-weapons-free environment. Experts believed that the hazards of a control system were potentially greater than retaining a nuclear force if non-compliance is not considered.[138]

The fourth principle states that "the plan must be one that is not wholly negative, suppressive, and police-like[...]the plan must be one that will tend to develop the beneficial possibilities of atomic energy[...]."[139] The need to provide incentives for states to accept rather cumbersome controls was noted by Prof. Skobeltzyn of the Soviet UNAEC delegation,

> Inspection and control from the outside are to some degree objectionable to any nation, but certainly much less so if they bring with

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[135] *The Acheson-Lilienthal Report, op. cit.*, p. 9; on the level of detection also see Dr. Nervo (Mexico), UNAEC, AEC/C.2/4, p. 4.

[136] Statement by Australia, UNAEC, AEC/W.C./2, p. 6.

[137] *The Acheson-Lilienthal Report, op. cit.*, p. 9.

[138] Normally, an arms control system must reduce the hazards of current armament policies by more than the risk introduced by the implemented measures. (Brennen, *op. cit.*, p. 37.)

[139] *The Acheson-Lilienthal Report, op. cit.*, p. 9.

them developments of peaceful uses which are of vital importance to that nation.[140]

Fifth, the plan had to cope with new threats as the field developed.[141] States needed to believe in the control system, not simply the controls. A rise in international tensions or the development of new technologies could cause states to re-evaluate control plan efficacy. It was therefore thought that the control authority should be accorded the power to assess and adjust safeguards periodically to meet changing technical conditions.[142] Adjustments might include staff members or detection procedures.[143] This also implied that the system of controls and safeguards needed to be based upon the most current information available.[144]

Finally, "[t]he plan must involve international action and minimise rivalry between nations in the dangerous aspects of atomic development."[145] Nuclear weapons have global implications and require global solutions. Nuclear technology is such that "the development and use of atomic energy are not essentially [and exclusively] matters of domestic concern of the individual nations, but rather have predominantly international implications and repercussions."[146] The system must function as an international threat reduction mechanism for nuclear security related

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[140] UNAEC, AEC/C.3/W.3, pp. 2-3.

[141] *The Acheson-Lilienthal Report, op. cit.*, p. 10. On the role of technology in arms control theory see Hedley Bull, *The Control of the Arms Race*, The Institute for Strategic Studies, London, 1961, pp. 196-197.

[142] "United States Memorandum No. 2, Dealing with the Functions and Powers of the Proposed Atomic Development Authority, Submitted to Sub-Committee No. 1 of the United Nations Atomic Energy Commission, New York, July 5, 1946" in *Growth of a Policy, op. cit.*, p. 155. (hereafter referred to as *United States Memorandum No. 2*); UNAEC, AEC/C.2/W.20, Appendix IV, pp. 14-15; *Official Records of the Third Session of the General Assembly*, First Committee, United Nations, New York, Part 1, 1948, p. 55.

[143] P. M. S. Blackett, M. Born, P. I. Dee, et al., "Memo to the UN Atomic Energy Commission", *Bulletin of the Atomic Scientists*, 1 June 1946, Vol. 1, p. 8. Also see *The Acheson-Lilienthal Report, op. cit.*, pp. 32-33.

[144] Dr. H. V. Evatt, (Australia), "Statements Relating to the United States Proposals Taken from the Official Records of the Third Meeting of the Atomic Energy Commission, June 25, 1946", in *Growth of a Policy, op. cit.*, p. 198.

[145] *The Acheson-Lilienthal Report, op. cit.*, p. 10.

[146] UNAEC, AEC/C.1/9, Appendix II; A/1050, Annex 1. Also see UNAEC, AEC/15/Rev.1.

issues.[147] Thus, the system was more than just a set of technical controls on equipment and materials. It was a mechanism that addressed political tensions relating to nuclear issues. This extended beyond giving the control authority a confidence-building function to enabling it to become directly involved in relations between states when nuclear concerns arose.

UNAEC Negotiations

The Acheson-Lilienthal Report served as the basis for the official US international control proposal, the Baruch Plan.[148] The Baruch Plan, presented to the United Nations General Assembly on 14 June 1946, called for an international authority, the Atomic Development Authority (ADA), to control the world's nuclear fuel cycle activities. The Soviet Union rejected the Plan and offered a counter-proposal five days later for a draft convention prohibiting the production and use of nuclear weapons and calling for nuclear weapons dismantlement within three months of entry-into-force. The proposal mentioned no verification mechanism and violations were penalized through domestic legislation. The West criticised the absence of verification citing the inefficacy of other international disarmament agreements without verification measures.[149]

Negotiations were already becoming bogged down in the emergent East-West conflict. On 11 June 1947, the Soviet Union presented a new proposal for national control with periodic inspection. The plan was rejected on 11 September as being weak. Irreconcilable differences between the two sides could not be resolved. Although the UNAEC reached an impasse in May 1948, the UNGA endorsed the principles and proposals of the Baruch Plan in November 1948. The Plan then became known as the "Majority Plan" and was seen by the UNGA as "constituting the necessary basis for establishing an effective system of international control of atomic

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[147] George Washington University National Security Archives, Nuclear Non-Proliferation Collection, 1945-1990 (1991) (hereafter referred to as GWU), Joint Chiefs of Staff, *Guidance as to the Military Implications of a United Nations Commission on Atomic Energy*, J. C. S. 1567/26, 12 January 1946, GWU Doc. No. 16.

[148] "The Baruch Plan" is reprinted in United States Congressional Research Service, *Nuclear Proliferation Factbook*, USGPO, Washington, DC, 99th Congress, 1st Session, August 1985, pp. 14-33 (hereafter publication is referred to as *Nuclear Proliferation Factbook).*

[149] For Australian comments see, UNAEC, AEC/W.C./2, p. 6; for sentiments expressed by the Netherlands see Lieberman, *op. cit.*, p. 331.

energy to ensure its use only for peaceful purposes[...]".[150] Subsequent discussions to resolve the disagreements between East and West were conducted among a core group of UNAEC members. The talks quickly degenerated and ceased in 1950. The UNAEC officially disbanded on 11 January 1952.

The Grand Scheme

The Baruch Plan not only embraced the principles of control but expanded them. The key objective was "to prevent illicit use of fissionable materials."[151] Prevention was considered feasible[152] and a requirement for an effective system.[153] The detection of violations was insufficient.[154] As noted by the United Kingdom, "It is completely unrealistic to expect any nation to renounce atomic weapons without any assurance that all nations will be *prevented* from producing them."[155] Prevention entailed not only violation detection, but violation correction.[156]

To implement prevention, the ADA was to be accorded broad rights. The ADA had the right to survey a nation's entire fuel cycle-related operations; conduct research and development on nuclear energy and weapons, own key materials, and establish safeguards including accounting and inspection systems. The Authority would have unhindered access to all locations, including military and R&D installations, to inspect for diversion and clandestine activities. It would have powers to regulate which concentrations and quantities of materials were subject to what levels of control; set

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[150] United Nations General Assembly (UNGA) Resolution 191 (III).

[151] *United States Memorandum No. 2*, *op. cit.*, p. 154; for similar sentiments see by the British see PRO FO 371/67492 , Sir George Thomson, Cabinet Official Committee on Atomic Energy, *Powers of An Atomic Development Authority*, Memorandum, A.E.(O)(47)4, 7 January 1947.

[152] The Technical Committee on Inspection and Control, *op. cit.*, p. 9.

[153] "Tentative Proposals by Chairman of the Atomic Energy Commission, Herbert V. Evatt, Representative of Australia, New York, July 1, 1946" (hereafter referred to as *Tentative Proposals*), in *Growth of a Policy*, *op. cit.*, pp. 202-203.

[154] PRO AB 16/38 27590, *Report on the Soviet Proposals,* 1947.

[155] *Ibid.* (Emphasis added.)

[156] "Report and Resolution on the Soviet Proposals by the Working Committee of the United Nations Atomic Energy Commission, April 5, 1948", in *Documents on Disarmament 1945-1959*, Vol. 1, *op. cit.*, p. 163; similar sentiments were expressed by the Netherlands, UNAEC, AEC/C.2/5, p. 3.

production and construction quotas; conduct, manage, and license operations; oversee nuclear R&D; approve the transfer of materials, facilities and equipment; and establish physical protection including guard forces and transportation standards. Only the Authority would have the right to conduct enrichment processes, operate large reactors, and reprocess plutonium. Under license, states could operate facilities able to produce minimal quantities of fissionable material avoiding the accumulation of dangerous stockpiles, and could lease "denatured" fissionable materials for power plant operations.[157]

To make the monopoly politically feasible, the experts sought to apply graded controls. Controls, including physical protection, were based on the contribution that materials, facilities and activities could make to the construction of a nuclear weapon.[158] The line between safe and dangerous activities was determined by the type and quantity of nuclear materials utilised and the potential to divert militarily significant amounts.[159] Analysts believed that control application should not be mechanical. For example, inspection was not necessarily applied because an activity was being conducted. Inspection requirements were determined by "all relevant factors" rather than the "dangerous" criterion.[160] As processes become increasingly complicated, feasible accounting measures for control would become increasingly difficult.[161] Experts anticipated situations where technical control was not possible. In those circumstances, the Authority needed to provide effective threat management.[162]

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[157] Key documents which describe the plan include: "`United States Atomic Energy Proposals' presented to the United Nations Atomic Energy Commission by Bernard M. Baruch, the United States Representative, 14 June 1946", in *Nuclear Proliferation Factbook*, pp. 14-24; "United States Memorandum No. 1 Submitted to Sub-Committee No. 1 of the United Nations Atomic Energy Commission 2 July 1946", in *Growth of a Policy, op. cit.*, pp. 148-151; *United States Memorandum No. 2, op. cit.*, p. 152.

[158] *Informal Statement on International Control of Atomic Energy, op. cit.*, p. 6; UNAEC, AEC/C.2/9, Appendix II, p. 10.

[159] *Ibid.*, p. 23.

[160] *Ibid.*, p. 7.

[161] UNAEC, AEC/C.3/W.8, p. 4.

[162] UNAEC, AEC/C.2/W.10, p. 5.

Comprehensive Knowledge and Control over Nuclear Activities

For effective control, the majority of UNAEC participants advocated that the ADA retain full knowledge of all activities relevant to nuclear energy production and apply controls as needed. According to the Second Report of the UNAEC to the UN Security Council:

> [...]all activities connected with the production and use of atomic energy must be known to and authorized BY THE AGENCY in which control is vested.[163]

The Authority's ability to maintain comprehensive knowledge on global nuclear developments was critical for effective control as it was central to identifying clandestine activities.[164] Comprehensive knowledge implied that the ADA should acquire all data relevant to prevent the illegal use of fissile materials. States reported nuclear related activities including information on facilities, components, materials and production activities. It included reporting on natural deposits, nuclear industry developments, non-nuclear relevant developments (e.g. large-scale construction, electricity production, dual-use industry), and nuclear-trained personnel. The Authority was also to conduct independent leading-edge R&D activities and potentially develop nuclear explosives.[165]

The need for comprehensive knowledge implied that nuclear programmes therefore needed to be transparent. This was achieved through regular and no notice inspections. To safeguard reactor, enrichment, fuel fabrication and reprocessing facilities classified as "dangerous", inspectors required "complete freedom within the plants".[166] Full access to all sites without exception was considered critical. A report of Committee Two of the UNAEC notes:

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[163] UNAEC, AEC/C.2/W.20, Appendix III, p. 11.

[164] CPNA USAEC, 1944-1952, Osborn to Paul Fine, 14 July 1947; Office of Mr. Bernard M. Baruch, *Scientific Information Transmitted to the United Nations Atomic Energy Commission by the United States* Representative, Technological Control of Atomic Energy Activities, Vol. 6, 14 October, 1946, p. 36; PRO FO 371/59652 29551, ViG. Laford, United Kingdom Delegation to the United Nations to Nevile M. Butler, Esq., 4 October 1946.

[165] Committee on Atomic Energy of the Carnegie Endowment for International Peace, *op. cit.*, p. 25; CPNA USAEC, 1944-1952, *Observations of the French Delegation Concerning the Functions of the International Agency Regarding Research and Development*, 1947.

[166] Office of Mr. Bernard M. Baruch, 14 October 1946, *op. cit.*, p. 36. Also see statement by the Netherlands, UNAEC, AEC/C.3/W.6, p. 8.

> It is obvious that no feeling of security could be established in the world if nations could reserve the right to prohibit access to certain parts of their territory.[167]

With this in view, the Authority required the right to search industrial buildings, military installations and ships.[168]

Comprehensive control meant that the control authority applied measures on all direct and indirect nuclear activities and was given autonomy in implementation procedures. The rationale was that only the grand scheme would be sufficiently effective to resolve nuclear threats since nation-states would have great difficulty in setting aside national interests for the international well-being of the community. Comprehensive control, as seen by the Baruch Plan, implied that the Authority approved permitted activities in which states could engage under specified controls while all other nuclear related activities were regarded as illicit.[169] The right for states to design peaceful nuclear programmes, manage their own stockpiles and set production operations had to be taken out of states hands if the prevention of rivalry was to be achieved.[170] This was in contrast to the inspection system proposed by the Soviet Union Soviet in which measures were to be applied to nuclear energy activities to ensure that prohibited activities did not take place. The philosophy of the approach was one of detecting crimes rather than conducting customs inspection over defined channels of transport.[171] Without controls over commercial production, the Authority could not maintain control or prevent the accumulation of dangerous stocks.[172]

While violations by nations and individuals required different treatments[173], physical protection of materials and facilities against diversion or malevolent acts was

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[167] UNAEC, AEC/C.2/44/Rev.2, p. 10. Also see UNAEC, AEC/C.2/74, p. 9.

[168] *Informal Statement on International Control of Atomic Energy, op. cit.*, pp. 63-65.

[169] Office of Mr. Bernard M. Baruch, 14 October 1964, *op. cit.*, p. 4.

[170] UNAEC, *AEC 2nd Supplementary Report*, United Nations, New York, 1947, p. 144.

[171] Blackett, Born, Dee, et al., *op. cit.*, pp. 8.

[172] UNAEC, AEC/C.2/16, pp. 2-3.

[173] Statement by Canada, UNAEC, AEC/C.1/9.

regarded as a factor in formulating any comprehensive control plan.[174] The Baruch Plan centralised physical protection whereby the Authority set standards with respect to guard units and shipping[175], and maintained minimum guarantees.

Justifying the Extreme

This proposed monopoly was not considered extreme in the West. The justification was the dual nature of nuclear energy, the inexact science of verification and the interdependency of safeguards measures.[176] A clear picture of a state's nuclear energy programme was not easy to obtain. Information sources on states' nuclear activities were not completely reliable. A highly accurate accounting system was extremely difficult to achieve even with complete access to a state's nuclear programme, because material balances varied considerably. One plant's monthly material unaccounted for (MUF) was 1.1 to 2 percent of materials flow.[177] Bulk processing and large inventories further complicated accounting.[178] This was problematic because the larger the variation in account balances, the greater the chances that assurances provided by the system will be undermined.

Safeguards measures were dependent upon one another.[179] The rate of loss and lack of verification technology was disturbing to control analysts. Gaps in the

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[174] UNAEC, AEC/C.2/W.12, p. 8.

[175] Archon, Black, Cassella, et al., *op. cit.*, p. 11; UNAEC, AEC/C.2/W.20, Appendix I, p. 7; Office of Mr. Bernard M. Baruch, *op. cit.*,14 October, 1946, p. 27.

[176] *United States Memorandum No. 2*, *op. cit.*, p. 155; *The Acheson-Lilienthal Report*, *op. cit.*, p. 6. Also see *Growth of a Policy*, *op. cit.*, p. 91 and "Report of the Scientific and Technical Committee of the United Nations Atomic Energy Commission on the Scientific and Technical Aspects of the Control of Atomic Energy, New York, Sept. 26, 1946" in *Growth of a Policy*, *op. cit.*, pp. 273-4, 278 (hereafter referred to as *Report of the Scientific and Technical Committee*); Joint Chiefs of Staff, *op. cit.*

[177] Office of the Mr. Bernard M. Baruch, *The International Control of Atomic Energy Scientific Information Transmitted to the United Nations Atomic Energy Commission*, 15 December 1946, Vol. 7, The United States and the United Nations Report Series 9, Department of State, 1947, p. 7.

[178] The Technical Committee on Inspection and Control, *op. cit.*, p. 25. Also see statement by the United States, UNAEC, AEC/C.3/W.7, p. 3; CPNA USAEC, 1944-1952, Memorandum for Dr. Bush, from Carroll L. Wilson, 2 January 1946. Also see Office of Bernard M. Baruch, 15 December 1946, *op. cit.*, pp. 22-23.

[179] *The Acheson-Lilienthal Report*, *op. cit.*, p. 6. Also see *Growth of a Policy*, *op. cit.*, p. 91; *Report of the Scientific and Technical Committee*, *op. cit.*, p. 278.

control system would permit diversion.[180] While losses might become predictable and regularised, reducing MUF would afford a diversion opportunity.[181] The Authority needed control over all aspects of the fuel cycle to assemble as many of the imperfect bits of data on nuclear programmes to produce an accurate picture.

Comprehensive control was also justified on the basis that as a strong system solved problems unremedied by a limited system. International monopoly prevented instability arising from excess accumulation of weapons usable materials or facilities that would be useful in the weapons programme. Distribution of stockpiles and limits on capacity and type of facilities also minimised the advantages of diversion or seizure.[182]

Ownership of facilities and materials served as a critical legal and administrative convenience.[183] Primarily, it remedied potential problems arising from commercial development. It avoided fuelling rivalries generated by states using national energy programme to hide clandestine activities or by their unintentional acquisition of virtual nuclear weapons capabilities.[184] Ownership contributed to global rather than national interests. The Third Report of the UNAEC concluded that nuclear energy must not be developed on the " basis of national interests and needs, means and resources". Rather, the planning and production of nuclear energy must be approached as a common international enterprise in all its phases.[185] Ownership was perceived as contributing to a strong and effective control authority. If states retained

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[180] UNAEC, AEC/C.1/77/Rev.1, pp. 63-64.

[181] Statement by the United States, UNAEC, AEC/C.3/W.7, p. 3 and UNAEC, AEC/C.3/W.6, pp. 7-8. Also see Office of Bernard M. Baruch, 15 December 1946, *op. cit.*, p. 19.

[182] CPNA USAEC, 1944-1952, *Principles Governing Geographical Location of Dangerous Activities and Stockpiling*, undated; Office of Mr. Bernard M. Baruch, 14 October, 1946, *op. cit.*, pp. 2-3.

[183] PRO AB 16/38 27590, Permanent United Kingdom Representative to the United Nations to Foreign Office, No. 1546, 5 June 1947.

[184] Statement by the United States, UNAEC, AEC/C.2/50, p. 7; *AEC 2nd Supplementary Reports*, 1947, *op. cit.*, p. 223; UNAEC, AEC/C.3/W.16. During the negotiations, the United Kingdom noted that excessive power costs in operating a plant might lead to a decision to accept greater losses of material as an overall economy. (UNAEC, AEC/C.3/W.6, p. 8.)

[185] "Third Report of the United Nations Atomic Energy Commission to the Security Council, May 17, 1948" *op. cit.*, p. 171. Also see *The United States Memorandum No. 2*, *op. cit.*, p. 155; *The Acheson-Lilienthal Report*, *op. cit.*, p. 19; *Tentative Proposals*, *op. cit.*, pp. 202-203.

programme ownership, they could question Authority decisions on the disposition of any nuclear material or facility or lay claim to source material, nuclear fuel or "dangerous" facilities located on their territory endangering international security.[186] As owner, the ADA could make unpopular decisions necessary to prevent diversion that would be difficult to do in a purely inspection role.[187] For example, it was recognized that the safest design was not necessarily the most commercially efficient one.[188] Requiring plants to utilise the safest or most proliferation-resistant materials available were considered. By extending such regulatory powers to the ADA, the required inspection level could be reduced.[189]

Transparency of the Authority and State Programmes

International nuclear control was more than a system of technical measures guarding against acquisition; it was a threat management system containing political measures. Transparency among states and the Authority was a *bona fide* control measure that could stabilise international relations.[190]

The Authority needed to be transparent to promote confidence in the system.[191] A transparent Authority assured states that its standards met requirements. Even more critical was the transparency of a state's nuclear programme. Transparency contributed to the ability to track nuclear activities and made concealment difficult.[192] Dialogue, contact and cooperative development

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[186] *AEC 2nd Supplementary Report*, 1947, *op. cit.*, p. 156; UNAEC, AEC/C.2/44/Rev.2, p. 9.

[187] *United States Memorandum No. 2*, *op. cit.*, p. 155; *The Acheson-Lilienthal Report*, *op. cit.*, p. 19.

[188] UNAEC, AEC/C.2/W.11, p. 5.

[189] Blackett, Born, Dee, et al., *op. cit.*, pp. 8; UNAEC, AEC/C.3/W.20, Appendix II. Also see The Technical Committee on Inspection and Control, *op. cit.*, p. 23.

[190] UNAEC, AEC/C.3/W.3, p. 6.

[191] *Informal Statement on International Control of Atomic Energy*, *op. cit.*, p. 12; Alexandre Parodi,"Statements Relating to the United States Proposals Taken from the Official Records of the Third Meeting of the Atomic Energy Commission, June 25, 1946", in *Growth of a Policy*, *op. cit.*, p. 184.

[192] *Informal Statement on International Control of Atomic Energy*, *op. cit.*, p. 12.

between nations would lessen distrust.[193] According to an informal group associated with the War Department Technical Committee on Inspection and Control, the most important step in providing adequate safeguards against nuclear weapons was securing complete access for inspectors to any location as necessary in any state. Without such access there could be no reliable safeguards against the development of nuclear weapons.[194]

Full access also implied speedy access.[195] This entailed using national or UN communication facilities and systems, movement in and between installations, available transportation facilities, and the provision of *laissez passer* for quick travel.[196] While proper procedures were required and varied with the territory or building accessed,[197] warrants were viewed cautiously. There was concern that if a state questioned the Authority's request for an inspection, other states would see this behaviour as an attempt to hide a clandestine programme.[198]

Information transparency about developments in the field was necessary. Under the UNAEC plan, research and development on nuclear weapons was limited to the Authority, but there was greater danger if nuclear explosives information was not disseminated than if it was.[199] A nation holding unique nuclear weapons production

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[193] Third Report of the United Nations Atomic Energy Commission to the Security Council, May 17, 1948, in *Documents on Disarmament 1945-1959*, Vol. 1, *op. cit.*, p. 171; CPNA, Department of State, *Functions of the International Agency for the Control of Atomic Energy, Fourth Draft Incorporating Views of the UK and US Delegations on Item A.2 (a) of UNAEC*, AEC/C.2/16; The Technical Committee on Inspection and Control, *op. cit.*, p. 52.

[194] *Informal Statement on International Control of Atomic Energy, op. cit.*, p. 11.

[195] *Ibid.*, p. 4.

[196] *United States Memorandum No. 2, op. cit.*, p. 159; UNAEC, AEC/C.2/61/Rev.1, pp. 4-12.

[197] UNAEC, AEC/C.2/44/Rev.2, p. 10. Also see UNAEC, AEC/C.2/74, p. 9.

[198] "British Atomic Scientists' Proposals for International Control of Atomic Energy", *British Atomic Scientists*, February 1947, Vol. 3, No. 2, pp. 43, 49.

[199] UNAEC, AEC/C.2/35, p. 22. Some discontentment was expressed on attempts to limit research to the Authority. The British Atomic Scientists Association argued against the classification of research on nuclear explosives as a dangerous as the danger derived from the application of the results. They believed that a sufficient safeguard would be to ensure that research efforts not directly owned by the Authority should have no access to dangerous amounts of material, except under supervision and to require that research be conducted openly. ("British Atomic Scientists' Proposals for International Control of Atomic Energy", *British Atomic Scientists*,

knowledge in violation of the treaty could have a greater advantage than one facing rivals without similar knowledge.

Enforcement as an Option to Address Security in the Event of System Failure

The Baruch Plan built on *The Acheson-Lilienthal Report* in seeking to establish guidelines in the event of non-compliance. The absence of an enforcement mechanism in *The Acheson-Lilienthal Report* was criticised by the US Ambassador to the UN, Bernard Baruch and by the Benedict Committee.[200] The strategic implications of a major violation required enforcement. Any violation in the manufacture or use of controlled items equated to contemplating armed attack on complying states.[201] Thus, violations were symbolic of system failure; without an enforcement mechanism, the plan could not provide true security in the event of such a failure.

Some decision-makers in the United States believed that effective control required an authority invested with enforcement powers.[202] Such an authority would make the system one that abolished nuclear warfare rather than warning of it. Enforcement through "rapid and codign punishment" of violators contributed to deterrence[203] and provided inducement for joining a reliable and effective system.[204] The Baruch Plan proposed that the veto rights of the UNSC should be suspended in the event that they needed to consider a matter of non-compliance. This framework aimed to prevent a member of the UNSC, which is either in non-compliance with its disarmament commitment or an ally of a non-complying state, from blocking

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February 1947, Vol. 3, No. 2, p. 43.)

[200] The Benedict Committee consisted of technical experts who reported to General Groves.

[201] CPNA USAEC 1944-1952, John Foster Dulles to Mr. Bernard A. Baruch, 3 July 1946; CPNA USAEC, 1944-1952, Paul C. Fine, *Memorandum Punishment of Violations of an Atomic Energy Treaty*, 13 January 1947.

[202] The Technical Committee on Inspection and Control, *op. cit.*. Also see Lilienthal, 1946, *op. cit.*, p. 15. Canada and the United Kingdom modified their stand for unanimity. (Lieberman, *op. cit.*, p. 385.)

[203] Lieberman, *op. cit.*, p. 277. Also see Alexander Cadogan, "Statements Relating to the United States Proposals Taken from the Official Records of the Second Meeting of the Atomic Energy Commission, 19 June 1946", in *Growth of a Policy, op. cit.*, p. 176; *Informal Statement on International Control of Atomic Energy, op. cit.*, p. 8; *Growth of a Policy, op. cit.*, pp. 177, 179, 194.

[204] Lieberman, *op. cit.*, p. 282.

corrective action by the international community. Controls would be ineffectual if the enforcement of security provisions could be prevented by the vote of a treaty-signatory state.[205] For gross violations, military sanctions would be left to the Security Council.[206]

According Power to the Authority

Linked to enforcement and comprehensive control was the concept of empowering the Authority. Enforcement mechanisms needed to be clearly defined so that the Authority could not be intimidated into side-stepping its responsibilities. Analysts wanted to avoid situations where the Authority's "lack of courage" in dealing with a compliance breach might constitute a threat to peace.[207] Enforcement regulations would prevent states from exploiting political alignments, confusion and hesitation to suppress a violation report until completion of nuclear weapons development.[208]

The Authority needed the power to investigate suspicious activities or assess penalties to avoid aggravating situations.[209] Baruch proposed an Authority empowered not only to rectify major offenses but also to address interference with verification activities or actions by states contrary to agreed terms.[210] Potential measures included closing plants, revoking licenses, cutting off material supplies and reporting the incident to the Security Council.[211]

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[205] "United States Memorandum No. 3, Dealing With the Relations Between the Atomic Development Authority and the Organs of the United Nations Submitted to Sub-Committee No. 1 of the United Nations Atomic Energy Commission, New York, July 12, 1946", in *Growth of a Policy, op. cit.*, p. 163; Parodi, *op. cit.*, p. 184.

[206] Archon, Black, Cassella, et al., *op. cit.*, p. 10.

[207] Statement by France, UNAEC, AEC/C.1/9, p. 7.

[208] CPNA USAEC, 1944-1952, Dean Rusk, Director of Office of Special Political Affairs to Warren R. Austin, US Representative to the United Nations, 23 June 1947; CPNA USAEC 1944-1952, Owen J. Roberts, Montgomery McCracken Walker & Rhoads Law Offices to F. Eberstadt Esq., 13 June 1946.

[209] Rusk, *op. cit.*

[210] *Growth of a Policy, op. cit.*, p. 91.

[211] Archon, Black, Cassella, et al., *op. cit.*, p. 10.

Control as a Means to an End

Negotiators realised that there were inherent flaws in the programme. The plan could not provide 100 percent assurance. In addition, control over industrial production bought time to find a solution to the plutonium stockpiles which would inevitably arise from large scale nuclear energy production. Measures to limit weapons-usable material to actual requirements were useful,[212] but regardless of programme nature or stockpile distribution, nuclear production growth would generate international tension.[213] Analysts considered temporarily limiting the scale of nuclear energy development and implementing the destruction of excess materials.[214]

Because the control system relied on the Authority obtaining comprehensive knowledge of state activities, expediency in the establishment of control was critical for efficacy. Experts believed that in view of the limits of the verification technologies available, the longer the delay in establishing international control, the less security the control plan would provide. This was due to difficulties in accurate assessment of past nuclear material production based on accounting, inspection and back-checking.[215]

Non-Possession of Nuclear Weapons, Universality and Permanency

Among the control proposals at the time, there was consistent agreement that to sustain effective control, the possession of nuclear weapons by any state was not tolerable. Renunciation was a *sin qua non* for broad participation, renunciation of nuclear weapons and submission to control. These sentiments were expressed in a Joint Chiefs of Staff memorandum:

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[212] UNAEC, AEC/C.2/39/Rev.2, p. 3.

[213] *Informal Statement on International Control of Atomic Energy, op. cit.*, p. 5; World Government Committee, p. 4; UNAEC, AEC/C.3/W.8, p. 6.

[214] *Informal Statement on International Control of Atomic Energy, op. cit.*, p. 5; World Government Committee, p. 5; *Report of the Scientific and Technical Committee, op. cit.*, p. 277.

[215] David F. Cavers, "An Interim Plan for International Control of Atomic Energy", *British Atomic Scientists*, Vol. 6, No. 10, (13-16) 1950, p. 13. Also see Dr. H. V. Evatt, "Statements Relating to the United States Proposals Taken from the Official Records of the Third Meeting of the Atomic Energy Commission, June 25, 1946", in *Growth of a Policy, op. cit.*, p. 195; The Technical Committee on Inspection and Control, *op. cit.*.

> The United States already has available atomic weapons in some quantity, has used them, and is making more of them. Consequently, it would be logically difficult to forbid other powers from developing and making ready atomic weapons unless the United States ceases production and destroys all its bombs or unless all other nations agreed to make the United States the trustee of the weapons [...].[216]

Therefore, the UNAEC concluded that an "international agreement to outlaw the national production, possession and use of atomic weapons is an essential part of any such international system of control and inspection."[217] To surrender their weapons, states needed assurances against nuclear attack and these "could only come from the basic conviction by all individuals and all nations concerned that atomic energy should not be used in weapons."[218]

Ultimately, non-universal participation would undermine effectiveness. A Harvard study on the Atomic Development Authority noted:

> Since the entire control program could be sabotaged if any area of the earth's surface were free from international control and inspection, it is necessary that every self-governing state be a member of the ADA whether or not it is a member of the United Nations.[219]

Permanent participation would maximise treaty effectiveness. A withdrawal would cause very serious repercussions, which could include cessation in control plan operation.[220]

Relevant Conditions of the Time that Affected Control System Design

In assembling a control system, analysts and policymakers made several assumptions, some of which we would now consider to be false. While these assumptions affected the effectiveness that any control plan could achieve, they did

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[216] Joint Chiefs of Staff, *op. cit.*, para. 21.

[217] UNAEC, AEC/18/Rev.1, Summary Findings, *op. cit.*, para. C.2.6.

[218] *Ibid.*, para. C.2.6.

[219] CPNA USAEC, 1944-1952, Archon, Black, Cassella, et al., *op. cit.*, p. 1.

[220] Rusk, *op. cit.*

not undermine the validity of the principles nor the dynamics of control as then understood.

The Baruch Plan rested on the premise that state interests "should be relegated to the background" as the control organ exercised its functions of control and inspection.[221] This was much to the dismay of the Soviets. Advocates assumed that the international control plan would be politically acceptable and garner universal participation. They assumed that the world viewed nuclear weapons as they did[222] - the nuclear threat was so great that states would easily sacrifice part of their sovereignty to mitigate the risk.

Negotiations faltered. Establishing a control system was not only a question of technical feasibility, but of political feasibility.[223] Views in the East on requirements for an international control plan differed considerably from those in the West. The Soviet representative to the United Nations, Andrei Gromyko, argued that management was not required for an effective system.[224] He cautioned that the importance of inspection had been exaggerated[225] and source material presented no danger in the absence of facilities to process it into nuclear fuel.[226] From the Soviet perspective, the only guarantee of security lay in the genuine desire of all UN members to cooperate.[227]

Likewise, perceptions varied regarding what "control" implied. The United States saw control in a regulatory sense which included ownership, management, licensing and supervision.[228] For the French, control implied quantitative accountability

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[221] United Nations Security Council, *Official Records*, 2nd year, No. 22, 5 March 1947, pp. 445-449.

[222] The British Government pointed out this assumption in *The Acheson-Lilienthal Report*. PRO FO 371/59636 29465, Cabinet, Atomic Energy, Gen. 75/37, 4 July 1946.

[223] CPNA USAEC, 1944-1952, Lincoln Gordon, Associate Professor of Business Administration, Harvard University to R. Gordon Arneson, US Representative to the UN Atomic Energy Commission, 27 March 1947; statement by the Netherlands, UNAEC, AEC/C.2/W.13, p. 2; PRO FO 371/59635 29490, *International Control of Atomic Energy The United States and Soviet Proposals*, Draft Memorandum by Officials, 1946.

[224] Statement by the Soviet Union, UNAEC, AEC/C.1/23.

[225] Statement by the Soviet Union, UNAEC, AEC/C.2/4, p. 3.

[226] *AEC 2nd Supplementary Report, op. cit.*, p. 139.

[227] Statement by the Soviet Union, UNAEC, AEC/C.2/4, p. 3.

[228] UNAEC, AEC/C.1/25.

and included inspection but not necessarily the power to manage. The British tended to link control with safeguarding.[229] The Soviets appeared to use control to mean the authority exercised by a director in running a commercial plant.[230] Eventually, a definition for "control" resembling the American definition was agreed on in the UNAEC negotiations.[231]

There were also assumptions made on the nature of the future control Authority. Negotiators believed that control and guarantees of its implementation were inseparable from an effective plan.[232] They assumed that the new control organ would function properly to execute its assigned tasks. When considering the application of a particular safeguard, the Authority was to base its decision on the effectiveness of the control and not its palatability.[233] It was assumed that the Authority would be vested with *all* necessary rights to carry out its duties without political hindrances.[234] In addition, although finances were not discussed, the Authority was expected to have sufficient funding to expedite its responsibilities.

Technical Assumptions

When nuclear control systems were under negotiation, nuclear energy was a new science and far from understood. Proposals were based on current technical understanding. Scientists mistakenly believed that uranium and thorium, required for nuclear weapon construction, had only limited availability. A monopoly of source materials was considered "one of the most effective measures" for nuclear control as it would prevent clandestine production.[235] Unless a state diverted material or

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[229] UNAEC, AEC/C.2/W.10, p. 8; statement by France, UNAEC, AEC/C.1/44; UNAEC, AEC/C.3/W.7, p. 5.

[230] UNAEC, AEC/C.2/W.18, p. 8. Also see UNAEC, AEC/C.1/23, p. 9; UNAEC, AEC/C.1/24, p. 7.

[231] Control was designed to act as a check on "bad faith" and to defeat evasion, in the same way that the UN Charter implies vigilance against aggressive designs and provides for forcible action to maintain or restore international peace and security when it is threatened or broken. (UNAEC, AEC/C.2/W.10, p. 8.)

[232] Parodi, *op. cit.*, p. 184.

[233] Statement by United States, UNAEC, AEC/C.2/W.20, Appendix IV, pp. 14-15.

[234] *Tentative Proposals, op. cit.*, pp. 202-203.

[235] *Informal Statement on International Control of Atomic Energy, op. cit.*, p. 11.

conducted large-scale mining operations, it could not build a nuclear force.[236] While scientists in 1946 knew that lower grade ore was widely available, they believed that a revolution in extraction techniques was needed to produce weapons-grade material from it.[237]

In reality, source materials were widely available and extraction not terribly difficult. As a result, the technical effectiveness thought possible was not actually achievable with available verification methods. Widespread availability of uranium meant that the authority could not easily control all uranium production sites. This situation effectively limited comprehensive control over the entire fuel cycle, and also the confidence of states on the absence of clandestine programmes.

Many experts placed equal faith in the possibility of "denaturing" fissile materials. Denaturing entailed adding isotopes to weapons grade nuclear materials to render them unusable for weapons while still usable in civil projects. Scientists hoped that once materials were denatured, chemical separation would be extremely difficult if not impossible.[238] The viability of denaturing was questioned shortly after the release of the *Acheson-Lilienthal Report*.[239] The relevance of denaturing to attaining technical control objectives was not terribly significant. A British government memo noted that:

> [...] if denaturing were entirely useless, a distinction could still be made in theory between `safe' and `dangerous' activities, though the scope of the `safe' activities would be very much diminished, and would be more or less confined to operations on a research scale [...].[240]

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[236] Cutbert Daniels and Arthur M. Squires, "International Control of Safe Atomic Energy", *British Atomic Scientists*, Vol. 3, (4-50) 1947, p. 115; The Technical Committee on Inspection and Control, *op. cit.*, p. 19.

[237] PRO AB 16/530 27590, C. K. Leith and G. C. Bateman, *Control of Uranium and Thorium Resources*, Memorandum to the Combined Development Trust, 7 May 1946.

[238] Szilard, 1963, *op. cit.*, p. 16.

[239] PRO FO 371/54631 29465, J. B. Ward, Esq. to Dennis Ricketts, Esq., June 1946; Kimball Smith, *op. cit.*, p. 463; statement by the United States, UNAEC, AEC/C.3/W.1, p. 9; PRO FO 371/59635 29490, *International Control of Atomic Energy The United States and Soviet Proposals Draft Memorandum by Officials*, 1946; PRO FO 371/59635 29490, Dennis Rickets, Esq. Cabinet Offices to J. B. Ward, Esq., Foreign Office, 24 June 1946.

[240] Rickets, *op. cit.*

Scientists generally considered that only one isotope of plutonium was usable (Pu-239) for nuclear weapons production.[241] Thus, control experts focussed on enrichment rather than plutonium management. In actuality, the quantity of "dangerous" materials produced from nuclear energy utilisation was higher than anticipated. More isotopes of plutonium would have to be treated with higher levels of control. Stockpile management would also be significantly more difficult as the quantity of materials from civilian activities would rise faster than anticipated, contributing to developing nuclear rivalries.

Plutonium was viewed as a lesser control problem than enriched uranium,[242] because, when produced in reactors, it was highly radioactive. Radioactivity was a very reliable safeguard against diversion because it complicated diversion efforts.[243] Scientists did not anticipate that more efficient ways to handle radioactivity would be found. As methods developed, checks on plutonium needed strengthening.

Scientists and negotiators underestimated the commercial value of nuclear energy. While they believed that nuclear energy had a positive outlook, there was no consensus regarding to what extent nuclear energy could be developed.[244] Benefits were still far in the future as no commercial reactor existed. Thus, the full opportunity cost of relinquishing national rights to nuclear energy was not appreciated. This lack of understanding contributed to a greater willingness to submit to control during the UNAEC negotiations.

Control analysts also underestimated that the Soviet Union was not prepared to forgo its newly-acquired UNSC veto in negotiations over the Baruch Plan. The Soviet Union said this veto was critical for protecting national sovereignty, especially in view of rising tensions between them and the West.

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[241] Some Scientists did keep an open mind. Professor Rudolf Peierls was cited as noting that "it is by no means impossible that a method of detonation could be devised which would make it practicable to use denatured plutonium as an atomic explosive." (PRO FO 371/59631 29465, Cabinet Advisory Committee on Atomic Energy, Note by the Joint Secretaries, A.C.A.E. (46) 57, 29 May 1946.)

[242] Statement by Mexico, UNAEC, AEC/C.2/7, 9 October 1946, p. 4.

[243] The Technical Committee on Inspection and Control, *op. cit.*, p. 32; CPNA USAEC, 1944 -1952, Carroll L. Wilson to Dr. Bush Memorandum, 2 January 1946; UNAEC, AEC/C.3/W.1, pp. 8-9; UNAEC, AEC/C.2/W.9, pp. 3-5; UNAEC, AEC/C.2/W.15, pp. 15-16.

[244] Daniels and Squires, *op. cit.*, pp. 111-113. Expectations of the benefits produced by nuclear energy took off in the 1950s.

Failure of the Negotiations

Control negotiations broke down when differences between East and West could not be resolved. The absence of trust and stability and environmental requirements for control aggravated the situation. The West saw the Soviet Plan as weak while "the Minority" saw the "Majority Plan" as excessive and a breach of sovereignty. Identifiable factors led to the failure of the negotiations. Political will was lacking for both the United States and the Soviet Union. Possession of nuclear weapons by a single state was already feeding the predicted arms race, and causing international stability to deteriorate. Structural problems in the Majority and Minority control systems violated some key principles of control undermining assurances and rendering them unacceptable.

The situation was also complicated by the dynamic created when states rely on nuclear weapons for security. These states may demand extraordinarily high levels of assurance from an international nuclear control system if they are to place their confidence in it. While the US government viewed the control system as a positive contribution to its security, possession of nuclear weapons provided greater security.

The Lack of Political Will

The lack of political will on the part of the United States was linked to it relinquishing its nuclear weapons. Its cautious behaviour was seen internationally as fuelling Soviet suspicions and undermining negotiations for control.[245] There was political will for nuclear control in the United States but not for disarmament which would lower US military superiority. As Acheson observed, there existed a contradiction between the United States' international nuclear control policy and its military policy.[246]

The United States did not trust control. In a memo to Secretary of State Burns in November 1945, Bush advocated that if the United States was subject to control, it should "be in a clear position" to use nuclear weapons "promptly" if its enemies acquired them.[247] This clearly went against the requirements of a nuclear control system. US decision-makers wanted exemptions. Bush advocated fissionable

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[245] Lieberman, *op. cit.*, pp. 161, 191.

[246] David E. Lilienthal, *The Journals of David E. Lilienthal: The Atomic Energy Years 1945-1950*, Harper & Row Publishers, London, Vol. 2, p. 615.

[247] *Ibid.*, p. 164.

materials should not be used commercially for many years.[248] This would enable states to fully establish a control system and ensure that it was properly functioning. Throughout the UNAEC negotiations, the United States continued to manufacture nuclear weapons, and on 1 July 1946 it conducted a nuclear test at the Bikini Atoll during UNAEC negotiations. Both the test and the continued weapons production were poorly received by the Soviets, French and British.[249]

Throughout negotiations, the military maintained that nuclear weapons were essential to US military strength and disarmament would have an adverse effect upon deterrence.[250] The British were also cautious, supporting the United States having a weapon stockpile until safeguards were proven.[251] A catch-22 situation resulted, where weapons were needed until control was proven to be effective but control could not be established until weapons were eliminated.

Absence of Soviet political will related to issues of sovereignty and enforcement. The Soviet Union was anxious to disarm the United States but not at the price of submitting to international inspection and control or compromising its freedom to pursue its own policies.[252] The Soviet Union consistently argued throughout the UNAEC negotiations that the Majority Plan was incompatible with national sovereignty which was a basic principle of the United Nations.[253] The Soviets argued:

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[248] *Ibid.*, p. 165.

[249] PRO FO 371/5964 29490, *Report on Congressional and Public Opinion in the USA on the USE and Control of Atomic Energy*, No. 23, 12-20 July 1946; Newhouse, *op. cit.*, p. 64; Lieberman, *op. cit.*, pp. 319-320, 335-336, 347-348, 356; Kimball Smith, *op. cit.*, p. 449; UNAEC, AEC/Sub.1/3, 15 July 1946, p. 5

[250] Lieberman, *op. cit.*, pp. 288, 299; Lilienthal, 1964, *op. cit.*, p. 582.

[251] PRO FO 371/59635 29490, Foreign Office to Paris, Telegramme, No. 619, 10 July 1946.

[252] Lieberman, *op. cit.*, p. 364.

[253] *Statement Made by Representative of Union of Soviet Socialist Republics at the Second Meeting of Committee II of the Atomic Energy Commission*, UNAEC, AEC/C.1/3, 24 July 1946; also "The Published Summary Records of Committee No. 2 of the United Nations Atomic Energy Commission, 24 July 1946", in *Growth of a Policy*, *op. cit.*, p. 219.

> [...] strict international control and strict inspection should not develop into interference with those branches of industry which are not connected with the production of atomic energy.[254]

The Soviet efforts to protect their sovereignty undermined their plan's technical effectiveness. For the Soviet Union, infringements upon sovereignty included placing controls on activities not directly related to nuclear energy production (e.g., mining) and key measures such as onsite inspection.[255] Those calls for setting a precedent in the context of nuclear control, regarding the diminution of sovereignty, went unheeded.[256]

The Soviet Union also had difficulties accepting enforcement measures. The central enforcement debate revolved around the suspension of the UN Security Council Veto on matters of non-compliance. While the Majority Plan linked enforcement with effectiveness, the Soviet Union feared that enforcement was vulnerable to abuse. It believed that the ADA would be dominated by the West and could potentially provide a pretext for a war against the Soviet Union.[257] The Soviet considered the veto a mechanism for self-protection.[258]

Structural Problems in the Majority and Minority Plans

The analysts identified principles for control, but they failed to adhere to them. Structural shortcomings in the Majority Plan badly undermined the chances for successful implementation. Among the shortcomings were system inequity and insufficient threat management measures. The Majority generally saw the Soviet

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[254] "Statement by the Soviet Representative (Gromyko) to the Security Council, March 5, 1947", in *Documents on Disarmament 1945-1959*, Vol. 1, *op. cit.*, p. 69.

[255] PRO AB 16/38 27590, *Report on the Soviet Proposals*; statement by the Soviet Union, UNAEC, AEC/C.2/4, p. 3.

[256] Statements by the Netherlands, UNAEC, AEC/C.2/3, pp. 3-4 and UNAEC, AEC/C.2/5, p. 6; statement by Belgium, *Official Records of the Third Session of the General Assembly, op. cit.*, p. 44; statement by Colombia, *Ibid.*, p. 23; Blackett, Born, Dee, et al., *op. cit.*, p. 6.

[257] Statement by the Soviet Representative (Gromyko) to the Security Council, March 5, 1947", in *Documents on Disarmament 1945-1959*, Vol. 1, *op. cit.*, p. 66; Joseph Levitt, *op. cit.*, p. 90; Lieberman, *op. cit.*, pp. 362-363.

[258] Lilienthal, *1964, op. cit.*, p. 401; Lieberman, *op. cit.*, p. 304.

proposal as failing to provide security due to shortfalls in safeguards.[259] Much of the criticism related to failure to adhere to the principles of control. Captain Alvaro Alberto, the Brazilian Representative to the UNAEC observed that "the USSR proposals provided for the continuation of national rivalries in the field of atomic energy."[260] Mexico's representative, Dr. Luis Padilla Nervo noted that "reliance on the good faith of Member States was not an adequate safeguard" and pointed to the distinction between preventative action before and corrective action following warning of illegal activities.[261] The Soviet Plan also failed to provide security in detecting and dealing with violations. With less than comprehensive controls, loopholes existed for diversion and no means for detecting clandestine activities existed. The West also rejected reporting to the UNSC as an insufficient enforcement mechanism.[262]

The Majority Plan failed to meet the rivalry management requirement. The approach did not preclude predominance by any one state or states and provided no check against rival states abusively manipulating the Authority. The Soviet Union felt threatened by the risk that it would be controlled by a Western-dominated Authority.

The Majority Plan also failed to manage rivalry during early implementation. The rate of disclosure on US nuclear weapon manufacturing processes was vague, since information release was conditioned on the development of international control. This vagueness was problematic for the Soviets since the United States would retain nuclear superiority and would share information on nuclear energy production as it saw fit, giving the United States a structural advantage.[263] The plan was slow to establish equity among states and contained ambiguities about effecting total disarmament.

The United States defended its position noting that premature information release could result in shortened bomb development for a rival.[264] The Americans

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[259] "Report and Resolution on the Soviet Proposals by the Working Committee of the United Nations Atomic Energy Commission, April 5, 1948", in *Documents on Disarmament 1945-1959,* Vol. 1, *op. cit.*, pp. 155-161; "Third Report to the Security Council", *Atomic Energy Commission Official Records,* 17 May 1948, p. 1.

[260] *AEC 2nd Supplementary Report, op. cit.*, p. 251.

[261] "The Published Summary Records of Committee No. 2 of the United Nations Atomic Energy Commission, 31 July 1946", in *Growth of a Policy., op. cit.*, p. 233.

[262] "Report and Resolution on the Soviet Proposals by the Working Committee of the United Nations Atomic Energy Commission, April 5, 1948", in *Documents on Disarmament 1945-1959,* Vol. 1, *op. cit.*, pp. 155-161, 165.

[263] Lieberman, *op. cit.*, p. 312.

[264] Acheson, *op. cit.*, pp. 54-59.

feared a scenario where the Soviet Government would cooperate with the Authority until they acquired valuable information, then build weapons and withdraw from cooperation.[265] Thus, the US position of withholding the distribution of technology until establishment of the safeguards system was non-negotiable.[266] The US sacrifice would come only under conditions in which the control system could provide security. The representative from New Zealand noted, "A really effective system of control was an essential condition for atomic disarmament."[267]

Although US policymakers understood that the "stages must be so designed to be fair and equitable to all nations"[268], they established an inequitable situation giving a "have" state a serious advantage over a rival "have-not" state. The division was for an unspecified period, was between two rivals and therefore rendered the system unacceptable. The asymmetries between the United States and Soviet Union combined with the incipient Cold War made the establishment of control impossible. The Soviets, fearful of a US nuclear attack, were bent on early US disarmament and relying on secrecy to protect their military and industrial establishments.[269] The two sides ended up in another catch-22 situation. The Soviets needed disarmament to accept control while the United States needed strong controls to disarm.

IV. Conclusion

The Baruch era analysts examined the dynamics of nuclear control and attempted to design and implement a control system which would provide effective security against nuclear weapon threats. The system would consist of international constraints on all aspects of a state's nuclear energy programmes. Conceptually, the plan was designed to function as an international threat management mechanism with a comprehensive globalist approach. This was to be achieved through setting its primary technical objective as *preventing* any state from acquiring nuclear weapons. If prevention failed, the Authority needed to detect a violation, which would trigger international measures that would neutralize any nuclear threat to security.

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[265] PRO FO 371/59631 29465, *Atomic Energy: Anderson Committee's Comment on the Lilienthal Report*, 1946.

[266] *Growth of a Policy, op. cit.*, p. 28.

[267] *Official Records of the Third Session of the General Assembly, op. cit.*, p. 56.

[268] *Growth of a Policy, op. cit.*, pp. 90-92.

[269] Bertrand Goldschmidt, "A Forerunner of the NPT? The Soviet Proposals of 1947, *IAEA Bulletin*, Spring 1986, p. 60.

The Baruch Plan suffered from a common problem for any international, supervised control system. That is, as noted by Lawrence Scheinman, "The value of an international safeguards system depends in large measure on its capacity to satisfy two criteria: acceptability and credibility."[270] No matter how credible a plan is, if it is not acceptable, it is not possible. Further aggravating the situation were the environmental conditions – the absence of political will, general stability and a willingness to sacrifice sovereignty. All were deemed prerequisites to achieve control. The result was that the only framework structurally sound enough to function contained unacceptably high requirements. When the Baruch Plan collapsed, so did the dreams of a nuclear-weapon-free-world. Eventually, history would compare those pursuing the Baruch Plan to Don Quixote chasing windmills.

So why pursue the concept further? The rejection of the plan does not necessarily invalidate its effectiveness. Credibility is linked to a synergy between technical conclusions and political structures. Acceptability is a function of societal attitudes. What was unacceptable in the past may and to some extent has become increasingly acceptable as time passes. The history of nuclear control shows that the sacrifice of credibility in the adopted control system for acceptability has yielded destabilising scenarios, triggering re-evaluations of what control measures are acceptable.

It should be noted that many of the ideas proposed for effective control match the criteria identified by Mark Imber for a functionalist safeguarding system. Drawing on David Mitrany's research on functionalism, Imber listed the functionalist characteristics as assigning responsibilities to Authority, designing rules for states to follow, employing sanctions and offering positive incentives.[271] Imber specifically identified universality, equality, coverage of the fuel cycle, system rigour (technical effectiveness and pursuit of suspected diversion), and provisions for review and amendment as functionalist features relevant to his case study of the IAEA.[272] He also noted the relevance of functionalism to address technical innovations.[273] Acheson

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[270] Lawrence Scheinman, "Political Aspects of NPT Safeguards", in *Preventing Nuclear Theft: Guidelines for Industry and Government*, Robert B. Leachman and Phillip Althoff, Praeger Publishers, London, 1972, p. 108; also see Mark F. Imber "NPT Safeguards: The Limits of Credibility, Arms Control", *Arms Control*, Vol. 1, No. 2, 1980, p. 180.

[271] Imber, *op. cit.*, pp. 34-35.

[272] *Ibid.*, pp. 58-60.

[273] *Ibid.*, p. 283.

and his contemporaries, however, were more specific, stating system requirements on the scope of coverage, level of rigour and the specific operating rules that needed to be incorporated into a plan (e.g., total disarmament).

When one considers, the debate of the period, *The Acheson-Lilienthal Report,* the Baruch Plan and the work on functionalism, one can draw a broad set of principles which can be used as a basis for examining effective control in the context of nuclear disarmament. In essence, analysts at the time attempted to create a system that would insulate nuclear control from political and technical environmental threats. The elements of their plan required that a control system must:

1. be feasible;
2. provide sufficient warning of non-compliance to enable states to respond effectively;
3. provide security in the event of system failure;
4. include positive aspects in the programme;
5. be able to adapt to changes in the environment;
6. manage rivalry driven by nuclear issues;
7. allow the control authority to have comprehensive knowledge of states' activities relevant to nuclear energy development;[274]
8. allow the control authority to apply controls comprehensively to states' nuclear activities;
9. ensure that nuclear programmes and control authority activities were transparent;
10. allow no state to possess nuclear explosives;
11. be universal and require permanent participation; and
12. treat states equally.

The first six principles were drawn from the *Acheson-Lilienthal Report.* Principles seven through eleven which are more specific to the nature of the control framework were derived from the Baruch Plan which was based upon the *Acheson-Lilienthal Report.* The final principle is understood and discussed in both plans.

The analysts of the era feared that any compromise on the above twelve principles would reduce the effectiveness of any disarmament control and would either risk collapse under international systemic pressures or promote instability. Only if the principles were incorporated into a control plan in some form would the programme be sufficiently rigorous that states could rely on control for security against nuclear

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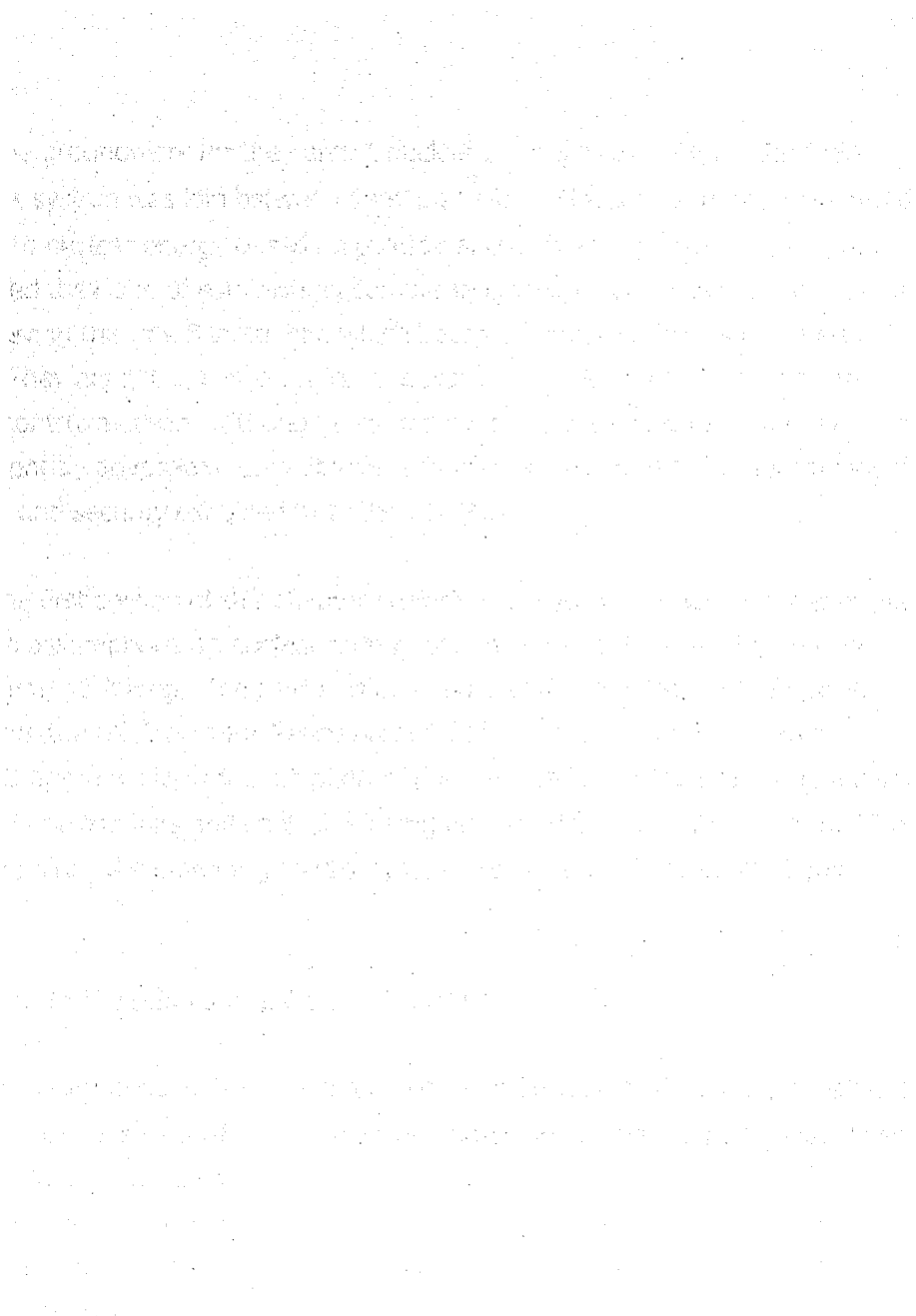
[274] This included addressing materials from uranium ore identification through waste disposition and the production of dual-use or other heavy equipment.

threats. For the short-terms states rejected control. In the long-term, states were given good reasons to re-evaluate their position.



CHAPTER 2: ACCEPTING A LIMITED FRAMEWORK FOR CONTROL

"Comparing the 1946 Baruch Plan with the 1953 Eisenhower speech, one notes a shift in emphasis from a proposal for control, with the dissemination of nuclear science and technology as an adjunct, to a proposal for promotion of peaceful uses, with control as an adjunct."[1]

Allan McKnight

The groundwork for the current nuclear control arrangement, the IAEA safeguards system was laid between 1949 and 1957. Governments reconsidered their approach to nuclear energy based on political and technical developments. They relinquished their aim of establishing comprehensive control in the short to medium term, believing that the Baruch Plan which became known as the UN Plan was not feasible. They did not, however, reject the plan's principles and structure as an effective control method. Although a limited control system was considered a positive development by advocates, the minimalist framework adopted could not provide the assurance and security expected from the UN Plan.

The first section of this chapter analyses the evolving conditions that triggered changes in assumptions on nuclear energy and the impact of those changes on nuclear control thinking. The next section examines the development of nuclear control from the US Atoms-for-Peace proposal through the advent of bilateral safeguards agreements to the adoption of the IAEA Statute. The process reveals how changes in assumptions and control thinking promoted a very limited system. The last section examines the emerging control system, its flaws and their implications.

I. Changes in Conditions and Nuclear Control Thinking

Developments in the global technical and political environment contributed to changes in attitudes toward nuclear control, particularly in the United States. These changes included the increased scientific understanding of nuclear energy, developments in technical verification and shifts in global power structures. Three critical beliefs about nuclear energy control emerged which affected the efforts on control. These were:

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[1] McKnight, 1971, *op. cit.*, p. 25.

- some control is better than none;
- nuclear energy is a commodity not a unique phenomena; and
- controls over civil and military aspects of nuclear energy can be separated.

Changes in the Technical Environment

By 1950, technical developments in nuclear energy changed some underlying assumptions in the UN Plan. While most changes complicated control, US officials did not believe that they undermined the basic aims of the Plan.[2] US analysts saw the advent of thermonuclear weapons as complicating control prospects since new materials would need tracking by the control agency.[3] Materials such as deuterium and lithium posed special problems because they were products of ordinary industrial processes and non-radioactive.[4] As time passed, effective control over thorium and uranium became increasingly difficult as mining and ore concentration operations spread,[5] reducing the Plan's ability to provide assurance by making clandestine activities harder to identify. The nature of fissile material was better understood as well. By 1953, the United States was coming to realise that different plutonium isotopes had different explosive properties. By September 1955, plutonium was principally classified as a weapons material.[6] This presented greater difficulties in stockpile management, but did not make it impossible if an authority could restrict civilian operations.

Simultaneously, there were strong incentives to pursue nuclear energy. With increases in uranium availability, military demands eased sufficiently to allow limited

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[2] For a discussion see College Park National Archives, United States Atomic Energy Commission, Special Assistant to that Secretary for Energy and Powder Space: Records Relating to Atomic Energy Matters, 1944-1963, *AEC 213/71, Enclosure B-4.* (All serialized USAEC documents in the 1944-1963 collection are hereafter referenced solely by their serial number. All others in the collection will be cited as "CPNA USAEC".)

[3] AEC 226/21, Appendix C.

[4] AEC 226/46, p. 11.

[5] PRO FO 371 123078, *Safeguards Against the Production of Nuclear Weapons by Countries Other than the USA, USSR and UK,* 9 December 1955.

[6] CPNA USAEC, *Observations on the Problem of Controlling Against Diversion of Fissionable Material from Nuclear Power Reactors*, 17 September 1955, p. 4 (hereafter referred to as *Observations on the Problem of Controlling Against Diversion*).

civilian development.[7] Concomitantly, nuclear energy held great promise for economic development.

Changes in verification technology also occurred. First, scientists dismissed the concept of permanent nuclear material denaturing.[8] The efficiency of nuclear operations, accounting systems and diversion inspection also improved. MUF levels dropped and became more predictable during processing.[9] Logistical and manpower requirements for inspection had also dropped since 1946.[10] Materials accounting expenses decreased dramatically to less than 1/10 of the original cost.[11] Accounting could therefore take a greater role in control than previously anticipated.

Reliable verification of past production was extremely difficult. Analysts believed that available verification methods for past production were not reliable.[12] Verification of past reactor nuclear material production was gauged at 5-20% accuracy; chemical plant verification was more difficult and enrichment verification as nearly impossible.[13] Past experience in domestic accounting convinced the United States that effective accounting of past production necessitated a broad range of cooperative controls and inspections, and a margin of uncertainty would still remain.[14]

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[7] Richard G. Hewlett and Francis Duncan, *Atomic Shield: 1947/1952*, University Park, London, 1969, p. 426; also see Richard G. Hewlett and Jack M. Holl, *Atoms for Peace and War 1953-1961*, University of California Press, London, 1989, pp. 212-213.

[8] AEC 226/34; AEC 226/33.

[9] Gaseous diffusion operations remained problematic. Control over reprocessing plants also required that 20% of the operational staff be inspectors. (AEC 997, p. 25; AEC 213/71, pp. 9, 30; CPNA USAEC, John A. Hall to Gerard C. Smith, *Proposed Work Program for International Atomic Energy Agency*, Appendix, 6 August 1956, p. 15.)

[10] For inspection manpower requirements see CPNA USAEC, *Safeguards and Controls Inspection and Review Categorization, Functions and Manpower Requirements Summary*, 1955.

[11] AEC 213/71, p. 9.

[12] AEC 226/30, p. 3.

[13] CPNA USAEC, S. G. English, Chief, Chemistry Branch, Division of Research to H. D. Smyth, *Possible Technical Methods for Verification of Production Under an International Control Plan*, 3 November 1953.

[14] AEC 226/21, Appendix C, pp. 11–13; AEC 226/30.

These changes affected control approaches by encouraging nuclear development while posing control complications not serious enough to discount plan validity. USAEC analysts concurred with their predecessors ten years before regarding control feasibility:

> Effective international control of atomic energy on a current and continuing basis after the United Nations plan went into full operation would be technologically feasible.[15]

Although the plan remained adequate, Chairman of the USAEC Gordon Dean conceded that the difficulty of accurate verification of declared past production meant that "complete assurance cannot be gained from purely technical methods utilized in the verification and inspection process."[16] Control remained more than a technical exercise.

Political Changes and Their Effect on Nuclear Control Thinking

Political developments had a deeper effect on nuclear control thinking than technical changes. By 1950, the failure to achieve international "effective" control left the United States considering other options of either no control or "something different".[17] Since no control held little appeal, "something different", that is control frameworks less than totally effective, attracted attention.

Of all events influencing control thinking, the development and production of Soviet nuclear weapons was the most critical. The Soviet Union's acquisition of nuclear weapons caused the United States to lower the estimated level of assurance it required from both the control system in place as well as those being considered for the future. In the mid-1950s, difficulties remained in accounting for fissionable

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[15] AEC 226/21, Appendix C, p. 16.

[16] CPNA USAEC, Gordon Dean to John D. Hickerson, Department of State, 3 March 1952.

[17] "Memorandum by the Deputy Under Secretary of State (Rusk) to the Counsellor (Kennan), 6 January 1950", *Foreign Relations of the United States 1950*, Vol. 1, National Security Affairs; Foreign Economic Policy, Department of State Publication No. 8887, Washington, DC, 1977, p. 9.

material from past production.[18] The United States believed that concealment of weapons or material stockpiles would have been impossible for the Soviet Union in 1946, but by the early 1950s, was relatively easy.[19] Soviet nuclear weapons possession increased the importance of empowering the control authority to search for clandestine production in a comprehensive plan.[20] By 1954, the lack of confidence in past production verification was such that USAEC Director of International Affairs John Hall concluded that:

> A policy of continued support for a control system having as its objective the total abolition of nuclear weapons is unrealistic and should be abandoned.[21]

Certain features of the UN plan no longer seemed salient. The USAEC concluded that potential clandestine fissionable material stockpiles from past production nullified limitations on "dangerous facilities" for nuclear power production.[22] Pandora's box had been opened; proliferation was not contained. The requirement for programme management faded.

The Soviet Union's nuclear status also influenced how the US viewed fissile material. Developments in the Soviet Union softened US attitudes towards physical protection. Originally, the United States wished to prevent the Soviets from acquiring any special nuclear materials. When the Soviets produced their own fissionable materials, the United States believed that any motive for obtaining small quantities disappeared. When the security threat changed, small quantities of fissionable nuclear materials lost strategic importance.[23] In addition, the strategic value of

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[18] GWU, Lewis L. Strauss to Bernard M. Baruch, 24 March 1955, GWU Doc. No. 194. For US Government doubts on inspection, CPNA USAEC, *Summary of Meeting in the White House,* 16 January 1954.

[19] NSA GWU, Lewis L. Strauss, *Memorandum,* 6 November 1953, Doc. No. 132; also see AEC 226/88, pp. 17-18.

[20] AEC 226/88, Appendix B.

[21] CPNA USAEC, John A. Hall to Robert R. Bowie, *Memorandum, Review of Technical Aspects Involved in the Problem of International Control of Atomic Energy,* 2 November 1954.

[22] AEC 226/30, pp. 3-4; AEC 226/21, p. 2.

[23] AEC 213/71, p. 2.

nuclear material also dropped as a high nuclear weapons production rate afforded security.[24] Interest shifted to preventing malicious acts by individuals.[25]

Consequently, small quantity accountancy was relaxed in March 1950.[26] A new assumption emerged that physical protection was logical for any entity engaged in nuclear production for security but also economic reasons. The United States still regarded physical protection as an integral part of safeguarding operations.[27] However, this change in views marks the beginning of physical protection becoming a separate entity from international control.

The Soviet bomb destroyed any remaining political will for complete disarmament and international nuclear control. Soviet nuclear weapons also reduced the significance of an enforcement mechanism. As noted by USAEC Commissioner Lewis Strauss, enforcement of an agreement with the Soviets was not possible without risking a nuclear war.[28] Implicitly, there would be no denuclearisation under control. Belief that disarmament was possible evaporated. The situation was aggravated by Cold War relations. For Americans, the "absence of good faith of the Soviet Union laid to waste any plan for international control of atomic energy."[29]

Despite not providing the assurance originally projected, the comprehensive plan remained sound for "effective" international control. In the fall of 1953, Edward Teller, the developer of the hydrogen bomb, approached Sterling Cole, Chair of the Joint Congressional Committee of Atomic Energy. Disturbed by the failure to reach any agreement on international control based on *The Acheson-Lilienthal Report*, he advocated that the model should nevertheless be pursued, noting that the only opposition stemmed from the Soviet Union. Cole went to USAEC Chairman Lewis

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[24] *Ibid.*, p. 2.

[25] Myron Kratzer, "Nuclear Cooperation and Non-Proliferation", *Atomic Energy Law Journal*, Vol. 17, No. 4, 1976, p. 259.

[26] AEC 213/71, pp. 10, 24, 63.

[27] For remarks on physical protection as an integral part of the safeguards system see CPNA USAEC, *Text of Remarks of Dr. I. I. Rabi on a Topical Outline of Basic Assumptions and Tentative Suggestions for Inspection and Control Under an International Agency*, 21 August 1955 (hereafter referred to as *Text of Remarks of Dr. I. I. Rabi)*; for similar sentiments see in the USAEC 213/17, p. 5.

[28] Strauss, 6 November 1953, *op. cit.*

[29] For a discussion see Beckman, *op. cit.*, pp. 57-68.

Strauss, but further action was preempted by US President Dwight Eisenhower with his Atoms-for-Peace proposal to the UNGA.[30]

Teller was not alone in supporting comprehensive control. Only days before, a modified UN Plan containing comprehensive technical measures plus political measures, including openness and forbearance from nuclear weapon acquisition was contemplated by the USAEC as an appropriate long-term goal for sustainable control.[31] This proposal called for agency ownership and use of fissionable materials coupled with continuous and unimpeded inspection of nuclear facilities which would suffice to ensure that all activities not directly related to peaceful purposes had ceased. Like the UN Plan, it called for proscription and/or limitations on commercial construction and operation of nuclear energy facilities. The control authority would own all reprocessing and fuel fabrication plants. Enrichment and mining would cease except as required for specific peaceful activities. Inspection would detect clandestine operations and diversion. Finally, other nuclear materials including deuterium, tritium and lithium would be subject to inspection.[32]

The modified plan chiselled at the original objective to prevent nuclear weapons acquisition. Experts at the time believed that a modified system was vulnerable to organised attempts to avoid disclosure and acquire nuclear weapons. Continuous and unimpeded inspection would not suffice to prevent significant diversion, but the proposal would likely provide warning of any serious diversion from atomic energy facilities devoted to peaceful utilisation.[33] Thus, modified international control objectives addressed those aspects of nuclear development that appeared most problematic: to stop the nuclear armaments race, to reduce nuclear armament stockpiles, to restrict the military use of nuclear energy and to promote its peaceful use.[34]

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[30] Scheinman, 1987, *op.cit.*, p. 61.

[31] For USAEC considerations see AEC 226/30; also see Hewlett and Holl, *op. cit.*, p. 210.

[32] AEC 226/30.

[33] *Ibid.*, Appendix A, p. 10.

[34] *Ibid.*, Appendix A, p. 9.

A New View of Nuclear Weapons and Proliferation

As the nuclear arms race heated up, a new perception of nuclear weapons emerged. In contrast to the thinking in 1946, which viewed nuclear weapons as unique and deserving of special handling, nuclear weapons were being identified with a conventional role.[35] Theory diverged from practice, however. The potential destruction in the superpower arsenals was increasing in geometric proportions, adding to the urgency of addressing nuclear control.

After Soviet acquisition, US concerns shifted focus to nuclear proliferation to other states. When Eisenhower proposed Atoms-for-Peace, 20 countries had "vigorous atomic energy programs".[36] Western European countries were capable of independent nuclear capability and appeared more interested in acquisition than control.[37] As a result, the USAEC shifted its policy from secrecy towards stopping spreading industrial nuclear capabilities.[38] The United States dilemma was to protect its exclusive nuclear status while meeting demands of other nations for nuclear technology.[39] This heightened fear of proliferation engendered views on control that sharply contrasted to those of 1946 - an imperfect control system was now better than none at all.[40]

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[35] *Address by President Eisenhower before the General Assembly of the United Nations on the Peaceful Used of Nuclear Energy*, 8 December 1953, reprinted in *Nuclear Proliferation Factbook, op. cit.* , pp. 25-33 ; Richard G. Hewlett and Jack M. Holl, *Atoms for Peace and War 1953-1961*, University of California Press, London, 1989, p. 214.

[36] United States Senate, *Atoms for Peace Manual*, 84th Congress, 1st Session, Document No. 55, Washington DC, 1955, p. 60.

[37] Harold L. Nieburg, *Nuclear Secrecy and Foreign Policy*, Public Affairs Press, Washington, DC, 1964, p. 84; David Fischer, 1997, *op. cit.*, p. 10.

[38] Nieburg, *op. cit.*, p. 66.

[39] *Ibid.*, pp. 78-79.

[40] "Memorandum by the Deputy Under Secretary of State (Rusk) to the Counsellor (Kennan)", 6 January 1950, in *Foreign Relations of the United States 1950, op. cit.*, p. 9.

Nuclear Energy Becomes a Commodity

Another sea change affecting the international nuclear control system was that nuclear energy became treated as a commodity, albeit one with dual-use applications. Several factors contributed to this development:

- Soviet nuclear weapons production and the subsequent reduction in information sensitivity caused previous justifications against international cooperation to lose force[41];
- scientific and technical developments in nuclear energy proceeded more rapidly than anticipated in 1946[42];
- US industry was losing its lead in the nuclear energy business[43];
- the USAEC and Department of State were eager to integrate nuclear energy into the national economy[44];
- the United States, with accumulations of material, sought to take the lead in commercial nuclear power development[45]; and
- the United States needed to maintain prestige and leadership.[46]

Since the genie was out of the bottle, civilian production could move ahead. The USAEC believed that to maintain superiority, it had "to permit American industry under appropriate safeguards to compete in the developing international competition

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[41] AEC 111/25, p. 29.

[42] *Atoms for Peace Manual, op. cit.*, pp. 58-59.

[43] The Geneva Conference on Peaceful Uses of Nuclear Energy especially impressed upon the American the strides made by the United Kingdom toward exploiting immediate commercial possibilities of nuclear energy. (Nieburg, *op. cit.*, p. 93.)

[44] CPNA USAEC, *Department of State View concerning Legislation Designed to Foster the Development of Atomic Power*, 3 June 1953; CPNA USAEC, *Factors to be Considered in Developing a US Policy on Nuclear Power Abroad*, 18 October 1954.

[45] AEC 226/30, p. 1.

[46] The USAEC and State Department considered that if the Soviet Union captured the lead in developing nuclear power there would be disastrous effects. They believed that US failure to maintain leadership would threaten the free world. Thus, it was paramount to US foreign relations to maintain and improve its leadership in nuclear energy development. (AEC 751/151. For a discussion also see Beckman, *op. cit.*, pp. 68-72.)

for achievement and customers in the peaceful uses of atomic energy."[47] Despite efforts to separate nuclear energy into civilian and military spheres, the United States required mastery in commercial as well as military aspects to maintain 'superiority'. They clearly linked the two, acknowledging that the commercial aspect affected the ability to achieve military superiority.

The United States entered the commercial nuclear energy market by replacing the Atomic Energy Act of 1946, which accorded the US government full control over domestic nuclear activities, with the more liberal Atomic Energy Control Act of 1954. The new law paved the way for international cooperation and industrial nuclear energy development by permitting private ownership of plants producing fissionable material, leasing nuclear materials, declassifying nuclear energy information, liberalising patents and transferring fissile materials to friendly states subject to safeguards.[48]

The attitude shift also manifested itself at the plant operations level. Materials accountability was established using the Baruch-Acheson reports as guides, mandating strict accountability on the basis of material scarcity and strategic value.[49] In June 1953, the USAEC replaced strategic with dollar cost valuing for special fissionable materials as an accountability criterion. The USAEC contended that "business prudence" dictated prevention of loss or diversion and that the dollar cost had been appropriate for the management of other strategic valued materials.[50]

By 1955, international competition was underway, with the United Kingdom and Canada also attempting to develop a substantial export business in nuclear reactors.[51] In addition, a declassification race ensued. The Soviet Union's release of information was driven by the desire not to fall behind in the propaganda game, while the French, who failed to establish effective cooperation with the United States, sought to compel the United States into a more open nuclear policy.[52] Thus, international pressure was mounting to commercialise nuclear energy which implied that nuclear control issues

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[47] AEC 809/28, p. 3.

[48] *Atoms for Peace Manual, op. cit.*, p. 15.

[49] Kratzer, 1976, *op. cit.*, p. 259.

[50] AEC 213/78, p. 1; CPNA USAEC, 874th AEC Meeting, 9 June 1953; AEC 213/71, p. 10.

[51] *Observations on the Problem of Controlling Against Diversion, op. cit.*, p. 6.

[52] Nieburg, *op. cit.*, pp. 97-98; David Fischer, 1997, *op. cit.*, p. 32.

need some sort of resolution, regardless of whether an ideal control mechanism could be established in the near-term.

New thinking indicated that peaceful nuclear energy development was no longer inhibited by a control system. Rather, it "should be allowed to develop along the lines indicated by scientific, technological and economic considerations."[53] Planning and implementation of international control required constant re-examination to "reconcile as nearly as possible the promises of atomic energy with the banning of atomic warfare".[54] Thus, control was placed in direct competition with industry.[55] In contrast to the previous decade, unrestricted growth and competition under safeguards was a viable, albeit limited, control approach.

II. Evolution of Controls

The interim controls based on secrecy and monopoly, set up in the early 1940s, were re-evaluated as the United States separated the peaceful and military uses of nuclear energy. While commercial information was released, military information was retained. Considering the delay in control, the United States maintained secrecy and monopoly on more sensitive nuclear energy aspects where possible. Additionally, the United States with some allied support increasingly used available national means to apply international controls to mitigate control mechanism absence. The United States would eventually conclude that if an international control organisation agreement was not reached, it would consider other provisions for control on a bilateral or regional basis.[56]

The CDT evolved into an international club of uranium suppliers and consumers in which the participants regularly exchanged information on sales and coordinated safeguards policy on materials and facilities exported to non-nuclear states.[57] The

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[53] AEC 226/46, p. 12.

[54] *Ibid.*, pp. 12-13.

[55] For a discussion see Hewlett and Holl, *op. cit.*, pp. 306-320.

[56] CPNA USAEC, *Proposed US Position on International Atomic Energy Agency*, in John Foster Dulles to Secretary of Defense, Chairman, Atomic Energy Commission, *Memorandum*, 20 January 1956, p. 6.

[57] Simpson, *op. cit.*, pp. 151-152.

United States worked closely with Canada and the United Kingdom to coordinate policies on safeguards, physical protection and declassification starting in June 1950.[58]

To support the denial approach on material technology, the United States tightened nuclear-related export controls. It also made overtures to individual states regarding nuclear technology export controls and utilised the Coordinating Committee on Multilateral Export Controls (COCOM) as a coordinating export control mechanism.[59] The nationally-established networks were prone to leaks as other states developed commercial interests. For example, the British Government used USAEC export lists but because of its export drive and administrative difficulties of operating with a net of too fine a mesh did not use a rigid approach.[60]

Moving from the UN Plan to Atoms-For-Peace

Although the position on nuclear control for both East and West remained entrenched into the 1950s, compromise on stringent control requirements for control began to appear in US policy between 1951 and 1953. The United States qualified its support of the UN plan by changing its stance on some controversial plan elements. It advocated that:

- the UN plan was a viable approach to nuclear energy control until a better but equally effective plan could be devised;
- the inspection system could be implemented in stages as disarmament progressed;

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[58] CPNA USAEC, *First Tripartite Security Conference*, Washington, DC, June 1950.

[59] "Memorandum by Mr. R. Gordon Arneson to the Under Secretary of State, June 15, 1950", in *Foreign Relations of the United States 1950, op. cit.*, p. 563; CPNA USAEC, *Memorandum for Information: International Export Control of Atomic Energy Items*, INFO Memo 109/12, 10 September 1954; GWU, *Nuclear Export Controls of Other Countries*, US Department of State, 11 December 1964, GWU Doc. No. 1076. In 1953, the United States export control team visited the United Kingdom and made and extensive study of their export control system. (CPNA USAEC, *Comment on Dr. Zinn's Trip Report Concerning US Licensing of Nuclear Instruments to European Countries*, 1954.)

[60] PRO EG 1/29 E52, *Export Control Policy - Atomic Energy Equipment*, Draft Brief for Sir John Cockcroft, 3 May 1949.

- "ownership" as related to control did not imply an international commercial monopoly; and
- the UN Plan's controversial veto regulations could be waived.[61]

While these changes addressed Soviet complaints about the UN Plan, it did little to bring the two sides together.

In addressing the monopolistic aspects of the UN Plan, in 1952 the French encouraged the Americans to consider a compromise control plan that avoided "international control" and replaced it with "continuous inspection".[62] The French, noting that the UN plan was preferable, argued its proposal was more acceptable because states could manage national applications of nuclear power. The United States rejected the French suggestion echoing arguments of *The Acheson-Lilienthal Report* that continuous inspection was insufficient as a basis for control. They cited, *inter alia*, that national control would make it more difficult to *prevent* diversion and to discover clandestine activities, and stockpile accumulation was not addressed.[63]

The impetus towards assembling acceptable measures into a limited nuclear energy control framework continued. On 8 December 1953, President Eisenhower presented his proposal on Atoms-for-Peace to the United Nations. The plan was presented not as a control framework, but a proposal to promote nuclear energy development in a non-destabilising manner. The assumptions made under Atoms-for-Peace were that peaceful nuclear energy development could proceed without disarmament since safeguards could prevent diversion and that development would not "make eventual comprehensive international control of atomic energy substantially more difficult."[64]

The United States pushed the comprehensive control system aside to seek prudent peaceful development – a feasible short-term goal. Eisenhower proposed that governments make nuclear material contributions to a control authority, the IAEA,

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[61] T. B. Koons, *The Disarmament Problem and US Policy Before the NSC*, 22 April 1955, 22 April 1955, GWU Doc. No. 199; "Statement by Deputy United States Representative (Cohen) to Committee I of the Disarmament Commission", 14 May 1952, *Documents on Disarmament* 1945-1959, *op. cit.*, pp. 358-364; for a discussion of the period, Bechhoefer, 1961, *op. cit.*, pp. 140-194.

[62] The Soviet Union refused to discuss continuous inspection with the United States. (AEC 226/25, p. 5.)

[63] AEC 226/23, pp. 3-4.

[64] *Observations on the Problem of Controlling Against Diversion, op. cit.*, p. 2.

which would function as a bank, that would siphon off materials available for nuclear weapons and protect them from seizure. The plan would encourage the peaceful use of fissionable material, diminish the destructive power of nuclear stockpiles, demonstrate the good will of the Superpowers and promote further discussions.[65]

The envisaged Agency role still reflected material management aspects but not a nuclear energy monopoly.[66] A US outline, submitted to the Soviet Union on 19 March 1954, accorded to the facilities and equipment to implement storage, issue materials, provide physical protection and verify nuclear material usage. Title to materials was vested in the Agency. Information on all transactions and Agency activities was open to all members as was voluntarily contributed data for dissemination.

Controlling the Military and Peaceful Aspects of Nuclear Energy Separately

The Atoms-for-Peace initiative marked the formal break from negotiating complete control over the peaceful and military aspects of nuclear energy in a single agreement.[67] It also signalled the end of the pursuit of comprehensive international control for the near term.[68] The new approach was welcomed by states less sensitive to security issues and more interested in economic ones. With a higher nuclear threat perception threshold, these states justified the split. For them, military applications were not promoted unless reprocessing plants, enrichment facilities, or weaponisation facilities accompanied the nuclear reactors.[69] Their assumption was that many states

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[65] *Address by President Eisenhower before the General Assembly of the United Nations on the Peaceful Used of Nuclear Energy, op. cit.*

[66] "Memorandum: Outline of an International Atomic Energy Agency, March 19, 1954" in *Atoms for Peace Manual, op. cit.*, p. 265; *A Suggested Basis for a Plan to Carry Out the President's Proposal "Atomic Power for Peace", op. cit.*, pp. 2, 8, 20.

[67] See also Allan McKnight, *op. cit.*, p. 25.

[68] Key personnel including Gerard Smith, Special Assistant to the Secretary of State for Energy Matters, and Ambassador James Wadsworth, US negotiator, rejected negotiations on the new control authority, the IAEA, as a means to seek an agreement on disarmament. (Astrid Forland, *Negotiating Supranational Rules: The Chances of the International Atomic Energy Agency Safeguards System*, Doctoral Thesis, University of Bergen, Oslo, 1997, pp. 40-41.)

[69] For example, see H. J. Bhabha, "Safeguards and the Dissemination of Military Power", *Disarmament and Arms Control*, Autumn 1964, Vol. 2, No. 4, p. 438.

had neither the funds nor the technical capability to pursue nuclear weapons in the foreseeable future.

After governments began approaching civilian and military aspects differently, negotiations between nuclear powers on military aspects moved from total disarmament rigorously verified to less comprehensive, more politically feasible arms control measures. Initially, negotiations on comprehensive disarmament, such as proposed by the West in the late 1950s and early 1960s or more limited arrangements such as a fissile material cut-off treaty, were considered by the USAEC to still require broad control measures such as seeking to detect clandestine activities.[70] Such proposals met with little success.

During the Cold War, the Superpowers settled for containing the military threats involved in an uncontrolled arms race. By February 1954, the United States briefly investigated negotiating a weapons test moratorium and, in 1957, discussions on a test ban commenced.[71] The conclusion of an international Partial Test Ban Treaty in 1963 and a Threshold Test Ban Treaty in 1974 marked successes for this limited approach. Unfortunately, the achievements amounted to very little. Despite additional agreements through the end of the millennium, six other states acquired nuclear weapons capabilities and the nuclear arsenals of the United States and Soviet Union increased to staggering proportions before they levelled off at the end of the Cold War.

The separation from military applications had significant impact on establishing control over peaceful uses of nuclear energy. Governments stopped viewing commercial nuclear energy development as a serious threat and the requirement for effective control over development evaporated. The system requirements could be "somewhat less" than those of a disarmed world since breakout was not as critical.[72] The split favoured a limited approach that aimed to achieve a technical objective (non-

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[70] For proposals see *United States Proposal Submitted to the Eighteen Nation Disarmament Committee: Outline of Basic Provisions of a Treaty on General and Complete Disarmament in a Peaceful World, April 18, 1962* and *British Paper Submitted to the Eighteen Nation Disarmament Conference: Technical Possibility of International Control of Fissile Material Production, August 31, 1962*, in *Documents on Disarmament 1962*, USGPO, Washington, DC, ACDA Publication No. 19, November 1963, pp. 351-381, 834-852; AEC 226/102.

[71] NSA, GWU, Thomas E. Murry, USAEC, Commission, to President Eisenhower, 14 March 1955, GWU Doc. No. 192; Hewlett and Holl, *op. cit.*, p. 222.

[72] *Observations on the Problem of Controlling Against Diversion, op. cit.*, p. 10.

diversion) rather than a political one (stability and security). Necessary but unpopular measures important in the UN plan (transparency, inspection for clandestine activities) were not needed in the near term.

US analysts did not believe that civilian development would lead to unmanageable threats. They thought that Soviet demands for veto retention were no longer an issue -- as long as the Agency disposed of relatively small amounts of material.[73] However, they failed to consider regional nuclear threats. From the US perspective, Atoms-for-Peace posed only minimal risk since, with no disarmament, the United States retained its large nuclear arsenal.[74]

Before long, control measures became susceptible to pressures for industrial nuclear energy development as predicted a decade earlier. As the United States implemented Atoms-for-Peace, the impact of control upon development came under scrutiny. The burden of control measures had to be minimised if states were to submit to control. As noted by Isadore Rabi, President of the USAEC General Advisory Commission:

> The inspection and control system is to be so designed and operated that it will be as economical as possible and will interfere with the operation as little as possible consistent with the objectives of inspection and control...[75]

Analysts, knowing that national control required some state cooperation, naively assumed it would be forthcoming. For example, they assumed that commercial plant designs would facilitate inspection and control and minimise the number and size of areas requiring control.[76]

The Soviet Union initially rejected splitting nuclear control into peaceful and military spheres. They favoured that states renounce nuclear weapons and argued against nuclear industry development under Atoms-for-Peace noting that the proposal

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[73] CPNA USAEC, *Working Paper Concerning the Creation of an International Atomic Energy Agency, Its Functions, Organization, and Powers*, 28 December 1953, p. 13.

[74] *Observations on the Problem of Controlling Against Diversion, op. cit.*, p. 2.

[75] *Text of Remarks of Dr. I. I. Rabi, op. cit.*

[76] *Ibid.*

would lead to an increase in nuclear stockpiles through unlimited production.[77] Soviet material management concerns were denigrated by the United States which held that sufficient safeguards against diversion of materials from power producing reactors could be devised.[78] The Soviets were not alone; the United Kingdom was also uneasy about the long-term implications of stockpiles and hoped for early disarmament.[79]

Approaching Statute Negotiations

In late 1954 the Soviet Union acknowledged that diversion risks could be managed if fuel fabrication and reprocessing were restricted, but refused to engage in Atoms-for-Peace negotiations.[80] Failing to secure Soviet participation, the United States proceeded, since it perceived minimal risk. Detecting diversion was not as difficult a control problem as total disarmament. In April 1955, informal discussions in Washington commenced among an 8-Nation Group of uranium producers and developed nuclear energy programme stewards.[81]

The Soviet absence had a "profound" effect upon US policy towards control under Atoms-for-Peace. In December 1954, the United States issued a new document from a British draft emphasising the clearinghouse function for safeguard requests rather than the depository function.[82] The United States originally intended that, if the Soviets participated, it would push for definitive nuclear material storage

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[77] "Draft Declaration Handed to Secretary Dulles by Mr. Molotov, Berlin, January 30, 1954" in *Atoms for Peace Manual, op. cit.*, p. 265; "Soviet Aide Memoire of April 27, 1954" in *Atoms for Peace Manual, op. cit.*, pp. 269-271.

[78] "Memorandum handed to Ambassador Zaroubin by Assistant Secretary Merchant, Washington, July 9, 1954" in *Atoms for Peace Manual, op. cit.*, p. 276.

[79] Forland, 1997, *op. cit.*, p. 53.

[80] *Ibid.*, p. 3.

[81] Australia, Belgium, Canada, France South Africa, United Kingdom, the United States and Portugal.

[82] For an account of the period see David Fischer, 1997, *op. cit.*, pp. 29-32; United States Congress, *Background Material for the Review of the International Atomic Policies and Programs of the United States*, Report to the Joint Committee on Atomic Energy, 86th Congress, 2nd Session, Washington, DC, Vol. 3, October 1960, pp. 721-731 (hereafter referred to as *Background Material for Review of International Atomic Policies*); AEC 751/2; CPNA USAEC, G. C. Smith, *Considerations on the Problem of Setting Up an International Atomic Energy Agency without Soviet Participation*, 11 June 1954.

provisions for the Agency. The Soviet Union's absence devalued that idea. An Agency would disadvantage the United States *vis-a-vis* the Soviet Union by siphoning only American materials and simplifying Soviet espionage.

A draft for the IAEA was issued in the summer of 1955. It allowed for the Agency to perform both banking and broker functions, but control provisions were expressed in broad terms. They entailed some inspection and control over assistance extended by the IAEA.[83] On 18 July 1955, the Soviet Union indicated an interest in joining the negotiations. The 8-Power negotiating group was then enlarged to 12-Powers to include Brazil, Czechoslovakia, India and the Soviet Union.

By the time that the Soviet Union entered into the negotiations, the United States had no interest in the pooling idea, which the Canadians and British never cared for. With Soviet participation, however, control issues regained prominence. Refocussing on safeguards in 1955 reminded the USAEC of national inspection shortcomings.

The Atoms-for-Peace Plan was not the panacea that US analysts anticipated. For control to be successful, John Hall, Chairman of the USAEC, believed that the IAEA would need to closely supervise reactor design, construction, and operations, while maintaining stringent controls over fissionable material preparation and extraction. Others also expressed serious concern. Over time, compromise on control risked rendering eventual control more difficult.[84] At an international conference in Geneva in August 1955, US participants affirmed earlier concerns about safeguarding large reactors and reprocessing facilities.[85] The Vitro Study, commissioned by the USAEC, estimated that, with a 90% detection probability, diversion from a power reactor was sufficient to build a nuclear weapon within five years.[86] A USAEC task force to investigate control voiced other criticisms. Among them was that the proposals did not deal with some threats, including threats from nuclear operations engineers. Maximum assurance was only possible with a highly

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[83] David Fischer, 1997, *op. cit.*, pp. 29-56; Forland, 1997, *op. cit.*, pp. 23-31.

[84] CPNA USAEC, 1160th AEC meeting, 4 January 1956; PRO EG 1/115 27549, *Record of Tripartite Meeting at the State Department on February 6 to Discuss the International Atomic Energy Agency, op. cit.*; PRO EG 1/115 27549, *Military Risks of International Collaboration*, 3 February 1956; CPNA USAEC, J. B. Hamilton to Gerard S. Smith, 22 September 1955.

[85] Hewlett and Holl, *op. cit.*, p. 312.

[86] *Ibid.*, pp. 315-316.

intrusive inspection system covering all facilities, areas, and national records, which represented an unprecedented infringement on industrial and personal privacy. The USAEC did not recommend withdrawal from Atom-for-Peace programme. They were convinced that if the United States did not go forward with nuclear energy cooperation, the Soviet Union, the United Kingdom or Canada would take its place as the leading exporter of nuclear energy technology.[87]

Positioning for Negotiations

Canada, the United Kingdom and the United States coordinated their negotiating positions on IAEA control. The three struggled to identify a position that satisfied three criteria: control needed to meet their security needs while being reasonably acceptable to other states and to their domestic situations.

Both the United Kingdom and the United States expressed interest in according the Agency control over all nuclear projects of all non-nuclear weapon countries.[88] This solution provided maximum control with no domestic interference, but it was unacceptable to other states due to its inequities. The two states and Canada were in favour of inserting a "no weapons" pledge for states receiving aid under the Statute. However, they dismissed the idea as they anticipated criticism, particularly by the French, that nuclear states were promoting double standards for control measures.[89] The appeal of the measure was further undermined because it required that the IAEA look for illicit activities. Such verification requirements were unacceptable invasions of sovereignty for an Agency concerned with peaceful uses and could only be successful in a universal plan.[90]

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[87] *Ibid.*, pp. 314-317.

[88] PRO EG1/87 27590, Outward Saving Telegram from Foreign Office to Washington, 21 January 1956.

[89] CPNA USAEC, *International Atomic Energy Agency*, Department of State Memorandum of Conversation, 3 February 1956; PRO EG 1/115 27549, *Present Attitudes Towards the Question of Controls*, 1956; PRO FO 371 123078, *Safeguards Against the Production of Nuclear Weapons by Countries Other than the USA, USSR and UK*, 9 December 1955; AEC 751/50; CPNA USAEC, *Control Provisions - Alternative #1*, 25 November 1955; CPNA USAEC, *NSC Proposed Policy on IAEA*, 8 November 1955; Astrid Forland, *Hope Over Fear; The Establishment of the International Atomic Energy Agency*, Institute for Forsvarsstudier, Defence Studies No.3, 1995.

[90] CPNA USAEC, *International Atomic Energy Agency Meeting: Proposed US Position on International Atomic Energy Agency*, IAM -D1/2/5c, 18 January 1956;

The United States preferred a limited approach to avoid creating controls with objectionable features that would discourage nations from joining the Agency. There were limits on US demands in light of US reluctance to make political or economic concessions in submitting itself to control.[91] Nuclear disarmament was out of the question. The United States had no intention of accepting any meaningful inspection of its civil programme and its key ally, the United Kingdom, would have difficulties because its civil and military programmes were fully integrated.[92] The United States also rejected any proposal that the Agency be a single, global nuclear broker or production manager because that would undercut US bilateral activities.[93]

The British held similar views but were more pragmatic in their approach in designing a framework. They saw practical challenges in implementing a system. Thus, they were willing to rely on accounting methods and book checks.[94] Staff costs required an evolutionary approach to control. Any safeguards system under the IAEA Statute was subject to an ever-increasing strain from the growing complexity of the supervision involved.[95] To work, safeguards must not become so elaborate or burdensome as to discourage countries from dealing with the Agency while offering real security guarantees. The simplest and most effective safeguards system required that the Agency retain maximum control over chemical processing.[96] Agency and bilateral controls would only be partially effective unless followed by strict controls over

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Proposed US Position on International Atomic Energy Agency, op. cit., p. 4; CPNA USAEC, G. C. Smith, *Discussion with Dr. Rabi -- Technical Planning for IAEA*, Memorandum to the File, 14 September 1995.

[91] PRO FO 371 123088, *Canadian Position International Atomic Energy Agency, Canadian Views on Inspection and Control.*

[92] PRO EG 1/115 27549, *Record of Tripartite Meeting at the State Department on February 6 to Discuss the International Atomic Energy Agency, op. cit.*; PRO EG 1/115 27549, *Present Attitudes Towards the Question of Controls, op. cit.*

[93] CPNA USAEC, *Summary of Meeting Held on 27 December 1953 in Commissioner Smyth's Office to Develop a Plan to Implement the President's December Speech*, 6 January 1954; PRO EG 1/115 27549, *Record of Tripartite Meeting at the State Department on February 6 to Discuss the International Atomic Energy Agency, op. cit.*; CPNA USAEC, Alex Bickel, *Atom Bank, Studies - II*, 23 December 1953.

[94] AEC 751/70, p. 1.

[95] Government of the United Kingdom, Cabinet Office, AEO WP 56 22, 3 December 1956.

[96] Government of the United Kingdom, Cabinet Office, AEO 56 42, 14 December 1956.

indigenous projects.[97] The British, like the United States, realised that discrimination in safeguards application would nullify any inducement for states to join the Agency. Like the United States, they were only willing to accept limited civil safeguards as a gesture.[98]

Canada, with the least developed nuclear programme of the three, cautioned its two partners on Agency interference with government prerogatives.[99] Canada focussed on system equality and protecting its source material production industry. It rejected non-universal safeguards on uranium. However, Canada sought extended controls on concentrates which increased the number of measures but provided for a more effective system for a longer time because states would depend on source rather than enriched material. The United Kingdom rejected this view, fearing Agency allocation of all raw materials would generate supply difficulties for the Americans and themselves.[100]

Promotion of Nuclear Energy

While the Atoms-for-Peace proposal included objectives such as diminishing material stockpiles, the primary focus, according to states wanting to develop a nuclear industry, was nuclear energy promotion and development.[101] Powerful

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[97] Forland, 1997, *op. cit.*, pp. 57-58.

[98] Government of the United Kingdom, Foreign Office, *IAEA Brief for 12 Power Meeting Safeguarding of Assistance Given by the International Atomic Energy Agency*, Meeting Minutes, 5 March 1956.

[99] CPNA USAEC, *Summary of Meeting Held on 27 December 1953 in Commissioner Smyth's Office to Develop a Plan to Implement the President's December Speech*, 6 January 1954; PRO EG 1/115 27549, *Record of Tripartite Meeting at the State Department on February 6 to Discuss the International Atomic Energy Agency, op. cit.*

[100] Government of the United Kingdom, Foreign Office, *IAEA Brief for 12 Power Meeting Safeguarding of Assistance Given by the International Atomic Energy Agency*, Meeting Minutes, 5 March 1956.

[101] *Address by President Eisenhower Before the General Assembly of the United Nations on the Peaceful Uses of Nuclear Energy, op. cit.*, p. 33; CPNA USAEC, *Relationship of President Eisenhower's General Assembly Proposal of December 8, 1953 to the Remainder of the Disarmament Program*. 24 December 1953; Informal Paper Left with Mr. Molotov By Secretary Dulles, Geneva, May 1, 1954, in *Atoms for Peace Manual, op. cit.*, p. 274; AEC 751/19, pp. 2, 7. For Polish views see IAEA/CS/OR.24. For Canadian Views see PRO FO 371 123088, *Canadian Position International Atomic Energy Agency, Canadian Views on Inspection and Control.*

incentives were necessary to obtain wide participation. Complicating control was that the IAEA would need to compete with bilateral offers and the fact that the application of control would increase long-term expenses over indigenous nuclear development.[102] The need for incentives was compounded by the division between the nuclear advanced and non-advanced safeguarded states. Although the State Department argued that acceptance of controls would increase if the United States accepted self-imposed restrictions, the proposal was not pursued.[103] Instead, effective control system propagation was dependent on major power readiness to furnish assistance to IAEA members.[104] Therefore, inequity forced the advanced states to overemphasize the promotional aspects of the control system.

As calls for promotion increased, so did those for limitations on scope. The French crusaded for a simplified system that based inspection on tracking materials at strategic points.[105] Costly measures designed to prevent diversion, and burdensome ones, such as source material control, would be avoided as expensive and a participation disincentive.[106]

The case for emphasising promotion over control in negotiations was strengthened by the boom in nuclear commerce before international control was established. As industry developed, uncontrolled exports of nuclear materials set precedents in the market. Mounting commercial pressures created increasing difficulties for exporters in securing safeguards agreements.[107] As the United States and the United Kingdom began negotiating bilateral agreements, they encountered mixed reactions. Less developed states had no significant objections to safeguards but developed states were a different story. They viewed source material controls as

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[102] EG 1/115 27549, *Record of Tripartite Meeting at the State Department on February 6 to Discuss the International Atomic Energy Agency, op. cit.*

[103] AEC 751/49, p. 1.

[104] AEC 751/41, p. 5; PRO EG 1/115 27549, *Safeguarding Against the Production of Nuclear Weapons by Countries other than the UK, USA & USSR; Proposed US Position on International Atomic Energy Agency, op. cit.*, p. 5.

[105] AEC 226/122, p. 33.

[106] CPNA USAEC, 1160th AEC Meeting, 4 January 1956; statement by France, IAEA/CS/OR.24, pp. 48-50.

[107] CPNA USAEC, Jim Langley, *Record prepared by the Canadian Delegation of a Meeting Held in the Conference Room of the Bass Block of the Parliament Buildings in Ottawa on November 5, 1958 to discuss "The Application of Safeguards to Nuclear Exports".*

infringements on sovereignty and were reluctant to make purchases subject to inspection by the seller or the Agency.[108] The absence of a single model agreement permitted varying controls to become competitive bargaining chips in bilateral negotiations. For example, the United States recognised its commercial disadvantage *vis-a-vis* the United Kingdom which applied no controls on natural uranium transfers.[109]

As importers assailed controls, physical protection demands also lessened. In 1955, the United States still viewed physical protection as central to safeguards. Initially, the United States worked with the United Kingdom and Canada to establish a standard approach to physical protection and attached a secret annex to all bilateral power reactor safeguards agreements. The United States could, however, muster little support for internationalising physical protection. By the late 1950s, the United States focus on centralised physical security was essentially abandoned.

Statute Negotiations

Negotiation of the IAEA Statute among the 12 Powers began on 23 January 1956 in Washington. The Western troika in January and February 1956 produced a new draft text with strong controls aimed at complicating efforts to develop nuclear weapons if it depended on IAEA assistance.[110] A final 12-Power draft was issued on 18 April. An 81-state Conference on the Statute followed in New York from 20 September to 26 October 1956.[111]

The 12-Power draft produced in April differed considerably from the 8-Power one of August 1955. States were obliged to submit to safeguards not based on membership in the Agency but from the receipt of Agency assistance.[112] The IAEA was tasked with ensuring that the source and fissile materials, facilities, equipment and information supplied should not be used to further military aims.[113] A new

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[108] AEC 750/3, p. 8; AEC 862/33, p. 4.

[109] CPNA USAEC, *Notes on John Halls Staff Meeting,* 24 July 1955.

[110] Forland, 1997, *op. cit.*, pp. 60-61.

[111] On the negotiation of the Statute, Bernhard G. Bechhoefer, "Negotiating the Statute of the International Atomic Energy Agency", *International Organization*, Vol. 13, 1959, pp. 38-59.

[112] Scheinman, 1987, *op. cit.*, p. 70.

[113] Forland, 1997, *op. cit.*, p. 61.

paragraph was added to safeguards provision making Agency controls over bilateral agreements possible by authorising the Agency to verify compliance if requested.[114]

In moving to a final document, the Statute Conference adopted 67 amendments, most of which were not substantial. The final text set out the main objective of the Agency as to:

> seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a ways as to further any military purpose.[115]

It established an annual general conference and Board of Governors. Members could make nuclear material available to the Agency or could apply for assistance in its supply[116], which was subject to safeguards. Members were to make available information helpful to the Agency which would be accessible to other states.[117] Sanctions to deal with non-compliance consisted of denying assistance, suspending membership, requiring the return of materials and reporting to the UN Security Council.[118]

During the Conference, some states envisioned a need for safeguards.[119] Some, like the United States and New Zealand, hoped that the initiative would lead to disarmament. Some industrial states and the Third World focussed on economic concerns including assurances of supply, dependence upon suppliers, and technical assistance based on ability to pay.[120]

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[114] PRO FO 371/123078, *Draft Statute of the International Atomic Energy Agency, Point at Issue.*

[115] Statute of the International Atomic Energy Agency (herein referred to as IAEA Statute), Article II.

[116] Statute of the International Atomic Energy Agency, Articles IX, X and XI.

[117] *Ibid.*, Article VIII.

[118] *Ibid.*, Articles, XII.A.7 and XII.C.

[119] Belgium, Jordan, Japan, Norway, Pakistan, Spain, Thailand.

[120] Guatemala, India, Iran, Israel, Japan. (Scheinman, 1987, *op. cit.*, pp. 71-72.)

Some issues plagued both the 12-Power and the Statute Conference negotiations. One was that states regarded the safeguards requirements under Article XII as infringing on sovereignty, promoting economic imperialism, and creating a division between developed states which would not receive safeguarded aid and less-developed states which would become subject to control.[121]

The Soviet Union, as a leading safeguards opponent, capitalised by proposing limits on Agency safeguard activities where individual states considered them an infringement of sovereignty. The adopted 12-Power group text rejected that view, but in the Statute Conference Poland proposed that the Statute obligations be subordinated to state's sovereign rights. Among Poland's supporters were Ceylon, Czechoslovakia, India, Mexico and the Soviet Union.[122] Nevertheless, the Polish amendment was rejected as states, including the United Kingdom, feared that the sovereign rights clause would hinder safeguards.[123]

Efforts to reduce the scope of control by amending specific aspects of the proposed control system were more successful. With the support of Ceylon, Egypt, Indonesia and others, India censured the non-universal application of safeguards as being discriminatory and argued that controls hindered development. Using the equity argument, this group advocated measures to ease the perceived burden of safeguards:

- Safeguards should be limited to the extent relevant to Agency-assisted projects or arrangements.[124]

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[121] Statement by the Philippines, IAEA/CS/OR.27 p. 42; statement by Ceylon, pp. 6-10 and statement by Czechoslovakia, pp. 82-85, IAEA/CS/OR.29; statement by Byelorussia, pp. 67-68 and statement by Pakistan, p. 91, IAEA/CS/OR.37.

[122] For statements by the Soviet Union and Poland City *Comments on the August 22, 1955 Draft Statute of the International Atomic Energy Agency, 27 February 1956*, Doc. 3. (Add.1); for comments by the Soviet Union and Czechoslovakia see *Summary Record - Fourteenth Session, Working Level Meeting on the Draft Statute of the International Atomic Energy Agency*, 16 March 1956, Doc. 19 (Rev.1), 21 March 1956; For the Soviet Amendment of inspections and respect of sovereignty see, *Proposed Revisions of Article XIII of the August 22, 1955 Draft Statute of the International Atomic Energy Agency*, Doc. 2 (Add. 13), 29 February 1956; for statements by India see *Summary Record - Tenth Session, Working Level Meeting on the Draft Statute of the International Atomic Energy Agency*, Attachment 2, 12 March 1956, Doc. 14 (Rev.1), 19 March 1956. (Forland, 1997, *op. cit.*, p. 77.)

[123] Forland, 1997, *op. cit.*, p. 76.

[124] In other words, entire nuclear programmes should not be covered.

- Individual safeguards agreements should be negotiated between the Agency and members.
- Source materials, including those processed by Agency projects, should not be subject to accountability, which would encourage states to seek outside (non-Agency) sources.[125]
- By-product materials should not be returned to the IAEA because it was burdensome and constituted interference in economic growth.[126]

The United States and the United Kingdom supported by other allies contended that these changes would make effective safeguards application impossible, reduce Agency bargaining power, allow diversion of Agency-supplied source material and limit Agency ability to address excessive stockpiling.[127]

Compromises resulted in limiting the nature and scope of safeguards. Several key ones limited the system's technical rigour. India was successful in restricting safeguards to those "relevant to the project or the arrangement".[128] Thus, states gave clear signals that IAEA safeguards would be very limited.

The Conference agreed to limit source material accountability to those used or produced in Agency projects. The Agency retained safeguards on source materials but lost some rights over by-product disposition. States gained the right to retain,

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[125] France, which had both military and peaceful interests in nuclear energy, also became involved in this debate, arguing that it was sufficient to report source materials to the Agency. (Forland, 1997, *op. cit.*, p. 71.)

[126] Statement by Ethiopia, IAEA/CS/OR.29, p. 16; statement by Indonesia, IAEA/CS/OR.27, p. 69-71; statement by India IAEA/CS/OR.7, para. 28. While Australia supported controls, it also found it "most desirable" to avoid Agency interference with free trade in uranium. (AEC 751/24, p. 1.)

[127] CPNA USAEC, *Report of the Chairman, United States Delegation to the Working Level Meeting on the Statute of the International Atomic Energy Agency February 27, 1956 through April 18, 1956*; CPNA USAEC, *History of IAEA Negotiations*, 2 October 1956; United States Senate, *Statute of the International Atomic Energy Agency*, Hearings before the Committee on Foreign Relations, United States Senate and Senate Member of the Joint Committee on Atomic Energy, 85th Congress, 1st Session, Washington, DC, May 1957, p. 43 (herein referred to as *US Senate Hearings on the Statute of the International Atomic Energy Agency*); CPNA USAEC, John A. Hall to Gerard C. Smith, *Draft Position Paper for International Atomic Energy Agency Conference on Reservations of India to Article XII on Agency Safeguards*, 17 August 1956.

[128] David Fischer, 1997, *op. cit.*, p. 44.

under continuing safeguards, quantities of by-product materials for use in research or in reactors, either extant or under construction.[129] The Agency's right to require deposit was limited "any excess of any special fissionable materials recovered or produced as a by-product over what is needed" for peaceful uses in order to prevent stockpiling.[130] This change restricted IAEA security management capabilities. US hearings noted that these changes prevented the Agency from judging the economic, security or technical merits of projects when reaching decisions concerning the retention of by-product fissionable materials.[131]

Another amendment denied the Agency any managerial rights over national programmes. Switzerland received support from the Federal Republic of Germany (FRG), the Netherlands, and Sweden on an amendment limiting the Agency rights to conduct design reviews and inspections. The Agency's approval over a design was limited to ensuring that equipment and facilities would not further military purposes, would comply with health and safety standards, and would permit effective safeguards application. The aim was to ensure that evaluations were conducted on technical and not political bases and assuage fears of Agency control over national programmes.[132] The amendment denied the Agency any ability to include security implications in project evaluations, an important UN Plan control function.

In this period states envisioned that the control organisation could provide sufficient assurance without managerial rights. An amendment proposed by Thailand gave the Agency the right to apply safeguards to states not receiving aid.[133] This allowed the application of safeguards to voluntary or bilateral agreements. It indicated that a number of states envisioned an IAEA role in providing assurance but without bestowing on it managerial rights.

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[129] *Background Material for Review of International Atomic Policies, op. cit.*; Forland, 1997, *op. cit.*, p. 74.

[130] IAEA Statute, Article XII.A.5.

[131] *US Hearings of the Statute of the International Atomic Energy Agency, op. cit.*, p. 43.

[132] IAEA/CS/Art.XII/Amend.1/Corr.1; IAEA/CS/OR.24; *International Atomic Energy Agency Preparatory Commission: Comparison of the Articles of the IAEA Statute, op. cit.*, p. 36; Forland, 1997, *op. cit.*, pp. 63-64.

[133] *International Atomic Energy Agency Preparatory Commission: Comparison of the Articles of the IAEA Statute, op. cit.*

Finally, the Conference added a clause to guard against industrial espionage by safeguard inspectors. This reflected the high perceived value of commercial endeavours. The clause would be the cornerstone to block future efforts to make both the Agency's and states' activities more transparent.

Achievements

In theory, the technical package for control appeared a reasonable beginning. Measures included accounting, reporting and an inspection regime to be determined at a later date. According to the Statute, inspectors had considerable access at all times to all places and records and to any person who dealt with safeguarded materials, equipment, or facilities.[134] The key managerial clause enabling the IAEA to require Agency deposit of any excess special fissionable material recovered or produced as a by-product remained, albeit in a limited form.[135] Materials under Agency possession would be safeguarded, physically protected, and distributed "in such a way as not to allow concentration of large amounts of such materials in any country or region of the world."[136]

Also, while states could establish their programmes as they chose, the IAEA retained a limited and theoretical right of approval on the design of specialised equipment and facilities, most importantly because it was not expected to safeguard facilities that technically could not be safeguarded. To increase transparency, a requirement was set that information from Agency projects be made available to other states.[137]

III. Bilateral Agreements and Undermining Control

Soviet hesitancy on Atoms-for-Peace led the United States to pursue bilateral cooperation in the fall of 1954 with a view that bilateral safeguards would serve as an

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[134] IAEA Statute, Article XII.A.6

[135] *Ibid.*, Article XII.A.5.

[136] *Ibid.*, Article IX.H.

[137] *Ibid.*, Article VII.B.

Agency model.[138] The United Kingdom and Canada followed suit. As in Statute negotiations, the exporters made compromises that would affect the future control framework.

The early British, Canadian and US bilateral agreements share similarities due to frequent consultations amongst the troika.[139] The technical objective was to ensure non-diversion of assistance while the political one was to demonstrate the workability and practicality of control measures for disarmament.[140]

The United States had two types of agreements - research reactor and power reactor - the latter of which contains tighter controls. The early US research reactor bilateral agreements, negotiated in 1955, provided for unclassified information exchange and transfer of research reactors and reactor fuel under 20% enrichment (low enriched uranium or LEU). The power reactor bilateral safeguard agreements included classified information transfer and highly enriched uranium (HEU). Before declassification of power reactor information, the United States also investigated and advised on physical protection procedures for potential recipients and required a secret annex on physical protection and classified material handling.[141]

Safeguards typically applied to reactor equipment and materials.[142] "Dangerous technologies" such as enrichment and reprocessing technology were not transferred. Controls included material tracking measures such as record keeping and data and facility inspections on an anywhere, any place, any time basis. Safeguards included structural threat management by restricting fuel quantity and isotopic concentration; requiring spent fuel reprocessing at an acceptable site; applying third party transfer controls; establishing storage location controls; and approving equipment and facilities design. Safeguards applied to derivative materials regardless of source. In the event of a violation, enforcement was considered moot since

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[138] *Department of State View Concerning Legislation Designed to Foster the Development of Atomic Power*; CPNA USAEC, *Implementation of Safeguards and Controls*, AEC 997, 1 May 1958, p. 4.

[139] Stephen Gorove, "Controls Over Atoms-for-Peace Under Canadian Bilateral Agreements with Other Nations", *Denver Law Center Journal*, Winter 1965, Vol. 42, No. 1, p. 42.

[140] AEC 997, Appendix B, pp. 16-18.

[141] For example see, AEC 779.

[142] Canadian bilaterals were unique in that they occasionally provided safeguard applications by both parties. (Gorove, Winter 1965, *op. cit.*, pp. 46-47.)

bilateral agreements were with friendly nations and thus agreement termination required only materials return.[143]

Not to be outdone in propaganda, the Soviet Union engaged in bilateral activity with its satellites and allies - but with restraint. Recipients reported numerous difficulties, significant time delays, prohibitive prices and Soviet equipment unreliability.[144] The Soviet Union directed its aid to build small-scale low-power reactors to develop competence in radioisotope technology. With the exception of a 7,000 KW and 25 MeV cyclotron provided to China, agreements were for projects with a 2000 KW capacity or less.[145]

Technical assistance appeared designed to retain Soviet control over cooperative programmes.[146] Soviet bilateral controls were indirect, with no official safeguards except guarantees not to transfer equipment, nuclear fuel, other materials, secret information or technical documentation concerning reactor technology to other countries or foreign individuals, and to guarantee security of information received and its utilisation for agreed purposes.[147]

The Soviet Union clearly arranged to exercise tight management over the structure of recipients' programmes and the knowledge base recipients would be able

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[143] The exporting state did not need to worry about security effects of its transfer because if the transfer was detrimental to the exporting state, it would not engage in nuclear commerce. It has little incentive to restrict transfers because they may be detrimental to another state's security.

[144] Kramish, *op. cit.*, pp. 180-181.

[145] CPNA USAEC, Charles H. Reichardt to Philip Farley, *Agreements on Cooperation and Aid in Utilization of Atomic Energy for Peaceful Purposes Concluded by the USSR with Other Countries*, 17 March 1960.

[146] CPNA USAEC, Report of the United States Delegation to the International Conference on the Peaceful Uses of Atomic Energy Held by the United Nations, *The International Conference on the Peaceful Uses of Atomic Energy*, 8-20 August 1995, Confidential Supplement, p. 16a; Nieburg, *op. cit.*, pp. 87, 112-113.

[147] Article 9, *Agreement on Cooperation between the Union of Soviet Socialists Republics and the Yugoslavian Federal Peoples's Republic in Developing Research in Nuclear Physics and in Utilization of Atomic Energy for Peaceful Purposes* in Charles H. Reichardt, Director of Intelligence to Philip Farley, Department of State, 17 March 1960; also see for a discussion Nieburg, *op. cit.*, pp. 87, 112-113; George Ginsburg, "The Soviet Union and International Co-operation in the Peaceful Use of Atomic Energy: Bilateral Agreements", *The American Journal of International Law*, Vol. 54, July 1960, pp. 605-614.

to build. It required that spent fuel be returned for processing. This kept sensitive or "dangerous" activities out of the hands of recipients and enabled the Soviets to conduct analysis that could indicate a recipient's operating conditions and attempts at diversion. Recipients also depended on the Soviet Union for enriched uranium to fuel reactors and supplies were LEU.[148] Finally, most nations receiving Soviet aid also accepted Soviet technicians, some of whom where trained to detect signs of diversion.[149]

Evolution of Bilateral Agreements

Early bilateral cooperation can be categorised as a learning period for technical construction of safeguard systems. Some measures relating to programme structure management slowly disappeared while some technical accounting loopholes were plugged. Often, exporters removed managerial measures due to economic pressures.

Technical loopholes were closed as states concluded successive agreements. For example, the United Kingdom sold two power reactors fuelled by natural uranium to Italy and Japan, but did not require safeguards on source material.[150] Under early US agreements, little or no control existed over the disposition of plutonium or U-233 produced outside of supplied fuel elements, a loophole recognised in 1956.[151]

Nevertheless, pressure for commercialization of nuclear energy at the expense of safeguards was strong. The United States compromised on safeguards by dropping requirements that placed structural restraints on the nature of a recipient's project to energise its sagging foreign reactor programme.[152] Although compromises were being made on safeguards, the United States was aware that economic competition was damaging control. A USAEC safeguards task force concluded in December 1955 that when enticing prospective customers away from less restrictive Soviet or British offers,

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[148] Goldschmidt, 1982, *op. cit.*, p. 340.

[149] *The International Conference on the Peaceful Uses of Atomic Energy*, Confidential Supplement, *op. cit.*, p. 16a; Nieburg, *op. cit.*, pp. 87, 112-113; Ginsburg, *op. cit.*, p. 613; Kramish, *op. cit.*, p. 64; Georges Fischer, *The Non-Proliferation of Nuclear Weapons*, St. Martin's Press, New York, 1971, p. 26.

[150] Kratzer, *op. cit.*, 1976, pp. 250-288.

[151] AEC 801/22, pp. 2-3.

[152] CPNA USAEC, 1160th AEC meeting, 4 January 1956.

minimal to no consideration had been given to the prevention of nuclear material diversion from power reactors.[153]

The United States debated leasing or retaining ownership over nuclear materials transferred or produced under its bilateral agreements, while developing its model agreement. It originally planned to raise the issue during negotiations but keep the policy unannounced in broad statements on nuclear transfers, fearing that potential recipients would object.[154] The United States rapidly came to prefer sale over leasing as the latter placed a greater economic burden on the provider. While the USAEC noted a psychological advantage if the material remained US Government property, they did not believe it critical because the material was subject to safeguards.[155]

The USAEC also debated the isotopic composition of export fuel, choosing LEU for two advantages.[156] The fuel was less likely to be diverted and LEU reactors could not utilise domestic uranium sources for clandestine production.[157] As bilateral cooperation commenced, both British and American engineers quickly discovered that using LEU instead of HEU was impractical for some reactors.[158] The British, who applied no enrichment level restrictions, believed that technical measures were adequate and that, since safeguards included detailed provisions for fissile material inspection and control, there was no need to confine the uranium supply to LEU. In addition, the British argued that such constraints were senseless without parallel

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[153] Hewlett and Holl, *op. cit.*, pp. 314-317.

[154] *Factors to be Considered in Developing a US Policy on Nuclear Power Abroad*, *op. cit.*, p. 1.

[155] CPNA USAEC, *Analysis of Considerations of Sale Versus Lease of Enriched Uranium Abroad*, 22 May 1957, prepared for National Advisory Council on International Monetary and Financial Problems, Meeting No. 258, 5 June 1957; AEC 890/24, p. 10.

[156] *Observations on the Problem of Controlling Against Diversion, op. cit.*, p. 9.

[157] PRO AB6/1613 29465, J. C. A. Roper, Memorandum, British Embassy, Washington, DC, 4 March 1956.

[158] Advantages of high enriched uranium over low enriched uranium in materials test reactors include safer operation, lower U-235 burnup and inventory, no plutonium production, more compact cores, and costs per element are perhaps half. (CPNA USAEC, Philip J. Farley to John A. Hall, *20% Enrichment Limitation*, Memorandum, 29 July 1957; AEC 890/25, p. 17; AEC 226/34; AEC 226/33; AEC 890/17, p. 1.)

controls on plutonium.[159] They acknowledged a potential risk, but maintained that civilian atomic power requirements could not be satisfied with a 20% limit significantly restricting reactor design.[160]

The United States believed it was at an unfair competitive disadvantage. Buyers would turn to the United Kingdom and would accuse the United States of using HEU in domestic commercial reactors.[161] In 1958, the United States adopted the policy that the 20% limitation duplicated protection against diversion covered in the rights and guarantees under bilateral agreements and could be construed as a lack of faith in control system workability. The degree of enrichment of fuel elements henceforth was deemed to be a "function of technological and economic criteria".[162] Under this policy, US producers could transfer materials enriched up to 90%, using up to eight kilograms per core for certain reactors in addition to fuel for the pipeline, burn-up, inventory purposes and testing reactors. In 1959 the USAEC liberalised the policy further.

Economic factors also compelled the United States to eliminate its repurchase option for plutonium in excess of a state's requirements. The United States was not in a position to become a repository for worldwide industry-produced plutonium in the absence of a control authority.

Finally, much as in the Statute negotiations, political and economic pressures forced the United States to rework its right to approve reprocessing activities. In later agreements, its approval over reprocessing was limited to ensuring that it was conducted under adequate safeguards.[163]

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[159] PRO EG 1/93 27549, M. I. Michaels to J. C. Walker, UK Atomic Energy Authority, 5 February 1957; AEC 890/28; AEC 890/25, p. 10; EG 1/115 27549, *Military Risks of International Collaboration*, Minutes of a Meeting, 3 February 1956.

[160] PRO EG 1/115 27549, *Military Risks of International Collaboration*, Minutes of a Meeting, 3 February 1956.

[161] AEC 890/28, p. 7; AEC 890/25, p. 10; PRO, EG 1/115 27549, Note of Informal Technical Meeting at A.E.C., 8 February 1956.

[162] AEC 890/25, p. 2.

[163] Kratzer, *op. cit.*, 1976, pp. 257-258.

Leading exporters, notably the United States, rejected cession of sovereign economic rights and exporting solely through the IAEA. In fact, bilateral operations had priority over Agency creation.[164] This decision severely lengthened the odds on the Agency developing into an effective control organisation. By pursuing individual agreements, recipients exploited the negotiation process to reduce safeguards. The exporting states set precedents by giving friends and allies preferential treatment, aggravating the situation.

When bilateral cooperation boomed without any agreed global safeguarding standard, it created a mixed system. The foundation for the mixed system was laid when the troika concluded their first bilateral nuclear cooperation agreements. These agreements addressed cooperation among each other. They neither placed limits on separation work nor contained safeguards for supplied materials. They contained no inspection rights and no commitments for reporting material quantities.

When the three started to cooperate with other states, they coordinated their policies. The US philosophy was that the "power" bilateral agreements should be substantively identical to future IAEA agreements. This was to avoid demonstrating to recipients that lighter safeguards terms could be acquired more easily through bilateral than IAEA negotiations. The United States did not wish to indicate that some states were more trustworthy than others.[165]

US special defence agreements with Canada and the United Kingdom established unfortunate precedents. Special treatment among the three rankled other states and complicated efforts to conclude strong control measures. This was especially true in US negotiations with the European Atomic Energy Community (EURATOM). Ultimately, the United States allowed EURATOM members to operate their own regionally directed control system provided that the United States could assist in the system's establishment; assure itself that it operated as intended; and have the right to consult with EURATOM.[166] The United States acquiesced to EURATOM control demands to develop new markets and to strengthen Western European allies vis-a-vis the Soviets, knowing that it was inflicting serious harm to the

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[164] Hewlett and Holl, *op. cit.*, p. 237.

[165] AEC 801/16, pp. 1-2.

[166] CPNA USAEC, Department of State, Memorandum of Conversation, *Safeguards Provisions of Proposed US-EURATOM Agreement*, 12 May 1958.

IAEA role as a central nuclear control organisation.[167] The United States saw both control organs as important but favoured EURATOM. It believed that EURATOM would re-enforce the IAEA's control when the two systems became integrated. The arrangement was advantageous over working with the IAEA as EURATOM met US economic and national interests while providing control over European atomic energy.

The British, like the United States, wanted to provide special safeguards concessions to the Commonwealth based on their special political relationship. The troika slowly recognised that a destabilising mixed control system was emerging.[168] In the long run, the effectiveness of bilateral safeguards in combating proliferation would erode as nuclear industries developed and competition for lower controls ensued.[169] They also knew that bilateral arrangements risked eliminating the IAEA[170], but continued bilateral activity external to the Agency. Support for the IAEA consisted of limited attempts to standardise bilateral safeguards measures to projected IAEA measures.

IV. Bypassing the Baruch Plan without Rejecting its Principles

Although the Baruch scheme was shunted aside with IAEA establishment, US analysts did not reject effective control principles. Over time, various aspects of a UN-type control plan were repeatedly identified as desirable in a control framework. In fact, a 1955 investigation by the USAEC into the constituents of an effective control system still remarkably resembled the UN Plan.[171]

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[167] For views on the affects of US bilaterals on the Agency see PRO FO 371 123099 Minutes Mr. Michaels Atomic Energy Office to Mr. Bendall, 13 November 1996, *Report on the Conference on the Statute of the IAEA*, New York, 20 September - 26 October.

[168] Langley, *op. cit.*; EG 1/115 27549, Saving Inward Telegram from Washington to Foreign Office, 7 July 1956.

[169] United States Senate, *Observations on the Problem of Controlling Against Diversion, op. cit.*, p. 6; *US Hearings on the Statute of the International Atomic Energy Agency, op. cit.*, p. 61; Glenn T. Seaborg, "Existing Arrangements for International Control of Warlike Material - 5: The United States Program of Bilateral Safeguards", *Disarmament and Arms Control*, Autumn 1964, Vol. 2, No. 4, pp. 424.

[170] *Observations on the Problem of Controlling Against Diversion, op. cit.*, pp. 6-8.

[171] A USAEC Division of International Affairs internal paper suggested that effective control required the following measures: Agency operation of fuel fabrication and reprocessing accountability measures; physical security measures; inspection at any

The pitfalls of compromising on measures found in the grand scheme were understood but considered a necessary risk. In analysing Atoms-for-Peace, one USAEC analyst emphasised that assurance would drop without a globalist approach:

> Unless there is international operation of facilities - as proposed in the current UN plan - there can be no assurance against loss or diversion of small quantities of materials.[172]

Although the limited control scheme forced governments to accept a shift in objective from preventing nuclear weapons acquisition to preventing material diversion, the leading states remained optimistic that the Agency could resolve their nuclear security concerns.[173] The United States and the United Kingdom hoped that the IAEA would "prevent for as long as possible the manufacture of nuclear weapons by countries outside the USA, USSR and UK."[174]

Nuclear industry growth remained a serious control challenge, with analysts fearing that widespread power reactor utilisation would challenge whether detailed technological inspection, sampling and measurement procedures would be adequate assurances against fissionable material diversion.[175] In addition, industrial growth increased diversion opportunities, and economic considerations threatened to limit

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part of an operation with no-notice, with increased frequency depending on nature and size of the nuclear programme and the state's general size and level of industrialisation; use of residential inspectors (40 personnel plus 12-16 guards for a moderate chemical plant); inspections for clandestine activities (using aerial surveys and environmental monitoring); designing in centralised facilities to facilitate inspection and control, requiring programme transparency including not withholding pertinent trade secrets from the Agency personnel, Agency supervision over transport and waste disposal, customs checks, initial baseline surveys and surveillance of resources not directly related to nuclear operations including, industrial material flows, large industrial construction or renovation, power usage, transportation systems. (CPNA USAEC, *Inspection and Control Under an International Agency*, 9 December 1955.)

[172] Bickel, 23 December 1953, *op. cit.*, p. 6.

[173] *Text of Remarks of Dr. I. I. Rabi, op. cit.*

[174] PRO EG 1/115 27549, *Present Attitudes Towards the Question of Controls, op. cit.*; also see PRO EG 1/115 27549, *Record of Tripartite Meeting at the State Department on February 6 to Discuss the International Atomic Energy Agency, op. cit.*; CPNA USAEC, Pertinent Sections from Draft Report by Harold Stassen "US Policy on Control of Armaments", 11 November 1955.

[175] AEC 226/30, p. 5.

resources available for effective control implementation.[176] Drives to relax controls and emergent indigenous programmes reducing the costs of nuclear power were anticipated.[177]

When negotiators considered the banker approach under Atoms-for-Peace, threat management via controls on production rate, material location, isotopic ratio and distribution was still salient.[178] Even after banker was replaced by broker, the United States believed some traces of materials management was possible under the Agency controls. The amount of fissionable material in possession of a single state at any one time should be comparatively small due to IAEA's mandate to prevent stockpiling. Regardless, the United States would remain secure should the plan fail. If material were seized, the non-complying state would still have to process the material to use it in a weapon.[179]

Stockpile management remained critical as growth risked escalating tensions with the increased diversion opportunities and the fact that stocks intended for peaceful uses were indistinguishable from those for military use.[180] Therefore, the future IAEA direction needed to emphasise management. The USAEC considered that, should industry growth generate large material stocks:

> [...] it might prove important or even essential from the standpoint of international security for the International Agency itself to operate the atomic energy projects to which it made allocations.[181]

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[176] *Ibid.*, p. 5 and Appendix B-4, p. 37; John A. Hall to Robert R. Bowie, *op. cit.*; PRO FO 371/123099, D. V. Bendall, *IAEA Comments on Report: Prepared by the Atomic Energy Office, Summarising the Position following the Conclusion of the Conference*, 1956.

[177] *Observations on the Problem of Controlling Against Diversion, op. cit.*, p. 9.

[178] Bickel, 23 December 1953, *op. cit.*; "Memorandum by the Director of the Policy Planning Staff (Bowie) to the Secretary of State", 30 October 1953, *Foreign Relations of the United States 1950, op. cit.*, pp. 1235-1240; Strauss, 6 November 1953, *op. cit.*

[179] *US Hearings on the Statute of the International Atomic Energy Agency, op. cit.*, p. 89.

[180] PRO FO 371/123088, *United States Views on the Safeguards System Contained in the Draft Statute of the International Atomic Energy Agency*, July 1956; IAEA/CS/OR.29, 15 October 1956.

[181] *Working Paper Concerning the Creation of an International Atomic Energy Agency, Its Functions, Organization and Powers, op. cit.*, p. 2.

The USAEC continued to support industrial growth management, believing it conceivable that the Agency "in the interest of effective control" limit "the number and types of power reactors" since some reactors presented inspection difficulties.[182] Fuel fabrication and reprocessing were still considered dangerous enough to merit Agency operation of the civilian fuel cycle.[183] In summation, long-term safeguarding of large-scale nuclear power utilisation possibly required "many of the control features described in Chapter 4 & 5 of the 2nd UNAEC Report".[184]

A decade after the Baruch Plan, comprehensive knowledge via operations transparency remained an important control precondition. Although the Agency mandate included partial control, in 1955 the USAEC noted:

> In order that the Agency may properly assess the accuracy of quantities of nuclear materials entered on the accountability records, all phases of the technical operations involved shall be open to authorized Agency personnel.[185]

Transparency could not be denied on the basis of industrial protection.

> Access of Agency inspectors to any places or data shall not be limited on the ground that such access might disclose trade or other types of secrets.[186]

Although the IAEA system was not a comprehensive control package, the United States internally maintained that comprehensive control over the entirety of a state's nuclear programme that received aid was highly desirable.[187] In an examination of an extended system to address disarmament, a comprehensive safeguards system needed to be in place which maintained "complete knowledge" of

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[182] AEC 226/30, p. 5.

[183] John A. Hall to Gerard C. Smith, *op. cit.*, 6 August 1956, p. 13; PRO EG 1/115 27549 *Safeguarding of Fissile Material Provided Under Bilateral Agreements and Under Agreements with the International Atomic Energy Agency*, 27 October 1955; AEC 751/33, p. 6; PRO, EG 1/115 27549, *Note of Informal Technical Meeting at A.E.C.*, 8 February 1956; Smyth, *op. cit.*

[184] CPNA USAEC, *Agenda for Discussion on Safeguarding Peaceful Uses of Atomic Energy*, 1955, p. 2.

[185] John A. Hall to Gerard C. Smith, *op. cit.*, 6 August 1956, Appendix, p. 5.

[186] *Ibid.*, Appendix, p. 5.

[187] *International Atomic Energy Agency Meeting: Proposed US Position on International Atomic Energy Agency, op. cit.*

nuclear production processes was a prerequisite.[188] As envisioned under the UN Plan, extreme measures were required. If the Agency was to investigate clandestine activities successfully, it required unimpeded access to all facilities in all countries.[189]

Until the mid-1950s, physical protection was deemed an integral part of the control system.[190] The original banking concept had emphasised physical protection measures under Agency domain.[191] Nuclear material transport regulation was also slated for Agency jurisdiction.[192] The United States was forced to drop the issue when other governments were uninterested in committing to a negotiated agreement on physical protection or including it in the Agency inspection system.[193] The United States continued to see physical protection measures as important to disarmament issues.[194]

While the United States relinquished demands on enforcement, the USAEC believed that the enforcement need would rise again. During the early IAEA years, the USAEC felt that violations were not critical. If the IAEA mandate expanded to verify disarmament, violations would pose a greater problem.

> It would probably be necessary to develop further safeguards which might include: increasing the powers of the Agency; increasing the effectiveness of UN action -- which might involve modification of the veto in the Security Council or adoption of weighted voting in the General Assembly; and increasing emphasis on individual or collective action against violators.[195]

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[188] AEC 226/118, p. 2.

[189] CPNA USAEC, *Inspection and Control Under an International Agency*, 9 December 1955, p. 9.

[190] *Text of Remarks of Dr. I. I. Rabi, op. cit.*; AEC 213/17, p. 5.

[191] CPNA USAEC, Alex Bickel, *Receipt, Custody and Distribution of Materials*, 21 December 1953; also see Bickel, 23 December 1953, *op. cit.*

[192] John A. Hall to Gerard C. Smith, *op. cit.*, 6 August 1956, Appendix, p. 5; AEC 751/33, p. 6.

[193] Author interview with Ben Sanders, January 1998.

[194] AEC 226/118, p. 2.

[195] *Working Paper Concerning the Creation of an International Atomic Energy Agency, Its Functions, Organization, and Powers, op. cit.*, p. 15.

Broad participation in a control plan inclusive of all nuclear weapon states remained essential for effective control.[196] To achieve universality, British and American policymakers alike accepted that nuclear states must be placed on an equal footing with other states.[197] They were fully cognizant of the validity of the developing state argument that the division between advanced and developing nuclear states under the IAEA proposals would militate against establishment since recipients would have little incentive if suppliers did not accept similar control measures.[198]

The efficacy of any control system without nuclear weapons renunciation was identified as having a limited duration because as states became self-sufficient, they could and would evade control. Thus, the United States and United Kingdom believed that, to increase system effectiveness and universality in the long-term, nuclear weapons states would need to work out and participate in an "effective system of disarmament" before incentives for others to accept controls disappeared.[199]

Although the establishment reduced the nuclear control framework to technical measures, for analysts effective nuclear threat management continued to require more than a set of technical measures. In actuality, the new partial control system still needed to

> provide for decision-making not exclusively on the basis of proof of diversion [...] but upon a serious change in the nation's political orientation or national objectives or upon any important failure of the nation to comply with [an] agreed-upon standard.[200]

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[196] *Proposed US Position on International Atomic Energy Agency, op. cit.*, pp. 3-4.

[197] PRO EG 1/115 27549, *Record of Tripartite Meeting at the State Department on February 6 to Discuss the International Atomic Energy Agency, op. cit.*; PRO FO 371/123088, Canadian Position International Atomic Energy Agency, *Canadian Views on Inspection and Control*; PRO EG 1/115 27549, P. H. Dean, Foreign Office Memorandum, 6 January 1956.

[198] AEC 751/41, p. 5; PRO EG 1/115 27549, *International Atomic Energy Agency, Canadian Views on Inspection and Control.*, Telegram, Ottawa to Canadian Embassy, Washington, 14 February 1956.

[199] PRO FO 371/123088, *UK Position Measures to Prevent the Manufacture of Nuclear Weapons By Countries Not Already Possessing Them*; *Proposed US Position on International Atomic Energy Agency, op. cit.*, pp. 3-4.

[200] AEC 997, Appendix A, p. 48.

Control was about norms, not numbers. One British official, skeptical of the IAEA approach, commented that he was "more inclined to concentrate on creating a system to set a moral climate and discourage misconduct."[201]

Finally, analysts understood that the IAEA programme could "supplement" but not replace a disarmament plan or an effective nuclear energy control plan.[202] The Agency could not be the final solution to the nuclear control problem but rather a step to a more comprehensive system.[203] It served as a basis to develop an effective international control or disarmament programme.[204] Visions for the Agency echoed the UN Plan structure. As world nuclear industry grew, the Agency contribution to diverting the world fissionable material supply to peaceful uses would be increasingly important.[205] Eventually, it would be the exclusive world fissionable material market and foster nuclear energy as an internationally-supervised activity.[206]

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[201] Langley, *op. cit.*, pp. 3-4.

[202] CPNA USAEC, *Relationship of President Eisenhower's General Assembly Proposal of December 8, 1953 to the Remainder of the Disarmament Program*, 24 December 1953; statement by Norway, IAEA/CS/OR.27, p. 52; statement by the Netherlands, IAEA/CS/OR.28, p. 32; statement by South Africa, IAEA/CS/OR.29, p. 51; AEC 751/19, p. 7.

[203] AEC 751/122, Appendix D; statement by Italy, IAEA/CS/OR.30, p. 17; G. C. Smith, 14 September 1955; PRO FO 371/123088, *UK Position Measures to Prevent the Manufacture of Nuclear Weapons By Countries Not Already Possessing Them*.

[204] *Observations on the Problem of Controlling Against Diversion, op. cit.*, p. 10; *Proposed US Position on International Atomic Energy Agency, op. cit.*, p. 3; CPNA USAEC, *NSC Proposed Policy on IAEA*, 8 November 1955; CPNA USAEC, *Draft Report of AEC Staff Committee on International Atomic Energy Agency*, 31 July 1956, p. 6; PRO EG 1/115 27549, *International Atomic Energy Agency, Canadian Views on Inspection and Control*, Telegram, Ottawa to Canadian Embassy, Washington, 14 February 1956.

[205] CPNA USAEC, *A Suggested Basis for a Plan to Carry Out the President's Proposal, "Atomic Power for Peace"*, 23 December 1953, pp. 2, 16.

[206] *Ibid.*, p. 24; PRO, EG 1/115 27549, *Note of Informal Technical Meeting at A.E.C.*, 8 February 1956; *Informal Paper Left with Mr. Molotov By Secretary Dulles, Geneva, May 1, 1954, op. cit.*, p. 275.

V. Conclusion - Losing Control

Political and commercial pressures took their toll on the negotiations of control systems. The mixed system that resulted did not address core nuclear threats. Rather, it served to minimise the destabilising effects of using nuclear energy and provide a foundation upon which a more effective system could be built.

A piecemeal approach compensated for political realities - lack of will to implement stringent measures, absence of mutual trust, and unwillingness to sacrifice sovereignty. While establishment of a control framework was an achievement, the loss of so many vital control elements presaged serious problems.

Nuclear threats remained unaddressed under limited control. Therefore, openness and disarmament, critical for promotion of a stable environment, were impossible to implement. Nationally applied interim controls stayed in place, since states interested in control were unsure if the new system was reliable. Australia, Canada, South Africa, the United Kingdom and the United States made it clear that cooperation with the Agency depended on their satisfaction with safeguards.[207]

The shift in control authority objective from the prevention of nuclear weapons development to the promotion of peaceful uses with assurances of non-diversion demanded a different technical framework than the UN Plan. The Agency was not the central focus of nuclear energy development and control, but a body that could provide assistance under safeguards for states if they believed that such an option was appropriate for their needs. Bilateral and indigenous activities could continue without supervision. Most non-technical control elements under the UN Plan disappeared.

The Atoms-for-Peace approach was not designed or conceived for effective control. Shortchanging on the incorporation of the principles was assumed to be a limited short-term risk since policymakers expected commercial operations would initially be modest. They would deal with large scale development when the time arrived. The inequities in the framework created by applying control only to aid recipients forced excessive focus on the promotional aspects. Originally, control was the trunk around which nuclear energy promotion could spread. This situation was reversed.

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[207] CPNA USAEC, W. B. McCool to John A. Hall, *Commission Decision on AEC 890/25 - Revision of 20% U-235 Assay Limitation on Enriched Uranium for Foreign Distribution*, 25 March 1958; AEC 946/4, p. 2.

A partial framework implied that not all routes to nuclear weapons were addressed. Measures established against a violation or system collapse provided little or no security, but relied on consensus by the UN Security Council for enforcement action. No controls were established over the growth and structure of national nuclear programmes leaving national rivalries unaddressed.[208]

As to the principle of adaptability, US analysts foresaw the evolution of the nuclear control system, but the framework *per sé* was not designed with flexibility in mind. The unwillingness of states to accept the universal application of measures and the prospects of a lucrative nuclear industry undermined the attractiveness of the system, therefore encouraging the establishment of substandard controls. Governments chose national interest, requiring them to put their faith in the national pledges of others.

The establishment of the IAEA system held great implications for future control efforts. It de-linked controlling nuclear energy and nuclear weapons. The creation of the IAEA signalled acceptance of state development of nuclear energy without constraints, regardless of whether peaceful developments were seen as threatening. As threats associated with peaceful nuclear energy were devalued, controls took second place to economic development.

Finally, since policymakers were unable to establish comprehensive control before nuclear energy developed into a commodity, a new dimension was added to the control problem. As more states developed nuclear programmes, any future control possibilities became more difficult. Verification problems involving past production would loom, and nuclear programmes would grow unchecked, producing large nuclear stockpiles and promoting nuclear rivalries.

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[208] While the plan could contribute to rivalry in terms of stockpile management, it will be seen later that the Agency was not in a position to exercise this option.

CHAPTER 3: MATURATION OF THE IAEA CONTROLS

This chapter examines the continuing evolution of the international framework to control nuclear energy. It tracks the difficulties for states in embracing the principles for control and their methods for ensuring the limitation of control, which ultimately undermined the effectiveness of the system. By embracing only certain aspects of Baruch's framework, negotiators created an unstable system that provided little security. The difficulties associated with a national inspection system, which were predicted by the Acheson-Lilienthal Committee, started to emerge and undermined the negotiations of the international control system as it evolved. Success was limited by a general dissatisfaction with the system, often created by imbalances derived from falling short of meeting the principles of control. These imbalances created dynamics that discouraged the institution of control. Success was also limited by states protecting immediate national interests. While protectionist attitudes were partially fed by dissatisfaction with the system, they were also driven by states' inability to embrace a system structure that required a global governance rather than nation-state type of approach.

This chapter will also identify early efforts to improve the system by incorporating Baruchian elements. Most advocates of safeguards focussed on improving the comprehensiveness of the system and the transparency of nuclear programmes to the Agency. Although threat management and equity concepts did arise, approaches relating to those concepts were not widely embraced.

I. Difficulties in Applying Bilateral Safeguards

After the adoption of the Statute, international attitudes soured quickly towards both bilateral and international control. Initial steps towards formulating safeguards (1956-1960) were complicated by Cold War tensions. Without a reduction in tension, the odds on strengthening IAEA controls appeared long to even the Agency's strongest proponent, the United States. *Bonafide* strengthening, according to a 1960 US study (the McKinny Report), would come through the Agency taking possession of large amounts of fissionable material,[1] a problematic outcome. The United States, dominant in formulating global nuclear policy, had been losing the ability to control negotiations both bilaterally and multilaterally. As national programmes in Europe and Asia developed, new states, keen to promote nuclear energy preferably outside IAEA auspices, started to shape international nuclear affairs.

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[1] Nieburg, *op. cit.*, p. 128.

The United States encountered this phenomenon while negotiating bilateral nuclear cooperation agreements, initially promoted as based on the Statute. Japan resisted US attempts to safeguard successive generations of plutonium because Article XII did not explicitly state such a requirement.[2] This was an early instance where prospective exporters conflicted with importers because they required higher assurance than the lax international standard.

The resistance efforts of importing states were successful even after IAEA standards were established. The market favoured buyers and safeguards were negotiating chips. Unlike INFCIRC/26[3], which permits the attachment of safeguards to equipment, India's bilateral agreement with the United States in 1963 attached safeguards to fuel but not equipment.[4] Bilateral agreements incrementally weakened to the point where the Agency's first Director General Stirling Cole accused the United States of letting recipient states make their own rules[5].

The United States was not alone in experiencing difficulties in negotiating strict bilateral controls. Constance Hunt points out Canadian reluctance to impose conditions on its nuclear exports. Five treaties signed by Canada for cooperation between 1957-1959 contained few concrete pledges of peaceful use; placed weak or no restrictions upon retransfer of information; and often did not provide for safeguards extension on termination of agreement.[6]

In April 1956, Canada agreed to supply India with a uranium heavy water reactor for peaceful purposes. It transferred half of the first core loading with the remainder indigenously supplied. Canada called for safeguards on supplied fuel, but India claimed that its word was sufficient and hinted that it would seek Soviet aid if Canada pressed further. Canada feared that indigenous Indian fuel elements would not work and that France and Belgium might supply elements with no safeguards at all since these countries had strong interests in developing their domestic nuclear industry

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[2] CPNA USAEC, John A. Hall, *Discussion on Proposed US-Japanese Comprehensive Agreement*, Memorandum, 23 October 1957.

[3] INFCIRC/26 was the first set of negotiated IAEA safeguards guidelines.

[4] Alvin Z. Rubinstein, "On IAEA's Future", *Bulletin of the Atomic Scientists*, January 1965, pp. 25-27.

[5] Nieburg, *op. cit.*, p. 122.

[6] Constance D. Hunt, "Canadian Policy and the Export of Nuclear Energy", *University of Toronto Law Journal*, Vol. 27, No. 1, Winter 1977, pp. 78-79.

and were not supporters of safeguards. Thus, Canada eased pressure for safeguards on the reactor.[7]

Similarly, heavy water for the same reactor was supplied by the United States without safeguards since no measures existed for heavy water at the time. The United States had an opportunity to negotiate an IAEA safeguards agreement on heavy water in 1963 when an agreement was reached to place the two US-supplied Tarapur Power reactors under IAEA safeguards. However, it was unsuccessful because the requirement jeopardised reaching agreement on IAEA safeguards for the Tarapur reactors.[8]

Although the United States included in its bilateral agreements provisions for the possibility to transfer safeguards to the IAEA, importing states resisted US transfer efforts. They viewed IAEA inspections with caution, seeing the Agency as "technically unqualified, administratively inefficient, a political tool of the Cold War, and an inadvertent cover for espionage activities by inspectors of undesirable nationality."[9] As late as 1969, USAEC inspectors made 52 inspections in five countries.[10] When transfers were made, the United States, for fear of discouraging future safeguards acceptance, supported some flexibility with the Agency's handling of bilateral agreements. When negotiating safeguards guidelines, US policy was that (1) parties rather than the Agency should decide what bilateral assistance would trigger a safeguards obligation and (2) the application of safeguards for an indefinite period should be a principle rather than a categorical requirement.[11]

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[7] *Ibid.*, p. 78.

[8] GWU, Edward Bauser to Fibes, Memorandum, 3 November 1965, GWU Doc. No. 1143; Gordon Sims, *A History of the Atomic Energy Control Board*, Ministry of Supply and Services, Ottawa, July 1980, pp. 190-196; GWU, United States Department of State, *Ribicoff Press Release on US Heavy Water in Cirus and Department Press Guidance*, 12 June 1976, GWU Doc. No. 1471; also see United States Government, *Congressional Record - Senate*, 16 June 1976, pp. S9632-9637.

[9] CPNA USAEC, J. Robert Schaetzel to Harlan Cleveland and Walter J. Whitman, 1962.

[10] United States Senate, Committee on Government Operations, *United States Agreements for Cooperation in Atomic Energy*, USGPO, Washington, DC, January 1976, p. 51.

[11] Statement by the United States, GOV/COM.14/OR.16, para. 35(a) and GOV/COM.14/OR.22, para. 46. The revised safeguards model INFCIRC/66 para. 16 states that it is "desirable" that safeguards agreements should provide for the continuation of safeguards. (Board of Governor records have been used based on

International safeguards negotiations did not fare any better. The IAEA Board of Governors (BOG) resisted Secretariat efforts to develop safeguards implementation methods because many on the BOG saw them as a minor function.[12] Safeguards became an issue when Japan requested three tonnes of uranium from the Agency. The Secretariat submitted a draft agreement and letter to the Board in January 1959. The agreement included undertakings against military use, restrictions on transfers, a declaration that safeguards in Article XII.A of the Statute were relevant to the transfer and a clause that further details shall be determined by the Board after the Director General consulted with Japan. The letter listed as relevant safeguards measures, *inter alia*, the submission of reactor design drawings and the fuel fabrication programme and the submission of periodic and special reports and inspections. These would be applied until the first reactor reached criticality. If no regulations were established, further safeguards would need arranging.

The Board rejected both documents. Its first confrontation with safeguards revealed a strong distaste for according the Agency broad discretion, flexibility and training time. They believed that safeguards under the Statute evolved through compromise and were accepted on the understanding that the Agency's rights and responsibilities were limited to those relevant to each individual arrangement. Safeguards listed for the Japanese agreement were seen as excessive and unnecessary. The Board wanted to see the complete safeguards package with clearly stated limitations, not as an installment approach.[13]

The negative attitude of the BOG towards safeguards was a function of several factors. Represented on the BOG were numerous developing and industrial states. The primary interest of the former was to support nuclear energy development, acquire aid and prevent economic colonialism. The latter sought to engage in a lucrative industry, acquire advanced technology and ensure a level playing ground with the nuclear weapon states, whose industry would not be subject to safeguards.

Several states argued that safeguards were not required under the Statute for Japan. South Africa felt that the Secretariat was trying to establish an unwise

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declassification according to GOV/2897, paras. 3-8 and GOV/2843, para. 8.)

[12] McKnight, 1971, *op. cit.*, pp. 44-45. The Eastern Bloc, India, United Arab Republic (UAR), Indonesia, South Africa, France, Belgium, Denmark, Argentina, Venezuela, Pakistan. (CPNA USAEC, Vedeler to Secretary of State, Telegram No. 1692, 20 January, 1959.)

[13] For a discussion of the negotiations see McKnight, 1971, *op. cit.*, p. 46. The Japanese agreement was issued as INFCIRC/3.

precedent and questioned whether the amount of uranium being transferred was sufficient to justify safeguards.[14] France, India and the UAR thought safeguards were unnecessary for source materials.[15] India called for a simple pledge by Japan not to divert material.[16] These attempts to prevent the application of safeguards failed.

Resistance also arose over a Finnish project agreement (INFCIRC/24) where several states objected to requiring Board review of design information since the transfer involved a "minor reactor"[17] and over a Norwegian agreement (INFCIRC/29), where the recipient criticised the proposed safeguards as an unpleasant complication, creating extra work, and threatening to limit free movement of materials from one reactor to another.[18]

Some allied states struggled behind the scenes to formulate a common front on safeguards as they also had economic interests. A series of technical meetings to establish uniform standards occurred from 1957-1958 between Australia, Canada, South Africa, United Kingdom and the United States.[19] Between 1959 and 1965, the Group expanded to include France, Belgium and Portugal, and became known as the Western Suppliers Group.[20] In those meetings, Australia, Canada, South Africa, the United Kingdom and the United States expressed support for controls over uranium. Interest was tempered by fear of commercial loss through non-universality and an unwillingness to broaden the scope of control. Canada refused to demand safeguards on uranium unless safeguards were applied on a universal basis. South Africa and Australia were generally reluctant to bind themselves to any formal agreements on uranium supply. However, South Africa, in an attempt to promote transparency, voluntarily reported its exports of materials to the group but discontinued the practice when its efforts were not reciprocated.

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[14] CPNA, USAEC, Matthews, Vienna, to Secretary of State, No. 1554, 7 January 1959; GOV/OR.116, para. 21.

[15] *Ibid.*, para. 21.

[16] *Ibid.*, para. 21.

[17] Statement by India, GOV/OR.238, para. 73.

[18] Statement by Norway, GOV/OR.244, para. 47.

[19] Simpson, *op. cit.*, pp. 151-152.

[20] Japan and the FRG were also consulted, US Department of State, *Nuclear Export Controls of Other Countries*, 11 December 1964, GWU Doc. No. 1076.

Agreement on a safeguards trigger list of non-nuclear material and equipment posed greater difficulties to establish controls for the same reasons. There was limited concurrence on classifying some critical technologies such as gas centrifuges, but neither formal agreement on a control list nor on US proposals to coordinate sales to ensuring limits on total imports were possible. France and South Africa rejected safeguards on heavy water fearing they would discourage heavy water reactor sales, making them discriminatory. They also cited unfair economic competition as Norway exported heavy water with no controls. The United Kingdom would accept controls over equipment, but only if they were generally imposed. The United Kingdom feared setbacks to reactor component exports remembering its loss of India's Tarapur contract to Canada which agreed to the transfer under lax conditions.[21] Meanwhile, Japan questioned the concept of the list, arguing that safeguards on reprocessing were more important.[22]

The developments outlined above mark the beginning of trends that developed over time. Unlike in the 1940s, states did not perceive a great need for a comprehensive system. As states established limited control, those targeted for safeguards started utilising three methods to reduce or evade control, i.e., play suppliers off against each other, delay acceptance until an acceptable compromise is reached, and argue in international fora that the safeguards are excessive. Interest in effective control, requiring the incorporation of the principles to promote effectiveness became secondary due to distrust of international control as it was perceived to be an inequitable system designed to protect the domestic interests of the nuclear weapon states.

II. INFCIRC/26

With international inspections under INFCIRC/26 being quite a novel development in verification, states proceeded cautiously. The problems associated with the development of INFCIRC/26 can be linked to the principle that control needs to be equitable. Standards ensured equity in the application of safeguards and were a *quid pro quo* for control system functionality. The British proposed to the BOG a standardisation of guidelines because the system would otherwise be inconsistent, costly and anti-promotional.[23]

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[21] Forland, 1997, *op. cit.*, pp. 67-68, 103-104, 208-209.

[22] *Ibid.*, pp. 158-159, 219-222.

[23] GOV/OR.116, para. 25; Imber, *op. cit.*, pp. 127-128.

The Secretariat produced two papers on safeguards in May 1959 entitled "The Relevancy and Method of Application of Agency Safeguards" and "Draft Regulations of Agency Safeguards".[24] They were debated by the Board and reviewed by the General Conference. A special working group was established in January 1960 to revise the text. The BOG provisionally approved revisions in April 1960 and submitted them to the General Conference, which found that the Board instructions regarding the text lacked clarity. The document was returned to the Board with instructions to reflect the opinions expressed by the Conference.[25] After further deliberations and amendments, INFCIRC/26, the first safeguards system, was adopted by the BOG on 31 January 1961.[26] The document functioned more as an experiment than as a control system. Because there was little interest in safeguards, consensus was achieved only at a very low common denominator.

Arguments Against a Strong System

Advocates of control faced negative attitudes that had hardened since the negotiation of the IAEA Statute. India and the UAR led an opposition including some Third World and Soviet Bloc nations. India crafted a five-power resolution at the Fourth General Conference in an unsuccessful attempt to replace safeguards and controls proposed in INFCIRC/26 with a "non-compulsory, self-administered system".[27] So vehement was this resistance that Canada criticised the Board's efforts to "rehash the validity of safeguards".[28]

Many of the arguments against control in the negotiation of INFCIRC/26 were carried over from the Statute debates. Contentions over sovereignty remained; a

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[24] Submitted as GOV/334.

[25] IAEA, GC(IV)/142, 20 September 1960, p. 3.

[26] For discussion of INFCIRC/26 see Richard William Butler, *The Safeguards System of the International Atomic Energy Agency-A Study of the International Politics of Atomic Control*, Sydney, Masters Thesis, Australian National University, 10 October 1968, pp. 134-137; David Fischer, 1997, *op. cit.*, pp. 245-248.

[27] The Draft Resolution was submitted jointly by Afghanistan, Burma, Ceylon, India and Indonesia (GC(IV)/COM.2/27) and was reworked and resubmitted to the BOG by Ceylon and India in January 1961 (GOV/676).

[28] Butler, 1968, *op. cit.*, p. 126; statement by Canada, GC(IV)/COM.2/OR.20, para. 14.

representative from Czechoslovakia noted, there was a fear of "extravagant" terms dictated by the Agency.[29] Resistance to this experiment in governance were fuelled by the nuclear powers bypassing the IAEA when national interests demanded. The United Kingdom exempted the Ottawa powers[30] from nuclear trade controls and made special allowances for Commonwealth members, while the United States made concessions in its deal with EURATOM in 1959, to promote its reactors in a European market.[31] Non-European states reacted badly, seeing safeguards proponents as hypocrites.[32]

Support for the Agency to become the single focal point of world nuclear energy development was constrained. Even the United States and the Agency recommended that states should obtain fissionable materials through world markets.[33] Regarding safeguards, key exporters were hesitant about the efficacy of the IAEA system. While desiring to support the IAEA system, the USAEC believed that individual bilateral arrangements held the advantage that the United States could retain some control over where its material went and for what purpose it was used. This was not possible if the United States channelled materials through the IAEA.[34] Charles Ebinger points to suspicions, however, that the reticence of key suppliers to fully utilise the Agency was aimed at maintaining flexibility for commercial purposes. He notes that both the United Kingdom and the United States resisted altering their nuclear transfer arrangements from direct bilateral agreements to multilateral third party negotiations with the IAEA which undermined the Agency's efforts to create a universal safeguards system.[35]

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[29] Statement by Czechoslovakia, GC(IV)/COM.2/OR.19, para. 60.

[30] Canada, the United Kingdom and the United States made up the Ottawa powers.

[31] Forland, 1997, *op. cit.*, pp. 94-95.

[32] On South Africa's linkage of rejecting stricter safeguards to concessions given to the West Europeans on EURATOM-US deal see Forland, 1997, *op. cit.* pp. 107-8.

[33] GC (III)/OR.28, para. 3; also see statement by the Soviet Union, GC(IV)/COM.2/OR.19, para. 18.

[34] United States Senate, *Peaceful Nuclear Exports and Weapons Proliferation: A Compendium*, Committee on Government Operations, USGPO, Washington, DC, April 1975, pp. 852-853.

[35] Charles K. Ebinger, "International Politics of Nuclear Energy", *The Washington Papers*, Vol. 6, No. 57, 1978, p. 30.

One explanation for this de-emphasising of the IAEA was that the Agency was no longer considered key to nuclear threats stemming from the Superpower arms race. The United States and the Soviet Union had begun to address the issue bilaterally. The USAEC Advisory Committee maintained that, considering Agency safeguard objectives, a disarmament role would undermine Agency's purpose and function. The safeguards system was regarded only as an example for disarmament purposes.[36]

Proponents of safeguards inevitably had to make compromises to conform with the political environment. Advances in technical control aspects inspired increased confidence in technical contributions to a control system. Technical approaches also gained popularity by being associated with the reduction of safeguards intrusiveness.[37] Public attitudes also changed. The shock of Hiroshima wore off and nuclear energy became disassociated from nuclear weapons.[38]

Commercial profits provided a powerful motivation for resisting control measures. States attempted to exploit the Agency's primary mandate to promote the peaceful uses of nuclear energy to justify relaxed safeguards.[39] Strong safeguards placed a financial burden on the Agency that interfered with its promotional mandate.[40] The Soviet Board member noted that nuclear development took priority over safeguards:

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[36]CPNA USAEC, *Advisory Committee on US Policy in the IAEA*, Summary Record of Fourth Session, Seventh Meeting, February 9, 1962.

[37] By 1958 material unaccounted for (MUF) was reduced to less than 1 percent per year in production plants. With this in view, the USAEC in 1959, realigned both the scope and purpose of its safeguards research and development by instructing contractors to place emphasis on techniques, methods, and instrumentation to make materials control more economical, more effective and less obtrusive. (*Background Material for the Review of the International Atomic Policies, op. cit.*, p. 853; CPNA USAEC, M. B. Kratzer, Division of International Affairs, *Inspection Program for Safeguards and Controls*, November 1958, p. 6.)

[38] Madhu Joshi, "Dead or Alive?" *Bulletin of the Atomic Scientists*, Vol. 17, No. 3, March 1961, p. 95.

[39] See for example, resolution by Afghanistan, Burma, Ceylon, India and Indonesia, GC(IV)/COM.2/27, para. (b).

[40] Statements by the Soviet Union, GC(IV)/COM.2/OR.19, para. 30 and GOV/OR.232, para. 11.

> The general principle's governing the application of such safeguards must not, however impede development of peaceful uses of atomic energy, which was the Agency's raison d'etre.[41]

Opponents of safeguards argued that safeguards should not be attached to items used in normal commerce including equipment, non-nuclear material, uranium and thorium[42] and that safeguards activities, including accounting and inspection, were to entail no burden for states.[43] They also called for safeguards to be applied rigorously only when a state received substantial assistance[44], or when a state had either a developed economy or was industrially or technically advanced.[45] Thus, the environment in which safeguards were being applied was characterised by a reduced sensitivity to nuclear threats (in comparison to the late 1940s) and broad international interest in reaping potential economic benefits of nuclear energy. The impact of this environment was that states paid increasing attention to economic factors when determining what type of control framework would be acceptable.

Negotiating the System

In negotiating INFCIRC/26, states attempted to limit safeguards by three means. First, there were numerous efforts, to increase safeguard exemptions. Proposals called for exempting from safeguards:

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[41] Statement by Brazil, GOV/OR.163, para. 3.

[42] For comments by Czechoslovakia, India and the Soviet Union see GOV/510, paras. 6-7, 11; statement by the Soviet Union, GOV/OR.237, paras. 27, 36.

[43] Statement by India, GOV/OR.180, para. 39; statement by Switzerland, GC(IV)/COM.2/OR.19, para. 43; statement by India, GOV/OR.116, para. 33; statement by the USSR, GOV/OR.116, para. 55.

[44] Proposal by India, GOV/428.

[45] Statement by Bulgaria, GOV/OR.235, para. 67 and proposal by Bulgaria, GOV/674 para. 3; statement by the Soviet Union, GOV/OR.235, para. 73; statement by Poland GOV/OR.235, para. 74; proposal by Afghanistan, Burma, Ceylon, India, Indonesia, GC(IV)/COM.2/27, para. 1(iv); proposal by Ceylon and India, GOV/676, para. 1 (iv).

- source and second generation materials[46];
- equipment or non-nuclear material supplied by the Agency used in principal nuclear facilities not subject to Agency safeguards[47];
- equipment in general[48];
- nuclear facilities[49];
- R&D activities[50];
- national projects not assisted by the Agency[51]; and
- reprocessing facilities.[52]

These attempts had mixed results. Safeguards were attached to nuclear facilities and specialised equipment used in principle facilities[53], but not R&D activities, national projects not assisted by the Agency, reprocessing facilities or second generation nuclear materials. Considerable debate arose over a safeguards exemption for source materials. The United Kingdom proposed an exemption for up to 10 tonnes of natural uranium, 20 tonnes of thorium and depleted uranium and 100 grams of fissile material. The United States judged the thresholds excessive and countered with a "means test". The limits would be accepted if the IAEA determined that a recipient did not have the capability to produce over two kilograms per year of fissile materials and included consideration of overall industrial development. The United States

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[46] India and Ceylon's draft resolution also included exemptions for special fissionable materials under certain amounts to be determined by the Board. (GOV/676). India and France opposed safeguards on source material. (Forland, 1997, *op. cit.*, p. 155). Argentina, Brazil, France, India, supported the lack of pursuit in the 1959 June Board. (*Ibid.*, pp. 163-165.)

[47] Czechoslovakia, India and the Soviet Union, GOV/540, paras. 3-4; GOV/510, paras. 6-7.

[48] Statement by India, (GC(IV)/COM.2/OR.20, para. 6.

[49] *Ibid.*, para. 6.

[50] Statement by India, GOV/OR.182, para. 4.

[51] Proposal by the Soviet Union, GOV/673, para. 8.

[52] In response to the Secretariat's first paper on safeguards GOV/334, the Europeans indicated that the Mol reprocessing plant in Belgium was not up for safeguards nor was any other EEC plant. (Forland, 1997, *op. cit.*, pp. 142-143.)

[53] INFCIRC/26, paras. 36-37.

attempt to re-invigorate a rivalry management approach to control proved unpopular with other Ottawa countries which saw it as incompatible with bilateral trade.[54]

A second approach to limiting safeguards was to clip the Agency's regulatory powers and revoke its role as an international nuclear energy clearing house. In an effort to de-emphasise safeguards, the Board separated health and safety controls from non-diversion.[55] Physical protection was left under the purview of states. Interest in the material control depository functions under Article XII also dissipated.[56] The prime backer of the measure, the United States, discounted it on economic grounds. According to USAEC Commissioner Harold S. Vance, if the IAEA supplied nuclear materials on special terms, it would directly compete with the United States for supply contracts.[57] States also sought to deny the Agency any rights to modify bilateral agreements as this "would lead to its [the Agency] controlling a control system."[58] States did not want to be obligated to meet standards incorporated into the IAEA system when concluding bilateral agreements.[59]

To reinforce the Agency's limited role, states sharply limited the IAEA's ability to collect information. The Agency could not regulate activities about which it had no knowledge. Proposals included exempting reporting on:

- equipment[60];
- material usage[61];

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[54] Forland, 1997, *op. cit.*, pp. 151-155.

[55] McKnight, 1971, *op. cit.*, p. 49. The United States did not seek for the IAEA to retain these powers as it was not prepared to accept the application of safety standards set by an international agency to its own nuclear activities. (*Peaceful Nuclear Exports and Weapons Proliferation: A Compendium, op. cit.* p. 854.)

[56] David Fischer, 1997, *op. cit.*, pp. 75-76, p. 128, Footnote 11.

[57] *Peaceful Nuclear Exports and Weapons Proliferation: A Compendium, op. cit.*, pp. 852-853.

[58] Statement by France, GOV/OR.169, para. 43; also see statement by Australia, GOV/OR.169, para. 38.

[59] Statement by the Union of South Africa GC(IV)/COM.2/OR.21, para. 31.

[60] Statement by India, GOV/OR.180, para. 66; GOV/COM.12/1, Annex, p. 18.

[61] *Ibid.*, Annex, p. 18.

- start up and shut down of facility operations[62];
- major facility maintenance or changes[63]; and
- transfers of Agency supplied material and equipment to and from facilities.[64]

States also sought to the deny IAEA rights to ask for information involving "industrial secrets", regardless of whether it was for routine reports, investigations of unusual circumstances or verifying facility plans.[65] In spite of their efforts, only some form of reporting on equipment was not directly or indirectly addressed under INFCIRC/26.

A third but unsuccessful strategy to limit safeguards was to give states latitude to negotiate the application of safeguards. One avenue was to leave certain decisions to the Board including whether to attach safeguards to principle nuclear facilities[66]; call for special inspections[67]; and approve safeguard exemptions of weapons grade material on a case-by-case basis.[68] A Soviet proposal went as far as to abandon any idea of establishing standards and to allow states individual negotiation of safeguards with the Agency based on the specific character of each project.[69] Of these proposals, the Board was to be given a report on the circumstances leading to a special inspection, but INFCIRC/26 did not require its approval in special circumstances.[70]

Another effort along these lines was to make specific measures subject to negotiation. Proposals included requiring individual negotiations on:

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[62] Statement by the Soviet Union, GOV/COM.12/1, Annex, p. 21.

[63] *Ibid.*, Annex, p. 21.

[64] *Ibid.*, Annex, p. 21.

[65] Statement by Czechoslovakia, GC (IV)/COM.2/OR.19, para. 58 and GOV/OR.200, para. 30.

[66] Statement by Czechoslovakia, GOV/OR.178, para. 7.

[67] Statement by India, GOV/OR.200, para. 90.

[68] Draft resolution submitted jointly by Afghanistan, Burma, Ceylon, India and Indonesia, GC (IV)/COM.2/27; also see GOV/676; GOV/OR.197, para. 5.

[69] Proposals by the Soviet Union, GOV/416, para. 2; GOV/420, para. 1. The Soviet Union received mild support from France, GOV/OR.164, para. 30 and Poland, GOV/675, para. 4.

[70] INFCIRC/26, paras. 58-59.

- the IAEA inspection schedule for weapons grade material[71];
- accounting and reporting on supplies and materials[72];
- which Agency-supplied assistance or processes were substantial and therefore subject to safeguards[73]; and
- the relevance of pertinent circumstances for safeguards on materials and facilities.[74]

In spite of these efforts, a sufficient majority of states supported that INFCIRC/26 set minimum basic standards on inspection, reporting and accounting requirements, without which the system would become cumbersome to manage and a farce. The BOG was given the responsibility to determine when safeguards where to be attached on Agency supplied facilities and equipment.[75] Safeguards were required on Agency supplied source and special fissionable materials.[76]

Although many of the efforts to downgrade the safeguards system were unsuccessful, the above propositions indicate the difficult political environment in which safeguards were being negotiated as well as states' ambivalence toward "effective" safeguards. The strongest indicator was states seeking to compel the Agency to adapt to their interests and convenience, preventing the Agency from obliging a state to alter normal reporting procedures[77] and advocating that safeguards considerations should have no bearing on facility design.[78] A facility design or a reporting style which complicated the Agency's work was deemed an Agency affair. This attitude is evident in a joint Czechoslovakia - Soviet Union statement:

> the possibility of effective application of safeguards should not be the overriding factor in the examination of any project submitted to the Agency.

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[71] Proposal by Ceylon and India, GOV/676, para. 1 (iii).

[72] A similar statement by Australia proposed that no Agency system could be enforced but the Agency would have the opportunity to "approve" state proposals for accounting and reporting (GOV/OR.200, para. 15).

[73] Proposal by Poland, GOV/675, para. 1.

[74] *Ibid.*, para. 2.

[75] INFCIRC/26, paras. 36-37.

[76] INFCIRC/26, paras. 32-35.

[77] Statement by Czechoslovakia, GOV/OR.200, para. 23.

[78] Statement by the Soviet Union, GOV/OR.200, para. 40.

> The main purpose of examining a design should be to determine whether it is primarily of a character to facilitate the use of nuclear energy for peaceful purposes, but a design should not be judged on the ease of application of Agency safeguards.[79]

The Final Product

In view of the difficult circumstances, INFCIRC/26, when finally adopted formed a weak foundation for control. The final document applied to only single facility type-reactors up to 100 thermal megawatts (MW (th)). The scope of safeguards measures was narrow. Safeguards applied to facilities, equipment and materials but only to the first generation of by-products.[80] Supporters of safeguards did manage to obtain provisions for the examination and approval of design information, and for routine and special reports and special inspections.[81] Routine inspection was limited to the examination of the safeguarded facility and/or material, and inspectors could audit reports, verify material accountancy by physical inspection, sample, take measurements, and examine instruments.[82]

The *extent* of safeguards application was quite limited. Routine reports were biannual,[83] while inspection frequency was limited to preset annual ceilings.[84] However, if the Agency considered that all routine authorised inspections were not required, fewer inspections were allowed.[85] While the Agency could apply safeguards beyond prescribed levels for security reasons only with extreme difficulty, it could quickly and easily reduce them for economic reasons.

The Board set narrow circumstances under which specific measures could be applied. Special inspections could only investigate unusual occurrences indicated in a

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[79] GOV/510, para. 12.

[80] INFCIRC/26, para. 4.

[81] *Ibid.*, para. 40.

[82] *Ibid.*, paras. 54-56.

[83] *Ibid.*, para. 62.

[84] Six was the maximum for large plants. (*Ibid.*, para. 65.)

[85] *Ibid.*, para. 57.

special report.[86] Agency rights to approve facility designs under INFCIRC/26 were confined to determining "whether the facility will further any military purpose and that the facility will permit the effective application of safeguards".[87] In contrast, under the UN Plan, the ADA could reject facility designs on broad grounds including unnecessarily high costs or overly complex safeguarding.[88]

States successfully created a role for themselves in determining safeguards. They inserted language allowing negotiation of facility records and material stockpiles requiring safeguards.[89] This feature evolved into an important method for states to quietly keep safeguards at bay.

INFCIRC/26 placed very limited obligations on states. *Inter alia,* they must maintain records for up to two years[90], provide routine reports to the IAEA[91], notify the IAEA within 48 hours of an incident[92], and provide two weeks advance notification of any facility alterations.[93]

Dynamics of a System not Meeting the Principles of Control

The adoption of INFCIRC/26 represented a milestone in setting up a framework for international control, but being limited and weak, it satisfied no party. Those states that were subject to control looked upon the framework with hostility while advocates found the system brought no enhanced security. This state of affairs would not have surprised Baruch era analysts. Issues involving missing elements arose in bilateral and INFCIRC/26 negotiations that undermined the limited system's ability to satisfy state's nuclear threat concerns. The safeguards system was non-universal, non-transparent, non-enforceable, non-comprehensive in coverage of the

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[86] *Ibid.*, paras. 6-10.

[87] *Ibid.*, para. 42.

[88] See UNAEC, AEC/C.1/Rev.1, Chapter 5.

[89] INFCIRC/26, para. 40.

[90] *Ibid.*, paras. 40(b) and 46.

[91] *Ibid.*, para. 40(c).

[92] *Ibid.*, para. 51.

[93] *Ibid.*, para. 52.

fuel cycle, minimal on nuclear misuse warnings, marginal on nuclear security threat management and provided little or no positive incentives.

Having only certain states subject to safeguards presented problems in perceptions and universality. The perception by developing states and the Eastern Bloc was one of atomic colonialism which undermined participation.[94] Without universality, states believed that no government would accept controls if it could evade them.[95]

Failure to achieve nuclear disarmament also undermined assurances and in turn universality. Testifying to the 1940s view that the peaceful and military aspects of the atom could not be separated, India observed that promoting peaceful cooperation without addressing military aspects risked inadvertent promotion of military programmes through spinoff know-how and technology.[96] Effective control meant addressing military programmes on a universal basis. As the Governor from Romania noted:

> There could be no real or effective application of safeguards while the principal countries producing and consuming fissionable materials remained outside the system, or until agreements on the prohibition of nuclear weapon tests and on disarmament had been concluded.[97]

A broader system offered an important security benefit and might have made control more palatable to its opponents. According to the Governor from Poland:

> A control system would have been indispensable if a kind of bank of fissionable materials actually existed.[98]

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[94] Statement by the Soviet Union, GOV/OR.237, para. 85; statement by Poland, GC(IV)/COM.2/OR.19. para. 69; statement by India, GOV/OR.150, para. 14; Butler, 1968, *op. cit.*, pp. 127-128.

[95] Statement by India, GOV/OR.232, para. 25.

[96] Statement by India, GC(IV)/COM.2/OR.20, paras. 6, 9.

[97] Statement by Romania, GC(IV)/COM.2/OR.19, para. 65.

[98] Statement by Poland, GOV/OR.232, para. 5.

For the East Bloc especially, control appeared senseless unless it addressed their nuclear concerns. Partial control could not function as a non-proliferation measure.[99] Rather, disarmament needed inclusion in the control.[100]

By the time that INFCIRC/26 was adopted, negotiations reflected that states held entrenched positions. Future development of control would occur through evolution not revolution. Without addressing disarmament or the application of safeguards to the advanced states, even small improvements that required an increase in safeguards measures became as complicated to implement as major ones. Many states had little to gain except being subject to increased inequity.

III. INFCIRC/26/Add.1

The creators of the new system understood its limits. If the nuclear industry expanded, changes would be necessary. The Governor from Poland noted that, "when nuclear research was more advanced and atomic installations were commonplace everywhere, safeguards and control would be essential, but then they would have to be applied to all nuclear projects and materials."[101]

The US proposals of June 1963 to extend safeguards to cover reactors over 100 MW (th) marks a turning point for strengthening the system. The negotiations reveal a subtle but important change, as the Soviet Union began to alter its proliferation and safeguards policy in response to its deteriorating relationship with China, with which it had engaged in nuclear cooperation, and concerns of nuclear development in the FRG and Japan. The Soviet Union had thought that measures were only necessary for states with reprocessing capabilities.[102] At the time, the Soviets were internally re-evaluating their international control policies. The outcome would become later evident in the negotiations of INFCIRC/66.

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[99] Statement by the Soviet Union GC(IV)/COM.2/OR.19, para. 23; statement by Bulgaria, GC(IV)/COM.2/OR.19, para. 50; statement by Romania GC(IV)/COM.2/OR.19 para. 65.

[100] Butler, 1968, *op. cit.*, pp. 127-128. Also see statement by India, GOV/OR.232, para. 25.

[101] Statement by Poland, GOV/OR.232, para. 9.

[102] Forland, 1997, *op. cit.*, pp. 110-111.

Strengthening safeguards was a slow process. Opposition from the industrial and developing world remained robust. Opponents again sought to exempt special equipment and source material from safeguards on economic grounds; rejected reports or inspections during reactor construction; resisted increasing inspection frequency; and spurned the principle of access "at all times" in spite of its explicit inclusion in the Statute.[103] Safeguards advocates managed to defer most issues to the scheduled review, when INFCIRC/66 was negotiated.

Agreement on the US-proposed extension was reached in February 1964. INFCIRC/26/Add.1 improved control scope and rigour. A whole class of facilities (reactors) became subject to safeguards, the maximum number of routine reports increased to 12 per year[104], inspection frequency rose to "access at all times" for larger reactors[105] and, most importantly, safeguards extended to successive generations of nuclear materials.[106]

Negotiations to extend INFCIRC/26 aimed to make control more comprehensive and represented the first system refinement. The exercise is notable for two reasons. First, an influential state, which was not a traditional safeguards supporter, began to re-evaluate the importance of control's contribution to its national security. Second, the short timespan between the negotiations of INFCIRC/26 and INFCIRC/26/Add.1 indicated that states realised safeguards development needed to continue, especially since the use of nuclear energy continued to grow.

IV. INFCIRC/66

In February 1964 the Board established a working group to review safeguards. They negotiated and adopted (May 1965) a new text, INFCIRC/66, covering all reactors. The General Conference unanimously endorsed the text in September 1965. The system was subsequently extended to address reprocessing (1966) and fuel fabrication (1968) plants.

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[103] India, Czechoslovakia and the Soviet Union, GOV/901, paras. 5, 17, 20; IAEA Statute, Article XII.6.A.

[104] INFCIRC/26/Add.1, para. 4.

[105] *Ibid.*, para. 6.

[106] *Ibid.*, para. 2.

The new text improved INFCIRC/26 in clarity, scope and rigour.[107] Success in strengthening safeguards is partly attributable to their increased acceptance especially by the Soviet Union. The tone of the negotiations has been described as "business like",[108] but negative attitudes persisted. Changes did not represent a significant shift in approach.

The new document delineated the general purposes and principles of safeguards, their circumstances and their implementation procedures. Being guidelines, INFCIRC/66 was a framework for future agreements rather than a specific model. INFCIRC/66 safeguards could apply to all reactors and to subsequent generations of special fissionable material for the duration of the agreement.[109] The Guidelines enjoined military use and referred to Agency sanctions against non-compliance.[110] In comparison to its predecessor, INFCIRC/66:

- set stronger criteria for safeguards termination[111];
- made the export of materials subject to safeguards "accepted by the Agency"[112];
- allowed special inspections on the basis of information in any state report[113];
- increased reporting requirements and inspection frequency[114]; and
- provided rules on the suspension and termination of safeguards.[115]

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[107] For further background and analysis of INFCIRC/66 see Sanders, 1973, *op. cit.*, pp. 32-43; McKnight, 1971, *op. cit.*, pp. 97-111; Butler, 1968, *op. cit.*, pp. 138-151.

[108] David Fischer, 1997, *op. cit.*, pp. 249, 251.

[109] INFCIRC/66, para. 16.

[110] *Ibid.*, paras. 1, 18.

[111] *Ibid.*, para. 26.

[112] *Ibid.*, para. 28. INFCIRC/26 contained no regulation on transfers.

[113] INFCIRC/66, para. 53(c). INFCIRC/26 authorises for special inspections only on the receipt of a special report or in the event of unforeseen circumstances. INFCIRC/26/Add.1, paras. 58-59.

[114] INFCIRC/66, paras. 55, 57.

[115] *Ibid.*, paras. 24-27. Also see Reinhard H. Rainer and Paul C. Szasz, *The Law and Practices of the International Atomic Energy Agency 1970-1980*, Legal Series No. 7-S1, IAEA, Vienna, December 1993, p. 317.

In addition to providing increased clarity and comprehensiveness, the changes offered the Agency a bit more discretion in rivalry management by enabling it to conduct a special inspection. The IAEA was also given a voice in determining what were acceptable transfer safeguards. Thus, they did not, in theory have to accept a sovereign state's design of transfer safeguards.

The approach to bilateral agreements when using the Agency to implement safeguards also changed. Promoting the principle of equality with regard to the application of control, INFCIRC/66 cultivated consistency between Agency safeguards under assistance and bilateral agreements, whereby the Agency could not assume responsibility for bilateral agreements unless the principles and procedures to be used were consistent with INFCIRC/66.[116]

Despite the changes, safeguards advocates still found technical defects, primarily related to scope. INFCIRC/66 did not ban peaceful nuclear explosions (PNEs); was vague in dealing with subsequent generations of materials; contained no stipulations for subsidiary arrangements and facility attachments[117]; and failed to address heavy water, considered a critical substance, as well as other parts of the fuel cycle.[118] Critics lamented the lack of provisions for the Agency to keep abreast of technical developments, a key control principle.[119] Finally, since assistance rather than national programmes was covered, the IAEA was forced to apply complex formulas to plants that simultaneously processed unsafeguarded and safeguarded materials.[120]

Keeping Safeguards at Bay

Although safeguards were being strengthened, a core of states either disliked the system or were cautious about increasing Agency rights. The concept of control

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[116] INFCIRC/66, para. 5.

[117] Subsidiary arrangements establish the actual safeguards implementation procedures within a state. Facility attachments are arrangements related to a specific facility.

[118] David Fischer and Paul Szasz, *Safeguarding the Atom: A Critical Appraisal*, Taylor & Francis, London, 1985, p. 77.

[119] Fischer and Szasz, *op. cit.*, p. 77.

[120] The formula for mixing safeguarded with unsafeguarded material can be found in INFCIRC/66, para. 23 or GOV/1245 Annex II 11(d).

as applied to facilities retained "some undesirable connotations" for many states.[121] At this time, they developed a set of arguments and principles which would regularly be employed to keep safeguards at bay. These concepts undermined the core of the control principles which demanded, the control authority have the right to obtain comprehensive knowledge of states nuclear activities and broad flexibility to apply measures as demanded by the environment.

There were two reasons for opposition to safeguards. With no immediate threat of military materials use perceived, states held that safeguards should focus on materials prepared for immediate use in weapons.[122] A case in point was Poland's rejection of safeguards on IAEA assistance to Finland and Norway because it saw no risk of nuclear materials being diverted.[123] In addition, robust opposition arose from India, the UAR and an increasing number of states engaged in nuclear energy development. Safeguard opponents made several proposals, which, although rejected, indicated a strong anti-control sentiment. Among their proposals were calls for:

- abolishing Agency review of measuring instruments and operating characteristics[124];
- dropping safeguards on nuclear instrumentation using special fissionable material[125];
- decreasing the number of routine reports at low processing levels[126];
- raising the safeguards exemption on small reactors from three to six MW[127];

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[121] GOV/COM.14/OR.15, para. 40.

[122] Statement by Japan, GOV/COM.14/2/Add.1, para. A.2.(a)(iii); statement by South Africa, GOV/COM.14/2/Add.1, para. B.6; statement by Sweden GOV/COM.14/2/Add.4, para. 7.

[123] Statement by Poland, GOV/OR.356, para. 27.

[124] Statement by Switzerland, GOV/COM.14/2/Add.2, para. C.2 and GOV/COM.14/OR.25, para. 78.

[125] Statement by Finland and the UAR, GOV/COM.14/OR.18 para. 59.

[126] Proposal by Japan, GOV/COM.14/2/Add.1, para. A.2(b)(ii); statement by Japan, GOV/COM.18/OR.2, para. 2.

[127] Statement by South Africa, GOV/COM.14/OR.19, para. 46 and GOV/COM.14/2/Add.1, para. B.12.

- limiting source material safeguards to formal assurances of non-use for military purposes and to Agency registration[128];
- identifying inspection control points enabling inspectors to follow irradiated fuel processing flows[129]; and
- raising safeguards exemption limits on fissile material from 200 grams to five kilograms.[130]

These proposals reflect their primary goal to make measures less intrusive and protect commercial secrets and indicate the significant opposition safeguards advocates had to overcome.

Opponents did successfully establish principles that were incorporated into INFCIRC/66 which demanded the non-interference with promotional activities which had a lasting impact on the implementation of the system. While states seeking to devise a mechanism to protect their legitimate activities from abuses that can be created by bureaucracies or by states using inspectors to exploit Agency access for national economic or military gains, they inadvertently created a means for states to complicate and constrain the IAEA in doing its job. States legally enshrined the principle, that inspector activities and other measures not hamper economic or technical development,[131] guaranteeing henceforth that promotion could effectively compete against safeguards. On these grounds, states argued for example, that approvals of facility design could delay construction and changes could be expensive.[132] Similar arguments were made against inspection of facility construction

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[128] Statement by South Africa, GOV/COM.14/OR.8, para. 47.

[129] Statement by France, GOV/COM.14/OR.5, para. 26. By 1958, the United States was also showing signs internally of thinking that "the number and size of areas which require safeguarding should be minimized." (Kratzer, November 1958, *op. cit.*, p. 3.)

[130] Statement by India, GOV/COM.14/OR.7, para. 3; statement by Japan, GOV/COM.14/OR.7, para. 9.

[131] Statements by Brazil, GOV/COM.14/OR.8, para. 3 and GOV/COM.14/OR.2, para. 25; statement by India, GOV/COM.14/OR.2, para. 11; statement by Japan, GOV/COM.14/2/Add.1, para. A.1.(b) and GOV/COM.14/2/Add.1, para. A.2.(b)(iii)(dd); statement by Netherlands, GOV/COM.14/OR.25, para. 79. For the injunction see INFCIRC/66, para. 9.

[132] Statement by Switzerland, GOV/COM.14/2/Add.2, para. C.1.

as it increased expenditures, caused unnecessary complications and deterred states from accepting safeguards.[133]

Protecting secrets and economic development suffused efforts to prevent safeguarding of facilities, non-nuclear materials and equipment. Foreshadowing materials flow safeguards under INFCIRC/153, India emphasised that safeguards should not apply to the facilities, but to the nuclear material they contained or produced.[134] Developing and industrial states argued that coverage of non-nuclear materials and equipment was unnecessary, and since the equipment would eventually be available, such coverage discriminated against less developed states.[135] Since the BOG could not agree on a basic equipment list for safeguards, specific items were left to the Agency's discretion where Agency projects were concerned. Generally, safeguards were no longer "attached" to equipment that was not used with nuclear material. Safeguarding equipment in bilateral arrangements was left to the parties involved.

Seeking to keep costs down sparked another negotiating trend – "the give and take" phenomenon. To submit to additional safeguards, states demanded reductions in other measures. For example, Japan and Switzerland noted that safeguards application to reprocessing facilities should result in less stringent reactor safeguards.[136] States assumed a direct relationship between new measures and those they wanted to see removed, indicating that for them the safeguards burden ceiling was set from that point on.

States also sought to limit transparency. In seeking to protect industry, the negotiators adopted another guiding principle that the Agency must take every precaution to protect commercial and industrial secrets crushing any potential to

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[133] Statement by India, GOV/COM.14/OR.3, paras. 44-45, 52; statement by Czechoslovakia, para. 47; statement by Romania, GOV/COM.14/OR.3, para. 45.

[134] Statement by the India, GOV/COM.14/OR.4, para. 27.

[135] Statement by Brazil, GOV/COM.14/OR.9, paras. 29-30; statement by Canada, GOV/COM.14/OR.9, para. 34; statement by Czechoslovakia, GOV/COM.14/OR.9, para. 31, statement by France GOV/COM.14/OR.9, para. 20; statement by Italy, GOV/COM.14/OR.9, para. 27 and GOV/COM.14/OR.10, para. 8; statement by India, GOV/COM.14/OR.16, para. 27 and GOV/COM.14/OR.10, para.13; statement by the Netherlands, GOV/COM.14/2, para. A.3.

[136] Statement by Japan, GOV/COM.14/2/Add.1, para. A.2.(a)(ii) and GOV/COM.14/OR.5, para. 15; statement by Switzerland, GOV/COM.14/OR.5, para. 29.

create a transparent organisation inspiring confidence during crises.[137] The argument was used frequently to justify placing limits on Agency activities such as restricting the provision of design information.[138]

Inspection also caused conflicts. Under INFCIRC/66, large magnitude (60 kilograms of throughput) reactors merited that the Agency should have "access at all times" implying no prior notification for an inspection. The UAR led a movement to require the Agency to give notice of inspection for administrative purposes.[139] India went farther, trying to legitimise no-notice inspections only "if so provided in the safeguards agreement", thus providing a mechanism for states to reject no-notice inspections in one-to-one negotiations.[140] Supporters of rigorous inspection acknowledged the administrative problem and adopted a Dutch proposal that administrative procedures for implementing access without notice but "no notice" would be defined in negotiated agreements.[141] Although no-notice inspections were legitimised, states could assert their rights in negotiations to stretch notification of supposedly no-notice inspections.

Achieving continuous access via resident inspectors was one solution to alleviate concerns over no-notice inspections. However, the UAR and Japan sought to uncouple the requirement for "access at all times" from the concept of resident inspectors. They argued that "access at all times" meant that the Agency could carry out a certain number of routine inspections without prior notice.[142] Japan redefined "access at all times", noting that an annual package of two advance notice inspections plus one visit without notice satisfied the need for "access at all times" under normal circumstances without hampering the economic operation of the reactors in question.[143]

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[137] INFCIRC/66, para. 13.

[138] Statement by Romania, GOV/COM.14/OR.3, para. 21; also see statement by Japan, GOV/COM.14/2/Add.1, para. A.2(b)(i).

[139] Statement by UAR, GOV/COM.14/OR.30, para. 38.

[140] Statement by India, COM.14/OR.27, para. 17.

[141] For discussions see GOV/COM.14/OR.26-27, 30-31.

[142] Statement by the UAR, GOV/COM.14/OR.26, para. 14; statement by Japan, GOV/COM.14/OR.25, para. 84.

[143] Statement by Japan, GOV/COM.14/OR.4, para.5.

While it accepted that the Director General could authorised additional no-notice inspections in special circumstances, it advocated the package should become a norm. Japan would continue its crusade and question the legitimacy of resident inspectors during INFCIRC/66/Rev.2 negotiations.[144] In spite of these efforts, right of access at all times was granted for reactors and of safeguarded nuclear material when more than 60 effective kilograms of nuclear material was in the inventory, annual throughput or the maximum potential annual production of special fissionable material.[145]

Those states with military programmes also wanted to limit intrusiveness towards their activities. The United States made token submissions to assist in developing and demonstrating willingness to accept safeguards. Under its 1962 agreement with the Agency, IAEA inspectors did not enjoy any special protection provided in the Agreement on the Privileges and Immunities of the Agency (INFCIRC/9/Rev.1, Sections 18(b) and 23).[146] Limits were also placed on access rights contained in Article XII.A.6 of the Statute protecting "classified data".[147] The US 1964 Agreement[148] more closely resembles INFCIRC/66 Guidelines, but rather than accepting permanent safeguards over materials, the United States committed to keeping designated amounts of material under safeguards. The access for inspectors also remained restricted.[149] The United Kingdom was reluctant to submit to safeguards since it continued to employ facilities for both military and peaceful purposes, but it did conclude an agreement.[150] The Soviet Union did not offer to safeguard any reactors.

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[144] Statement by Japan, GOV/COM.18/OR.2, para. 37.

[145] INFCIRC/66/Rev.2, para. 57.

[146] GOV/780, paras. 11, 13-14; CPNA USAEC, Advisory Committee on US Policy in the IAEA, Summary Record of Second Session, Third Meeting, 3 January 1962.

[147] CPNA USAEC, Lee Marks to Philip Farley, *Proposed Agreement Between the International Atomic Energy Agency and the Government of the United States of America for the Application of Agency Safeguarded to Four United States Reactor Facilities*, 6 October 1961; CPNA USAEC, Lee Marks to Mr. Farley, Department of State, 6 October 1969.

[148] INFCIRC/57.

[149] GOV/992, paras. 11, 17.

[150] Forland, 1997, *op. cit.*, p. 208.

Some states also sought to increase the bargaining power vis-a-vis the Secretariat. INFCIRC/66 required the Director General and States to consult regarding application of the provisions of the negotiated agreement, in effect guaranteeing the right to exercise some quiet diplomacy in resisting safeguards.[151] The same strategy was applied to specific measures that were viewed as uncomfortably intrusive. For example, conducting initial inspections of facilities under construction could be carried out "if so provided in a safeguards agreement".[152]

Some states sought to restrict the influence of the Agency on their nuclear programmes. Problems arose with according the IAEA authority over design execution.[153] The right to "approve" facility designs to ensure that they did not further any military purpose and permit effective safeguarding, incorporated in the Statute had control connotations, offending national sovereignty.[154] Since Agency review could not establish the actual facility use, in contrast to the Statute criterion of ensuring no military purpose, a facility design judgement only pertained to effective safeguards application.[155] The Board effectively rejected the possibility that certain facility types were destabilising, just more difficult and expensive to safeguard. By endorsing their acceptance of all nuclear facility types, states rejected the principle of rivalry management as applied to nuclear programme structures.

States sent a clear signal that the Agency must conform to domestic operations by denying any right to halt construction or operation of any principle nuclear facility except by explicit Board decision.[156] They also pressured the IAEA to be efficient by proposing two-three week time limits for IAEA design approvals, leaving little opportunity for the Agency to react to design problems.[157] States sought to tailor

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[151] INFCIRC/66, para. 12.

[152] *Ibid.*, para. 51.

[153] Statement by India, GOV/COM.14/OR.3, para. 22.

[154] Statement by Romania, GOV/COM.14/OR.3, para. 17; statement by India, GOV/COM.14/OR.3, para. 22.

[155] For comments see statement by the Chairman, GOV/COM.14/OR.3, para. 24; statement by the United Kingdom, GOV/COM.14/OR.3, para. 18.

[156] INFCIRC/66, para. 11.

[157] Statement by Switzerland, GOV/COM.14/OR.24, para. 12; statement by Japan, GOV/COM.14/OR.3, para. 23; statement by Australia, GOV/COM.14/OR.24, para. 14. The agreed formulation was more liberal, stating that the IAEA shall complete the review probably after submission of information. (INFCIRC/66, Article 32.)

safeguards to specific nuclear energy economic requirements, regardless of consequences. The British sought to exempt material held for reprocessing. Their justification was that military plants could not be safeguarded without segregating peaceful and military use material, increasing reprocessing costs dramatically.[158] States with developed programmes lacking reprocessing capability, such as Sweden and Japan, were calling for reprocessing safeguards while reducing measures on reactors.[159]

One final critical development was the effort to mould the safeguards system into a series of mechanical and quantitative exercises. As early as March 1957, a majority of the USAEC Committee on Implementation of International Safeguards and Controls, which examined the US system saw the future of safeguards in purely technical terms.[160] They advised that research and development for safeguards procedures emphasise technical approaches.[161] By 1965, others exhibited similar interest in mechanistic approaches.[162] In one respect, the move aimed to enhance system equity by promoting verification outcomes that were not politically coloured. However, quantitative approaches were also considered more economical, more effective and less intrusive.[163]

The various efforts to block safeguards by the industrial, nuclear weapon and developing states point to that effectively, there is no difference between a state hiding a military programme and one hiding an economic one. Because the system was not highly valued, states easily placed other domestic interests ahead of promoting the effectiveness and general well-being of the system, as seen by informing the Agency to conform to domestic operations. Each state had an agenda which required that particular aspects of the current system undergo no expansion or even a retraction as seen with the redefining of "access at all times". The nuclear weapon and nuclear weapon potential states sought to protect military secrets and all

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[158] Statement by the United Kingdom, GOV/COM.14/13.

[159] Proposal by Japan, GOV/COM.14/2/Add.1; proposal by Sweden, GOV/COM.14/2/Add.4.

[160] AEC/997, p. 20.

[161] *Background Material for the Review of the International Atomic Policies, op. cit.*, p. 853.

[162] See, for example, Sweden's endorsement of accounting as the principal control tool. (Statement by Sweden, GOV/COM.14.2/Add.4, para. 15.)

[163] *Ibid.*, para. 15.

states had economic interests. Each group's efforts to block safeguards development for whatever reasons ultimately inflicted harm upon the system.

Implications of INFCIRC/66 Developments

When viewing INFCIRC/66 in the context of the principles and framework for control, some important gains were made over INFCIRC/26. The new system became more comprehensive and intrusive, making nuclear programmes more transparent. Nevertheless, it could provide little in the way of warning that a state was developing nuclear weapons. The Persistance of inequities reduced the positive aspects and efforts aimed at security universality. Thus, states had little interest in paying for an expensive system that was viewed as unfair, unpopular and of limited utility.

The negotiations indicated that serious challenges to the system were ahead. While there was a greater acceptance of the safeguards system, a mindset emerged regarding its limited role in international relations. States did not see the IAEA playing a threat management role. Nuclear threats could not always be assuaged by a system like the IAEA's which was based on accounting. Threat management, rather, required a greater sacrifice of sovereignty than states were willing to make. While states gave way on transparency and intrusiveness, mechanisms were being put into place to ensure that further gains would be much more difficult.

V. INFCIRC/66/Rev.1 and 2

After INFCIRC/66 was completed, negotiations began extension of safeguards to reprocessing and fabrication plants. States focussed on safeguard mechanisation, industrial protection, comprehensive coverage limitations, and IAEA safeguards budget growth prevention.

While states recognised that coverage of critical areas of the fuel cycle was important and necessary, extending coverage re-introduced fears that safeguards would threaten industrial development.[164] Despite the support for extension, concern was expressed about the need for a more comprehensive system. Pakistan and India

[164] Statement by South Africa, GOV/COM.18/OR.1, para. 14.

questioned the need to cover fuel fabrication.[165] Japan continued with the above-mentioned "give and take" policy, calling for a reduction in measures applied to power reactors.[166] South Africa saw the extension as a move towards intensive safeguards throughout the fuel cycle and considered it impractical due to limited manpower and budget. In reconciling safeguarding LEU with keeping safeguards at the lowest level possible, South Africa sought to exempt source material conversion and fabrication plants since these provided only indirect diversion opportunities.[167]

Interest in mechanisation continued to increase. Discussions at the June 1967 working group on fuel conversion and fabrication safeguards foreshadowed events. FRG proposed that to simplify procedures, protect commercial information, reduce operator and IAEA costs, and promote non-interference with commercial activities, safeguards should be designed to mechanically track fissionable material flow at strategic points.[168] The logic was materials as the control focus since materials were required for weapons.

The FRG received support from Japan, South Africa, Turkey, the United Kingdom and the United States.[169] Several states, including the United Kingdom and the United States, indicated that they were already researching the possibility.[170] No

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[165] Statement by Pakistan, GOV/OR.384, para. 47; statement by India, GOV/OR.384, para. 57.

[166] Statement by Japan, GOV/OR.384, para. 49.

[167] Proposal by South Africa, GOV/COM.18/11, paras. 3-4; statement by South Africa, GOV/COM.18/OR.1, para. 15.

[168] Statement by the FRG, GOV/COM.18/OR.1, para. 27; GOV/COM.18/2/Add.1 para. 6; "Arbeitspapier der deutschen Delegation über die Sicherungsmassnahmen (Kontrollen) beim Nichtweiterverbreitungsvertrag der Genfer Konferenz der Nichkernwaffenstaaten unterbreitet" 16 September1968, Doc. No. 243, in *Dokumentation zur Abrüstung und Sicherheit*, Band VI, 1968, Siegler & Co. K.G., Bonn, 1969, pp. 370-372. "Deutscher Delegierter erläutert das von der deutschen Delegation der Genfer Konferenz der Nichtkernwaffenstaaten unterbreitete Arbeitspapier über Sicherungsmassnahmen (Kontrollen)" 18 September 1968, Doc. No. 245, in *Dokumentation zur Abrüstung und Sicherheit, op. cit.*, pp. 373-375.

[169] Statement by South Africa; GOV/COM.18/OR.3, para. 23; statement by Turkey, GOV/COM.18/OR.3, para. 7; statement by the United States, GOV/COM.18/OR.3, para. 11; statement by the United States, GOV/COM.18/OR.3, para. 17; statement by Japan, para. 21.

[170] Statement by the United Kingdom GOV/COM.18/OR.3, para. 22; statement by the United States, GOV/COM.18/OR.3, para. 26; GOV/1245, paras. 3-4.

immediate action was taken because there was a sense that the logistics of such as system were not yet understood. There were certain drawbacks in the approach, which were seen as problematic and needing to be addressed. The United States and Canada emphasised the implicit restriction in the authority and access granted to inspectors in safeguards application.[171] Where plants were complex, safeguards would be more difficult.[172] The Chairman of the negotiating committee noted that the approach failed to recognise the importance of facility control, "control of nuclear material could not be effected in a vacuum [...] the facilities containing safeguarded material would have to be subject to a certain amount of control."[173] Such mechanistic approach was not comprehensive nor conducive to threat management.

The continuing evolution of the safeguards system reflected a learning process and gradual absorption of practices earlier rejected. States' recognised that the control system needed to be more comprehensive, but research and development by states on tracking material flows reflected their dilemma with control. A more effective system required an increase in scope which in turn necessitated increased transparency, increased costs and subjugation of sovereignty. With the extension of the system, states started to approach the point that comprehensiveness conflicted with economic burden feasibility. This was evident in states' "give and take" policy as well as concerns of inconvenience seen in South Africa's rejection of source material safeguards. The desire to mechanise safeguards emerged again, in the form of material flow tracking. While making safeguards more acceptable, the drawbacks of putting such constraints on the Agency were quickly identified.

VI. The Revised Safeguards System and the Need for a Baruchian Approach

The control plan as finalised under INFCIRC/66/Rev.2 bore little resemblance to the Baruch Plan, but the wisdom in those original ideas echoed in sporadic negotiator observations betraying a general dissatisfaction with the system. The problems associated with the limited system, which were predicted by the analysts in the 1940s and linked to the principles become evident as implementation occurred.

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[171] Statement by the United States, GOV/COM.18/OR.3, para. 12; statement by Canada, GOV/COM.18/OR.3, para. 24.

[172] Statement by Canada, GOV/COM.18/OR.3, para. 24.

[173] Statement by the Chairman, GOV/COM.14/OR.15, para. 42.

As a result, states were forced to compensate for where the system failed to meet their needs.

Limitations on control made the exercise seem confusing and senseless, whereas an ideal system would be based on a more holistic, comprehensive approach. Australia advocated comprehensiveness stating that "to be effective, safeguards should take account of the totality of nuclear material and facilities in a State concerned".[174] While the majority viewed the safeguard objective as providing adequate "assurance" against diversion[175], some states endorsed the broader objective of *preventing* diversion and proliferation.[176] Argentina went a step further arguing that a real safeguards system was more centralised and needed to go beyond providing a guarantee that nuclear materials were not used for military purposes. Proper systems of safeguards included controls over health and safety measures, implying an organ with broader regulatory powers.[177]

The belief that universality was a *quid pro quo* for an effective plan was not disputed. As the Japanese Governor noted:

> the ultimate purpose of the safeguards document was to establish a system that would in due course be universally applied.[178]

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[174] Statement by Australia, GOV/OR.150, para. 52; also see INFCIRC/26, para. 24.

[175] Statement by the United States, GOV/OR.324, para. 3; statement by South Africa, COM.14/OR.2, para. 38; Butler, 1968, *op. cit.*, p. 135. According to INFCIRC/66, the objective of the safeguards system was to ensure that materials, facilities and equipment were not used to further any military purpose. (INFCIRC/66/Rev.2, para. 1.)

[176] Statement by the Netherlands, GOV/OR.356, para. 60, statement by the Soviet Union, GOV/COM.14/OR.5, para. 27; statement by Romania, GOV/COM.14/OR.7, para. 8. Language on prevention which had slipped into the second working draft for INFCIRC/66 was criticised by South Africa on the grounds that the new definition of safeguards was not in the Statute, and was subsequently removed (Statement by the Director General, GOV/COM.14/19, para. 17; statement by South Africa, GOV/COM.14/OR.29, para. 6.)

[177] Statement by Argentina, GOV/OR.356, para. 10.

[178] Statement by Japan, GOV/COM.14/OR.2, para. 29; also see statement by the UAR, GOV/OR.356 para. 32.

The problem of universality was linked to the requirement for disarmament. As the Soviet Union noted, because the safeguards system did not include disarmament, it could not be universally applied.[179]

Without disarmament provisions, the Soviet Union was uninterested in submitting its peaceful nuclear activities to control.[180] France did not submit any facilities to safeguards during this period.[181] The United States and United Kingdom concluded token INFCIRC/66 style safeguards agreements.[182] In spite of their efforts to equalise the burden, the possession of nuclear weapons by states remained problematic. However, the failure of the three powers to disarm disinclined other states to participate in the system. In the absence of disarmament, the dynamics were created that nullified whatever contribution the system could make to global security.

Nuclear weapons possession undermined transparency, an important element of control. By retaining nuclear weapons, the United States could neither be fully transparent nor freely exchange information as it might aid proliferation.[183] Beyond the simple negative, the absence of disarmament blocked the incorporation of positive benefits.

The positive role of Agency knowledge and state transparency in safeguarding was endorsed on numerous occasions. During the negotiations, suggestions to increase IAEA's knowledge base included:

- requiring information on all domestic nuclear materials accumulation when considering safeguards application in connection with assistance[184];

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[179] Statement by the Soviet Union, GOV/COM.14/OR.5, para. 27.

[180] Statement by the Soviet Union, GOV/OR.345, para. 7.

[181] It only became subject to safeguards when it concluded an agreement with EURATOM and the IAEA. See INFCIRC/290.

[182] These agreements were designed to assist the Agency in designing safeguards. For the United States see INFCIRC/57. For the United Kingdom see INFCIRC/86.

[183] CPNA USAEC, *EURATOM*, 1 December 1955, p. 4.

[184] Statement by the Chairman, GOV/COM.14/OR.6, para. 35.

- registering sources and principal nuclear material transfers between countries[185]; and
- providing advance notification of new facility construction.[186]

States also validated the importance of threat management through controlling programme structures and activities. Returning to the rivalry management concept of stockpile control, the Chairman of the negotiations believed that the system objective "should be to prevent a country from storing inside its borders more plutonium than it needed for its immediate peaceful programme".[187] Meanwhile, Canada and Pakistan foresaw a role for the Agency to "approve" or "supervise" international transfers of nuclear materials on that basis as opposed to functioning as a registry. They argued, "[i]t would be extremely dangerous if such materials came to be marketed like normal commercial products."[188] While INFCIRC/66 did not provide the IAEA with the right to approve transfers on a stockpile management basis, they did receive the right of approval that on the basis that standard IAEA or equivalent safeguards are applied.[189]

Safeguards experts were not unaware that mechanisation of safeguards undermined threat management. The minority view of the USAEC Committee on the Implementation of International Safeguards and Controls supported a threat management approach by placing a greater reliance on non-inspection information, including political indicators reflecting national motivation, political orientation, and previous safeguard record. The intensity of control would vary according to the faith placed in assurances and demonstrated performance.[190]

The implications of discounting non-quantitative elements were clear. The United States implied the importance of non-quantitative approaches in advocating that project design review could promote security better if the IAEA could inquire into

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[185] Statement by Canada, GOV/COM.14/OR.6, para. 19.

[186] Statement by the Chairman, GOV/COM.14/OR.25, para. 5.

[187] Statement by the United Kingdom, GOV/COM.14/OR.4, para. 55.

[188] Statement by Canada, GOV/COM.14/2/Add.2, para. B.2.(f); statement by Pakistan, GOV/OR.324, para. 36.

[189] For details see INFCIRC/66, para. 28.

[190] AEC/997, pp. 3-4.

the "real" purpose of a facility's construction before considering sponsorship.[191] Similarly, the Soviet Union found mechanised inspections problematic:

> That purely mechanical approach to the problem was scarcely justifiable, since the matter of inspection frequency was not only scientific and technical in character but also political.[192]

Thus, a programme needed to be logical and internally consistent.

Control needed to not only produce quantitative data, it needed to meet threats. As the nuclear industry grew, a latent nuclear threat emerged. Governments besides the United States and its immediate allies began to value nuclear control. The Soviet Union, bordering a nuclear China and potentially facing a new adversary with nuclear capabilities, the FRG, echoed the 1940s appreciation that the distinction between peaceful and military nuclear aspects was "artificial". It argued that disarmament required a "different"control system. It proposed as a symbolic measure to report both peaceful and military nuclear material under INFCIRC/66, reflecting a need to return to dealing with both aspects of nuclear energy together.[193]

As anticipated in 1946, an expanding global nuclear industry presented negotiators with numerous problems in 1965. They needed to compromise between precision and feasibility.[194] Expanding commercial development undermined the technical feasibility of the control structure. Although uranium producers and the United Kingdom unsuccessfully advocated higher exemption levels on natural uranium, thorium and depleted uranium[195], special fissionable material exemption limits were raised from 200 grams to one kilogram in order to meet increased research demands. Two hundred grams was considered the minimum quantity of fissionable material required to sustain a chain reaction and was considered to provide sufficient early

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[191] Statement by the United States, GOV/COM.14/OR.3, para. 28.

[192] Statement by the Soviet Union, GOV/OR.324, para. 62; also see GOV/COM.14/OR.4, para. 12.

[193] Statements by the Soviet Union, GOV/COM.14/OR.6, paras. 5, 12; GOV/COM.14/OR.5, para. 27 and GOV/OR.356, para. 42;

[194] Statement by India, GOV/COM.14/OR.2, para. 44.

[195] Forland, 1997, *op. cit.*, pp. 198-199.

warning by safeguards advocates.[196] This change meant that the IAEA's error margin and the system warning level was reduced.[197]

Lower limits required greater intrusiveness, greater operational interference and greater system resources. With no interest in such measures, states forced the decision to increase limits. The issue of safeguards financing started percolating in the background. The issue rose concurrently with the safeguards review when the United States pressed for the transfer of its bilateral agreements to the Agency.[198] States expressed fears of an unwieldy high-cost system that would be a burden on nuclear industry if caps on safeguards were not established.[199]

Compensating for a Weak System

While the control system was being formalised, efforts to compensate for its weaknesses were already underway. The Western Suppliers Group discussed control measures to support the IAEA system between 1961-1965.[200] Proposals to register nuclear-related transfers were made, thereby coordinating sales with a view to limit the total assistance given to any specific state.[201] Variations were discussed, extending registration to source nuclear materials, bilateral transfers, nuclear equipment and non-nuclear materials.

Consensus on a policy was difficult to achieve due to desires to protect industry and military programmes. The United Kingdom found itself in an awkward position on registration because military purchases would be covered. Belgium and France feared that a materials registry would have negative industrial repercussions from difficulties in maintaining confidentiality. A group including France and South Africa decided to

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[196] INFCIRC/66, para. 21.

[197] Statement by the United States, GOV/COM.14/OR.9, para. 4.

[198] For complaints on funding of Agency safeguards of bilateral operations see the statement by the Soviet Union, GOV/OR.349, para. 18; statement by India, GOV/OR.357, para. 55.

[199] Statement by the Soviet Union, GOV/COM.14/OR.25, para. 9; statement by Sweden, GOV/COM.14/2/Add.4, para. 5.

[200] Forland, 1997, pp. 212-224.

[201] *Ibid.*, p. 212.

therefore require universal supplier participation before they would engage in registration.[202]

Registering bilateral nuclear transfers encountered difficulties when South Africa proposed to standardise implementation with measures including the formal notification of transfers. Numerous disagreements arose regarding what equipment and non-nuclear material should be registered. A question also arose regarding who would preside over the register. Australia and Japan rejected any registry agent outside the Agency, but the United Kingdom preferred an alternative as the IAEA had been unable to attract support and failed to inspire performance confidence because of its weak structure.[203]

The result of the efforts was that in June 1965, the United States, a strong registry supporter, convinced some bilateral partners to register transfers of natural uranium and plutonium with the IAEA semi-annually.[204] The group, as a whole, accepted a Canadian proposal for individual notification of the suppliers if and when a general agreement was adopted.[205]

The initiative is noteworthy because, states, in attempting to create a supplementary control mechanisms encountered issues associated with the principles of control. Their objective was to increase the assurances of the international control regime through programme structure management, by limiting how built up a nuclear programme can develop via trade. The move also aimed to increase transparency in order to expand the IAEA's understanding of states' activities.

Their efforts were undermined by industrial pressures. Economic interests undermined consensus against the scope of the registry. Competition made universal participation critical so participating exporters would not be disadvantaged. Otherwise, the system's limited positive advantage of enhancing security would by counterbalanced by the more valued economic losses.

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[202] South Africa practised voluntary notification of its transfers, but its endeavours were not reciprocated. (*Ibid.*, p. 216.)

[203] *Ibid.*, p. 217.

[204] *Ibid.*, pp. 213-215.

[205] *Ibid.*, p. 217.

VII. Negotiations of Control over the Military Atom

While foundations for peaceful nuclear energy control were laid, the potential for nuclear weapons proliferation was still a threat. Broad controls over nuclear activities briefly re-surfaced during discussions of a nuclear materials cutoff agreement which would serve as a prelude to total disarmament. These proposals were not packaged to provide the assurances necessary to make the transition from reliance on nuclear weapons to reliance on nuclear control.

From the mid-1950s until 1970, the cutoff of fissile materials production was considered a possibility to manage security threats arising from uncontrolled nuclear material stockpile growth. US President Dwight D. Eisenhower proposed a stricter control framework than that considered for the IAEA under which fissionable material production anywhere in the world would not increase explosive weapon stockpiles.[206] The US cutoff proposal (June 1957) aimed at universal materials coverage and, by default, eventual disarmament. Soviet and US nuclear force asymmetries left the Soviets at a perceived disadvantage, making the cutoff unacceptable unless accompanied by guaranteed disarmament.

For the United States, disarmament required that states move from a nuclear deterrence-based security system to a nuclear-control-based security system. While considering the cutoff agreement, the United States realised that to reduce reliance on nuclear weapons production, it needed stronger guarantees than those provided by the IAEA control system. Breakout again became a dominant issue. US security risks would increase over time as more fissionable material became available and weapons stockpiles were reduced.[207]

To permit a nuclear-control-based security system, the system needed to be broader and more reliable. In the cutoff/disarmament proposals of the period, the Agency could only verify a cutoff agreement if the Statute was "revised and

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[206] "Letter from President Eisenhower to the Soviet Premier (Bulganin), 1 March 1956", *Documents on Disarmament 1945-59*, Vol. 1, *op. cit.*, pp. 593-595.

[207] "United States Working Paper Submitted to the Eighteen Nation Disarmament Committee: Inspection of a Fissionable Material Cutoff, June 25, 1964" ENDC/134 in *Documents on Disarmament 1964*, USGPO, Washington, DC, United States Arms Control and Disarmament Agency (ACDA), Publication No. 27, October 1965, p. 236.

strengthened" politically and technically.[208] The necessary implementation measures included:

- ensuring against inspection veto by possible evaders;
- expanding the IAEA's inspection and safeguards staff to ensure adequate US representation;
- providing "adversarial basis" inspection with full plant access and the right to search for clandestine facilities;
- requiring operational accounting and reporting;
- allowing facility design review to assure effective inspection;
- requiring physical protection at facilities and during transport[209];
- declaring all peaceful nuclear materials production;
- placing all fissionable material from nuclear weapons available for peaceful purposes under the IAEA's control; and
- closing military facilities.[210]

In the early 1960s, the United States linked a cutoff to disarmament measures but refrained from committing itself to total nuclear disarmament. The *US Program for General and Complete Disarmament* of 25 September 1961 combined a cutoff of weapon material production, safeguarded transfers to peaceful uses, a nuclear delivery vehicle reduction and eventually total disarmament.[211] In January 1964, US

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[208] "Memorandum from the Joint Chiefs of Staff to Secretary of Defense McNamara, 23 March 1961", *Foreign Relations of the United States 1961-1965,* Vol. 7, USGPO, Washington, DC, Department of State Publication No. 10242, 1995, p. 26.

[209] For further commentary by the British Government on the important role of physical security as one of two basic methods to prevent diversion in the context of a cutoff see *Further Documents Relating to the Conference of the 18-Nation Committee on Disarmament*, Her Majesty's Stationary Office (HMSO), London, Cmnd. 1857, November 1962, p. 28.

[210] "United States Working Paper Submitted to the Eighteen Nation Disarmament Committee: Inspection of a Fissionable Material Cutoff, June 25, 1964", in *Documents on Disarmament 1964, op. cit.*, pp. 235-238; "Testimony by Dr. Spofford G. English before the Senate Subcommittee on Disarmament {Extracts}", March 12, 1958, *Documents on Disarmament 1945-1959*, Vol. 2, *op. cit.*, pp. 966-967; "Memorandum from the Joint Chiefs of Staff to Secretary of Defense McNamara, 23 March 1961", *Foreign Relations of the United States 1961-1965,* Vol. 7, *op. cit.*, p. 26.

[211] "United States Declaration Submitted to the General Assembly: A Program for General and Complete Disarmament in a Peaceful World, September 25, 1961", in *Documents on Disarmament 1961*, ACDA, Washington, DC, ACDA Publication No. 5, August 1962, pp. 475-482.

President Lyndon Johnson proposed a package of non-proliferation measures, a cutoff treaty, a comprehensive test ban treaty, a strategic nuclear delivery vehicles construction freeze, safeguarding of most major powers' peaceful activities and safeguarding of all nuclear-related transfers.[212] The Soviets remained reticent about the transparency necessary for cutoff verification and criticised the freeze as control without disarmament.[213] With the Soviet Union highly sensitised to the US nuclear threat, transparency required higher assurances than the US cutoff proposals could provide.

VIII. The Non-Proliferation Treaty

The arms race threat, predicted by Acheson and Lilienthal, reached a crisis level during the 1960s. Moscow became seriously alarmed by the late 1963 FRG decision to order several US reactors[214], while, the United States became concerned that India, Israel, Sweden and Japan were considering nuclear weapons development.[215] On the other hand, non-nuclear weapon powers feared the spiralling vertical proliferation between the superpowers. Therefore, states embarked upon negotiating a mechanism to address nuclear threats, resulting in the conclusion of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

Reflecting a need for high nuclear assurances, the three western NWSs indicated in 1962 that the condition under which they would eliminate nuclear weapons was general and complete disarmament (including nuclear weapons) under "effective

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[212] "Message from President Johnson to the Eighteen Nation Disarmament Committee, January 21, 1964", *Documents on Disarmament 1964, op. cit.*, pp. 7-8; ACDA, *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons*, USGPO, Washington, DC, ACDA Publication No. 48, January 1969, p. ix.

[213] "The Fourth Annual Report of the United States Arms Control and Disarmament Agency [Extracts], January 21, 1965", in *Documents on Disarmament 1964, op. cit.*, pp. 539-540; J. Prawitz, "Safeguards and Related Arms Control Problems", in C. F. Barnaby, *Preventing the Spread of Nuclear Weapons*, Souvenir Press, London, Pugwash Monograph 1, 1969, p. 119.

[214] W. Haefele, "NPT Safeguards Nuclear Proliferation Problems," in *Nuclear Proliferation Problems*, SIPRI, Stockholm, 1974, pp. 146-147.

[215] GWU, *Value and Feasibility of a Nuclear Non-Proliferation Treaty*, Internal Paper Committee on Non Proliferation, Lyndon B. Johnson Library National Security File, 10 December 1964, GWU Doc. No. 1070.

international control".[216] Seeking equity, the non-nuclear weapon states indicated a willingness to renounce future development of nuclear weapons, if they obtained reciprocity, universal adherence, and equal acceptance of safeguards measures by the nuclear powers.[217] However, convincing states dependent on nuclear weapons for security to disarm and rely on control was far more intricate and challenging, than negotiating an agreement that non-nuclear weapon powers relinquish any right to acquire nuclear weapons and apply safeguards to their nuclear programme. In addition, the established model with its structural limitations set precedents that were difficult to overcome. The result of the negotiating effort was the foundation of a system that retained numerous structural flaws contained in the IAEA safeguards system.

Negotiations

The roots of the NPT go back to a series of UN draft resolutions submitted by Ireland between 1958-1961.[218] The resolutions reflected the direction that thinking on nuclear control was moving by setting a norm against the acquisition or possession of nuclear weapons. The 1958 Resolution called for an incremental approach to develop control by setting an immediate goal of preventing proliferation and a long-term goal of achieving disarmament.[219] The two-step approach took into account that the nuclear powers depended on their weapons as defences.[220] Finally, echoing scientists of the 1940s, UN Resolution 1665, adopted in 1961, noted that proliferation risked intensifying the arms race and increased the probability of nuclear war.[221]

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[216] Mohamed Shaker, *The Non-Proliferation Treaty*, Oceana, London, 1980, pp. 38-40.

[217] Shaker, *op. cit.*, pp. 38-40.

[218] For a summary of the period see Shaker, *op. cit.*, pp. 3-31.

[219] "Irish Draft Resolution Introduced in the First Committee of the General Assembly: Further Dissemination of Nuclear Weapons, October 17, 1958", *Documents on Disarmament 1945-1959*, Vol. 2, *op. cit.*, pp. 1185-1186.

[220] Statement by Ireland, A/C.1/SR.1120, General Assembly 15th Session (Part. 1), 1st Committee, 1 December 1960, para. 8.

[221] "General Assembly Resolution 1665 (XVI): Prevention of the Wider Dissemination of Nuclear Weapons, December 4, 1961", in *Documents on Disarmament 1961, op. cit.*, p. 693.

The United States introduced its first NPT draft treaty on 17 August 1965, and a Soviet version followed in September. Joint US-Soviet texts were issued in August 1967 and January 1968 and the NPT was adopted by the UNGA on 12 June 1968. Central issues in the Treaty's negotiations all can be linked to where the nuclear control principles fell short. These issues included (1) defining the scope of controls over NWS military nuclear activities or lack thereof, (2) determining security assurances necessary to NNWSs since the military controls fell short due to the absence of immediate disarmament and (3) seeking to effect universality through positive incentives to correct inequities between NWSs and NNWSs.

The inability of the nuclear powers to substitute reliance on nuclear control for reliance on nuclear weapons forced the bifurcating of negotiating states into two groups - states that detonated a nuclear explosive device before 1967 (Nuclear Weapon States - NWSs) and the remainder (Non-Nuclear Weapon States - NNWSs). By establishing two groups, negotiators needed to develop rules to apply two sets of controls, setting up a recipe for tension.

The Treaty constituted a compromise whereby the NWSs promised not to transfer nuclear weapons or assist NNWSs in their acquisition, while the NNWSs agreed not to seek, acquire or manufacture nuclear weapons. The NNWSs were guaranteed access to the benefits of PNEs, and all states were permitted the right to fully develop and use nuclear energy for peaceful purposes. All parties undertook to facilitate and participate in the fullest exchange of equipment and information for peaceful uses. The NWSs also agreed to pursue negotiations in good faith on effective measures relating to ending the nuclear arms race and eliminating nuclear weapons.

Negotiations were shaped by the continuity in policies towards nuclear energy visible in previous negotiations. Developing states and emerging industrial powers maintained their insistence that commercial considerations have the same prominence as military concerns. The United States and the Soviet Union resisted efforts by the NNWSs to place some constraints on their military nuclear operations. In 1966, the Soviet Union began supporting safeguards but only on the NNWSs. The United Kingdom and the United States initially took the similar views but they eventually compromised by inviting the IAEA to safeguard certain civilian activities. France and China abstained from the Treaty.[222] Their positions exacerbated problems of discrimination, non-transparency and insecurity. The resulting framework contained

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[222] George Bunn, *Arms Control by Committee*, Stanford University Press, Stanford, 1992, pp. 86-91; Shaker, pp. 666, 795-796, 806-807.

two unfortunate elements for control - the nuclear powers retained weapons programme flexibility and developing states protected civil programmes by placing safeguards development in a straightjacket.

Controls over the Military Atom

Since non-proliferation and not disarmament was the primary NPT objective, the scope of NNWS controls was comprehensive, while the scope of NWS control was not. A two-tiered control system was necessarily complex. NWS temporarily permitted retention of nuclear weapons made negotiations difficult and reduced any assurance provided by the system. This is illustrated in the Soviet Union's heightened concern that a key adversary, the FRG, could gain access to or acquire nuclear weapons under the US-proposed Multilateral Force (MLF) or NATO.

The United States, unlike the Soviet Union, did not fear proliferation in Western Europe. The August 1965 American draft allowed the US supply of weapons to an organisation of states, which it foresaw as a possibility in Europe.[223] The Soviets, which never shared control with the Warsaw Pact, found controls denying nuclear weapons access to most adversaries more beneficial to its security. The September 1965 Soviet draft banned all NNWSs from any form of possession, control, emplacement or use of nuclear weapons even if they were under the command of a NWS.[224] The Soviet draft also included "knowledge controls" and sought to prevent parties from obtaining information which could be employed for the manufacture or use of nuclear weapons.[225] This proposal would have affected existing NATO arrangements, and could technically have prohibited information transfer for the construction of nuclear reactors to produce electricity.[226] This extreme approach testifies to problems posed by nuclear energy when difficult political relations exist.

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[223] A NWS could not transfer nuclear weapons to the national control of a NNWS. (The American Draft Treaty of 17 August 1965, Article 1, reprinted in Shaker, *op. cit.*, pp. 937-939.) For a discussion see, E. L. Burns, "The Nonproliferation Treaty: Its Negotiation and Prospects", *International Organization*, Vol. 23, No. 4, Autumn 1969, p. 793.

[224] *The Soviet Draft Treaty of 24 September 1965*, reprinted in Shaker, *op. cit.*, pp. 940-943, Article II. Also see, Georges Fischer, *op. cit.*, p. 63.

[225] *The Soviet Draft Treaty of 24 September 1965*, Article II, *op. cit.*

[226] Burns,*op. cit.*, p. 794.

US draft amendments of March 1966 did little to assuage Soviet fears. "Control" was defined as the "right or ability to fire nuclear weapons without the concurrent decision of an existing nuclear-weapon-State". The Soviet Union felt this definition permitted NNWSs to "physically and legally" possess nuclear weapons.[227] Ultimately, Washington abandoned MLF while the Soviet Union accepted US deployment of nuclear weapons on Allied territory and existing NATO nuclear weapons consultation arrangements.[228] Limited nuclear weapons access under a group arrangement was unacceptable because adversaries did not believe that adequate warning of diversion or seizure was possible.

The early superpower drafts were quite permissive regarding NWS constraints. The NNWSs rallied to ensure NWS weapons programme controls. Being vulnerable to a nuclear attack without any deterrent and aware that nuclear war implied world destruction, the NNWSs felt that disarmament must proceed. India's Ambassador, while reaffirming support for non-proliferation, noted "there was less danger from proliferation than from the buildup of nuclear strength by the existing nuclear-weapon powers."[229] The NNWSs echoed the 1940s view that any nuclear weapon strikes at control system integrity. Ambassador Correa de Lago of Brazil noted:

> As long as states felt threatened and unless and until the nuclear Powers take positive steps to ally their fears, it will be impossible to prevent the spread of nuclear weapons, and vain to think that any agreement could in the long run stop it.[230]

The NNWSs, perceiving themselves second-level powers and permanently nuclear weapon vulnerable, endeavoured to rectify the imbalance. Initiatives by the NNWSs to clamp down on the NWSs included proposals to:

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[227] *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons, op. cit.*, p. xii.

[228] Goldschmidt, 1982, *op. cit.*, p. 193; Shaker, *op. cit.*, p. 240 and for a full discussion of the period, pp. 129-190.

[229] *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons, op. cit.*, p. 58.

[230] *Ibid.*, p. 21.

- prohibit nuclear weapon and nuclear weapon technology transfers among NWSs[231];
- institute controls over NWS deployments on NNWS territories[232];
- prohibit further nuclear weapons manufacture[233];
- ban nuclear tests[234];
- reduce existing stocks[235]; and
- require definitive commitments to move towards and create binding nuclear disarmament agreements.[236]

The 11 March 1968 draft preamble specifically called for CTBT negotiations.[237] The NWSs were unwilling to agree to substantive disarmament provisions, however.[238] The reference was removed leaving a more general formulation in Article VI committing the NWSs to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament [...]" and a reference in the NPT's Preamble recalling the 1963 Partial Test Ban Treaty' call for the conclusion of a CTBT. The NWSs did not reject vertical proliferation issues but argued that disarmament agreements required time and effort which should not delay the NPT.[239] Their intentions expressed in Article VI were unconvincing, leading India

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[231] "Statement by the Indian Representative (Chakravarty) to the Disarmament Commission [Extracts], May 4, 1965, *Documents on Disarmament 1965*, USGPO, Washington, DC, ACDA Publication No. 34, December 1966, p. 148. Deployment was seen as proliferation by some states. (Shaker, *op. cit.*, p. 231.)

[232] Proposal by Romania, ENDC/223, para. 1 (c), 6.

[233] "Statement by the Indian Representative (Chakravarty) to the Disarmament Commission [Extracts], May 4, 1965", in *Documents on Disarmament 1965*, *op. cit.*, p. 148; Piet de Klerk "Notes on History and Meaning of the NPT", in *Beyond the Bomb*, Huub Jaspers (ed.), Transnational Institute, Amsterdam, 1996, p. 35.

[234] ENDC/178, p. 3.

[235] "Statement by the Indian Representative (Chakravarty) to the Disarmament Commission [Extracts], May 4, 1965", *Documents on Disarmament 1965*, *op. cit.*, p. 148.

[236] Statement by Burma, ENDC/PV.337, para. 17; De Klerk, *op. cit.*, p. 35.

[237] The Joint American-Soviet Draft Treaty of 11 March 1968 is reprinted in ENDC/225.

[238] Burns, *op. cit.*, p. 802.

[239] Shaker, *op. cit.*, p. 254.

to echo UNAEC negotiation statements that good intentions are no substitute for *bonafide* control:

> While the addition of article VI is a most welcome development, the mere declaration of good intent does not provide any credible commitment on the part of the nuclear-weapon Powers.[240]

With only a promise of eventual nuclear disarmament, the security concerns of the NNWSs were unmet. The Nigerian representative noted "it would be unfair to ask any responsible government to adhere to a non-proliferation treaty without guarantees" and he urged a treaty containing an "international deterrent system against nuclear blackmail".[241] Vulnerability drove the NNWSs to pressure the NWSs to provide binding security assurances.[242] To their dismay, they managed only to secure limited unilateral declarations by the United States, the Soviet Union and the United Kingdom.[243]

The negotiations on the military aspects of nuclear energy demonstrates the problems nuclear weapons created for control and explains why experts rejected continued nuclear weapons possession as feasible in the 1940s. Possession of nuclear weapons by a state will undoubtedly create security concerns for other parties. This was the case with the Soviets vis-a-vis potential nuclear weapons capable allies of the United States and the NNWSs vis-a-vis the NWSs.

IX. Negotiating NPT Safeguards

The negotiation of safeguards in the context of the NPT was controversial.[244] Despite the recognised need for nuclear control, establishing a verification system was

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[240] Statement by India, ENDC/PV.370, para. 23.

[241] *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons, op. cit.*, p. 73.

[242] "Statement by the Indian Representative (Chakravarty), to the Disarmament Commission [Extracts], May 4, 1965", *Documents on Disarmament 1965, op. cit.*, p. 148.

[243] The security assurances were acknowledged by UNSC Resolution 225 (1968) reprinted in Emily Bailey, Darryl Howlett, John Simpson, *PPNN Briefing Book*, Sixth Edition, University of Southampton, Southampton, 1997, p. L9.

[244] For a summary of NPT negotiations see Bunn, pp. 83-105.

sensitive. To appease EURATOM states, the August 1965 US draft called for parties to "co-operate in facilitating the application of IAEA or equivalent international safeguards".[245] The September 1965 Soviet Union draft contained no safeguard requirements, while the August 1967 joint US-Soviet draft left the safeguards article blank. A safeguards arrangement was finalised in the joint draft of January 1968, after a debate over who would apply safeguards on whom and how.

On Whom Safeguards Are Applied

The sustainability of the treaty was linked to a high participation rate. In addressing the issue on whom safeguards were to be applied, the NNWSs focussed on rectifying the NPT's inequities by making numerous proposals to extend coverage. They felt economically and militarily disadvantaged relative to the NWSs and states not entering the regime.[246] To promote NPT safeguards, Canada, Eastern Europe, the Netherlands, Scandinavia, and the United Kingdom sought ways to make the burden of NPT safeguards less than that of INFCIRC/66.[247] Sweden supported extending safeguards step-by-step to EURATOM, which was seeking to be subject only to their internal controls. Other proposals to equalise the system were aimed at increasing the burden for the NWSs. These unsuccessful proposals sought to have safeguards be applied:

- to all materials in civil programs including the NWSs but offering the NWSs flexibility in the rate of submission;
- to military as well as civil programmes; and
- to all material transfers.[248]

The NWSs held fast against addressing the disadvantage perceived by the NNWSs and failed to grasp the role that having equal burdens played in sustaining a

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[245] McKnight, 1971, *op. cit.*, p. 67.

[246] Proposal by Switzerland, ENDC/204, para. 4.

[247] Fischer and Szasz, *op. cit.*, p. 79.

[248] On Canada see Burns, *op. cit.*, p. 792; on Sweden see J. Prawitz, "Safeguards: The Long-term Prospects", in C. F. Barnaby, *Preventing the Spread of Nuclear Weapons*, Souvenir Press, London, Pugwash Monograph 1, 1969, pp. 116, 159, 161-162; statement by Switzerland, ENDC/204; proposal by Sweden, ENDC/195 Sweden and statement by Sweden, ENDC/PV.327, paras. 23-25; *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons, op. cit.*, pp. 42, 103; statement by the UAR, ENDC/PV.333, para. 13.

control system. The NWSs resisted submission to control by appealing to the NNWSs' economic concerns, stressing that safeguards on their civilian activities were irrelevant while their weapons production was unaffected by any treaty.[249] In meeting the NNWSs' concerns regarding economic competition, the United States and United Kingdom pledged to safeguard their peaceful nuclear activities excluding those relating to national security[250], while the Soviet Union maintained that a pre-condition for cooperation was that it remain outside any control system.[251]

Beyond exempting their civil programmes, the Superpowers drafted the Treaty such that, until they negotiated disarmament, they faced few operational constraints on their nuclear military activities. Article I allowed the NWSs to continue cooperation among themselves provided that they did not transfer nuclear weapons or control thereof. The NWSs could also receive limited aid from NNWS' providing that the NNWS by engaging in providing aid did not become involved in the manufacture or acquisition of nuclear weapons.[252]

The debate on who would be subject to safeguards revolved more around the principle of equity than security. The system which gave special privileges to the NWSs from a security standpoint also further aggravated the NNWSs sense of discrimination because it required applying safeguards on the NWSs in a different manner from the NNWSs. Erection of two different standards would haunt efforts to build and strengthen the new system.

Who Applied Safeguards

Many states with the potential to develop nuclear weapons were in EURATOM, whose role in international control caused heated debate. In negotiating on who would apply safeguards, the issues of equality and system credibility again arose.

Keen to entice EURATOM members to join, the United States, in its August 1965 draft, permitted the application of "equivalent" safeguards. The United States, having assisted in EURATOM safeguards design and enjoying a good relationship with the group found their system an acceptable equivalent. The Eastern Bloc, not a

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[249] Shaker, *op. cit.*, p. 671.

[250] *Ibid.*, p. 657.

[251] De Klerk, *op. cit.*, p. 33.

[252] For an explanation see Shaker, *op. cit.*, p. 268.

EURATOM participant demanded a system that met their security needs. According to the Soviet Union, EURATOM safeguards amounted to self-inspection and could provide no assurance.[253] The transparency provided by the substituting of IAEA for EURATOM safeguards would place the Soviet Union in a stronger position to follow West German nuclear developments.[254]

Defending their sovereignty, EURATOM members held that the IAEA should not interfere with EURATOM operations and the Community should not be subject to NPT safeguards.[255] EURATOM members considered their own system politically more beneficial and technically stronger than the IAEA's and refused to accept double safeguarding. EURATOM's advantages were that:

- the nuclear industry in France, a nuclear weapons state, was subject to EURATOM safeguards but would be exempt under the NPT;
- members were protected from Eastern espionage;
- the system served a central function in European security, integration and cooperation;
- the system was already established; and
- EURATOM safeguards were considered technically more accurate.[256]

The dispute illustrates the importance of consistent application to control and its contribution to universality. Regional safeguards provide "limited credibility and undermine efforts for establishing universal controls".[257] International control was simply more credible and provided higher assurances because it contains "adversary mechanisms" derived from global participation.[256]

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[253] Shaker, *op. cit.*, p. 107.

[254] Howlett, *op. cit.*, p. 125.

[255] For Italy's call on non-interference see *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons, op. cit.*, p. 81.

[256] Shaker, *op. cit.*, p. 697.

[257] For a discussion see Lawrence Scheinman, "EURATOM and the IAEA", in Bennet Boskey and Mason Willrich, *Nuclear Proliferation: Prospects for Control*, The Dunellen Company, New York, 1970, p. 75.

[258] George H. Quester, "The Nuclear Nonproliferation Treaty and the International Atomic Energy Agency", *International Organization*, Vol. 24, No. 2, 1970 pp. 171-172.

Despite safeguards moving towards a more technical nature, the debate demonstrated the link between control and threat management. Scheinman noted that the technical effectiveness of a regional system was no substitute for the political effectiveness found in an international system which included enhancing confidence, credibility, impartiality and equality. The regional system fell short in that, what was suitable to one state *vis-a-vis* another was not to a third party.[259] To resolve the issue, groups of states were permitted to conclude agreements with the Agency. The IAEA would negotiate cooperation with EURATOM, ensuring that Agency verification standards would be met, and consistent safeguards application would be maintained. A seed was planted for future problems as the implementation of measures still differed from the norm even though the safeguard conclusions drawn were to be made on the same basis as those of other NNWSs.

How Safeguards Are Applied

The trend of accompanying the strengthening of safeguards with limitations on how they were to be applied was upheld under the NPT. States sought to individually negotiate aspects of their safeguards agreement with the Agency; limit safeguarding objectives; specify Agency operations; and link controls to development. This was epitomised in EURATOM's October 1967 statement requiring that the NPT meet four conditions for its participation:

- the Treaty should be subordinated to a satisfactory arrangement between EURATOM and the Agency;
- control should apply to nuclear materials not facilities;
- the arrangement should verify EURATOM control operations, not involve direct IAEA control; and
- assurances should be given on nuclear material supply until agreement was reached.[260]

The NNWSs, while not wishing EURATOM to have special privileges, held similar objectives regarding their individual nuclear programmes. Together, the two groups effectively debilitated the future safeguards system. As in past negotiations, their motivation was promoting system equity– if certain states were going to be free of control, then controls needed to be minimised.

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[259] Scheinman, in Boskey and Willrich, *op. cit.*, pp. 70, 76.

[260] Shaker, *op. cit.*, p. 699.

Narrowing Safeguards Objectives

While NPT political obligations were extended to promote nuclear control by committing the NNWSs to renounce their right to nuclear weapons and submit their entire nuclear programme to safeguards, the NPT safeguards objectives were narrowed. Safeguards were to be applied

> [...] for the exclusive purpose of verification of the fulfilment of its [the State's] obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons and other nuclear explosive devices.[261]

The weakness in the formulation often cited is that verification is restricted to preventing diversion.[262] In addition, observers have deemed that the term "preventing" is misleading. President of the Third NPT Review Conference Mohamed Shaker observed:

> The ultimate objective of the application of NPT safeguards is the timely or early detection of diversion of significant quantities of nuclear material. Safeguards are not devised to prevent by physical action the diversion of nuclear material, as the words "preventing diversion" in Article III.1 of the NPT may give the impression that they do. The Safeguards' objective is to deter diversion by the risk of early detection.[263]

The Treaty actually set obligations that would require a stronger control system than specified if full verification was to be executed. As safeguards expert Mason Willrich noted in 1968:

> A system for effective verification of these [NPT] fundamental obligations Articles I and II would require access not only to declared peaceful nuclear activities within states, but also to all areas and activities suspected of being related to a nuclear weapons program. Such verification would probably be so

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[261] NPT, Article III.1.

[262] The limitation was confirmed by the US delegation which explained that Article III applied to declared facilities and was not aimed at detecting clandestine activities. (Georges Fischer, *op. cit.*, p. 99.)

[263] Shaker, *op. cit.*, p. 714.

> *intrusive and extensive as to render the Non-Proliferation Treaty unacceptable* to some nuclear-weapon as well as many non-nuclear-weapon states.[264]

Verifying the absence of clandestine activities was not an established safeguards objective.[265] Former NPT negotiators George Bunn and Roland Timerbaev observed that Article III.1 did not authorise inspection of all Article II prohibitions including the NNWS obligation to renounce nuclear weapons.[266]

Because no guidance was given regarding the effort devoted to control obligations, states were able "to act on minimal interpretations". For example, by not obligating exporters to notify the IAEA of equipment transfers to NNWSs, exporting states perceive no obligations to control anything not specified in internationally-agreed export control lists.[267]

The NPT thus opened the door to precarious situations. The negotiating record indicates that building and testing a prototype nuclear explosive device was prohibited if the intention was to make nuclear weapons.[268] Without the intent, a state like Japan could declare that the NPT did not prohibit R&D to short of actual nuclear explosive device production.[269] Since pre-assembly activities covering device

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[264] Mason Willrich, "The Treaty on the Non-Proliferation of Nuclear Weapons: Nuclear Technology Confronts World Politics", *The Yale Law Journal*, Vol. 77, No. 8, July 1968, p. 1480.

[265] Georges Fischer, *op. cit.*, p. 79; Shaker, *op. cit.*, pp. 709-711.

[266] Bunn and Timerbaev, *op. cit.*, p. 10.

[267] Dr. 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*, Programme for Promoting Nuclear Non-proliferation (PPNN), Southampton, PPNN Study 4, October 1993, p. 2.

[268] George Bunn and Roland M. Timerbaev, "Nuclear Verification under the NPT: What Should It Cover - How Far May It Go?" *PPNN Study*, PPNN, Southampton, 5 April 1994.

[269] Working paper submitted to General Disarmament Conference by Japan: "Arms Control Implications of Peaceful Nuclear Explosions, CCD/454, 7 July 1975", in *Documents on Disarmament 1975*, USGPO, Washington, DC, ACDA Publication No. 93, pp. 229, 231.

components were inadequately inspected under international procedures, the warning provided was questionable.[270]

Stating How Safeguards Are Applied

In seeking to limit safeguards, several states reiterated old fears and complaints already debated in the BOG. Source material producers, anxious to avoid "safeguards creep", resisted US efforts to safeguard natural uranium ores and downstream products.[271] Japan continued to crusade for safeguards to be "simplified and mechanised as much as possible".[272] Other industrial NNWSs, seeking industrial protection, succeeded in inserting Article III.3 into the NPT, guaranteeing that safeguards were to "avoid hampering the economic or technological development of the Parties or international co-operation in the field of peaceful nuclear activities". The NPT also ensured that states retained negotiating flexibility. Article III stipulating that NNWSs accept safeguards *negotiated* with the IAEA.

The FRG played a central role in negotiating the safeguards standards. Its influence was high because its participation was critical for the success of the Treaty. In 1967, the FRG set itself negotiation targets of abolishing the control clause, instituting material flow-strategic points safeguards, and allowing minimal inspections.[273] The FRG placed its priority on EURATOM. On 28 November 1969, it stated its preconditions for NPT ratification:

- a safeguards agreement was to be concluded between the IAEA and EURATOM on the basis of the principle of verification;
- verification was not to affect EURATOM's tasks in the political, scientific, economic or technical fields;

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[270] For a discussion the inspection limits to seek weaponisation, see Bunn and Timerbaev, *op. cit.*, p. 10.

[271] *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons*, *op. cit.*, p. 121; statements by South Africa, A/C.1/PV.1571 and A/C.1/PV.1579. On Australia, see Richard Leaver, "The NUKEM Scandal and Australian Safeguards", *Working Paper*, No. 49, September 1988, p. 59.

[272] *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons*, *op. cit.*, p. 118.

[273] Küntzel, *op. cit.*, p. 43.

- safeguards were to be applied to source and special fissionable material in conformity with safeguards for the flow of material at strategic points; and
- the costs of safeguards were to be settled in a way that place no unfair burdens on NNWSs.[274]

The Soviets, who had originally rejected the strategic points approach, now reversed their position to put controls on the FRG after being convinced by the West Germans that their accession depended on the acceptance of strategic points safeguards.[275]

With the support of leading industrial states, the FRG was successful in setting the safeguards approach despite its effectiveness not yet being proven.[276] The NPT Preamble identified the safeguarding principle as measuring the flow of source and special fissionable materials by using instruments and other techniques at certain strategic points. Article III.1 limited safeguards to be applied to "all source or special fissionable material". The implication was that the IAEA had no access rights to facilities unless material was present.[277] Thus, while the Agency had broader access to nuclear programmes, Agency knowledge of programmes remained restricted and flexibility in implementation reduced. For the next 30 years, emphasis was on material tracking and the IAEA did not search for weaponisation, and were never encouraged to do so.[278]

New Framework - Old Problems

While states had good intentions to deal with nuclear threats and did make some inroads on strengthening control, many of the shortcomings that existed in INFCIRC/66 were also present in the revised safeguards system under the NPT. Revised safeguards fell short in meeting the principles of rivalry management, equality, universality, comprehensive knowledge and comprehensive control. As a

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[274] Werner Ungere, "The Verification Agreement Euratom/IAEA", *AussenPolitik*, Vol. 24, No. 2, 1973, pp. 191.

[275] Forland, 1997, *op. cit.*, p. 325; Küntzel, *op. cit.*, p. 233.

[276] The concept is fully described in the "Karlsruhe Doctrine" (KFK 800), May 1968. For a statement by Switzerland, see ENDC/204; for a summary of Japan's position see *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons*, *op. cit.*, p. 118.

[277] Burns, *op. cit.*, pp. 799-800.

[278] Bunn and Timerbaev, *op. cit.*, p. 12.

result, these shortcomings impacted negatively on the IAEA's ability to implement safeguards effectively.

By treating the NWSs and NNWSs differently in safeguards application, the NPT aggravated the discontents of the developing states, already sensitised to control inequity. As in the past, the NNWSs strove to protect and promote enhanced nuclear development at the expense of control. The NNWSs strove for the insertion of Article IV.1 to protect the right "to develop research, production and use of nuclear energy for peaceful purposes" and Article IV.2 to facilitate the fullest possible exchange of equipment, materials and information and to cooperate in contributing to the development of nuclear energy for peaceful purposes. These Articles became the cornerstone of NNWS efforts to promote their economic interests and stifle further controls. Two months after the Treaty opened for signature, Spain argued that NWS restrictions on exporting LEU processing technology were contrary to the spirit of Article IV.[279]

Developing states were extremely wary of arrangements appearing to promulgate atomic colonialism.[280] Like INFCIRC/66 type safeguards, NPT safeguards were set up to be applied on a contractual basis. Since agreements had to be negotiated with the IAEA, states once again left themselves negotiating room. The danger of flexibility was not discounted by all states. The UAR, endorsing the principle of equity, called for compulsory and uniform application of a single safeguards system noting that flexibility could provide excessive freedom leading away from uniform nuclear control.[281]

The NPT's objective to halt proliferation and lead to eventual disarmament aimed to prevent rivalry. However, design of the control framework fell short in this area. The NNWSs, holding the view that nuclear proliferation was neither imminent nor drastically dangerous[282], placed economic interests over nuclear security ones. States rejected rivalry management, which required a sacrifice of sovereignty such as controls over programme structure. Switzerland and Japan led efforts to ensure that

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[279] Shaker, *op. cit.*, p. 313.

[280] Butler, 1968, *op. cit.*, pp. 108-110.

[281] Statements by the UAR, ENDC/PV.294, para. 14, ENDC/PV.333, para. 13 and ENDC/PV.367, para. 16.

[282] Quester, *op. cit.*, p. 168.

the NPT did not prohibit any fuel cycle operations including the most sensitive activities.[283] Japan noted that regardless of an activity's potential threat:

> [...] no peaceful nuclear activities in non-nuclear-weapon States shall be prohibited or restricted, nor shall the transfer of information, nuclear materials, equipment or other material relating to the peaceful uses of nuclear energy be denied to non-nuclear-weapon States, merely on the grounds that such activities or transfers could be used also for the manufacture of nuclear weapons or other nuclear explosive devices.[284]

States argued against the obstruction of the free flow of information or supply under the pretext that it would aid weapons development.[285]

The NNWS concerns of economic discrimination played an important role in shaping Article V, which gave the NNWSs access to PNE services under safeguards to ensure there would be no diversion to weapons technology. The NNWSs had feared losing technology spin-off benefits derived from nuclear explosive development and testing. States such as Brazil, India and the FRG supported the rights of NNWS to develop PNEs, on the grounds that these were considered different in essential character from nuclear weapons. Other NNWS, such as Nigeria and Switzerland, felt that NNWS scientists should at least be fully cognizant of explosive technology.[286] Industrial states, including the FRG, Japan and Italy also renounced their rights to develop PNEs provided they had complete freedom of action in civil development.[287] Once again, inequities helped discourage controls on civilian activities.

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[283] On Switzerland see Georges Fischer, *op. cit.*, p. 5; Atshuhiko Yatabe "A Note on the Treaty on the Non-Proliferation of Nuclear Weapons: The Japanese Point of View", *Japanese Annals of International Law*, Vol. 14, 1970, p. 27.

[284] Statement by the Government of Japan, 3 February 1970 quoted in Yatabe, *op. cit.*, p. 27.

[285] *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons, op. cit.*, p. 121; statements by Malaysia and Nigeria, A/C.1/PV.1563; statement by India, A/C.1/PV1567; statements by Algeria and Belgium, A/C.1/PV.1571.

[286] *International Negotiations on the Treaty on the Nonproliferation of Nuclear Weapons, op. cit.*, pp. 64, 84-86, 103-104; Burns, *op. cit.*, p. 797; also see Shaker, *op. cit.*, pp. 293-297; statement by Brazil, ENDC/201, para. 4.

[287] Goldschmidt, 1982, *op. cit.*, p. 198.

Although the NPT set obligations for the NWSs to work towards disarmament in good faith, disarmament was not achieved. As for enforcement, the Treaty established a Review Conference after five years to review the operation of the Treaty and an option to conduct reviews every five years thereafter. It also delayed taking a decision on the Treaty's duration calling for a conference after 25 years to decide whether the Treaty shall continue indefinitely or be extended for an additional fixed period or periods.

The NPT made a strong contribution to control by extending safeguards to the entire civilian programmes of the NNWS. In doing so, states acknowledged that nuclear energy activities require control if global stability was to be sustained. The NPT did make a limited endorsement of the 1940s view that the peaceful and military aspects of nuclear energy could not be separated. Canada, Czechoslovakia, the Soviet Union, Sweden and the United States led efforts rejecting any idea that nuclear weapons and PNEs could be differentiated.[288] Their success represented a contribution to rivalry management, by avoiding the possibilities of virtual NWSs development via PNEs.

X. INFCIRC/153

With the NPT negotiated, the IAEA faced the task of establishing a safeguards system that would meet Treaty specifications. This document became known as INFCIRC/153. Unlike past negotiations, there was little interest in building the safeguards system into a stronger, more comprehensive control apparatus. Safeguards were instead negotiated to maximise acceptability by minimising asymmetrical political, economic and industrial implementation costs.[289] The BOG and the Secretariat focussed on states' rights, inspector restraints and secrecy, holding a belief that a strong Agency would implement an overly strict inspection regime.[290]

INFCIRC/153 negotiations were conducted from June 1970 through to March 1971 and the model agreement was approved by the BOG in April 1971. Although the document targeted different objectives from INFCIRC/66, it addressed the same non-

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[288] Burns, *op. cit.* p. 798; Shaker, *op. cit.*, pp. 203, 207-209; statement by Czechoslovakia, ENDC/PV.373, para. 59.

[289] Robert Pendly, Lawrence Scheinman and Richard W. Butler, "International Safeguarding as Institutionalized Collective Behavior", *International Organization*, Vol. 29, Summer 1975, pp. 615-616.

[290] Quester, *op. cit.*, p. 165; Fischer and Szasz, *op. cit.*, pp. 83-84.

diversion concept using identical elements - knowledge of the facilities where nuclear material was present, material accountancy, material reporting and independent verification.[291] During the negotiations a range of different interests were prevalent - NWSs were interested in strong safeguards that would not interfere with their nuclear trade; advanced NNWSs were interested in non-inhibition of domestic programs and protection from smaller competitors; EURATOM was interested in preserving their safeguards system; everyone was interested in minimising costs; and the Secretariat sought a coherent instrument with limitations consistent with its responsibilities.[292]

Determining Safeguards Objectives

In formulating specific INFCIRC/153 objectives, negotiators posited that NPT safeguards had a reduced function compared to the existing system because the NPT linked the purpose of safeguards to verification.[293] Instead of being the control system itself, safeguards verified a state's system of accounting and control. Control was a state responsibility, while verification became an Agency one.[294] For some states, national control made little contribution to safeguards assurances. Some states argued that inspection frequency be based on national system effectiveness[295], refuting ideas that the entire national fuel cycle needed consideration.[296]

During INFCIRC/153 negotiations, the relationship between safeguards and "prevention" was scrutinzed. In a Secretariat report, which provided a basis for INFCIRC/153 negotiations, the Director General linked safeguards to diversion prevention:

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[291] GOV/COM.22/3, para. 4.

[292] Paul C. Szasz, "International Atomic Energy Agency Safeguards", in Mason Willrich, *International Safeguards and Nuclear Industry*, American Society of International Law, La Grange Park, IL, 1973, p. 78.

[293] See for example statement by the United States, GOV/COM.22/2, paras. 13, 16-17.

[294] Statement by Australia, GOV/COM.22/OR.18, para. 1; statement by the United States, GOV/COM.22/OR.8, para. 2.

[295] Statement by Japan, GOV/COM.22/OR.30, para. 53; proposal by Japan GOV/COM.22/15.

[296] Statement by Hungary, GOV/COM.22/OR.50, para. 46 and GOV/COM.22/OR.30, para.43; statement by Canada, GOV/COM.22/OR.50, para. 47.

> The Agreement should provide for the Agency's right and obligation to apply safeguards in accordance with the terms of the Agreement to all nuclear material in all peaceful nuclear activities within the territory of the State, under its jurisdiction, or carried out under its control anywhere, with a view to prevent the diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices[297]

Australia argued, however, that the obligations of the IAEA should be limited to verification and not diversion prevention since "only a State could prevent such diversion".[298] This effectively devalued the role of the IAEA. Japan went so far as to have states ascertain that no diversion occurred which the IAEA would then verify.[299] The language eventually adopted was thus constricting. INFCIRC/153 cites Article III.1 of the NPT that safeguards are "for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices" and makes no reference to prevention.[300]

Once safeguarding was linked to verification, the whole system became viewed in a clinical manner. There was an emphasis on quantitative approaches such as equating diversion identification with MUF levels. The Agency would therefore be tasked with deducing from a material balance over a specified period that no more than an agreed nuclear material amount was missing.[301]

The establishment of technical objectives and conclusions[302] further evolved safeguards away from a security threat management mechanism and towards a technical verification system. The agreed text set the safeguards technical objective as:

> [...] the timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear

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[297] GOV/COM.22/3, part. 1, para. 2.

[298] Statement by Australia, GOV/COM.22/OR.7, para. 12.

[299] Statement by Japan, GOV/COM.22/15.

[300] INFCIRC/153, Article I.

[301] Proposal by the FRG and the United Kingdom, GOV/COM.22/72, para. 1.

[302] INFCIRC/153, para. 30.

weapons or of other nuclear explosive devices for purposes unknown, and deterrence of such diversion by the risk of detection.[303]

To support the technical objectives, the Standing Advisory Group on Safeguards Implementation (SAGSI) developed safeguards criteria for timely detection of significant quantities in 1975. These criteria made safeguards more quantitative than qualitative.[304] In 1976-1977, the process continued as safeguards underwent a technical criteria clarification. The technical approach provided states with a sense that the system was objective, but encouraged the overlooking of political elements associated with nuclear control.

By identifying NPT safeguards with verification, states could disassociate NPT safeguards from unpopular aspects of Agency safeguards under the Statute. Among those were:

- prohibitions on non-explosive military use;
- examination and approval of plant design;
- approval of chemical processing;
- unlimited inspection;
- Agency rights to withdraw excess material not in use;
- powers of the Board to deal with non-complying states; and
- powers of the Board to stop construction or operation of principal nuclear facilities.[305]

It was also argued that these individual measures served different purposes under the old system and needed to be adjusted. For example, a reduction in inspection frequency was justified because the purpose of inspection was to determine whether the international community could maintain confidence that a country was complying with its NPT obligations.[306]

These efforts were only partially successful. INFCIRC/153 did not prohibit non-explosive military use and did not accord the Agency with the right to withdraw excess material. However, the IAEA retained the right to examine and approve plant design

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[303] *Ibid.*, para. 28.

[304] Shaker, *op. cit.*, p. 759.

[305] Statement by Italy, GOV/COM.22/2/Add.1 paras. 17.16.a-g and 17.9; statement by Turkey, GOV/COM.22/2/Add.3, para. 27.6.

[305] Statement by Belgium, GOV/COM.22/OR.50, para. 31.

on a limited basis although no special rights were given to approve chemical processing. There was no specific ban on halting facility construction or operations, but rather an injunction to avoid interference in commercial activities.

It became clear from the start that negotiators had a limited vision for INFCIRC/153. While the NPT extended coverage across a considerable portion of the national fuel cycle, the role of safeguards was narrowed by being placed in the framework of verification. With such limits created at the start, INFCIRC/153 would represent an evolution rather than a revolution in the development of nuclear control.

XI. Strategies of Resistance

Protecting industry once again emerged as the prime motivation to minimise control. The central tactics employed to limit safeguards were those used before, including:

- a balance of obligations;
- measures to protect commercial interests;
- limitations on safeguards scope
- means to force the Agency to work around states' prerequisites;
- secrecy of operations; and
- retention of their ability to influence how their safeguards agreement was implemented.

The tactics were successful within limits. Certain boundaries across which states could not transgress were clearly being set as the safeguards system approached maturity. Nevertheless, numerous states consistently endeavoured to test the resilience of those boundaries.

Balance of Obligations

As the Baruch Plan anticipated in 1946, states with large nuclear industries endeavoured to protect themselves at the expense of control. Concerns were expressed over the "fast development" of safeguards, the cost increase of new tasks, the potential effect of cost increases on IAEA promotional activities and the increase

of safeguards costs due to industrial growth.[307] The IAEA landed in an awkward situation as a promotional organisation presiding over a non-proliferation treaty. The new IAEA burden, acknowledged as being a non-proliferation concern, meshed poorly with the organization's primary mandate.[308] Some states insisted that the new burden should not lead to a diminution, stagnation or imbalance in Agency promotional and technical assistance activities.[309]

Safeguards financing was discussed in the context of balancing IAEA promotional and verification obligations. Proposed formulas to finance NPT safeguards included (1) charging safeguards to the Agency, thus rectifying the discrimination between safeguarded and unsafeguarded programmes; (2) requiring the safeguarded state to pay for safeguarding as a nuclear energy associated cost; or (3) charging safeguard costs to the NWSs as the primary beneficiaries of the NPT.[310] Option 1 compensated for non-universal participation and a highly competitive nuclear energy market. Option 2 attempted to factor the cost of maintaining security when states engaged in unlimited nuclear energy production. Option 3 compensated for the inequitable system. Ultimately, safeguards were financed from the regular IAEA budget and to its detriment, the safeguards budget was linked to the size of the promotional budget which was in a large measure voluntarily funded.

Protection of Commercial Interests

States insisted on a strong legal mandate in INFCIRC/153 requiring the IAEA not to hamper their peaceful activities, despite its absence in the NPT. The original formulation protecting commercial interests proposed by the Director General was:

> The Agreement should provide that the Agency is required to implement safeguards in a manner designed to avoid hampering the economic or technological development of the State or international co-operation in the field of peaceful nuclear activities and that the Agency is to take every precaution to

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[307] Statement by Brazil, GOV/COM.22/2/Add.3, para. 26.C; statement by Australia, GOV/COM.22/OR.18 para. 1; statement by India, GOV/COM.22/OR.17, para. 4.

[308] Statement by Australia, GOV/COM.22/2 para. 1.4.a.

[309] Statement by India, GOV/COM.22/2, para. 5.D.11; also see statement by the Philippines, GOV/COM.22/OR.17, para. 22.

[310] Shaker, *op. cit.*, pp. 762-763.

protect commercial and industrial secrets and other confidential information coming to its knowledge in the implementation of this Agreement[311]

This was considered insufficient and had to be expanded. This occurred over Hungarian warnings that undue stress on verification minimisation, which had always been an Agency safeguards principle, risked reducing safeguards system effectiveness.[312] The formulation adopted sharply strengthened injunctions against Agency hampering of a state's peaceful activities as compared to INFCIRC/66. The IAEA was instructed to implement safeguards in a manner consistent with prudent management practices, not to publish or communicate information obtained, to take full account of technical safeguards developments, and to ensure optimum cost effectiveness.[313] Nevertheless, some states felt these injunctions an insufficient replacement for specific measures.[314] Protective measures were eventually incorporated, including that a state could request that the Agency examine sensitive design information on its own premises.[315]

Related to the protection of economic interests was the pressurise for the Agency to implement safeguards in a "cost-effective" way in order to reduce the high costs. Having a specific vision of cost-effectiveness lead negotiators to name measures in INFCIRC/153 which they considered cost-effective. These focussed on material accountancy with containment and surveillance as complementary measures. They used statistical techniques and concentrated on certain parts of the fuel cycle containing materials from which nuclear weapons could readily be made.[316] Cost-effectiveness was, however, quickly pushed aside for national commercial interests. Negotiators rejected extensive usage of resident `inspectorates' which was identified as a means to reduce travel costs, manage visa formalities and effectively carry out unannounced inspections.[317]

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[311] GOV/COM.22/3, para. 3.

[312] Statement by Hungary, GOV/COM.22/OR.12, para. 11.

[313] INFCIRC/153, Articles 4-6.

[314] Statement by Belgium, GOV/COM.22/2/Add.1, para. 14.4.d.

[315] INFCIRC/153, Article 8.

[316] *Ibid.*, paras. 6.a-c and 29.

[317] Fischer and Szasz, *op. cit.*, p. 156.

Limits of Agency Activities

The negotiators of INFCIRC/153 thus took a conservative view of safeguards. Japan led but was not alone in seeking to eliminate or restrict critical verification methods. Among the proposals were:

- exempting ores and ore processing from safeguards[318];
- verifying containment effectiveness by direct observation of nationally installed instruments, seals and other devices, as opposed to allowing the Agency to install its own devices[319];
- preventing inspectors being stationed in States with facilities which qualified for unrestricted access[320];
- abolishing the concept of unannounced visits[321]; and
- inserting injunctions against the Agency stopping operations as it could under INFCIRC/66, with no provision for the Board to override them.[322]

These efforts were only partially effective. Uranium and thorium stocks were made subject to reporting, but safeguards started when nuclear material of a composition and purity suitable for fuel fabrication or enrichment left a plant or process stage.[323] The IAEA was not denied any of the other rights as proposed above, but they were given the injunction to be as unintrusive as possible. While legally the Agency was not constrained, politically the positions adopted by states made a lasting impression.

In view of the interests of some states to limit the system, it is hardly surprising that the resulting model represented a rigid framework within which the IAEA had to operate. The Agency was narrowly constrained in its approach (material

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[318] This was supported by producers of uranium and thorium. Statement by Australia, GOV/COM.22/2, para. I.4.B; statement by South Africa, GOV/COM.22/OR.1 para. 27; statement by Portugal, GOV/COM.22/2/Add.4, para. 29.C.12; statement by Turkey, GOV/COM.22/Doc.2/Add.3/Mod.1, para. 27.F.12.

[319] Statement by Japan, GOV/COM.22/117; statement by Poland, GOV/COM.22/OR.49, para. 25; compare with original in GOV/COM.22/62/Rev.1, para. 38(e).

[320] Statement by Japan, GOV/COM.22/OR.35, para. 18.

[321] Statement by Japan, GOV/COM.22/OR.66, paras. 61-62.

[322] Statement by the United States, GOV/COM.22/OR.24, para. 15. A milder formulation was adopted. (INFCIRC/153, para. 5(b).)

[323] INFCIRC/153, para. 34.

balance area, MBA); its activities (e.g. design review, inspection); its required emphasis on cost-effectiveness (containment, statistical techniques)[324]; the areas of the fuel cycle it concentrated on (production, processing, use or storage of nuclear-weapons-usable material)[325]; the manner in which it applied safeguards (for cost-effectiveness, to avoid interference and to be consistent with prudent management practices)[326]; and the purposes for which it could implement different measures.[327] The system offered little flexibility to cope with a changing environment. The main avenue for adjusting measures to meet environmental changes was Article 74 (e), the right to use other objective methods demonstrated to be technically feasible. As reasonable as this sounded, the Agency faced a non-receptive Board.

Since safeguard measures were designed to prevent diversion, the system operated on the assumption that a state would utilise its safeguarded operations to acquire nuclear weapons. Little credence was given to the possibility of a parallel clandestine programme. This contributed to the lack of interest in more proactive safeguards approaches towards such programmes. As the Governor from Italy noted:

> We cannot conceive of a situation where the Agency would have to concern itself with materials which a party to the Treaty has not itself placed on the inventory in terms of the agreement concluded with the Agency.[328]

INFCIRC/153 was based on the presumption that all participating states had an obligation to declare all nuclear materials. However, where there was a question of undeclared materials, as the Agency had no policing power and no authorisation to collect intelligence.[329] The ability of the IAEA to address concerns of clandestine activities were limited. If the Board, upon examination of information reported by the

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[324] INFCIRC/153, para. 6.

[325] *Ibid.*, para. 6(c).

[326] *Ibid.*, para. 4.

[327] See INFCIRC/153, paras. 71-73 for the purposes of the different types of inspection and para. 46 for the purposes of the examination of design information.

[328] Statement by Italy, GOV/COM.22/2/Add.1, para. 17.4. For a corresponding proposal see statement by South Africa, GOV/COM.22/8, para. 2.

[329] J. M. Rames, The Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons in the Non-Nuclear-Weapon States of EURATOM Pursuant to the Agreement among the EURATOM Non-Nuclear-Weapon States, EURATOM and the International Atomic Energy Agency, Sub-Thesis, Australian National University, May 1983, p. 33.

Director General, found that the Agency was unable to verify that no diversion of nuclear material has taken place, it may take action.[330] At the time of the negotiations, the focus was not on detecting clandestine programmes as it was still an area that states preferred to leave to national governments. At the time, the US representatives indicated to an IAEA official that Agency did not need to search for clandestine activities as the United States would provide information when necessary.

In ensuring a limited system, many states held that safeguards regulations must remain separated from physical protection, which was a state's internal responsibility.[331] Despite Secretariat efforts, physical protection measures remained unverified and uncontrolled.[332] Few states recognised the role of physical protection in the safeguards system. Echoing I. I. Rabi, the Governor of Australia noted that

> physical security would represent a more direct approach to the problem [of safeguarding] as opposed to information derived from MBA which might be misleading.[333]

Nevertheless, the majority gave no indication of appreciating the role that a credible physical protection system could add to the assurances provided by safeguards.

Finally, the "give and take" approach towards safeguards re-emerged. Since the Agency covered entire national programmes, some arguments for the reduction of safeguards on power reactors and other facilities deemed unlikely diversion points were made.[334] Routine inspection lost critical relevance and numerical reductions were considered.[335] Likewise, advance notification of transfers among the NNWSs was perceived as both unnecessary and a complication to safeguards rather than increasing efficiency.[336]

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[330] INFCIRC/153, para. 18.

[331] Statement by Japan, GOV/COM.22/2, para. 7.1.

[332] GOV/COM.22/3, Part I, para. 5(a).

[333] Statement by Australia, GOV/COM.22/OR.35, para. 13. Also see statement by Egypt, GOV/COM.22/OR.51, para. 23.

[334] Statement by Australia, GOV/COM.22/2, para. 1.4.c.

[335] Statement by the FRG, GOV/COM.22/OR.50, para. 23.

[336] Statement by Norway, GOV/COM.22/OR.51, paras. 49-50; supported by Italy and Japan, GOV/COM.22/OR.51, para. 51.

Denial of Knowledge to the Agency

The safeguards structure encouraged states to deny information to the control body. Numerous Committee members shared the conviction that Agency-held commercial information was at risk, and therefore the Agency should be strictly limited in requesting information.[337] A proposal, reminiscent of Atoms-for-Peace, to accord the Agency a clearinghouse function relative to intended nuclear material movements was rejected lest it be difficult to verify accuracy and be subject to misuse.[338] Similarly, allowing the IAEA to use *all* available information on quantities and location of nuclear material for verification was also dismissed:

> If verification was to include establishing the validity of all information from all sources on the quantities and locations of nuclear material held by a State, the door would be opened to all kinds of activities that were not provided for in the NPT or in the documents before the Committee. To take one hypothetical case: relations between two States might be deteriorating, and one might supply "information" to the Agency that the other was accumulating large quantities of weapons-grade nuclear fuel [...] the Agency would be authorized to initiate what would amount to police procedures to establish the validity of that "information", which was clearly not the intention of the sponsor. [339]

While there was no question about adopting a material balance area (MBA) approach, there was an effort to enhance its secrecy aspects. Opponents of safeguards proposed numerous potentially damaging measures:

- confining reporting to nuclear material flow and facility features pertaining to such flow[340];
- omitting blueprints in the requirements for facility design information[341];

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[337] Observation by the United States, GOV/COM.22/OR.8, para. 28.

[338] *Review of the Negotiating History of the IAEA Safeguards Document INFCIRC/153*, International Energy Associates Limited, 30 July 1984, p. 269.

[339] Statement by Australia, GOV/COM.22/OR.37, para. 96; also see proposal by the United States of America, GOV/COM.22/81.

[340] Statement by Japan, GOV/COM.22/OR.8, para. 26 and GOV/COM.22/17.

[341] Statement by Italy, GOV/COM/2/Add.1 para. 17.18.(h).

- restricting the IAEA from requiring material transfer notifications between NPT parties[342];
- permitting limited advance notification of transfers thus avoiding commercial disclosures, with full notification only after transaction completion[343];
- discontinuing routine IAEA access to operating reports and permitting access only on request[344];
- exempting nuclear material not subject to NPT safeguards from reporting requirements[345];
- limiting Agency inspection rights to nuclear material and its flow[346]; and
- limiting access to strategic points except when abnormal losses are reported and accompanied by justification for additional access.[347]

While these extreme measures were rejected because they would create serious gaps in Agency knowledge, opponents were successful keeping information supplied to a minimum. For example, operating records were to be kept but regular operating reports were not required. Instead, operational information, clarifying inventory changes, was submitted as explanatory notes and the Agency could request additional information if the explanation was insufficient.[348] In the event, the IAEA was implicitly

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[342] Statement by Norway, GOV/COM.22/OR.51, para. 49.

[343] Statement by Belgium, GOV/COM.22/OR.12, para. 52; also see statement by the United States, GOV/COM.22/OR.29, para. 66.

[344] Statement by The FRG, GOV/COM.22/OR.29, para. 16 and GOV/COM.22/OR.43, para. 51; statement by Japan, GOV/COM.22/OR.43, para. 53; statement by United Kingdom, GOV/COM.22/OR.28, para. 61.

[345] Statement by South Africa, GOV/COM.22/OR.31 para. 40; statement by Italy, GOV/COM.22/OR.31, para. 41; statement by the United Kingdom, GOV/COM/OR.31 para. 42.

[346] Proposal by Japan, GOV/COM.22/116. The proposal, which removed all references to facilities, would have had the effect of restricting the inspector from questioning or investigating concerns on material flow but not directly related to the actual flow itself

[347] Statement by the FRG, GOV/COM.22/OR.30, para. 26; supported by South Africa GOV/COM.22/OR 30, para. 28. As noted by the United States, abnormal losses may not appear in a state's report (GOV/COM.22/OR.31, para. 24).

[348] INFCIRC/153, para. 64; GOV/COM.22/OR.43, paras. 20-21.

instructed to require the minimum information consistent with executing its responsibilities.[349]

The level of opposition constrained the ability of supporters of safeguards to ameliorate the damage to the system. The United States and the Secretariat supported starting safeguards with uranium concentrate produced by ore-producing plants on the basis that at the concentration stage, uranium in the product became significant from a safeguards perspective. South Africa categorically rejected the proposal. The compromise left safeguards beginning when material reached a composition and purity suitable for fuel fabrication, despite such material being suitable for isotopic enrichment. Thus, safeguards were applied when material left the plant or the process in which it was manufactured.[350]

The new structure created fundamental knowledge gaps for IAEA officials on nuclear activities expressly subject to safeguards.[351] No notification obligation existed for exporters of nuclear equipment or facilities, and so long as a facility of a transferred or indigenous origin contained no material, it was not subject to reporting or inspection requirements.[352] Information collection on transfers of uranium concentrates was also inadequate. The NNWSs were not obligated to report locations of materials that were not subject to inspection. Safeguards relied primarily on the integrity of states.[353]
In addition, because the NPT contained no provisions on non-explosive military uses, a number of states successfully inserted a loophole into the document to allow the removal of material from safeguards for non-nuclear non-explosive military use. This served to oblige those states considering the acquisition of nuclear-powered naval vessels, but not willing to accept foreign inspectors on military ships.[354]

The new inspection formula restricted the Agency's ability to quantitatively and qualitatively acquire knowledge as well. The concept of MBA was a poor replacement for full access rights under the Statute. Unlike INFCIRC/66, which placed no limitation

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[349] *Ibid.*, para. 8(b).

[350] Forland, 1997, *op. cit.*, pp.. 329-330; INFCIRC/153, para. 33.C.

[351] Fischer and Szasz, *op. cit.*, p. 159; Rainer and Szasz, *op. cit.*, p. 303.

[352] For a discussion see Fischer and Szasz, *op. cit.*, pp. 80-81.

[353] *Ibid.*, p. 159.

[354] Ben Sanders and John Simpson, *Nuclear Submarines & Non-proliferation: Cause for Concern*, Occasional Paper, PPNN, Southampton, No. 2, July 1988, p. 7.

on access during facility inspections and required no notice when dealing with sensitive quantities of materials, INFCIRC/153 required 24 hour notice for *ad hoc* inspections[355] at larger facilities[356], restricted access to strategic points and placed limits on the total "intensity" of inspection by measuring inspections in terms of man-days or man-years. A "knowledge" objective for inspection effort was set with maximum inspection level being "necessary and sufficient to maintain continuity of knowledge of the flow of inventory of nuclear material".[357]

If states were interested in keeping knowledge from the Agency on peaceful activities, they were even more hesitant when material was withdrawn from safeguards for non-peaceful, non-explosive purposes (i.e. for miliary power reactors). When a NNWS withdraws nuclear material from safeguards, it promises that the material will not be used for nuclear explosives. The state informs the Agency of the approximate length of the withdrawal and keeps the Agency informed of the total quantity and composition of withdrawn material and any export thereof. Withdrawal arrangements to be negotiated with the Agency were procedural only.[358]

With knowledge playing a key role in effective safeguarding, efforts to deny knowledge were reducing the IAEA's chance of providing assurances. In addition, states were effectively advocating a safeguarding culture of don't ask, don't tell. As will be seen in chapter five, effective safeguards required more information than the Agency had access to.

Onus on the Agency

The trend towards demands on the IAEA to work around the needs of member states continued. The IAEA was forced to provide services which it could not necessarily deliver. The MBA may have become the favoured approach but as the former long-term Czech member of SAGSI's Central Advisory Committee Jiri Beranek

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[355] Ad hoc inspections under INFCIRC/153 are for the purpose of verifying information contained in a states initial safeguards report on nuclear material; identify and verify changes in the situation which have occurred since the date of the initial report; and to identify and verify the quantity and composition of nuclear material before or after it is exported. (INFCIRC/153, para. 71.)

[356] However, routine inspections can be conducted without notice once a year.

[357] INFCIRC/153, para. 79.

[358] *Ibid.*, para. 14.

noted, "Strategic points made safeguards more expensive and complicated."[359] Agency views on workable solutions for safeguard problems were increasingly discounted. Starting from the NPT drafts, the superpowers resisted consulting with the IAEA.[360] When the US accepted the FRG's argument on the material balance approach, they made their discussions public and advocated the approach over IAEA protests. The United States bluntly responded to these concerns expressed by a former Agency official with the observation that "the purpose of the IAEA was not to serve itself but rather its member states."[361]

Safeguarding was seen as Agency business, not an exercise in which all party participation was needed for functionality. A West German proposal read:

> The visits and activities of Agency inspectors shall be so arranged as to ensure on the one hand the minimum possible inconvenience to the State and disturbance to the facilities inspected [sic].[362]

States showed no interest in shaping obligations to enhance the IAEA's ability to execute its duties. Rather than acting in partnership with the IAEA, states attempted to remove their safeguarding burden. One state even proposed that, because national accounting systems were an internal matter, each State should choose which Agency procedures most suited its needs. If a state rejected a procedure, the Agency might need special arrangements to carry out its verification functions.[363]

On measures for advanced export notification, states felt that procedures delaying international transfers, thus potentially damaging commercial interests, were a serious concern.[364] As a result, two weeks prior transfer notification was required but both transfers and dispersal on receipt could not be delayed by any Agency action

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[359] Author interview with Jiri Beranek, 3 March 1998.

[360] Quester, *op. cit.*, p. 170.

[361] Matthias Küntzel, "Germany and the Origin and History of the NPT", in Jaspers, *op. cit.*, p. 43.

[362] Proposal by the FRG, GOV/COM.22/29.

[363] Statement by Yugoslavia, GOV/COM.22/OR.37, para. 30; statement by India, GOV/COM.22/OR.37, para. 33.

[364] See for example statement by Italy, GOV/COM/2/Add.1, paras. 17.18-19.

taken or contemplated.[365] While limiting Agency flexibility, states increased their own by doubling their allotted time to report material movements and routine report submission from 30 days to 61 days.[366] The delay worked to state convenience but reduced the warning time provided by the Agency.

By compelling the Agency to adapt to the state, a new threat to control system effectiveness was created. The problem was acknowledged by Fischer and Szasz, who showed that a state could hide diversion by making it difficult for the IAEA to apply effective safeguards.[367] Catering to the requirements of states severely lengthened IAEA response time. If inspectors needed additional access or discovered that agreed strategic points were insufficient, a justification process for additional access was necessary. A delay in state responses could determine whether diversion was detected. Similarly, in unusual circumstances states could restrict previously agreed points of access contrary to their safeguards agreement.[368] Although states needed to arrange for the IAEA to discharge its responsibilities, exercising such options added to the Agency's burden in drawing timely conclusions and keeping costs down.

Even states that supported safeguards sought to target measures that could reduce their efforts. The United Kingdom resisted having included in states' initial inventory declarations retroactive reports on safeguard-exempt material for non-peaceful non-explosive use (e.g. materials used to construct military hardware). Its reluctance was attributed to complications anticipated in compilating data due to its wide use of exempted material in the past.[369] The NNWSs showed little sympathy and argued that denying such information on grounds of convenience risked raising suspicions and undermining confidence.[370]

At times the Agency, having developed a reticent organizational culture, hurt its own case. In formulating text on design information examination, the Secretariat proffered a draft text that moved further away from the explicit Agency right to approve or disapprove design, observing that "the main purpose of the design review

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[365] INFCIRC/153, paras. 92, 96.

[366] *Ibid.*, paras. 62-63; INFCIRC/66/Rev.2, para. 55.

[367] Fischer and Szasz, *op. cit.*, p. 161.

[368] INFCIRC/153, para. 76(d).

[369] Statement by the United Kingdom, GOV/COM.22/OR.39, para. 60.

[370] For example see statement by Hungary, GOV/COM.222/OR.39, para. 66.

is to obtain sufficient information about the facility to make possible the application of safeguards."[371] Design information was to be made available for establishment of Agency safeguards procedures.[372] There was now no question of whether safeguards could be applied but only how.[373] Although the proposed formulation was weaker than in INFCIRC/66, it was still rejected as too strong because it gave the Agency the power to reject a proposed design.[374] States agreed that even poorly designed facilities from the standpoint of *facilitating* safeguards could be effectively safeguarded, provided the Agency was permitted to apply adequate verification procedures.[375] States failed to recognise that an Agency which struggles to apply safeguards risked undermining the assurances the system was designed to provide.

This attitude not only directly contradicted the 1946 analysis that plant design was key to providing effective control dynamics, but also their IAEA consultants who were hired in 1969 to examine the material flow approach, and who also made a critical link between design and assurance:

> The overall relation between confidence levels and inspection effort is determined much more by plant characteristics and appropriate deployment of inspections than by number of measurements.[376]

In the Board's vision of a mechanistic system, there was no place for confidence-building.

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[371] GOV/COM.22/3, Part II, para. C.

[372] INFCIRC/153, paras. 46-48.

[373] *Review of the Negotiating History of the IAEA Safeguards Document INFCIRC/153, op. cit.*, p. 175.

[374] Statement by the United Kingdom, GOV/COM.22/OR.25, para. 23.

[375] *Review of the Negotiating History of the IAEA Safeguards Document INFCIRC/153, op. cit.*, p. 177.

[376] F. Morgan, *Report to the Director-General of the International Atomic Energy Agency by the Consultants on Criteria for Safeguards Procedures*, Topic 1, Part 1: Assumptions and Relevant Concepts, May 1969, p. 5, para. 15.

States' Rights to Influence their Safeguards Agreement

States made it clear that their sovereignty over their peaceful nuclear programmes was non-negotiable. The Governor from Italy noted:

> It cannot be sufficiently emphasized that the Agency has no powers of supervision or inspection other than those which the State itself entrusts to the Agency under the terms of the agreement which the State negotiates with the Agency.[377]

Some supporters, believing that a strong IAEA was necessary for effective safeguards, expressed concerns that the Agency would have no veto over transfers[378], no veto over State's rights to use safeguarded nuclear material in a non-safeguarded activity pursuant to NPT[379], no role in directing operations[380], and no responsibility regarding nuclear materials in transit.[381]

Although INFCIRC/153 was a model rather than an agreement guideline, states attempted to increase opportunities to influence their obligations under their safeguards agreement. Suggestions included:

- making containment equipment use and installation subject to agreement in the subsidiary arrangements[382];
- allowing parties to determine what was to be included in the inventory of materials placed under safeguards[383];
- leaving each party to decide for itself what equipment or material should fall under the NPT's export provisions (Article III.2)[384];

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[377] Statement by Italy, GOV/COM.22/2/Add.1, para. 17.4.

[378] Statement by the United Kingdom, GOV/COM.22/OR.12, para. 47.

[379] Statement by the United States, GOV/COM.22/OR.13, para. 7.

[380] Statement by the United Kingdom, GOV/COM.22/OR.29, para. 30; statement by the FRG, para. 34.

[381] Statement by Japan, GOV/COM.22/OR.30, para. 3.

[382] *Review of the Negotiating History of the IAEA Safeguards Document INFCIRC/153, op. cit.*, p. 220.

[383] Statement by Italy, GOV/COM.22/2/Add.1, para. 17.4.

[384] Statement by the FRG, GOV/COM.22/2/Add.1, para. 16.17.

- making inspection of non-operating facilities subject to "future, specific, case-by-case agreement" between the state and the Agency[385]; and
- subjecting access for inspections to specific limitations for health, safety, and security and allow the State to suspend access temporarily for such reasons.[386]

The three former proposals were not accepted. As for inspection of non-operating facilities, states decided to base inspection on the presence of materials. Thus, a non-operating facility would be subject to inspection if nuclear material was present. States were permitted to temporarily restrict access in unusual circumstances, but arrangements needed to be made promptly to enable the Agency to discharge its responsibilities.[387] Areas that the model left subject to negotiation included setting procedures for safeguarding nuclear materials that were in the state's opinion not practical for recovery but not qualifying for safeguard termination[388]; subsidiary arrangements[389]; notification of material transfers [390]; setting actual inspection efforts and establishing the location of MBAs in each facility.[391] States were also to make available information on health and safety procedures which the Agency needed to observe.[392]

Assisting states efforts to ensure their ability to assert influence over safeguards were time pressures to negotiate the model. Safeguards negotiators were forced to discuss safeguards before technical experts could complete the principles and procedures for the new MBA approach.[393] As a result, many of the model agreement articles were imprecisely worded, leaving ample room for interpretation.[394] In certain circumstances the Committee adopted general principles and stipulated that

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[385] Statement by Italy, GOV/COM.22/125; *Review of the Negotiating History of the IAEA Safeguards Document INFCIRC/153, op. cit.*, pp. 184-185.

[386] Statement by South Africa, GOV/COM.22/122.

[387] INFCIRC/153, para. 76(d).

[388] INFCIRC/153, para. 35.

[389] *Ibid.*, paras. 39-40.

[390] *Ibid.*, para. 92.

[391] *Ibid.*, para. 81.

[392] INFCIRC/153, para. 44.

[393] Ryukichi Imai, "Nuclear Safeguards", *Adelphi Papers*, No. 86, March 1972, p. 7.

[394] *Ibid.*, p. 7.

the details should be worked out in subsidiary arrangements. The outcome was that states once again had some bargaining power to negotiate the implementation of their safeguards agreements.

Implications

The resistance elucidated above yielded a control system that both detracted from and implemented the principles of control. NPT safeguards incorporated important improvements over INFCIRC/66. To verify NNWS NPT obligations, the system made strides in comprehensiveness by applying measures to materials throughout the entire core of a state's nuclear programme. The legal design provided greater consistency, since the document served as a model agreement rather than a set of guidelines allowing extensive variations in individual agreements.[395]

States did relinquish some sovereignty to enable the formation of a framework which was significantly more comprehensive in scope than its predecessor. NPT safeguards remain in force for all material generations and for as long as a state remain an NPT party, unless they were terminated by the Agency. INFCIRC/153 required states to erect a Safeguards System of Accounting and Control (SSAC) which, unlike its predecessor, allows inspection efforts to be influenced *inter alia* by the effectiveness of a state's SSAC.[396]

INFCIRC/153 increased Agency rights to make decisions involving technical tracking aspects to ensure safeguards standards were met. Under the new model, the IAEA determined what materials were practically irrecoverable.[397] The Agency gained the right to use and install its own equipment during inspections provided appropriate arrangements were made with the inspected state. Finally, INFCIRC/66's direct prohibition of stopping operations was softened in INFCIRC/153 para. 4(b) to a more general provision that the Agency avoid interference.

The model's approach to dealing with non-compliance included a small improvement over the existing system. It empowered the Board to call for corrective

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[395] Sanders, 1975, *op. cit.*, p. 13.

[396] INFCIRC/153, paras. 31-32, 81(b).

[397] *Ibid.*, para. 25.

action if it was deemed essential and urgent to ensure verification.[398] The core of the sanctioning regime stayed intact, however. Preventative authority remained absent since no mechanism existed to compel compliance nor were there any prescriptions for specific actions to be taken in response to certain types of non-compliant behaviour.

Serious problems remained. Inequities in application, a lack of disarmament, a heavy emphasis on promotion and protection of sovereignty resulted in a system that put heavy constraints on the IAEA. The inability to make concessions created dynamics that fed the view that control was a necessary evil at best and an unwanted child at worst. The limitations ensured that the system would not be flexible, nor would its structure evolve easily. In this round of negotiations, there were a few parties that endorsed Baruch era framework concepts. Some sympathies were expressed for an Agency role during safeguarded materials transport[399]; Agency need for knowledge about state activities[400]; assurance of adequate warning through increased and timely access especially where prompt action is necessary for drawing conclusions[401]; and strategies for a control system failure by rejecting state's right to withdraw from NPT obligations.[402] However, these views were subsumed because the NNWSs first needed to cope with fully submitting nuclear programmes to control while the NWSs received a fairly flexible deal.

XII. Conclusion

By 1972, the international control system reached maturity. In launching the IAEA, control advocates made compromises believing that the elementary control system would someday be strengthened to address the complete range of global nuclear threats. In the short-term, addressing nuclear proliferation would have to suffice as only measures suitable for non-proliferation were politically feasible. The period ended with an international organization presiding over an expanded technical system which states continually barraged with exclusionary messages.

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[398] INFCIRC/66, para. 18 simply referred to measures provided under the Statute. For further discussion see Imber, 1981, *op. cit.*, p. 243.

[399] Statement by UAR, GOV/COM.22/OR.51, para. 23.

[400] Statement by the IAEA Inspector General, GOV/COM.22/OR.31, para. 19.

[401] *Ibid.*, para. 19.

[402] GOV/COM.22/OR.16, para. 5.

The nature of control presented states with a dilemma. By virtue of their willingness to negotiate stronger controls they acknowledged a need for control to provide global security. However, control that provides high assurances requires meeting the principles of control. The partial measures may have met non-proliferation goals, but the limits of the system were evident. The adopted framework generated only partial participation, dissatisfaction for a variety of reasons and at times derision of the system.

In comparing the fully established system with the principles of effective control, the mechanism, targeting just nuclear proliferation, only met a portion of the principle requirements. The system aggravated rivalry more than it managed it, not only because it did not address all nuclear threats but because it was also inequitable. When the NPT failed to achieve nuclear disarmament in a definite timespan, it failed to address nuclear rivalries among the NWSs and created rivalries between the NWSs and the NNWSs which played out in safeguards negotiations. The two-class system functioned as a disincentive for NNWS participation, undermining universality and interest in a strong system. By allowing states to direct their own programmes, the system could not address latent threats from emergent nuclear energy programmes. The development of national energy programmes also undermined developing strict controls since economic interests took precedence. Economic interests ensured minimised transparency measures to be incorporated in the control system yielding a reduction in the Agency's knowledge base and decreased transparency of state's nuclear programmes.

The system did meet the criteria for incorporating non-negative characteristics. The NPT control system contained a positive element to promote nuclear energy under Article IV, but the positive element was overemphasised. A high demand for technical support became compensation for the system's inequities. Arguments against a reduction in the technical support were difficult to make if the NWS did not meet expectations of the NNWSs in achieving disarmament. Instead of being one of several aspects of a control system, the promotional side was set up as a competing objective. The new system, being designed to meet two objectives - economic security and military security - was inherently dysfunctional.

The system did not contain broad mechanisms to provide security in the event of a system breakdown. Although it contained procedures to coerce states found guilty of non-compliant behaviour, there were no measures to ensure compliant state security if a renegade acquired nuclear weapons. While system structure could be amended to meet environmental demands, the process was not simple. The Agency was limited to adjusting techniques allowed under the narrow system verification

objectives. Although system scope expanded, technical rigour was questionable. With controls focussed on materials, not facilities or activities, the framework was clumsy and contained technical loopholes. The design, however, was the price to be paid to make the system acceptable. At the time, the sacrifices in the level of assurances were not considered excessively detrimental. The future, however, would demonstrate the need for greater credibility as political relations shifted.[403]

On a more positive note, throughout the negotiations, some basic standards were established despite states best efforts to weaken the system through legal means. A sufficient majority saw that the international community needed to more in the direction of international control. Reticence on the part of states can be attributed to that the IAEA system was a novelty and therefore states needed a period to adjust to a new form of intrusive international cooperation. As they became more familiar with how the system operated, they found the system sufficiently valuable, that they were willing to extend it.

[403] For discussions on credibility vs. feasibility see Imber, 1980 *op. cit.*, pp. 180-181; Lawrence Scheinman, *The Nonproliferation Role of the International Atomic Energy Agency*, Resources for the Future, Washington, DC, 1985, pp. 64-67; Lawrence Scheinman, *The International Atomic Energy Agency and World Order*, Resources for the Future, Washington, DC, pp. 1987, pp. 230-242.